Comparison of photobiomodulation therapy and suprascapular nerve-pulsed radiofrequency in chronic shoulder pain: a randomized controlled, single-blind, clinical trial.

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Shoulder pain can be difficult to treat due to its complex anatomic structure, and different treatment methods can be used. We aimed to examine the efficacy of photobiomodulation therapy (PBMT) and suprascapular nerve (SSN)-pulsed radiofrequency (RF) therapy. In this prospective, randomized, controlled, single-blind study, 59 patients with chronic shoulder pain due to impingement syndrome received PBMT (group H) or SSN-pulsed RF therapy (group P) in addition to exercise therapy for 14 sessions over 2 weeks. Records were taken using visual analog scale (VAS), Shoulder Pain and Disability Index (SPADI), and Nottingham Health Profile (NHP) scoring systems for pretreatment (PRT), posttreatment (PST), and PST follow-up at months 1, 3, and 6. There was no statistically significant difference in initial VAS score, SPADI, and NHP values between group H and group P ($p > 0.05$). Compared to the values of PRT, PST, and PST at months 1, 3, and 6, VAS, SPADI, and NHP values were statistically significantly lower in both groups ($p < 0.001$). There was no statistically significant difference at all measurement times in VAS, SPADI, and NHP between the two groups. We established that PBMT and SSN-pulsed RF therapy are effective methods, in addition to exercise therapy, in patients with chronic shoulder pain. PBMT seems to be advantageous compared to SSN-pulsed RF therapy, as it is a noninvasive method.

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The effects of two different low level laser therapies in the treatment of patients with chronic low back pain: A double-blinded randomized clinical trial.

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OBJECTIVE: The purpose of this study was to compare the effectiveness of two different laser therapy regimens on pain, lumbar range of motions (ROM) and functional capacity in patients with chronic low back pain (CLBP). METHODS: Forty nine patients with CLBP were randomly assigned into two groups. Group 1 (n= 20) received hot-pack + laser therapy 1 (wavelength of 850 nm Gallium-Aluminum-Arsenide (Ga-Al-As) laser); group 2 (n= 29) received hot-pack + laser therapy 2 (wavelength of 650 nm Helium-Neon (He-Ne), 785 ve 980 nm Gal-Al-As combined plaque laser) for 15 sessions. Pain severity, patient's and physician's global assessments were evaluated with visual analogue scale (VAS). Modified Schober test, right and left lateral flexion measurements were done. Modified Oswestry Disability Questionnaire (MODQ) was used for evaluation of functional disability. Measurements were done before and after the treatment. RESULTS: After treatment there were statistically significant improvements in pain severity, patient's and physician's global assessment, ROM and MODQ scores in both groups (P< 0.05). After the treatment there were statistically significant differences between the groups in lateral flexion measurements and MODQ scores (P< 0.05) except in pain severity, Modified Schober test, patient's and physician's global assessments (P> 0.05) in favor of those patients who received combined plaque laser therapy (group 2). CONCLUSION: Laser therapy applied with combined He-Ne and Ga-Al-As provides more improvements in lateral flexion measurements and disability of the patients, however no superiority of the two different laser devices to one another were detected on pain severity.`

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Low intensity laser and LED therapies associated with lateral decubitus position and flexion exercises of the lower limbs in patients with lumbar disk herniation: clinical randomized trial.

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The objective of this study is to evaluate the effectiveness of laser and LED therapies, associated with lateral decubitus position and flexion exercises of the lower limbs in patients with lumbar disk herniation (LDH). It is a randomized blinded clinical trial. Fifty-four subjects with LDH L4-L5 and L5-S1 were selected and randomly allocated into groups: laser 904 nm, placebo, and LED 945 nm. The numbers of subjects for each group that completed the treatment were 18, 13, and 18, respectively. Twelve points over the lumbar spine region (L2 to S1) and eight points on the injured thigh in the path of the lumbar roots L5 and S1 were irradiated. Irradiation parameters for each point were as follows: laser wavelength 904 +/- 10 nm, average power 0.038 +/- 20 % W, irradiated area 0.16 cm2, energy per point 4 J, and treatment time per point 104 s; LED wavelength 945 +/- 15 nm, power 0.1 W, irradiated area 1.0cm2, energy per point 4 J, and treatment time per point 40 s. Lateral decubitus opposite to the side of the radicular was the standard position for all patients. After phototherapy and laser placebo sessions, the subjects performed sequences of flexion exercises of the lower limbs (ten per session) for 15 daily sessions. VARIABLES STUDIED: pain intensity assessed by visual analog scale (VAS), degree of flexion of the affected hip measured by the universal goniometer and functional capacity assessed by the Oswestry Disability Index. The three groups had statistically significant improvement in lumbar and radicular pain, in hip mobility, and in the functional disability index ($p </= 0.001$). There was a statistically significant difference ($p = 0.024$) in radicular pain between the groups, gait claudication and Oswestry Disability Index. We can conclude that in the treatment of L4-L5 and L5-S1 LDH with radiculopathy, LED, associated with lateral decubitus position and flexion exercises of the lower limbs, showed better therapeutic performance for radicular pain, gait claudication, and functional disability.

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Photobiomodulation of the dorsal root ganglion for the treatment of low back pain: A pilot study.

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BACKGROUND AND OBJECTIVE: Chronic low back pain is a worldwide public health issue with high socioeconomic impact. The aim of this study was to determine the efficacy of laser irradiation of the dorsal root ganglion of the second lumbar spinal nerve for chronic axial low back pain compared to lidocaine injection and radiofrequency treatment. STUDY DESIGN/MATERIALS AND METHODS: Twenty-eight patients were randomly divided into three treatment groups: lidocaine injection, radiofrequency, or laser. The second intervertebral foramen between the second and third lumbar vertebrae was accessed by percutaneous needle puncture bilaterally, guided by fluoroscopy. In the local anesthetic group, injection of 1 ml lidocaine without epinephrine was applied through a 20-gauge (G20) Quincke tip spinal needle inserted in the second lumbar intervertebral foramen. In the radiofrequency group, the probe (150 mm long with a 5 mm active tip) was directed through a G20 needle placed in the second lumbar intervertebral foramen and neuromodulation was done with a radiofrequency of Cosman G4(R) in pulses of 20 ms with wash-out period of 480 ms, for 300 seconds at 42 degrees C. A single treatment was used. In the laser treatment group, a continuous wave, 808 nm wavelength diode laser (Photon Lase III(R) DCM, Brazil), with an output power of 100 mW was used for a single treatment. An 18 gauge needle was placed in the second lumbar intervertebral foramen guided by fluoroscopy. Light was delivered through a 600 microm optical fiber placed in the G18 needle. The tip of the fiber extended 5 mm beyond the tip of the needle in the second lumbar intervertebral foramen. The beam spot size was 0.003 cm2 , irradiance = 35W/cm2 , exposure time = 84 seconds, energy density = 2800J/cm2 , total energy was 8.4 J. The low back pain score was assessed by the visual analog scale (VAS) and Pain Relief Scale (PRS) pre, post procedure and in 1 month follow up. Temperature was measured using a digital thermometer. RESULTS: All patients in the local anesthetic and laser treatment groups reported a pain reduction of at least 50% immediately post-procedure and 10 out of 11 patients in the radiofrequency group reported a pain reduction of at least 50%. At 1 month post-treatment, the laser treatment group had the greatest number of patients who reported more than 50% pain relief based on PRS (7 out of 10 patients) while only 2 out of 7 patients and 3 out of 11 patients in the lidocaine and radiofrequency treatment groups respectively reported more than a 50% pain relief. CONCLUSION: Laser irradiation caused an immediate decrease in low back pain post-procedure similar to pain reduction caused by lidocaine injection. Both lidocaine injection and laser irradiation were more effective than radiofrequency treatment for immediate and longer term (1 month post-treatment) chronic back pain. Lasers Surg. Med. (c) 2016 Wiley Periodicals, Inc.

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Effect of manual therapy and neurodynamic techniques vs ultrasound and laser on 2PD in patients with CTS: A randomized controlled trial.

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STUDY DESIGN: Randomized controlled trial. INTRODUCTION: Two-point discrimination (2PD) test can be used to assess both clinical condition and the effects of therapy in carpal tunnel syndrome (CTS) patients. PURPOSE OF THE STUDY: To determine whether there are specific differences in 2PD between symptomatic and asymptomatic hands in CTS patients and to evaluate the impact of 2 therapy regimes on 2PD in patients with CTS. METHODS: Therapy for the neurodynamic mobilization group was based on manual therapy and neurodynamic techniques. Therapy for the electrophysical modalities group was based on red and infrared laser and ultrasound therapy using a contact method applied in the transverse ligament area. Therapeutic cycle consisted of 20 therapy sessions delivered at twice-weekly intervals. RESULTS: After therapy, 2PD in the symptomatic limbs in the neurodynamic mobilization and electrophysical modalities groups significantly improved ($p < .001$). However, there was no statistically significant difference between the treatment groups. CONCLUSIONS: Both therapy programs used in this study were beneficial for improving 2PD. LEVEL OF EVIDENCE: 2.

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Efficacy of high-intensity laser therapy in the treatment of chronic neck pain: a randomized double-blind placebo-control trial.

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The aim of the study was to investigate the effect of high-intensity laser therapy (HILT) in treatment of patients with chronic neck pain (CNP) on cervical range of motion (ROM), pain, and functional activity. Sixty male patients participated in this study with mean (SD) age of 35.47 (4.18) years. Patients were randomly assigned into two groups and treated with HILT plus exercise (HILT + EX) and placebo laser plus exercise (PL + EX) in groups 1 and 2, respectively. The outcomes measured were cervical ROM, pain level by visual analog scale (VAS), and functional activity by neck disability index (NDI) score. Statistical analyses were performed to compare the differences between baseline and post-treatment. The level of statistical significance was set as $p < 0.05$. Cervical ROM significantly increased after 6 weeks of treatment in all groups. VAS and NDI results showed significant decrease post-treatment in both groups. HILT + EX effectively increased cervical ROM and decreased VAS and NDI scores after 6 weeks of treatment compared to PL + EX. HILT + EX is an effective physical therapy modality for patients with CNP compared to PL + EX therapy. The combination of HILT + EX effectively increased cervical ROM, functional activity, and reduced pain after 6 weeks of treatment.

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Photobiomodulation and eccentric exercise for Achilles tendinopathy: a randomized controlled trial.

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BACKGROUND: The common regime of eccentric exercise in use for Achilles tendinopathy is somewhat arduous and compliance issues can arise. This is the first study to investigate the effectiveness of a regime of fewer exercise sessions combined with photobiomodulation for the treatment of Achilles tendinopathy. METHODS: A double blind randomized controlled trial and intention-to-treat analysis were performed. Eighty participants, 18-65 years with Achilles tendinopathy and symptoms for longer than 3 months, were included in the trial. Participants randomized into one of four groups; 1 (Placebo + Ex Regime 1) or 2 (Laser + Ex Regime 1) or 3 (Placebo + Ex Regime 2) or 4 (Laser + Ex Regime 2). The primary outcome measure was the Victorian Institute of Sports Assessment-Achilles (VISA-A) questionnaire. Outcomes were collected at baseline, week 4 and week 12. RESULTS: Sixteen participants were lost to follow-up at 12 weeks, 4 of which due to adverse reactions. As per intention to treat, missing data were imputed, 80 participants were included in the final analysis. For VISA-A at 12 weeks, group 4 achieved significant gains over the other 3 groups: group 1 (18.5 [9.1, 27.9]), group 2 (10.4 [1.5, 19.2]), group 3 (11.3 [3.0, 19.6]). There was a moderate effect size in favour of exercise twice per week (7.2 [-1.8, 16.2], ES .7). CONCLUSIONS: Twice-daily exercise sessions are not necessary as equivalent results can be obtained with two exercise sessions per week. The addition of photobiomodulation as adjunct to exercise can bring added benefit.

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Outcome of low level lasers versus ultrasonic therapy in de Quervain's tenosynovitis.

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BACKGROUND: de Quervain's tenosynovitis is an inflammation of abductor pollicis longus (APL) and extensor pollicis brevis (EPB) muscle tendon sheaths at the level of radial styloid process. Its conservative management includes nonsteroidal anti-inflammatory drugs, wrist and thumb immobilization, ultrasonic therapy (US Th.) and low level laser therapy (LLLT). Literature is scanty on comparative efficacy of US Th. and LLLT for its management. This prospective study evaluates outcome of US Th. versus LLLT in de Quervain's disease. MATERIALS AND METHODS: Thirty patients clinically diagnosed de Quervains tenosynovitis were included in the study and randomly assigned to two groups. The average age was 36 years (range: 21-45 years). One group was given LLLT and the other US Th. for a total of 7 exposures on alternate days. The clinical criteria used were Finkelstein's test, tenderness over radial styloid (Ritchie's tenderness scale), grip strength, pain (visual analog scale [VAS]) and radiological criteria was ultrasonographic assessment of change in thickness of APL and EPB tendon sheath. They were measured before commencement and at the end of seven sessions of therapy, as per standard procedure. RESULTS: Significant improvement was seen within both groups in the following outcome measures assessed: Ritchie's tenderness scale, grip strength and VAS. Finkelstein's test was not significantly improved in either groups. Ultrasonographic measurement of tendon sheath diameters, the mediolateral (ML), and anteroposterior (AP) diameters was not found to be significantly different in the US Th. group and the laser therapy group after treatment. On comparing both the groups, no statistically significant difference was found. However, looking at the mean values, the grip strength and VAS showed better improvement in the US Th. group as compared to the laser therapy group.

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Efficacy of low-level laser therapy associated to orthoses for patients with carpal tunnel syndrome: A randomized single-blinded controlled trial.

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OBJECTIVE: Compare the efficacy of orthoses and patient education with and without the addition to Low-Level Laser Therapy (LLLT - 660 nm, 30 mW, a continuous regime and bean area of 0.06 cm2). The laser irradiation was delivered with the fluency of 10J/cm2 in patients with mild and moderate Carpal Tunnel Syndrome (CTS). METHODS: 48 patients were randomized and 30 finished the protocol (a sample loss of 37.5%), 90% female and 10% males. Randomization was applied to allocate the patients in each one of the groups, with association or not to LLLT (group orthoses or LLLT and orthoses). All of them were submitted to ergonomic home orientations. The short-term symptoms and function outcome were assessed through: Boston Carpal Tunnel Questionnaire (BCTQ) - Severity of Symptoms (SS) Functional Score (FS). Pain (VAS), Semmes-Weinstein monofilaments, 2PD and pinch strength was used for characterization of the sample. Most of the participants were women, over 4th decade enrolled on heavy hand duties occupations, right-handed, 66.7% affected on dominant hand, without alterations in sensory median nerve thresholds or pinch strength. RESULTS: Both groups showed a reduction of total BCTQ score and its subdomains after six weeks, with significant difference ($p< 0.05$), comparing to baseline. No significant difference was found between groups. A Minimal clinical change was observed after the intervention in 92.3% of participants for BCTQ subdomain severity of symptoms at individual comparison for LLLT and orthoses group and 76.5% for the orthoses group, demonstrating clinical relevance. Effect size Cohen's index was moderate for the severity of symptoms. CONCLUSION: LLLT in association to orthoses and ergonomic orientation seems to be effective in short-term symptoms relieve for patients with mild and moderate CTS.

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Does addition of low-level laser therapy (LLLT) in conservative care of knee arthritis successfully postpone the need for joint replacement?

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The current study evaluates whether the addition of low-level laser therapy into standard conventional physical therapy in elderly with bilateral symptomatic tri-compartmental knee arthritis can successfully postpone the need for joint replacement surgery. A prospective randomized cohort study of 100 consecutive unselected elderly patients with bilateral symptomatic knee arthritis with each knee randomized to receive either treatment protocol A consisting of conventional physical therapy or protocol B which is the same as protocol A with added low-level laser therapy. The mean follow-up was 6 years. Treatment failure was defined as breakthrough pain which necessitated joint replacement surgery. After a follow-up of 6 years, patients clearly benefited from treatment with protocol B as only one knee needed joint replacement surgery, while nine patients treated with protocol A needed surgery ($p < 0.05$). We conclude low-level laser therapy should be incorporated into standard conservative treatment protocol for symptomatic knee arthritis.

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LASER versus electromagnetic field in treatment of hemarthrosis in children with hemophilia.

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Children with hemophilia usually have recurrent joint bleeding that leads to joint damage, loss of range of motion, and restriction of mobility, therefore affecting the quality of life in these children. The purpose of this study was to compare the effects of low-level laser therapy (LLLT) to that of pulsed electromagnetic field (PEMF) in treatment of hemarthrosis in children with hemophilia. Thirty boys with hemophilia A with ages ranging from 9 to 13 years were selected and assigned randomly, using sealed envelopes, into two equal intervention groups. The study group I received the traditional physical therapy program in addition to LLLT, whereas the study group II received the same physical therapy program given to the study group I in addition to PEMF. Both groups received the treatment sessions three times per week for three successive months. Pain, laboratory investigations, swelling, and range of motion (ROM) of the affected knee joint, in addition to physical fitness were evaluated before, at the end of the sixth week and at 12 weeks of the treatment program. Laser group showed significant improvement in all measured variables after the sixth week of treatment when compared with PEMF. By 12 weeks of treatment, there was a significant improvement in pain, ROM, ESR and leucocytes levels in laser group compared with PEMF, while there was no significant difference in knee circumferences and the 6-min walk test (6MWT) between both groups. Both groups showed significant improvement at 12 weeks of treatment compared with that at 6 weeks. Both LLLT and PEMF are effective modalities in reducing pain, swelling, increasing ROM and improving physical fitness. Twelve weeks of treatment of both modalities demonstrated significant improvement than 6 weeks of treatment. Laser therapy induced significant improvement than electromagnetic therapy in treatment of hemarthrosis-related problems in children with hemophilia.

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Long-term effect of pulsed high-intensity laser therapy in the treatment of post-mastectomy pain syndrome: a double blind, placebo-control, randomized study.

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We assess the long-term effect of pulsed high-intensity laser therapy (HILT) in the treatment of the post-mastectomy pain syndrome (PMPS). A total of 61 women participated in this study (30 in the laser group and 31 in the placebo laser group), with a mean age of 53.56 +/- 1.11 years. Patients who were randomly assigned to the laser group received HILT three times per week for 4 weeks, plus a routine physical therapy program (RPTP). The placebo laser group received placebo HILT plus RPTP. The outcomes measured were pain level by visual analog scale (VAS), shoulder range of motion (ROM), and quality of life (QOL). Statistical analysis was performed by ANOVA with repeated measures to compare the differences between baseline and post-treatment measurements and after 12 weeks of follow-up for both groups. The level of statistical significance was set at $P < 0.05$. Shoulder ROM significantly increased in the laser group after 4 weeks of treatment and after 12 weeks of follow-up compared with the placebo group. VAS results showed a significant decrease post-treatment in the laser group relative to the placebo group, and QOL results showed a significant improvement in the laser group compared with the placebo group and still improved after 12 weeks of follow-up. HILT combined with an RPTP appears to be more effective in patients with PMPS than a placebo laser procedure with RPTP.

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The "at-home LLLT" in temporo-mandibular disorders pain control: a pilot study.

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OBJECTIVES: The Temporo-Mandibular Disorders (TMD) are a set of dysfunctional patterns concerning the temporo-mandibular joints (TMJ) and the masticatory muscles; its main symptom is pain, probably caused by inflammatory changes in the synovial membrane, alterations in the bone marrow of the mandibular condyle and impingement and compression. The aim of this preliminary study was to investigate the effectiveness in the TMD pain reduction of a new laser device recently proposed by the commerce that, due to its reduced dimensions and to be a class I laser according the ANSI classification, may be used at home by the patient himself. MATERIAL AND METHODS: Twenty-four patients with TMD were randomly selected: the inclusion criteria for the sample was the diagnosis of mono- or bi-lateral TMD, with acute pain restricted to the joint area, associated with the absence of any muscle tenderness during palpation. The patients were randomly assigned to two groups: Group 1 (12 patients): patients receiving real LLLT (experimental group). Group 2 (12 patients): patients receiving inactive laser (placebo group). The treatment was performed once a day for two weeks with an 808 nm diode laser by the patient himself with irradiation of the cutaneous zone corresponding to the TMJ for 15 minutes each side. Each patient was instructed to express its pain in a visual analogue scale (VAS) making a perpendicular line between the two extremes representing the felt pain level. Statistical analysis was realized with GraphPad Instat Software, where $P<0.05$ was considered significant and $P<0.01$ very significant. RESULTS: The patient's pain evaluation was expressed in the two study groups before the treatment, 1 week and two weeks after the treatment. The differences between the two groups result extremely significant with $p<0.0001$ for the comparison of VAS value after 1 and 2 weeks. CONCLUSION: This study, even if it may be considered such a pilot study, investigated a new way to control the pain in the temporo-mandibular diseases by an at home self administered laser device. RESULTS are encouraging but they will have to be confirmed by greater studies.

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Short-term effects of high-intensity laser therapy on frozen shoulder: A prospective randomized control study.

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BACKGROUND: Frozen shoulder, which is characterized by shoulder pain and limitation of the range of motion (ROM), is a common disorder. High-intensity laser therapy (HILT) was recently introduced in the musculoskeletal therapeutic field. OBJECTIVE: The objective of this study is to evaluate the clinical efficacy of HILT in patients with frozen shoulder. DESIGN: A prospective randomized controlled study. METHOD: Patients with frozen shoulder were randomly divided into 2 groups: a HILT group (n = 33) and a placebo group (n = 33). The treatment was administered 3 times per week on alternate days for 3 weeks. For all patients, the visual analog scale (VAS) for pain, VAS for satisfaction, and passive ROM were measured at baseline and 3, 8, and 12 weeks after the treatment. RESULTS: The HILT group had a lower pain VAS score at 3 weeks (3.2 +/- 1.7 vs. 4.3 +/- 2.2, p = 0.033) and 8 weeks (2.2 +/- 2.0 vs. 3.4 +/- 2.7, p = 0.042), however, no statistically significant difference in the pain VAS was observed between the two groups at the final follow-up (12 weeks). No statistical difference in the ROM and the satisfaction VAS was observed between the 2 groups at serial follow-ups. CONCLUSIONS: In management of frozen shoulder, HILT provided significant pain relief at 3 and 8 weeks, but not at the final follow-up time point. HILT is a noninvasive adjuvant treatment that can reduce pain in frozen shoulders. Further study is needed in order to optimize the dose and duration of HILT.

Man Ther 2015 Mar 2

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Effect of MLS((R)) laser therapy with different dose regimes for the treatment of experimentally induced tendinopathy in sheep: pilot study.

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OBJECTIVE: The aim of this preliminary study was to investigate the effect of Multiwave Locked System (MLS((R))), a particular model of low-level laser, in the acute phase of collagenase-induced tendon lesions in six adult sheep randomly assigned to two groups. BACKGROUND DATA: Tendon injuries are common among human athletes and in sport horses, require a long recovery time, and have a high risk of relapse. Many traditional treatments are not able to repair the injured tendon tissue correctly. In recent years, the use of low-level laser therapy (LLLT) produced interesting results in inflammatory modulation in different musculoskeletal disorders. METHODS: Group 1 received 10 treatments of MLS laser therapy at a fluence of 5 J/cm(2) on the left hindlimb. Group 2 received 10 treatments of MLS laser therapy at a fluence of 2.5 J/cm(2) on the left hindlimb. In every subject in both groups, the right hindlimb was considered as the control leg. RESULTS: Clinical follow-up and ultrasonography examinations were performed during the postoperative period, and histological examinations were performed at day 30 after the first application of laser therapy. In particular, results from histological examinations indicate that both treatments induced a statistically significant cell number decrease, although only in the second group did the values return to normal. Moreover, the MLS laser therapy dose of 2.5 J/cm(2) (group 2) caused a significant decrease of vessel area. CONCLUSIONS: In this study, clinical and histological evaluation demonstrated that a therapeutic dose <5 J/cm(2) furnished an anti-inflammatory effect, and induced a decrease of fibroblasts and vessel area. Overall, our results suggest that MLS laser therapy was effective in improving collagen fiber organization in the deep digital flexor tendon.

Photomed Laser Surg 2015 Mar 33(3) 154-63

http://www.ncbi.nlm.nih.gov/pubmed/?term=25751667

Low level laser effect in treatment of patients with intractable tinnitus due to sensorineural hearing loss.

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INTRODUCTION: Tinnitus is defined as a perception of sound without an external acoustic stimulus. Due to large number of causes and limited knowledge of its pathophysiology, tinnitus still remains an obscure symptom. METHODS: This was a cross-sectional study on 120 patients with tinnitus and sensorineural hearing loss who were randomly divided into two groups; one group received low-level laser and the second group used the same instrument but off, for 20 sessions of 20 minutes. A tinnitus handicap inventory (THI) and Visual Analog Scale (VAS) were used to evaluate the severity of patients' symptoms. Severity and frequency of tinnitus were also determined using Audiometric tests. RESULTS: The average age of the 120 patients in the two groups of study were not statistically significantly different. The mean difference of severity of tinnitus between the two groups was statistically significant at the end of the study and 3 month after completion of treatment. The VAS and THI mean differences after the treatment were statistically significant between the two groups but not statistically significant after 3 months of completion the study. CONCLUSION: Low level laser radiation is effective for short-term treatment of Tinnitus caused by sensorineural hearing loss and its impact may be reduced over the time.

J Lasers Med Sci 2014 Spring 5(2) 71-4

http://www.ncbi.nlm.nih.gov/pubmed/?term=25653802

Effectiveness of high-intensity laser therapy and splinting in lateral epicondylitis; a prospective, randomized, controlled study.

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Lateral epicondylitis (LE) is a common disorder that causes pain on the outside of the elbow, as well as pain and weakness during gripping. In this prospective, randomized, controlled, assessor-blinded trial, we planned to investigate the effects of high-intensity laser therapy (HILT) in patients with LE and to compare these results with those of a brace and placebo HILT. Patients were randomly assigned to three treatment groups. The first group was treated with HILT. The second group (sham therapy group) received placebo HILT, while the third group (brace group) used the lateral counterforce brace for LE. The patients were assessed for grip strength, pain, disability, and quality of life. Outcome measurements and ultrasonographic examination of the patients were performed before treatment (week 0) and after treatment (after 4 and 12 weeks). HILT and brace groups showed significant improvements for most evaluation parameters (pain scores, grip strength, disability scores, and several subparts of the short-form 36 health survey (physical function, role limitations due to physical functioning, bodily pain, general health, and vitality)) after treatment (after 4 and 12 weeks). However, the improvements in evaluation parameters of the patients with LE in HILT and brace groups were not reflected to ultrasonographic findings. Furthermore, comparison of the percentage changes of the parameters after treatment relative to pretreatment values did not show a significant difference between HILT and brace groups. We conclude that HILT and splinting are effective physical therapy modalities for patients with LE in reducing pain and improving disability, quality of life, and grip strength.

Lasers Med Sci 2015 Apr 30(3) 1097-107

http://www.ncbi.nlm.nih.gov/pubmed/?term=25614134

Conservative treatment of carpal tunnel syndrome: Comparison between laser therapy and fascial manipulation((R)).

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The etiopathogenesis of Carpal Tunnel Syndrome (CTS) is multifactorial and most cases are classified as idiopathic (Thurston 2013). A randomized controlled trial was performed to compare the effectiveness of Fascial Manipulation((R)) (FM) and Low-Level Laser Therapy (LLLT) for CTS. This prospective trial included 42 patients (70 hands with symptoms) with clinical and electroneuromyographic diagnosis of CTS. The patients were randomly assigned to receive multiple sessions of FM or multiple session of LLLT. The Visual Analogic Scale (VAS) and Boston Carpal Tunnel Questionnaire (BCTQ) were performed at baseline, end of treatment and after three months. The group that received FM showed a significant reduction in subjective pain perception and an increased function assessed by BCTQ at the end of the treatment and follow-up. The group that received LLLT showed an improvement in the BCTQ at the end of the treatment but the improvement level was not sustained at the three month follow-up. FM is a valid alternative treatment for CTS.

J Bodyw Mov Ther 2015 Jan 19(1) 113-8

http://www.ncbi.nlm.nih.gov/pubmed/?term=25603750

New treatment alternatives in the ulnar neuropathy at the elbow: ultrasound and low-level laser therapy.

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Ulnar nerve entrapment at the elbow (UNE) is the second most common entrapment neuropathy of the arm. Conservative treatment is the treatment of choice in mild to moderate cases. Elbow splints and avoiding flexion of the involved elbow constitute majority of the conservative treatment; indeed, there is no other non-invasive treatment modality. The aim of this study was to investigate the efficacy of ultrasound (US) and low-level laser therapy (LLLT) in the treatment of UNE to provide an alternative conservative treatment method. A randomized single-blind study was carried out in 32 patients diagnosed with UNE. Short-segment conduction study (SSCS) was performed for the localization of the entrapment site. Patients were randomized into US treatment (frequency of 1 MHz, intensity of 1.5 W/cm2, continuous mode) and LLLT (0.8 J/cm2 with 905 nm wavelength), both applied five times a week for 2 weeks. Assessments were performed at baseline, at the end of the treatment, and at the first and third months by visual analog scale, hand grip strength, semmes weinstein monofilament test, latency change at SSCS, and patient satisfaction scale. Both treatment groups had significant improvements on clinical and electrophysiological parameters ($p < 0.05$) at first month with no statistically significant difference between them. Improvements in all parameters were sustained at the third month for the US group, while only changes in grip strength and latency were significant for the LLLT group at third month. The present study demonstrated that both US and LLLT provided improvements in clinical and electrophysiological parameters and have a satisfying short-term effectiveness in the treatment of UNE.

Acta Neurol Belg 2014 Oct 16

http://www.ncbi.nlm.nih.gov/pubmed/?term=25319131

Effect of high-intensity laser therapy in the management of myofascial pain syndrome of the trapezius: a double-blind, placebo-controlled study.

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Myofascial pain syndrome (MPS) of the trapezius muscle is one of the main causes of neck pain. In this randomized, double-blind study, we evaluated the effects of high-intensity laser therapy (HILT) in female patients with chronic MPS of the trapezius muscle. The patients were assigned to two groups. The HILT group was treated with HILT and exercise, and the sham therapy group was treated with placebo HILT and exercise. The patients were assessed for pain, cervical active range of motion, disability, and quality of life. Evaluations were performed before treatment (week 0) and after treatment (weeks 4 and 12). Both groups showed significant improvement in all parameters at weeks 4 and 12. However, in a comparison of the percentage changes in the parameters at weeks 4 and 12 relative to pretreatment values, the HILT group showed greater improvement in pain scores, the neck disability index, and several subparts of the short-form 36 health survey (SF-36) (physical functioning, role limitations due to physical functioning, bodily pain, general health perceptions, social functioning, and role limitations due to emotional problems) than did the sham therapy group. We conclude that HILT is an effective therapeutic method in the treatment of patients with chronic MPS of the trapezius muscle.

Lasers Med Sci 2015 Jan 30(1) 325-32

http://www.ncbi.nlm.nih.gov/pubmed/?term=25274197

The effect of low-level laser on postoperative pain after tibial fracture surgery: a double-blind controlled randomized clinical trial.

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BACKGROUND: Postoperative pain is a common complication that can lead to serious morbidities and delayed recovery. OBJECTIVES: The aim of this study was to investigate the effect of low-level laser therapy on acute pain after tibial fracture surgery. PATIENTS AND METHODS: In this randomized clinical trial, 54 patients who were candidate for tibial fracture surgery were allocated randomly to two groups, namely, control and laser therapy. Both groups had the same type of surgery and technique of spinal anesthesia. Patients in laser group were treated with the combination of two lasers (GaALAs, 808 nm; and GaALInP, 650 nm) at the end of the surgery while control group received laser in turn-off mode with the same duration as laser group. Patients were evaluated for pain intensity according to the visual analogue scale (VAS) and the amount of analgesic use during 24 hours after surgery. RESULTS: Laser group experienced less pain intensity in comparison with control group at second, fourth, eighth, 12(th), and 24(th) hours after surgery (P Value < 0.05). In addition, the amount of consumed opioid in laser group was significantly less than the control group (51.62 +/- 29.52 and 89.28 +/- 35.54 mg, respectively; P Value, 0.008). CONCLUSIONS: Low Level Laser Therapy is a proper method to reduce postoperative pain because it is painless, safe, and noninvasive and is easily accepted by patients.

Anesth Pain Med 2014 Aug 4(3) e17350

http://www.ncbi.nlm.nih.gov/pubmed/?term=25237637

Effect of diode laser in the treatment of patients with nonspecific chronic low back pain: a randomized controlled trial.

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Abstract Background data: Low back pain is a common, highly debilitating condition, whose severity is variable. This study evaluated the efficacy of treatment with Ga-Al-As diode laser (980 nm) with a large diameter spot (32 cm(2)), in association with exercise therapy, in reducing pain. OBJECTIVE: The present study aimed to evaluate the pain reduction efficacy of treatment with the Ga-Al-As diode laser (980 nm) in combination with exercise therapy, in patients with chronic low back pain (CLBP). METHODS: This study evaluated 100 patients with CLBP (mean age 60 years) who were randomly assigned to two groups. The laser plus exercises group (Laser+EX: 50 patients) received low-level laser therapy (LLLT) with a diode laser, 980 nm, with a specific handpiece [32 cm(2) irradiation spot size, power 20 W in continuous wave (CW), fluence 37.5J/cm(2), total energy per point 1200 J] thrice weekly, and followed a daily exercise schedule for 3 weeks (5 days/week). The exercises group (EX: 50 patients) received placebo laser therapy plus daily exercises. The outcome was evaluated on the visual analogue pain scale (VAS), before and after treatment. RESULTS: At the end of the 3 week period, the Laser+EX group showed a significantly greater decrease in pain than did the EX group. There was a significant difference between the two groups, with average Delta VAS scores of 3.96 (Laser+EX group) and 2.23 (EX group). The Student's t test demonstrated a statistically significant difference between the two groups, at $p<0.001$. CONCLUSIONS: This study demonstrated that the use of diode laser (980 nm) with large diameter spot size, in association with exercise therapy, appears to be effective. Such treatment might be considered a valid therapeutic option within rehabilitation programs for nonspecific CLBP.

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http://www.ncbi.nlm.nih.gov/pubmed/?term=25141218

Efficacy of low level laser therapy and intramuscular electrical stimulation on myofascial pain syndrome.

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BACKGROUND: Myofascial pain syndrome (MPS) which is an important cause of musculoskeletal pain has shown a dramatic increase in recent years. OBJECTIVES: We aimed to evaluate the efficacy of intramuscular electrical stimulation therapy (IMS) and low-level-laser-therapy (LLLT) in patients with MPS. METHODS: Patients were randomly divided into three groups. First group were treated with LLLT and streching exercise. Second group were treated with IMS and streching exercise. Third group were treated with only streching exercise. The patients were evaluated through the pain intensity, pain threshold, cervical joint movement range and the neck disability index parameters. RESULTS: An improvement was found in all parameters for all groups, except for the pain threshold within the control group at the end of the treatment and one month after the treatment. It was found that pain score was significantly lower in Group 1 and 2 at one month after the treatment compared to Group 3. Similarly, it was found that pain threshold score was significantly higher in Group 2 at one month after the treatment compared to Group 3. CONCLUSIONS: In this study we observed that both LLLT and IMS treatments added on to stretching are effective in improving pain parameters in patients with MPS.

J Back Musculoskelet Rehabil 2014 Jul 24

http://www.ncbi.nlm.nih.gov/pubmed/?term=25061034

Treatment of dentin hypersensitivity with a low-level laser-emitting toothbrush: double-blind randomised clinical trial of efficacy and safety.

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Dentin hypersensitivity (DH) is defined as pain derived from exposed dentin in response to chemical, thermal, tactile, or osmotic stimuli that cannot be explained as having arisen from any other dental defect or disease. The aim of this trial was to test the efficacy and the safety of a low-level laser-emitting toothbrush on management of DH. A prospective, double blind, randomised clinical trial was designed; 96 individuals with hypersensitive teeth without caries or fracture were selected as subjects. The subjects were randomly allocated to either the test group with the 635 nm per 6 mW laser-emitting toothbrush, or the control group with the 635 nm per 12.9 muW light-emitting diode (LED) toothbrush. An air blast was applied with a dental air syringe held 3 mm away from the selected tooth and a visual analogue scale (VAS: 0-10) was used to quantify subjective pain. Assessments were completed at a screening visit and after 2-week and 4-week of using a test/control toothbrush. Results demonstrated that the use of both control and test toothbrushes resulted in decreased discomfort after 4 weeks. In the test group, pain intensity scores decreased from 5.8 +/- 1.2 to 2.3 +/- 1.6, and in the control group, the scores decreased from 6.4 +/- 1.3 to 5.5 +/- 2.0 ($P < 0.05$). This decrease was significantly greater in the test group. There were no significant adverse events or side effects. It was concluded that the use of the low-level laser emitting toothbrush is a safe and effective treatment option for the management of DH.

J Oral Rehabil 2014 Apr 10

http://www.ncbi.nlm.nih.gov/pubmed/?term=24717149

Therapeutic outcomes of low-level laser therapy for closed bone fracture in the human wrist and hand.

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Abstract Objective: The therapeutic outcomes of low-level laser therapy (LLLT) on closed bone fractures (CBFs) in the wrist and hand were investigated in this controlled study. Background data: Animal research has confirmed that LLLT increases osteocyte quantity; however, little research has been conducted to determine the effect of LLLT on the treatment of human bone fractures. Methods: In this study, the therapeutic outcomes of administering 830 nm LLLT to treat CBFs in the wrist or hand were examined. Fifty patients with CBFs in the wrist and hand, who had not received surgical treatment, were recruited and randomly assigned to two groups. The laser group underwent a treatment program in which 830 nm LLLT (average power 60 mW, peak power 8 W, 10 Hz, 600 sec, and 9.7 J/cm(2) per fracture site) was administered five times per week for 2 weeks. Participants in a placebo group received sham laser treatment. The pain, functional disability, grip strength, and radiographic parameters of the participants were evaluated before and after treatment and at a 2-week follow-up. Results: After treatment and at the follow-up, the laser group exhibited significant changes in all of the parameters compared with the baseline ($p<0.05$). The results of comparing the two groups after treatment and at the follow-up indicated significant between-group differences among all of the parameters ($p<0.05$). Conclusions: LLLT can relieve pain and improve the healing process of CBFs in the human wrist and hand.

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http://www.ncbi.nlm.nih.gov/pubmed/?term=24649935

Five-day, low-level laser therapy for sports-related lower extremity periostitis in adult men: a randomized, controlled trial.

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Periostitis in the lower leg caused by overexercise is a universal problem in athletes and runners. The purpose of this study was to observe the functional improvement of the lower limbs upon rehabilitation low-level laser therapy (LLLT). All medical data were gathered from enrolled adults with sports-related lower leg pain. A total of 54 patients underwent triple-phase bone scans using skeletal nuclear scintigraphy, which confirmed periostitis in their lower limbs. The patients were then randomly divided into two groups: one group received laser therapy (N = 29) and the other group (N = 25) received an equivalent placebo treatment (a drug or physical therapy). Treatment protocol commenced with rehabilitation intervention and LLLT was performed three times daily for 5 days at a dosage of 1.4 J/cm2. A Likert-type pain scale was used to evaluate the severity of pain. Balance function, including postural stability testing (PST) and limits of stability (LOS), was also performed to evaluate the function outcome. Patients experienced a significant improvement in pain by day 2 or day 5 after starting LLLT, but here was no significant difference in pain scale between the measurements before (baseline) and after LLLT. Comparing the PST, the group differences of dynamic vs. static testings ranged from -18.54 to -50.22 (compared 12, 8, 4, 3, 2, 1 to 0, all $p < 0.0001$), and the PST after LLLT were 3.73 units ($p = 0.0258$) lower than those of before LLLT. Comparing the LOS, the group differences of dynamic vs. static testing were similar to those in PST, and the relationship between LOS and groups only varied with the direction control during dynamic testing in direction at backward/right vs. right ($p < 0.0001$). LLLT had a positive effect on proprioception in patients with lower limb periostitis. Larger, better controlled studies are needed to determine what specific effects LLLT has on the function of proprioception.

Lasers Med Sci 2014 Mar 13

http://www.ncbi.nlm.nih.gov/pubmed/?term=24622816

What is the ideal dose and power output of low-level laser therapy (810 nm) on muscle performance and post-exercise recovery? Study protocol for a double-blind, randomized, placebo-controlled trial.

de Oliveira AR, Vanin AA, De Marchi T, Antonialli FC, Grandinetti Vdos S, de Paiva PR, Albuquerque Pontes GM, Santos LA, Aleixo Junior Ide O, de Carvalho Pde T, Bjordal JM, Leal-Junior EC

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BACKGROUND: Recent studies involving phototherapy applied prior to exercise have demonstrated positive results regarding the attenuation of muscle fatigue and the expression of biochemical markers associated with recovery. However, a number of factors remain unknown, such as the ideal dose and application parameters, mechanisms of action and long-term effects on muscle recovery. The aims of the proposed project are to evaluate the long-term effects of low-level laser therapy on post-exercise musculoskeletal recovery and identify the best dose andapplication power/irradiation time. DESIGN AND METHODS: A double-blind, randomized, placebo-controlled clinical trial with be conducted. After fulfilling the eligibility criteria, 28 high-performance athletes will be allocated to four groups of seven volunteers each. In phase 1, the laser power will be 200 mW and different doses will be tested: Group A (2 J), Group B (6 J), Group C (10 J) and Group D (0 J). In phase 2, the best dose obtained in phase 1 will be used with the same distribution of the volunteers, but with different powers: Group A (100 mW), Group B (200 mW), Group C (400 mW) and Group D (0 mW). The isokinetic test will be performed based on maximum voluntary contraction prior to the application of the laser and after the eccentric contraction protocol, which will also be performed using the isokinetic dynamometer. The following variables related to physical performance will be analyzed: peak torque/maximum voluntary contraction, delayed onset muscle soreness (algometer), biochemical markers of muscle damage, inflammation and oxidative stress. DISCUSSION: Our intention, is to determine optimal laser therapy application parameters capable of slowing down the physiological muscle fatigue process, reducing injuries or micro-injuries in skeletal muscle stemming from physical exertion and accelerating post-exercise muscle recovery. We believe that, unlike drug therapy, LLLT has a biphasic dose-response pattern. TRIAL REGISTRATION: The protocol for this study is registered with the Protocol Registry System, ClinicalTrials.gov identifier NCT01844271.

Trials 2014 15 69

http://www.ncbi.nlm.nih.gov/pubmed/?term=24576321

Low-level laser therapy with a wrist splint to treat carpal tunnel syndrome: a double-blinded randomized controlled trial.

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The efficacy of low-level laser therapy (LLLT) was evaluated in a total of 66 patients with mild to moderate carpal tunnel syndrome (CTS) with a double-blinded randomized controlled study. The patients were randomly assigned into two groups. Group I received 15 sessions of a gallium-aluminum-arsenide laser treatment at a dosage of 18 J per session over the carpal tunnel area with neutral wrist splint. Group II received placebo laser therapy with neutral wrist splint. The patients were evaluated with the following parameters: (1) clinical parameters which consisted of visual analog scale, symptom severity scale, functional status scale, and pinch strength and grip strength before the treatment and at 5- and 12-week follow-ups and (2) electroneurophysiological parameters from nerve conduction study which were evaluated before the treatment and at 12-week follow-up. Fifty nine patients (112 hands: unilateral CTS = 6 hands and bilateral CTS = 106 hands) completed the study. Both groups I and II had n = 56 hands. Improvements were significantly more pronounced in the LLLT-treated group than the placebo group especially for grip strength at 5- and 12-week follow-ups. At 12-week follow-up, distal motor latency of the median nerve was significantly improved in the LLLT group than the placebo group ($p < 0.05$). LLLT therapy, as an alternative for a conservative treatment, is effective for treating mild to moderate CTS patients. It can improve hand grip strength and electroneurophysiological parameter with a carry-over effect up to 3 months after treatment for grip strength of the affected hands.

Lasers Med Sci 2014 Jan 30

http://www.ncbi.nlm.nih.gov/pubmed/?term=24477392

CHELT therapy in the treatment of chronic insertional Achilles tendinopathy.

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The application of laser therapy on soft tissue is used for pain relief, anti-inflammation action and biostimulation. The efficiency of High Energy Laser Therapy has not yet been studied on Achilles tendinopathy. The aim of the study is to evaluate the effectiveness of a flow of Cold air and High Energy Laser Therapy (CHELT) versus Extracorporeal Shock Waves Therapy (ESWT) in the treatment of Achilles tendinopathy. In this prospective, clinical trial, 60 subjects affected by insertional Achilles tendinopathy were enrolled and randomized to CHELT (30 subjects) or to ESWT (30 subjects). In CHELT group the patients received ten daily sessions of 1,200 J and 12 W of laser therapy (wavelength of 1,084, 810 and 980 nm) added to a flow of cold air at -30 degrees C. In the ESWT group, the patients received three sessions at 3- to 4-day intervals of 1,600 impulses with an energy flux density (EFD) of 0.05-0.07 mJ/mm2. Both groups of participants performed stretching and eccentric exercises over a 2-month period. The visual analogue scale (VAS), the Ankle-Hindfoot Scale, and the Roles and Maudsley Score were measured before treatment (T0), and at end of the treatment session (T1) and 2 (T2) and 6 months (T3) after treatment during the follow-up examinations. In both groups, we found a statistically significant improvement of the VAS at T1, T2 and T3 ($p < 0.01$). The difference between the two groups was statistically significant in favour of the CHELT group ($p < 0.001$). At 2 months, the CHELT group was statistically better for Ankle-Hindfoot Scale and the Roles and Maudsley Score ($p < 0.05$) and at 6 months only for the Roles and Maudsley Score ($p < 0.001$). High Energy Laser Therapy gave quicker and better pain relief. It also gave the patient a full functional recovery and greater satisfaction.

Lasers Med Sci 2013 Dec 19

http://www.ncbi.nlm.nih.gov/pubmed/?term=24352875

Low-level laser therapy versus ultrasound therapy in the treatment of subacromial impingement syndrome: A randomized clinical trial.

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OBJECTIVE: The aim of this study was to compare the effectiveness of low-level laser therapy and ultrasound therapy in the treatment of subacromial impingement syndrome. MATERIALS AND METHODS: Thirty one patients with subacromial impingement syndrome were randomly assigned to low-level laser therapy group (n=16) and ultrasound therapy group (n=15). Study participants received 10 treatment sessions of low-level laser therapy or ultrasound therapy over a period of two-consecutive weeks (five days per week). Outcome measures (visual analogue pain scale, Shoulder Pain and Disability Index -SPADI-, patient's satisfactory level and sleep interference score) were assessed before treatment and at the 1st and 3rd months after treatment. All patients were analyzed by the intent-to-treat principle. RESULTS: Mean reduction in VAS pain, SPADI disability and sleep interference scores from baseline to after 1 month, and 3 months of treatment was statistically significant in both groups ($P< 0.05$). However, there was no significant difference in the mean change in VAS pain, SPADI disability and sleep interference scores between the two groups ($P > 0.05$). The mean level of patient satisfaction in group 1 at the first and third months after treatment was 72.45 +/- 23.45 mm and 71.50 +/- 16.54 mm, respectively. The mean level of patient satisfaction in group 2 at the first and third months after treatment was 70.38 +/- 21.52 mm and 72.09 +/- 13.42 mm, respectively. There was no significant difference in the mean level of patient satisfaction between the two groups ($p > 0.05$). CONCLUSIONS: The results suggest that efficacy of both treatments were comparable to each other in regarding reducing pain severity and functional disability in patients with subacromial impingement syndrome. Based on our findings, we conclude that low-level laser therapy may be considered as an effective alternative to ultrasound based therapy in patients with subacromial impingement syndrome especially ultrasound based therapy is contraindicated.

J Back Musculoskelet Rehabil 2013 Dec 17

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Effect of low-level laser therapy on the post-surgical inflammatory process after third molar removal: study protocol for a double-blind randomized controlled trial.

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BACKGROUND: Low-level laser therapy (LLLT) has been shown to modulate the inflammatory process without adverse effects , by reducing pain and swelling and promoting the repair of damaged tissues. Because pain, swelling and muscle spasm are complications found in virtually all patients following oral surgery for the removal of impacted teeth, this model has been widely used to evaluate the effects of LLLT on the inflammatory process involving bone and, connective tissue and the muscles involved in mastication. The aim of the present study was to evaluate the effectiveness of LLLT in reducing pain, swelling and muscle spasm resulting from the removal of impacted lower third molars and evaluate the effects of surgery on patients' quality of life of patients (QOL).Methods/design: After meeting the eligibility criteria, 60 patients treated at a Specialty Dental Center for the removal of impacted lower third molars will be randomly divided into five groups according to the type of laser therapy used at the end of surgery (intraoral irradiation with 660 nm laser; extraoral irradiation with 660 nm laser; intraoral irradiation with 808 nm laser; extraoral irradiation with 808 nm laser and no irradiation). To ensure that patients are blinded to the type of treatment they are receiving, the hand piece of the laser apparatus will be applied both intraorally and extraorally to all participants, but the device will be turned on only at the appropriate time, as determined by the randomization process. At 2 and 7 days after surgery, the patients will be evaluated by three blinded evaluators who will measure of swelling, mouth opening (muscle spasm evaluation) and pain (using two different pain scales). The 14-item Oral Health Impact Profile (OHIP-14) will be used to assess QOL. All data will be analyzed with respect to the normality of distribution using the Shapiro-Wilk test. Statistically significant differences between the experimental groups will be determined using analysis of variance, followed by a suitable post hoc test, when necessary. The significance level will be set at alpha = 0.05. DISCUSSION: The lack of standardization in studies with regard to the samples, methods and LLLT parameters complicates the determination of the actual effect of laser therapy on this model. The present study aims to provide a randomized, controlled, double-blind trial to compare four different LLLT parameters in relation to the outcomes of pain, swelling and muscle spasm following surgery for the extraction of impacted third molars.Trial registration: Brazilian Registry of Clinical Trials - Rebec (RBR-6XSB5H).

Trials 2013 Nov 6 14(1) 373

http://www.ncbi.nlm.nih.gov/pubmed/?term=24195796

Long-term effect of high-intensity laser therapy in the treatment of patients with chronic low back pain: a randomized blinded placebo-controlled trial.

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The aim of this study was to compare the effect of high-intensity laser therapy (HILT), alone or combined with exercise, in the treatment of chronic low back pain (CLBP). A total of 72 male patients participated in this study, with a mean (SD) age of 32.81 (4.48) years. Patients were randomly assigned into three groups and treated with HILT plus exercise (HILT + EX), placebo laser plus exercise (PL + EX), and HILT alone in groups 1, 2, and 3, respectively. The outcomes measured were lumbar range of motion (ROM), pain level by visual analog scale (VAS), and functional disability by both the Roland Disability Questionnaire (RDQ) and the Modified Oswestry Disability Questionnaire (MODQ). Statistical analyses were performed to compare the differences between baseline and post-treatment measurements. The level of statistical significance was set as $P < 0.05$. ROM significantly increased after 4 weeks of treatment in all groups, then significantly decreased after 12 weeks of follow-up, but was still significantly more than the baseline value in groups 1 and 2. VAS, RDQ, and MODQ results showed significant decrease post-treatment in all groups, although the RDQ and MODQ results were not significantly different between groups 2 and 3. HILT combined with exercise appears to be more effective in patients with CLBP than either HLLT alone or placebo laser with exercise.

Lasers Med Sci 2013 Nov 2

http://www.ncbi.nlm.nih.gov/pubmed/?term=24178907

The adjunct therapeutic effect of lasers with medication in the management of orofacial pain: double blind randomized controlled trial.

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Abstract Objective: This study aimed to evaluate the efficacy of laser therapy in conjunction with a pharmaceutical approach to alleviate myofascial pain dysfunction syndrome. Background data: A few clinical studies have evaluated the analgesic effect of laser therapy on orofacial pain, most of which reported controversial results. Myofascial pain dysfunction syndrome (MPDS), trigeminal neuralgia, and atypical facial pain are the most common facial pain. Methods: A double-blind randomized controlled trial was designed to evaluate the therapeutic effect of GaAs laser (peak power 10 W; pulse frequency 3000 Hz; average power 0.012 W; wavelength 980 nm; irradiation duration 300 sec; and dose 12.73 J/cm(2)) on the management of common orofacial pain. The laser group (n=30) received 10 sessions of treatment with GaAs laser. The control group (n=30) was treated identically with sham laser. All patients received the appropriate pharmaceutical treatment as well. Visual analog scale (VAS) was recorded for all patients at baseline, and immediately, 2, and 4 months after the final treatment session. The qualitative variables among the groups were compared using the chi(2) test. Results: Both groups demonstrated a significant reduction in pain with the progression of time ($p<0.05$). The difference between the two groups was not significant ($p>0.05$). Whereas laser therapy in the present study failed to show any significance over the control group, the role of covariates such as radiation parameters (wave length, dose) should not be overlooked. Conclusions: We found no significant level of efficacy for the GaAs laser in the management of common orofacial pain. Further studies are suggested to evaluate the efficacy of other types of lasers with different parameters in the management of orofacial pains.

Photomed Laser Surg 2013 Oct 31(10) 474-9

http://www.ncbi.nlm.nih.gov/pubmed/?term=24102165

High power laser therapy treatment compared to simple segmental physical rehabilitation in whiplash injuries (1 degrees and 2 degrees grade of the Quebec Task Force classification) involving muscles and ligaments.

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INTRODUCTION: whiplash is a frequent post traumatic pathology caused by muscle, tendon and capsular elements over stretching. The authors conducted a short term prospective randomised study to test the effectiveness of a multi wave High Power Laser Therapy (HPLT) versus conventional simple segmental physical rehabilitation (PT) included in Italian tariff nomenclature performance physiotherapy Study Design: prospective randomised study (Level II). MATERIAL AND METHODS: the authors identified 135 homogeneous patients with whiplash grade 1 - 2 of the Quebec Task Force classification (QTFC). INAIL, the Italian National Workers Insurance, based in Milan, was reliable source for identifying patients. All patients with whiplash injuries grade 1 or 2 QTFC, were eligible for the study, starting from April 28 2010 to September 30 2010. Patients referred to a Coordinator (C.M.) who applied the inclusion and exclusion criteria. Patients who agreed to participate were randomly assigned to one of the two treatment groups. Dates for initial treatment session were arranged, including cervical spine X-ray, and assessment. Each patient gave informed consent for participation and agreed to adopt only the study treatment for 6 weeks. Group A (84 patients) was treated with High Power Laser Therapy (HPLT), Group B (51 patients) received conventional simple segmental physical rehabilitation (PT). During the treatment period, no other electro-medical therapy, analgesics or anti-inflammatory drugs were allowed. All patients were assessed at baseline (T0) and at the end of the treatment period (T1) using a Visual Analogical Scale (VAS), (T2) the date of return to work was registered afterwards. RESULTS: there was a reduction in VAS pain scores at T1. Group A (VAS = 20) Group B (VAS = 34,8) (p =0.0048). Laser treatment allowed quick recovery and return to work (T2). Group A after 48 days against 66 days of Group B (p=0.0005). CONCLUSIONS: results suggest that High Power Laser Therapy - is an effective treatment in patients with whiplash injury, compared to conventional simple segmental physical rehabilitation.

Muscles Ligaments Tendons J 2013 Apr 3(2) 106-11

http://www.ncbi.nlm.nih.gov/pubmed/?term=23888293

Laser therapy and needling in myofascial trigger point deactivation.

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The aim of this study was to evaluate different approaches to deactivating myofascial trigger points (MTPs). Twenty-one women with bilateral MTPs in the masseter muscle were randomly divided into three groups: laser therapy, needle treatment and control. Treatment effectiveness was evaluated after four sessions with intervals ranging between 48 and 72 h. Quantitative and qualitative methods were used to measure pain perception/sensation. The Wilcoxon test based on results expressed on a visual analog scale (VAS) demonstrated a significant ($P < 0.05$) decrease in pain only in the laser and needle treatments groups, although a significant increase in the pressure pain threshold was evident only for needling with anesthetic injection ($P = 0.0469$), and laser therapy at a dose of 4 J/cm(2) ($P = 0.0156$). Based on these results, it was concluded that four sessions of needling with 2% lidocaine injection with intervals between 48 and 72 h without a vasoconstrictor, or laser therapy at a dose of 4 J/cm(2), are effective for deactivation of MTPs. (J Oral Sci 55, 175-181, 2013).

J Oral Sci 2013 55(2) 175-81

http://www.ncbi.nlm.nih.gov/pubmed/?term=23748458

The Effectiveness of Therapeutic Class IV (10 W) Laser Treatment for Epicondylitis.

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BACKGROUND AND OBJECTIVE: Photobiomodulation has been shown to modulate cellular protein production and stimulate tendon healing in a dose-dependent manner. Previous studies have used class IIIb lasers with power outputs of less than 0.5 W. Here we evaluate a dual wavelength (980/810 nm) class IV laser with a power output of 10 W for the purpose of determining the efficacy of class IV laser therapy in alleviating the pain and dysfunction associated with chronic epicondylitis. METHODS: Sixteen subjects volunteered for laser therapy, or an identically appearing sham instrument in a randomized, placebo-controlled, double-blinded clinical trial. Subjects underwent clinical examination (pain, function, strength, and ultrasonic imaging) to confirm chronic tendinopathy of the extensor carpi radialis brevis tendon, followed by eight treatments of 6.6 +/- 1.3 J/cm(2) (laser), or sham over 18 days. Safety precautions to protect against retinal exposure to the laser were followed. The exam protocol was repeated at 0, 3, 6 and 12 months post-treatment. RESULTS: No initial differences were seen between the two groups. In the laser treated group handgrip strength improved by 17 +/- 3%, 52 +/- 7%, and 66 +/- 6% at 3, 6, and 12 months respectively; function improved by 44 +/- 1%, 71 +/- 3%, and 82 +/- 2%, and pain with resistance to extension of the middle finger was reduced by 50 +/- 6%, 93 +/- 4%, and 100 +/- 1% at 3, 6 and 12 months, respectively. In contrast, no changes were seen until 12 months following sham treatment (12 months: strength improved by 13 +/- 2%, function improved by 52 +/- 3%, pain with resistance to extension of the middle finger reduced by 76 +/- 2%). No adverse effects were reported at any time. CONCLUSIONS: These findings suggest that laser therapy using the 10 W class IV instrument is efficacious for the long-term relief of the symptoms associated with chronic epicondylitis. The potential for a rapidly administered, safe and effective treatment warrants further investigation. Lasers Surg. Med. 45:311-317, 2013. (c) 2012 Wiley Periodicals, Inc.

Lasers Surg Med 2013 Jul 45(5) 311-7

http://www.ncbi.nlm.nih.gov/pubmed/?term=23733499

Effects of light-emitting diodes on muscle fatigue and exercise tolerance in patients with COPD: study protocol for a randomized controlled trial.

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BACKGROUND: Light-emitting diodes (LED) have been used to minimize muscle fatigue in athletes and healthy subjects. Patients with chronic obstructive pulmonary disease (COPD) are susceptible to early muscle fatigue. OBJECTIVE: The objective of this study is to investigate the acute effects of LED on muscle function, exercise capacity and cardiorespiratory responses during isometric and dynamic exercise in patients with COPD. METHODS: This study will assess 30 patients with moderate to severe obstruction (forced expiratory volume-one second,FEV1 </=70% predicted). Isometric and dynamic protocols will be conducted in two visits each, for a total of four visits a week apart. First, venous blood will be taken from the patients. The isometric protocol will start with the determination of the maximum voluntary isometric contraction (MIVC) to determine the workload (60% of MIVC) for the isometric endurance test (IET). Patients will be randomized to receive either the placebo or LED application (each point will be irradiated for 30 s and the energy received at each point will be 41.7 J). Immediately after finishing this procedure, the patients will carry out the IET until the limit of tolerance or until a 20% fall of strength is observed. After the test, another blood draw will be taken. In another visit (one week later), the same order of procedures will be performed, except with the opposite (LED or placebo). For the dynamic endurance test (DET), the same procedures described above will be followed, except with 75% of the maximal workload obtained from the incremental cycle ergometer test used instead of the IET. The electromyography will be recorded during the isometric and dynamic protocols. Differences in muscle function, exercise capacity and cardiorespiratory responses between the LED and placebo applications will be analyzed. The therapeutic effects of LED could minimize muscle fatigue in patients with COPD by increasing exercise tolerance. TRIAL REGISTRATION: Trial registration number: NCT01448564.

Trials 2013 14 134

http://www.ncbi.nlm.nih.gov/pubmed/?term=23663518

Management of chronic tendon injuries.

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Chronic tendon injuries present unique management challenges. The assumption that these injuries result from ongoing inflammation has caused physicians to rely on treatments demonstrated to be ineffective in the long term. Nonsteroidal anti-inflammatory drugs should be limited in the treatment of these injuries. Corticosteroid injections should be considered for temporizing pain relief only for rotator cuff tendinopathy. For chronic Achilles tendinopathy (symptoms lasting longer than six weeks), an intense eccentric strengthening program of the gastrocnemius/ soleus complex improved pain and function between 60 and 90 percent in randomized trials. Evidence also supports eccentric exercise as a first-line option for chronic patellar tendon injuries. Other modalities such as prolotherapy, topical nitroglycerin, iontophoresis, phonophoresis, therapeutic ultrasound, extracorporeal shock wave therapy, and low-level laser therapy have less evidence of effectiveness but are reasonable second-line alternatives to surgery for patients who have persistent pain despite appropriate rehabilitative exercise.

Am Fam Physician 2013 Apr 1 87(7) 486-90

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Intense pulsed light treatment of chronic mid-body Achilles tendinopathy: A double blind randomised placebo-controlled trial.

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We conducted a randomised controlled trial to determine whether active intense pulsed light (IPL) is an effective treatment for patients with chronic mid-body Achilles tendinopathy. A total of 47 patients were randomly assigned to three weekly therapeutic or placebo IPL treatments. The primary outcome measure was the Victorian Institute of Sport Assessment - Achilles (VISA-A) score. Secondary outcomes were a visual analogue scale for pain (VAS) and the Lower Extremity Functional Scale (LEFS). Outcomes were recorded at baseline, six weeks and 12 weeks following treatment. Ultrasound assessment of the thickness of the tendon and neovascularisation were also recorded before and after treatment. There was no significant difference between the groups for any of the outcome scores or ultrasound measurements by 12 weeks, showing no measurable benefit from treatment with IPL in patients with Achilles tendinopathy.

Bone Joint J 2013 Apr 95-B(4) 504-9

http://www.ncbi.nlm.nih.gov/pubmed/?term=23539702

Evaluation of the effectiveness of vibroacoustic therapy treatment of patients with so-called "heel spur". A preliminary report.

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Background: The so-called "heel spur" is a radiological term referring to adaptive bone growth as a result of chronic overload enthesopathy of the proximal attachment of the plantar fascia. The main cause of the pain is continued localised pressure on the surrounding soft tissues. Vibroacoustic wave therapy is a relatively new method gaining popularity among doctors, physiotherapists and patients. The aim of this study was to confirm the clinical efficacy of vibroacoustic therapy compared to laser and ultrasound therapy. Material and Methods: The study enrolled 60 patients treated for plantar heel spurs who were divided into a study group of 40 patients who underwent vibroacoustic therapy and a control group of 20 patients treated with ultrasound and laser therapy. The outcome measure for evaluating the effectiveness of physiotherapy was a subjective assessment of pain intensity by VAS and the modified short-form McGill Pain Questionnaire. Results: The mean pain intensity score in patients undergoing vibroacoustic therapy decreased by about 2.6 points according to the VAS scale and 17 points according to the McGill questionnaire, compared to reductions of 0.6 and 6 points, respectively, in the ultrasound and laser therapy group. The correlation between subjective assessment of pain according to the VAS scale and palpation-based assessment of pain was significantly positive between the two groups, demonstrating similarity of the two scales, with a slight dominance of the group undergoing laser and ultrasound therapy. Conclusions: These results represent a tentative confirmation of analgesic effectiveness of the vibro-acoustic method in musculoskeletal overload conditions. 2. In order to confirm its effectiveness, it is necessary to conduct further prospective randomized studies with blinding and evaluate the long-term results.

Ortop Traumatol Rehabil 2013 Feb 28 15(1) 77-88

http://www.ncbi.nlm.nih.gov/pubmed/?term=23510823

A double-blind, placebo-controlled randomized trial evaluating the ability of low-level laser therapy to improve the appearance of cellulite.

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BACKGROUND AND OBJECTIVE: Cellulite is present in 90% of post-adolescent women. Several technologies have been developed for treating cellulite; however, they all involve some degree of massage or mechanical manipulation. The purpose of this study was to assess the effectiveness of a low-level laser light device employing green 532 nm diodes as a stand-alone procedure without massage or mechanical manipulation for improving the appearance of cellulite in the thighs and buttocks. STUDY DESIGN/MATERIALS AND METHODS: This double-blind study randomized subjects to undergo treatment with the LLLT device (N = 34) or sham treatment (N = 34). During a 2-week treatment phase, each subject received three weekly treatment sessions 2-3 days apart. During each session, the front and back of the hips, thighs, and waist were exposed for 15 minutes (30 minutes total). RESULTS: Nineteen subjects in the LLLT group achieved a decrease of one or more stages on the Nurnberger-Muller grading scale (55.88%) versus three subjects (8.82%) in the sham-treated group ($P < 0.0001$). Two LLLT-treated subjects achieved 2-stage improvements on the Nurnberger-Muller Scale at the 2-week study endpoint and four did at the 6-week follow-up evaluation versus none of the sham-treated subjects at either time point. Subjects treated with LLLT achieved a significant decrease in combined baseline thigh circumference at the 2-week study endpoint and 6-week follow-up evaluation (for each, $p < 0.0001$ vs. baseline) versus no change for sham-treated subjects. LLLT-treated subjects also showed significant decreases in mean baseline body weight ($P < 0.0005$), BMI ($P < 0.001$), and percent BSA affected by cellulite ($P < 0.0005$) versus no change for any parameter among sham-treated subjects. Most LLLT-treated subjects (62.1%) were Very Satisfied or Somewhat Satisfied with the improvement in cellulite they received versus 25.8% of sham-treated subjects. There were no reports of adverse events. CONCLUSIONS: Low-level laser therapy using green 532 nm diodes is safe and effective for improving the appearance of cellulite in the thighs and buttocks. In contrast with other technologies, LLLT is effective as a stand-alone procedure without requiring massage or mechanical manipulation. Future studies will assess the long-term benefits of LLLT for the treatment of cellulite. Lasers Surg. Med. 45: 141 -147, 2013. (c) 2013 Wiley Periodicals, Inc.

Lasers Surg Med 2013 Mar 45(3) 141-7

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Effectiveness of low-level laser therapy for patients with carpal tunnel syndrome: design of a randomized single-blinded controlled trial.

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ABSTRACT: BACKGROUND: Carpal tunnel syndrome is the most common neuropathy in the upper extremity, resulting from the compression of the median nerve at wrist level. Clinical studies are essentials to present evidence on therapeutic resources use at early restoration on peripheral nerve functionality. Low-level laser therapy has been widely investigated in researches related to nerve regeneration. Therefore, it is suggested that the effect of low-level laser therapy associated with other conservative rehabilitation techniques may positively affect symptoms and overall hand function in compressive neuropathies such as carpal tunnel syndrome. The aim of this study is to evaluate the effectiveness of low-level laser therapy in addition to orthoses therapy and home orientations in patients with carpal tunnel syndrome. METHODS/DESIGN: Patients older than 18 years old will be included, with clinical diagnosis of carpal tunnel syndrome, excluding comorbidies. A physiotherapist will conduct intervention, with a blinding evaluator. Randomization will be applied to allocate the patients in each group: with association or not to low-level laser therapy. All of them will be submitted to orthoses therapy and home orientations. Outcome will be assessed through: pain visual analogic scale, Semmes Weinstein monofilaments threshold sensibility test, Pinch Gauge, Boston Carpal Tunnel Questionnaire and two point discrimination test. DISCUSSION: This paper describes the design of a randomized controlled trial, which aim to assess the effectiveness of conservative treatment added to low-level laser therapy for patients with carpal tunnel syndrome. TRIAL REGISTRATION: Brazilian Clinical Trials Registry (ReBec) - 75ddtf / Universal Trial Number: U1111-1121-5184.

BMC Musculoskelet Disord 2012 13 248

http://www.ncbi.nlm.nih.gov/pubmed/?term=23237204

Effects of Class IV Laser Therapy on Fibromyalgia Impact and Function in Women with Fibromyalgia.

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Abstract Objectives: This study evaluated the effects of Class IV laser therapy on pain, Fibromyalgia (FM) impact, and physical function in women diagnosed with FM. Design: The study was a double-blind, randomized control trial. Setting: Testing was completed at the university and Rheumatologist office and treatment was completed at a chiropractic clinic. Participants: Thirty-eight (38) women (52+/-11 years; mean+/-standard deviation) with FM were randomly assigned to one of two treatment groups, laser heat therapy (LHT; n=20) or sham heat therapy (SHT; n=18). Intervention: Both groups received treatment twice a week for 4 weeks. Treatment consisted of application of LHT or SHT over seven tender points located across the neck, shoulders, and back. Treatment was blinded to women and was administered by a chiropractic physician for 7 minutes. Outcome measures: Participants were evaluated before and after treatment for number and sensitivity of tender points, completed the FM Impact Questionnaire (FIQ) and the pain question of the FIQ, and were measured for function using the continuous scale physical functional performance (CS-PFP) test. Data were evaluated using repeated-measures analysis of variance with significance accepted at p</=0.05. Results: There were significant interactions for pain measured by the FIQ (LHT: 7.1+/-2.3 to 6.2+/-2.1 units; SHT: 5.8+/-1.3 to 6.1+/-1.4 units) and for upper body flexibility measured by the CS-PFP (LHT: 71+/-17 to 78+/-12 units; SHT: 77+/-12 to 77+/-11 units) with the LHT improving significantly compared to SHT. There was a time effect for the measure of FM impact measured by the FIQ, indicating that FM impact significantly improved from pre- to post-treatment in LHT (63+/-20 to 57+/-18 units), while no change was observed in the SHT (57+/-11 to 55+/-12 units). Conclusions: This study provides evidence that LHT may be a beneficial modality for women with FM in order to improve pain and upper body range of motion, ultimately reducing the impact of FM.

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http://www.ncbi.nlm.nih.gov/pubmed/?term=23176373

Low-level laser therapy in meniscal pathology: a double-blinded placebo-controlled trial.

Malliaropoulos N, Kiritsi O, Tsitas K, Christodoulou D, Akritidou A, Del Buono A, Maffulli N

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We performed a randomized, double-blinded, placebo-controlled study (ISRCTN24203769) to assess the effectiveness of low-level laser therapy (LLLT) in patients with meniscal pathology, including only symptomatic patients with tiny focus of grade 3 attenuation (seen only on 0.7 thickness sequences) or intrasubstance tears with spot of grade 3 signal intensity approaching the articular surface. None of the patients in the study group underwent arthroscopy or new magnetic resonance imaging investigation. Paired-samples t test was used to detect significant changes in subjective knee pain over the experimental period within groups, and ANOVA was used to detect any significant differences between the two groups. Pain was significantly improved for the LLLT group than for the placebo group ($F = 154$, $p < 0.0001$). Pain scores were significantly better after LLLT. Four (12.5 %) patients did not respond to LLLT. At baseline, the average Lysholm score was 77 +/- 4.6 for the LLLT group and 77.2 +/- 2.6 for the placebo group ($p > 0.05$). Four weeks after LLLT or placebo therapy, the laser group reported an average Lysholm score of 82.5 +/- 4.6, and the placebo group scored 79.0 +/- 1.9. At 6 months, the laser group had an average Lysholm score of 82.2 +/- 5.7, and after 1 year, they scored 81.6 +/- 6.6 ($F = 14.82923$, $p = 0.002$). Treatment with LLLT was associated with a significant decrease of symptoms compared to the placebo group: it should be considered in patients with meniscal tears who do not wish to undergo surgery.

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http://www.ncbi.nlm.nih.gov/pubmed/?term=23093133

The effect of low level laser therapy on pain reduction after third molar surgery.

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AIM: The aim of this study was to evaluate the effects of low level laser on the postoperative pain of patients who had to undergo third molar surgery. METHODS: In a randomized clinical setting, 100 patients were assigned to two groups of 50 in each. Every patient underwent surgical removal of one mandibular third molar (with osteotomy). After suturing the flap, the soft laser was applied to every patient. In group I laser radiation was applied by the dental assistant with output power of 100 mW, in continuous mode with sweeping motion, in group II, the laser hand piece was only brought into position without releasing energy, so that no patient knew which group he belonged to. The patient was given a pain evaluation form where they could determine their individual pain level and duration. RESULTS: The statistical tests showed significant difference in pain level between laser and control group ($P<0.001$) but no significant difference found in pain duration in two groups ($P=0.019$). CONCLUSION: The result of this study verifies the positive effect of the soft-laser therapy in the postoperative complication after third molar extraction.

Minerva Stomatol 2012 Jul-Aug 61(7-8) 319-22

http://www.ncbi.nlm.nih.gov/pubmed/?term=22976514

Clinical and functional evaluation of patients with acute low back pain and radiculopathy treated with different energy doses of low level laser therapy.

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BACKGROUND/AIM: The main clinical phenomena in acute low back pain (LBP) with radiculopathy are pain and neurological disorders. Although some studies show that low level laser therapy (LLLT) has the ability to modulate inflammatory processes and relieve acute pain condition, the laser therapy dose protocol has not been yet completely established. The aim of this study was to investigate the effects of three different energy doses of LLLT in patients with acute LBP and radiculopathy. METHODS: The study included 66 patients with acute LBP and radiculopathy who had been randomly divided into three groups (22 patients each) received three different doses of LLLT. The patients were treated 5 times weekly, for a total of 10 treatments, with the following parameters: wave length 904 nm, frequency 3,000 Hz, average diode power 25 mW; energy dose of 0.1 J per point in the first group, 1 J per point in the second and 4 J per point in the third group; daily treatment time and accumulated energy were 16 s and 0.4 J in the first group, 160 s and 4J in the second group and 640 s and 16 J in the third group, respectively. The parameters of assessment before and after the therapy were: lumbar and leg pain measured by visual analogue scale (VAS), local and general functional changes (Schober test, manual muscle test, straight leg raise test and the modified North American Spine Society-Low Back Pain Outcome Instrument-NASS LBP). RESULTS: Highly significant improvements ($p < 0.01$) were noted in all the groups after LLLT with respect to all the investigated parameters. The VAS scores were significantly lower in all the groups without a difference between the groups ($p > 0,05$). Functional improvements were better in the third group treated with the dose of 4 J per point than in other two groups ($p < 0.05$). CONCLUSIONS: Three different energy doses of LLLT were equally effective in alleviating lumbar and leg pain without side effects, but the dose of 4 J per point seemed to be more effective in improving the activities of daily living and lumbar mobility.

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Therapeutic effects of low-level laser therapy after premolar extraction in adolescents: a randomized double-blind clinical trial.

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Abstract Objective: The purpose of this study was to evaluate the effect of low-level laser therapy (LLLT) on wound healing process and pain levels after premolar extraction in adolescents. Background data: The advantage of using LLLT in oral surgeries is the reduction of inflammation and postoperative discomfort; however, the optimal dosing parameters and treatment effects in surgical procedures are inconclusive. Methods: A double-blind, randomized, controlled clinical trial was conducted with 14 patients who were to undergo surgical removal of premolars. Patients were randomly allocated to the LLLT (test) group and placebo (control) group. Patients in the test group received 5.1 J (60 J/cm(2)) of energy density of a gallium-aluminum-arsenide (GaAlAs) diode laser (wavelength, 830 nm; output power, 0.1 W) at three different points intraorally, 1 cm from the target tissue immediately and at 48 and 72 h after the surgical procedure. For patients in the placebo group, the laser device was applied to the same points without activating the hand piece. The wound healing process was evaluated by an independent examiner by visual inspection with the support of digital photographs at baseline and 2, 7, and 15 days postoperatively. Patients recorded the degree of pain using the visual analogue scale (VAS). Results: Compared with the placebo group, the test group showed a lower intensity of pain, but this difference was not statistically significant at any time point. The wound healing process was similar in both groups. Conclusions: Within the limitations of this study, the LLLT parameters used neither increased the wound healing process nor significantly decreased pain intensity after premolar extraction in adolescents.

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http://www.ncbi.nlm.nih.gov/pubmed/?term=22870960

Effect of low-level laser therapy after extraction of impacted lower third molars.

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The aim of this study is to evaluate the effectiveness of the low-level laser therapy (LLLT) in the control of pain, swelling, and trismus associated with surgical removal of impacted lower third molars. Thirty patients were randomized into two treatment groups, each with 15 patients-group test (LLLT) and a group control (no-LLLT)-and were told to avoid any analgesics 12 h before the procedure. In group test, the 980-nm diode-laser (G-Laser 25 Galbiati, Italy) was applied, using a 600-mum handpiece, intraorally (lingual and vestibular) at 1 cm from the involved area and extraoral at the insertion point of the masseter muscle immediately after surgery and at 24 h. The group control received only routine management. Parameters used for LLLT were: continuous mode, at 300 mW (0.3 W) for a total of 180 s (60 s x 3) (0.3 W x 180 s = 54 J). Group test showed improvement in the interincisal opening and remarkable reduction of trismus, swelling and intensity of pain on the first and the seventh postoperative days. Although LLLT has been reported to prevent swelling and trismus following the removal of impacted third molars, some of these studies reported a positive laser effect while others did not. All references to the use of laser therapy in the postoperative management of third molar surgery employ different methodologies and, in some, explanations as to selection of their respective radiation parameters are not given. This study has demonstrated that LLLT, with these parameters, is useful for the reduction of postoperative discomfort after third-molar surgery.

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http://www.ncbi.nlm.nih.gov/pubmed/?term=22843310

Interferential light therapy in the treatment of shoulder tendinopathies: a randomized controlled pilot study.

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Objectives: To test the safety of the diode light therapy and evaluate the advantages of the interferential effect of two light probes versus a conventional light probe in the relief of shoulder pain and disability caused by shoulder tendinopathies.Design: Randomized single-blind pilot study.Setting: Clinical electrotherapy unit.Participants: A total of 30 patients with shoulder pain from tendinopathies. Interventions: The patients were randomly assigned into two groups. Group 1 (n = 15) received interferential light therapy generated by two independent and identical cluster probes composed of light emitting and superluminescent diodes. Similarly, two applicators were applied in group 2 (n = 15), but only one was active, as in conventional clinical therapy. Each multi-diode cluster probe was composed of seven light-emitting diodes at 600 nm and 12 superluminescent diodes at 950 nm.Main outcome measures: Pain was evaluated by visual analogue scale (VAS) at day, at night and during several shoulder movements. Shoulder functional status was measured by means of the University California Los Angeles scale (UCLA).Results: Comparison between both treatments using the Mann-Whitney U-test showed better results for the interferential treatment. There were significant differences in pain reduction during abduction ($P < 0.05$) and external rotation ($P < 0.05$), with pain reductions in abduction and external rotation of 1.5 (+/- 1.3) and 0.5 (+/- 1.0) respectively.Conclusion: Interferential light therapy was safe and effective regarding the shoulder pain reduction during abduction and external rotation movements. The estimated size sample needed for future two-treatment parallel-design studies will require about 60 patients.

Clin Rehabil 2012 May 29

http://www.ncbi.nlm.nih.gov/pubmed/?term=22643725

Clinical effectiveness of low-level laser therapy as an adjunct to eccentric exercise for the treatment of achilles' tendinopathy: a randomized controlled trial.

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Tumilty S, McDonough S, Hurley DA, Baxter GD. Clinical effectiveness of low-level laser therapy as an adjunct to eccentric exercise for the treatment of Achilles' tendinopathy: a randomized controlled trial. OBJECTIVE: To investigate the effectiveness of low-level laser therapy (LLLT) as an adjunct to a program of eccentric exercises for the treatment of Achilles' tendinopathy. DESIGN: Randomized controlled trial with evaluations at baseline and 4, 12, and 52 weeks. SETTING: Primary care clinic. PARTICIPANTS: Participants with midportion Achilles' tendinopathy were randomly assigned to 2 groups (LLLT n=20: mean age +/- SD, 45.6+/-9.1y; placebo n=20: mean age +/- SD, 46.5+/-6.4y). The 12-week evaluation was completed by 36 participants (90%), and 33 participants (82.5%) completed the 52-week evaluation. INTERVENTION: Both groups of participants performed eccentric exercises over a 3-month period. In addition, they received either an active or placebo application of LLLT 3 times per week for the first 4 weeks; the dose was 3J per point. MAIN OUTCOME MEASURES: The primary outcome was the Victorian Institute of Sport Assessment-Achilles' questionnaire (VISA-A) score at 12 weeks; secondary outcome was a visual analog scale for pain. Outcomes were measured at baseline and 4, 12, and 52 weeks. RESULTS: Baseline characteristics exhibited no differences between groups. At the primary outcome point, there was no statistically significant difference in VISA-A scores between groups (P>.05). The difference in VISA-A scores at the 4-week point significantly favored the placebo group (F(1)=6.411, sum of squares 783.839; P=.016); all other outcome scores showed no significant difference between the groups at any time point. Observers were blinded to groupings. CONCLUSIONS: The clinical effectiveness of adding LLLT to eccentric exercises for the treatment of Achilles' tendinopathy has not been demonstrated using the parameters in this study.

Arch Phys Med Rehabil 2012 May 93(5) 733-9

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Interferential laser therapy in the treatment of shoulder pain and disability from musculoskeletal pathologies: a randomised comparative study.

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BACKGROUND: Interference is an important feature of the waves. When two or more in phase light waves meet, a new and reinforced wave is generated. Shoulder pain is a common clinical problem and laser is one of the treatments frequently used to relieve it. OBJECTIVE: To test the safety of interferential laser therapy generated by two independent low level lasers and compare its effectiveness with conventional single laser therapy in the reduction of shoulder musculoskeletal pain and associated disability. DESIGN: Randomised and single-blind controlled clinical trial. SETTING: Physiotherapy Unit and Rehabilitation Department of Ramon y Cajal University Hospital (Madrid). PARTICIPANTS: 200 patients with shoulder musculoskeletal pain were randomly assigned in two groups, 100 people each. INTERVENTIONS: Group I, experimental (n=100) received interferential laser, placing two probes opposite each other over the shoulder joint. Group II, control (n=100) received conventional laser therapy, using a single probe along with a second inactive dummy probe. Lasers used were GaAlAs diode (810 nm, 100 mW), in continuous emission. Laser was applied in contact mode through ten sessions, on 5 shoulder points (7 Joules/point) per session. MAIN OUTCOME MEASURES: Visual Analogue Scale (VAS) score and Shoulder Pain Disability index (SPADI), recorded before and after laser treatment. RESULTS: There were no differences between both groups in the reduction of pain, either assessed by VAS scale (median difference=0, 95% CI of the difference =-.6 to .5, p=0.81) or SPADI index (median difference = .4, 95% CI of the difference =-2.9 to 3.8, p=0.80), using the Mann-Whitney U-test. Comparison between the scores recorded before and after the treatment, within each group, showed significant differences for VAS during movement (median difference=3, 95% CI of the difference =2.07 to 4, p<0.001) and SPADI index (median difference=3.5, 95% CI of the difference =2.67 to 3.85, Wilcoxon test, p<0.001), for both groups. CONCLUSIONS: In this study, the application of two low level lasers in order to generate interference inside the irradiated tissue showed to be a safe therapy. Both interferential and conventional laser therapy reduced shoulder pain and disability. Nevertheless, differences between them were not detected. Future research in this field could include applying this technique with other laser parameters or application forms.

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http://www.ncbi.nlm.nih.gov/pubmed/?term=22507365

The beneficial effects of adding low level laser to ultrasound and exercise in Iranian women with shoulder tendonitis: A randomized clinical trial.

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Objectives: A randomized, double-blind, clinical trial study was conducted with the aim of determining the efficacy of adding laser (830 nm) to ultrasound (US) and exercise for the management of shoulder tendonitis. Methods: 42 subjects (n=21, in adding laser group and n=21, in US and exercise group) received a course of 10 sessions treatment over one month in the shoulder region. Outcome measures such as Visual Analogue Scale (VAS), Tenderness Severity Scale (TSS), Constant Murley Score (CMS) and Manual Muscle Testing (MMT) were performed before treatment and at the end of 4 weeks treatment. In addition, follow up were performed 2 months after the end of treatment based on the degree of pain improvement. Results: VAS, TSS and CMS improved significantly (P=0.001) in both groups, however the muscle strengths only improved significantly in adding laser group (P< 0.01).Conclusion: It seems that both protocols of physical therapy interventions were effective in relieving the signs and symptoms of shoulder tendonitis. Furthermore, adding low level laser therapy (LLLT) to the US and exercise was more efficient in improving the muscle strength in patients with shoulder tendonitis over a period of three months. However, it should be emphasized that, the current results might be due to the effects of laser and exercise instead of laser, us and exercise (as we had no independent group for US).

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http://www.ncbi.nlm.nih.gov/pubmed/?term=22398262

Effects of low-level laser therapy in combination with physiotherapy in the management of rotator cuff tendinitis.

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Rotator cuff tendinitis is one of the main causes of shoulder pain. The objective of this study was to evaluate the possible additive effects of low-power laser treatment in combination with conventional physiotherapy endeavors in these patients. A total of 50 patients who were referred to the Physical Medicine and Rehabilitation Clinic with shoulder pain and rotator cuff disorders were selected. Pain severity measured with visual analogue scale (VAS), abduction, and external rotation range of motion in shoulder joint was measured by goniometry, and evaluation of daily functional abilities of patients was measured by shoulder disability questionnaire. Twenty-five of the above patients were randomly assigned into the control group and received only routine physiotherapy. The other 25 patients were assigned into the experimental group and received conventional therapy plus low-level laser therapy (4 J/cm(2) at each point over a maximum of ten painful points of shoulder region for total 5 min duration). The above measurements were assessed at the end of the third week of therapy in each group and the results were analyzed statistically. In both groups, statistically significant improvement was detected in all outcome measures compared to baseline ($p < 0.05$). Comparison between two different groups revealed better results for control of pain (reduction in VAS average) and shoulder disability problems in the experimental group versus the control (3.1 +/- 2.2 vs. 5 +/- 2.6, $p = 0.029$ and 4.4 +/- 3.1 vs. 8.5 +/- 5.1, $p = 0.031$, respectively) after intervention. Positive objective signs also had better results in the experimental group, but the mean range of active abduction (144.92 +/- 31.6 vs. 132.80 +/- 31.3) and external rotation (78.0 +/- 19.5 vs. 76.3 +/- 19.1) had no significant difference between the two groups ($p = 0.20$ and 0.77, respectively). As one of physical modalities, gallium-arsenide low-power laser combined with conventional physiotherapy has superiority over routine physiotherapy from the view of decreasing pain and improving the patient's function, but no additional advantages were detected in increasing shoulder joint range of motion in comparison to other physical agents.

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Comparison of the effects of low energy laser and ultrasound in treatment of shoulder myofascial pain syndrome: a randomized single-blinded clinical trial.

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BACKGROUND: Myofascial pain syndrome (MPS) is one of the most prevalent musculoskeletal diseases. MPS impaired quality of life in the patients. There is a lot of controversy about different treatment options which include medical treatments, physical therapy, injections, ultrasound and laser. The effects of laser in MPS are challenging. AIM: To assess the effects of laser and ultrasound in treatment of MPS. DESIGN: Randomized single blinded clinical trial SETTING: Outpatient physical therapy clinic at university hospital POPULATION: Sixty three subjects (females: 46, males: 17), (age range: 17-55 year old) who had a diagnosis of definite MPS were entered in the study. METHODS: We measured the pain intensity at rest, during activity and at night using Visual Analogue Scale (VAS) questionnaire. The patients also filled the Neck Disability Index (NDI) form and the pain threshold provoked by pressure was determined using algometric assessment. Then, the patients were categorized randomly in groups A, B and C (receiving laser therapy, ultrasound and sham laser therapy, respectively). Six weeks after the initial visit, they were visited again and filled the forms again. RESULTS: Ultrasound was effective in VAS improvement during activity (46%), at rest (39%) and at night (35%). It also improved NDI scores (34%) and algometric assessment (37%). Laser was effective in VAS improving during activity (54%), at night (51%) and at rest (51%) and also improved NDI scores (73%). It was also found effective in algometric assessment improvement (105%). Laser resulted in more NDI score and algometric assessment improvements comparing to ultrasound ($p<0.05$). CONCLUSION: This study introduces laser as one of the preferred treatments of myofascial pain syndrome in shoulder.

Eur J Phys Rehabil Med 2011 Sep 47(3) 381-9

http://www.ncbi.nlm.nih.gov/pubmed/?term=21946400

Are ultrasound, laser and exercise superior to each other in the treatment of subacromial impingement syndrome? A randomized clinical trial.

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BACKGROUND: Subacromial impingement syndrome (SIS) is the most common reason for shoulder pain. Ultrasound and laser are the physical therapy modalities, in conservative treatment of SIS. AIM: The aim of this study was to define and compare the efficacy of ultrasound, laser and exercise in the treatment of SIS. DESIGN: This was a randomized controlled trial with-pre and post-treatment evaluations SETTING: Out-patients referred to physical medicine and rehabilitation unit. POPULATION: This study was performed on 52 patients with SIS. The patients were randomly allocated into three groups METHODS: The patients were treated five days a week for three weeks with hotpack+ultrasound +exercise (the first group); hotpack+laser+exercise (the second group), or hotpack+exercise (the third group). The pre and post treatment ranges of motion were measured in the patients. The visual analogue scale (VAS) was used to evaluate the severity of pain. Constant scoring was used to evaluate the shoulder functions and the results were compared after the treatment. RESULTS: When the post-treatment results of the groups were compared with the pretreatment results, there was a statistically significant improvement in each of the three groups, in the pain, the range of motion and the functional improvement at the shoulder ($P<0.05$). However, the inter-group comparison did not reveal any statistically significant difference in the parameters indicating improvement ($P>0.05$). CONCLUSION: The results of this study demonstrated that ultrasound and laser treatments were not superior to each other in the treatment of SIS. CLINICAL REHABILITATION IMPACT:. Exercise treatment forms the base for the conservative treatment.

Eur J Phys Rehabil Med 2011 Sep 47(3) 375-80

http://www.ncbi.nlm.nih.gov/pubmed/?term=21946399

Comparison of the effects of low energy laser and ultrasound in treatment of shoulder myofascial pain syndrome: a randomized single-blinded clinical trial.

Rayegani SM, Bahrami MH, Samadi B, Sedighipour L, Mokhtarirad MR, Eliaspoor D

Physical Medicine and Rehabilitation Department, Shohada Medical Center, Shaheed Beheshti Medical University of Medical Sciences, Tehran, Iran - bahrami7mh@gmail.com.

BACKGROUND: Myofascial pain syndrome (MPS) is one of the most prevalent musculoskeletal diseases. MPS impaired quality of life in the patients. There is a lot of controversy about different treatment options which include medical treatments, physical therapy, injections, ultrasound and laser. The effects of laser in MPS are challenging. AIM: To assess the effects of laser and ultrasound in treatment of MPS. DESIGN: Randomized single blinded clinical trial SETTING: Outpatient physical therapy clinic at university hospital POPULATION:Sixty three subjects (females: 46, males: 17), (age range: 17-55 year old) who had a RESULTS: Ultrasound was effective in VAS improvement during activity (46%), at rest (39%) and at night (35%). It also improved NDI scores (34%) and algometric assessment (37%). Laser was effective in VAS improving during activity (54%), at night (51%) and at rest (51%) and also improved NDI scores (73%). It was also found effective in algometric assessment improvement (105%). Laser resulted in more NDI score and algometric assessment improvements comparing to ultrasound ($p<0.05$). CONCLUION: This study introduces laser as one of the preferred treatments of myofascial pain syndrome in shoulder.

Eur J Phys Rehabil Med 2011 Jun 13

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Efficacy of low-level laser therapy in the management of pain, facial swelling, and postoperative trismus after a lower third molar extraction. A preliminary study.

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Pain, swelling, and trismus are the most common complications after surgical removal of impacted lower third molars. The aim of this study was to evaluate the analgesic and anti-inflammatory effects of a low-level laser therapy (Laser Smile, Biolase(R), San Clemente, USA) applied to the wound appeared after the surgical removal of impacted lower third molars. A prospective, randomized, and double-blind study was undertaken in 20 healthy patients with two symmetrically impacted lower third molars. The application of a low-level laser was made randomly on one of the two sides after surgery. The experimental side received 5 J/cm(2) of energy density, a wavelength of 810 nm, and an output power of 0.5 W. On the control side, a handpiece was applied intraorally, but the laser was not activated. Evaluations of postoperative pain, trismus, and swelling were made. The sample consisted of 11 women and nine men, and mean age was 23.35 years (18-37). The pain level in the first hours after surgery was lower in the experimental side than in the placebo side, although without statistically significant differences ($p = 0.258$). Swelling and trismus at the 2nd and 7th postoperative days were slightly higher in the control side, although not statistically significant differences were detected ($p > 0.05$). The application of a low-level laser with the parameters used in this study did not show beneficial affects in reducing pain, swelling, and trismus after removal of impacted lower third molars.

Lasers Med Sci 2011 May 27

http://www.ncbi.nlm.nih.gov/pubmed/?term=21617973

Additive effects of low-level laser therapy with exercise on subacromial syndrome: a randomised, double-blind, controlled trial.

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The subacromial syndrome is the most common source of shoulder pain. The mainstays of conservative treatment are non-steroidal anti-inflammatory drugs and exercise therapy. Recently, low-level laser therapy (LLLT) has been popularized in the treatment of various musculoskeletal disorders. The aim of this study is to evaluate the additive effects of LLLT with exercise in comparison with exercise therapy alone in treatment of the subacromial syndrome. We conducted a randomised clinical study of 80 patients who presented to clinic with subacromial syndrome (rotator cuff and biceps tendinitis). Patients were randomly allocated into two groups. In group I (n = 40), patients were given laser treatment (pulsed infrared laser) and exercise therapy for ten sessions during a period of 2 weeks. In group II (n = 40), placebo laser and the same exercise therapy were given for the same period. Patients were evaluated for the pain with visual analogue scale (VAS) and shoulder range of motion (ROM) in an active and passive movement of flexion, abduction and external rotation before and after treatment. In both groups, significant post-treatment improvements were achieved in all parameters (P = 0.00). In comparison between the two groups, a significant improvement was noted in all movements in group I (P = 0.00). Also, there was a substantial difference between the groups in VAS scores (P = 0.00) which showed significant pain reduction in group I. This study indicates that LLLT combined exercise is more effective than exercise therapy alone in relieving pain and in improving the shoulder ROM in patients with subacromial syndrome.

Clin Rheumatol 2011 May 4

http://www.ncbi.nlm.nih.gov/pubmed/?term=21538218

Are ultrasound, laser and exercise superior to each other in the treatment of subacromial impingement syndrome? A randomized clinical trial.

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BACKGROUND: Subacromial impingement syndrome (SIS) is the most common reason for shoulder pain. Ultrasound and laser are the physical therapy modalities, in conservative treatment of SIS. AIM: The aim of this study was to define and compare the efficacy of ultrasound, laser and exercise in the treatment of SIS. DESIGN: This was a randomized controlled trial with-pre and post-treatment evaluations SETTING: Out-patients referred to physical medicine and rehabilitation unit. POPULATION: This study was performed on 52 patients with SIS. The patients were randomly allocated into three groups METHODS: The patients were treated five days a week for three weeks with hotpack+ultrasound +exercise (the first group); hotpack+laser+exercise (the second group), or hotpack+exercise (the third group). The pre and post treatment ranges of motion were measured in the patients. The visual analogue scale (VAS) was used to evaluate the severity of pain. Constant scoring was used to evaluate the shoulder functions and the results were compared after the treatment. RESULTS: When the post-treatment results of the groups were compared with the pretreatment results, there was a statistically significant improvement in each of the three groups, in the pain, the range of motion and the functional improvement at the shoulder ($P<0.05$). However, the inter-group comparison did not reveal any statistically significant difference in the parameters indicating improvement ($P>0.05$). CONCLUSION: The results of this study demonstrated that ultrasound and laser treatments were not superior to each other in the treatment of SIS. Clinical Rehabilitation Impact. Exercise treatment forms the base for the conservative treatment.

Eur J Phys Rehabil Med 2011 Mar 2

http://www.ncbi.nlm.nih.gov/pubmed/?term=21364511

The effectiveness of low laser therapy in subacromial impingement syndrome: a randomized placebo controlled double-blind prospective study.

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OBJECTIVES: Conflicting results were reported about the effectiveness of Low level laser therapy on musculoskeletal disorders. The aim of this study was to investigate the effectiveness of 850-nm gallium arsenide aluminum (Ga-As-Al) laser therapy on pain, range of motion and disability in subacromial impingement syndrome. METHODS: A total of 52 patients (33 females and 19 males with a mean age of 53.59 +/- 11.34 years) with subacromial impingement syndrome were included. The patients were randomly assigned into two groups. Group I (n = 30, laser group) received laser therapy (5 joule/cm(2) at each point over maximum 5-6 painful points for 1 minute). Group II (n = 22, placebo laser group) received placebo laser therapy. Initially cold pack (10 minutes) was applied to all of the patients. Also patients were given an exercise program including range of motion, stretching and progressive resistive exercises. The therapy program was applied 5 times a week for 14 sessions. Pain severity was assessed by using visual analogue scale. Range of motion was measured by goniometer. Disability was evaluated by using Shoulder Pain and Disability Index. RESULTS: In group I, statistically significant improvements in pain severity, range of motion except internal and external rotation and SPADI scores were observed compared to baseline scores after the therapy ($p < 0.05$). In Group II, all parameters except range of motion of external rotation were improved ($p < 0.05$). However, no significant differences were recorded between the groups ($p > 0.05$). CONCLUSIONS: The Low level laser therapy seems to have no superiority over placebo laser therapy in reducing pain severity, range of motion and functional disability.

Clinics (Sao Paulo) 2010 65(10) 1019-22

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[Evaluation of low level laser and interferential current in the therapy of complex regional pain syndrome by infrared thermographic camera].

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

Vojnosanit Pregl 2010 Sep 67(9) 755-60

http://www.ncbi.nlm.nih.gov/pubmed/?term=20954414

Low-level laser therapy for acute neck pain with radiculopathy: a double-blind placebo-controlled randomized study.

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OBJECTIVE: The objective of the study was to investigate clinical effects of low-level laser therapy (LLLT) in patients with acute neck pain with radiculopathy. DESIGN: Double-blind, randomized, placebo-controlled study. SETTING: The study was carried out between January 2005 and September 2007 at the Clinic for Rehabilitation at the Medical School, University of Belgrade, Serbia. PATIENTS AND INTERVENTION: Sixty subjects received a course of 15 treatments over 3 weeks with active or an inactivated laser as a placebo procedure. LLLT was applied to the skin projection at the anatomical site of the spinal segment involved with the following parameters: wavelength 905 nm, frequency 5,000 Hz, power density of 12 mW/cm(2), and dose of 2 J/cm(2), treatment time 120 seconds, at whole doses 12 J/cm(2). OUTCOME MEASURES: The primary outcome measure was pain intensity as measured by a visual analog scale. Secondary outcome measures were neck movement, neck disability index, and quality of life. Measurements were taken before treatment and at the end of the 3-week treatment period. RESULTS: Statistically significant differences between groups were found for intensity of arm pain (P = 0.003, with high effect size d = 0.92) and for neck extension (P = 0.003 with high effect size d = 0.94). CONCLUSION: LLLT gave more effective short-term relief of arm pain and increased range of neck extension in patients with acute neck pain with radiculopathy in comparison to the placebo procedure.

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Clinic-epidemiological evaluation of ulcers in patients with leprosy sequelae and the effect of low level laser therapy on wound healing: a randomized clinical trial.

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

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Low level laser therapy before eccentric exercise reduces muscle damage markers in humans.

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

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Low-level laser therapy of dentin hypersensitivity: a short-term clinical trial.

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

Lasers Med Sci 2010 Jun 30

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Treatment of Post-Mastectomy Lymphedema with Laser Therapy: Double Blind Placebo Control Randomized Study.

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

J Surg Res 2010 Apr 18

http://www.ncbi.nlm.nih.gov/pubmed/?term=20538293

Low level laser effects on pain to palpation and electromyographic activity in TMD patients: a double-blind, randomized, placebo-controlled study.

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The purpose of this study was to evaluate the effect of diode laser (GaAlAs - 780 nm) on pain to palpation and electromyographic (EMG) activity of the masseter and anterior temporalis muscles. The laser was applied on the temporalis and masseter muscles twice a week (four weeks). Forty-eight (48) patients with myofascial pain were randomly assigned between actual and placebo treatments and between the energetic doses of 25 J/cm2 and 60 J/cm2, and were evaluated using VAS before, immediately after the final application, and 30 days after the laser treatment. Surface electromyography was performed with maximum dental clenching before and after laser therapy. The results show there were no significant statistical differences in the EMG activity between the groups before and after laser treatment. With regard to the pain at palpation, although both groups presented a significant difference in the symptoms before and after the treatment, only the active doses showed statistically significant reductions in pain level in all the regions of the palpated muscles. However, there was no significant statistical difference between groups (experimental and placebo). In conclusion, low level laser did not promote any changes in EMG activity. The treatment did, however, lessen the pain symptoms in the experimental groups.

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Is low-level laser therapy effective in acute or chronic low back pain?

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The purpose of this study was to compare the effectiveness of low-level laser therapy (LLLT) on pain and functional capacity in patients with acute and chronic low back pain caused by lumbar disk herniation (LDH). LLLT has been used to treat acute and chronic pain of musculoskeletal system disorders. This study is a randomized, double-blind, placebo-controlled study. Forty patients with acute (26 females/14 males) and 40 patients with chronic (20 females/20 males) low back pain caused by LDH were included in the study. Patients were randomly allocated into four groups. Group 1 (acute LDH, n = 20) received hot-pack + laser therapy; group 2 (chronic LDH, n = 20) received hot-pack + laser therapy; group 3 (acute LDH, n = 20) received hot-pack + placebo laser therapy, and group 4 (chronic LDH, n = 20) received hot-pack + placebo laser therapy, for 15 sessions during 3 weeks. Assessment parameters included pain, patients' global assessment, physician's global assessment, and functional capacity. Pain was evaluated by visual analog scale (VAS) and Likert scale. Patients' and physician's global assessment were also measured with VAS. Modified Schober test and flexion and lateral flexion measures were used in the evaluation of range of motion (ROM) of lumbar spine. Roland Disability Questionnaire (RDQ) and Modified Oswestry Disability Questionnaire (MODQ) were used in the functional evaluation. Measurements were done before and after 3 weeks of treatment. After the treatment, there were statistically significant improvements in pain severity, patients' and physician's global assessment, ROM, RDQ scores, and MODQ scores in all groups ($p < 0.05$). However, no significant differences were detected between four treatment groups with respect to all outcome parameters ($p > 0.05$). There were no differences between laser and placebo laser treatments on pain severity and functional capacity in patients with acute and chronic low back pain caused by LDH.

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Assessment of the effectiveness of low-level laser therapy on the hands of patients with rheumatoid arthritis: a randomized double-blind controlled trial.

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Assess the effectiveness of low-level laser therapy on pain reduction and improvement in function in the hands of patients with rheumatoid arthritis. A randomized double-blind controlled trial was carried out on 82 patients with rheumatoid arthritis. The experimental group was submitted to the application of laser therapy, whereas the control group received a placebo laser. Aluminum gallium arsenide laser was used, at a wavelength of 785 nm, dose of 3 J/cm(2) and mean power of 70 mW. The groups were homogenous at the beginning of the study with regard to the main variables ($p > 0.05$). There were no statistically significant differences between groups in most of the measurements taken at the end of the intervention including the primary variables; the following variables were the exceptions: favoring the experimental group-inflammation of the interphalangeal joint of the right thumb ($p = 0.012$) and perimetry of the interphalangeal joint of the left thumb ($p = 0.013$); and favoring the control group-flexion of the proximal interphalangeal joint of the right fifth finger ($p = 0.021$), perimetry of the third proximal interphalangeal joint of the right hand ($p = 0.044$), grip strength in the left hand ($p = 0.010$), and the work domain of the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire ($p = 0.010$). We conclude that low-level aluminum gallium arsenide laser therapy is not effective at the wavelength, dosage, and power studied for the treatment of hands among patients with rheumatoid arthritis.

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Low-level laser therapy as a non-invasive approach for body contouring: a randomized, controlled study.

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BACKGROUND AND OBJECTIVE: Transmission electron microscopic images have demonstrated the formation of transitory pores in adipocyte cell membranes followed by the collapse of adipose cells subsequent to laser irradiation of 635 nm. The objective is to evaluate the application of a 635 nm and 17.5 mW exit power per multiple diode laser for the application of non-invasive body contouring of the waist, hips, and thighs. STUDY DESIGN/PATIENTS AND METHODS: Double-blind, randomized, placebo-controlled trial of a 2-week non-invasive laser treatment conducted from May 2007 to June 2008 across multiple-private practice sites in the United States of America. Sixty-seven volunteers between the ages of 18-65 with a body mass index (BMI) between 25 and 30 kg/m(2) and who satisfied the set inclusion criteria participated. Eight of the 67 subjects did not have circumference measurements recorded at the 2-week post-procedure measurement point. Participants were randomly assigned to receive low-level laser treatments or a matching sham treatment three times per week for 2 weeks. Reduction in the total combined inches of circumference measurements of the waist, hip and bilateral thighs from baseline to the completion of the 2-week procedure administration phase was assessed. RESULTS: Participants in the treatment group demonstrated an overall reduction in total circumference across all three sites of -3.51 in. ($P < 0.001$) compared with control subjects who revealed a -0.684 reduction ($P < 0.071745$). Test group participants demonstrated a reduction of -0.98 in. ($P < 0.0001$) across the waist, -1.05 in. ($P < 0.01$) across the hip, and -0.85 in. ($P < 0.01$) and -0.65 in. ($P < 0.01$) across the right and left thighs from baseline to 2 weeks (end of treatment). At 2 weeks post-procedure, test group subjects demonstrated a gain of 0.31 total inches collectively across all three sites. CONCLUSION: These data suggest that low-level laser therapy can reduce overall circumference measurements of specifically treated regions.

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Acute Low Back Pain with Radiculopathy: A Double-Blind, Randomized, Placebo-Controlled Study.

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

Photomed Laser Surg 2009 Dec 9

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Evaluation of low intensity laser therapy in myofascial pain syndrome.

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

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Managing postmastectomy lymphedema with low-level laser therapy.

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

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http://www.ncbi.nlm.nih.gov/pubmed/?term=19878027

Investigation of the Effect of GaAs Laser Therapy on Lateral Epicondylitis.

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Abstract Background and Objective: There are conflicting reports regarding the efficacy of low energy laser therapy in treatment of lateral epicondylitis (LE). Contradictory results are considered to be due to different joint treatment protocols regarding variables such as dose, duration, and frequency. The aim of this study was to investigate the efficacy of gallium-arsenide (GaAs) laser therapy, which was performed with the dose regimen recommended by the World Association for Laser Therapy, in relieving pain and improving functional activities in patients with LE. Patients and Methods: Forty-nine patients (50 elbows) evaluated in our outpatient clinic were included in the study. Elbows were randomized into two groups: laser (n = 25) and placebo laser (n = 25). Either laser or placebo laser therapy was applied to patients for 15 sessions (5 d per week for 3 weeks). Main outcome measures were visual analog scale, tenderness, Disability of the Arm Shoulder and Hand (DASH) questionnaire, the Patient-Related Lateral Epicondylitis Evaluation (PRTEE) test, pain-free grip strength, and the Nottingham Health Profile (NHP) questionnaire. Evaluations were performed before treatment, at the end of 3 weeks of treatment, and after the 12th week of treatment ended. Results: Upon post-treatment evaluation, a significant improvement in all parameters was observed for both groups ($p < 0.05$). No significant difference was found when the laser and placebo groups were compared. At the 12 week evaluation, a significant sustained improvement in all parameters was observed. On intergroup evaluation, a significant improvement was observed in favor of the active treatment group regarding pain with resisted extension of the wrist, tenderness with pressure, and for both the total and subgroup scores of the DASH questionnaire and PRTEE test, as well as for the pain subgroup of the NHP questionnaire ($p < 0.05$). Conclusion: Although low energy laser therapy had no advantage compared to placebo in patients with LE for the short term, a significant improvement, particularly in functional parameters, was achieved in the long term. Laser, which has relatively no side effects, might be included among long-term treatment options for LE.

Photomed Laser Surg 2009 Oct 30

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Ultrasonographic evaluation of plantar fasciitis after low-level laser therapy: results of a double-blind, randomized, placebo-controlled trial.

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

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[Comparison of non-invasive and invasive techniques in the treatment of patients with myofascial pain syndrome.]

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OBJECTIVES: We compared in this study the efficiency of non-invasive techniques including transcutaneous electrical nerve stimulation (TENS) and laser treatments with invasive techniques including lidocaine and botulinum toxin-A injection in patients with myofascial pain syndrome (MPS). METHODS: One hundred patients who admitted to Firat University Hospital Pain Department and who were diagnosed as MPS were included in the study. Patients were randomized into four groups of 25 patients each. Sixty sessions of TENS and 20 sessions of laser treatments were performed in the first and second groups, respectively. Lidocaine and botulinum toxin-A were injected in the third and fourth groups, respectively. 2 ml (20 mg) 1% lidocaine was injected in each patient twice a week for one month in Group III. 25 U (0.5 ml) of botulinum toxin-A was injected in each patient only once in Group IV. Pain was evaluated with visual analogue scale (VAS), palpable muscle spasm scoring (PMSS) and anesthesiometer at baseline, 15, 30 and 45 days. RESULTS: There were no statistically significant differences between the groups with respect to age, sex and education level. Pain control was statistically better in Group IV compared with the other groups with respect to VAS, PMSS and anesthesiometer scores. CONCLUSION: Botulinum toxin-A injection provided better pain control when compared to trigger point injection with lidocaine and non-invasive techniques including TENS and laser treatments.

Agri 2009 Jul 21(3) 104-12

http://www.ncbi.nlm.nih.gov/pubmed/?term=19780001

Placebo-controlled randomized clinical trial of the effect two different low-level laser therapies (LLLT)-intraoral and extraoral-on trismus and facial swelling following surgical extraction of the lower third molar.

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

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Short-term effects of high-intensity laser therapy versus ultrasound therapy in the treatment of people with subacromial impingement syndrome: a randomized clinical trial.

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BACKGROUND: Subacromial impingement syndrome (SAIS) is a painful condition resulting from the entrapment of anatomical structures between the anteroinferior corner of the acromion and the greater tuberosity of the humerus.

OBJECTIVE: The aim of this study was to evaluate the short-term effectiveness of high-intensity laser therapy (HILT) versus ultrasound (US) therapy in the treatment of SAIS.

DESIGN: The study was designed as a randomized clinical trial. SETTING: The study was conducted in a university hospital. PATIENTS: Seventy patients with SAIS were randomly assigned to a HILT group or a US therapy group.

INTERVENTION: Study participants received 10 treatment sessions of HILT or US therapy over a period of 2 consecutive weeks. MEASUREMENTS: Outcome measures were the Constant-Murley Scale (CMS), a visual analog scale (VAS), and the Simple Shoulder Test (SST). RESULTS: For the 70 study participants (42 women and 28 men; mean [SD] age=54.1 years [9.0]; mean [SD] VAS score at baseline=6.4 [1.7]), there were no between-group differences at baseline in VAS, CMS, and SST scores. At the end of the 2-week intervention, participants in the HILT group showed a significantly greater decrease in pain than participants in the US therapy group. Statistically significant differences in change in pain, articular movement, functionality, and muscle strength (force-generating capacity) (VAS, CMS, and SST scores) were observed after 10 treatment sessions from the baseline for participants in the HILT group compared with participants in the US therapy group. In particular, only the difference in change of VAS score between groups (1.65 points) surpassed the accepted minimal clinically important difference for this tool.

LIMITATIONS: This study was limited by sample size, lack of a control or placebo group, and follow-up period.

CONCLUSIONS: Participants diagnosed with SAIS showed greater reduction in pain and improvement in articular movement functionality and muscle strength of the affected shoulder after 10 treatment sessions of HILT than did participants receiving US therapy over a period of 2 consecutive weeks.

Phys Ther 2009 Jul 89(7) 643-52

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Efficacy of Interferential Low-Level Laser Therapy Using Two Independent Sources in the Treatment of Knee Pain.

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Abstract Objective: The aim of this study was to evaluate the effectiveness of an interferential pattern generated by two identical and independent lasers in the relief of knee pain. Background Data: Low-level laser therapy (LLLT) is generally applied by a single probe. Materials and Methods: A double-blind controlled clinical trial was performed on 152 patients with knee pain who were randomly assigned into two different groups. Group I patients (n = 76) received interferential laser therapy generated by two identical laser probes located opposite each other on the knee joint. Group II patients (n = 76) received one live probe in conventional laser therapy and one dummy probe. The device used in both groups was an AlGaAs laser (wavelength 810 nm, power 100 mW, in continuous mode). Fifteen laser sessions were applied transcutaneously on 5 knee points (6 J/point) per session. In addition, patients in both groups received a quadriceps strength program based on isometric exercises. A visual analogue scale (VAS) was used for pain evaluation in different situations, such as in standing, in knee flexion/extension, and when going up and down stairs. VAS pain scores were evaluated before, in the middle of, and after treatment. Results: ANOVA results showed no significant differences between groups for all VAS scores or in the interaction with the sessions ($p > 0.05$). The VAS score results showed a statistically significant pain reduction throughout all sessions ($p = 0.000$). Conclusions: Interferential laser therapy is safe and effective in reducing knee pain. However, the results of the study indicate that it is not superior to the use of a single conventional laser.

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http://www.ncbi.nlm.nih.gov/pubmed/?term=19405858

Low-level laser therapy in subacromial impingement syndrome.

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Abstract Background Data and Objective: Although previous studies have evaluated the effect of different kinds of physical therapy in subacromial impingement syndrome (SIS), there have been few investigations assessing the effectiveness of low-level laser therapy (LLLT) in shoulder disorders. The goal of this prospective randomized study was to assess whether gallium-arsenide (Ga-As) laser therapy improves the outcome of a comprehensive home exercise program in patients with SIS. Materials and Methods: Forty-four newly-diagnosed SIS patients were enrolled in this study. Group 1 patients (n = 22) received Ga-As laser therapy combined with a 12-wk comprehensive home exercise program, and group 2 patients (n = 22) received the same 12-wk comprehensive home exercise program alone. Night pain, shoulder pain and disability index (SPADI), and University of California-Los Angeles end-result (UCLA) scores were used as outcome measures. Results: Both groups showed a significant reduction in night pain and SPADI scores at the second and 12th weeks with respect to baseline values, with the exception of the SPADI total score at the second week in group 1. UCLA results improved significantly in both groups at the 12th in comparison to the second week. There were no significant differences between groups in mean actual changes in night pain and SPADI scores at the second week from baseline. When values at the 12th week were compared to baseline, mean actual changes in night pain differed significantly between the groups, with a larger change in group 1, but there was no difference between groups in mean actual change in SPADI scores. Second- and 12th-week UCLA scores did not differ between the two groups. Conclusion: Our study was unable to demonstrate any distinct advantage of low-level laser therapy over exercise alone. Comprehensive home exercise programs should be the primary therapeutic option in the rehabilitation process in SIS.

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http://www.ncbi.nlm.nih.gov/pubmed/?term=19250050

Effectiveness of combined counseling and low-level laser stimulation in the treatment of disturbing chronic tinnitus.

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We recruited 46 adult patients affected by disturbing tinnitus lasting for at least 3 years. All were treated with a combined counseling protocol constituting hypnotherapeutic and muscle relaxation techniques. We randomly assigned 26 patients to the group receiving low-level laser stimulation treatment and 20 to the placebo group. The laser power was 5 mV and the wavelength 650 nm. The irradiation lasted 20 minutes daily for 3 months. The Tinnitus Handicap Inventory (THI) questionnaire was submitted at the beginning and at the end of treatment. The THI scores improved in the entire sample after treatment but more significantly in the group receiving low-level laser stimulation. From the point of view of clinical classification, approximately 61% of irradiated patients had tinnitus severity decreased by one class, in comparison to 35% of the placebo group.

Int Tinnitus J 2008 14(2) 175-80

http://www.ncbi.nlm.nih.gov/pubmed/?term=19205171

The Effect of Low-Level Laser Therapy on Trismus and Facial Swelling Following Surgical Extraction of a Lower Third Molar.

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Abstract Objective: The purpose of this study was to evaluate the effect of low-level laser therapy (LLLT) on postoperative trismus and edema after the removal of mandibular third molars. Materials and Methods: Thirty-two patients who were to undergo surgical removal of lower third molars were studied. Patients were randomly allocated to two groups, LLLT and placebo. Patients in the LLLT group received 12 J (4 J/cm(2)) low-level laser irradiation to the operative side intraorally 1 cm from the target tissue, and to the masseter muscle extraorally immediately after surgery. In the placebo group the handpiece was inserted into the operative side intraorally and was applied to the masseter muscle extraorally each for 1 min, but laser power was not activated. Inter-incisal opening and facial swelling were evaluated on postoperative days 2 and 7. Student's t-test used to analyze the data. Results: It was determined that the trismus and the swelling in LLLT group were significantly less than in the placebo group on postoperative days 2 and 7. Conclusion: Within the limitations of this study it can be concluded that LLLT can be beneficial for the reduction of postoperative trismus and swelling after third molar surgery.

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http://www.ncbi.nlm.nih.gov/pubmed/?term=19196113

The Effectiveness of Conservative Treatments of Carpal Tunnel Syndrome: Splinting, Ultrasound, and Low-Level Laser Therapies.

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Abstract Objective: The objective of this study was to investigate the effectiveness of splinting, ultrasound (US), and low-level laser (LLL) in the management of carpal tunnel syndrome (CTS). Background Data: CTS is the entrapment mononeuropathy most frequently seen in clinical practice, caused by compression of the median nerve at the wrist. Although several treatment modalities are routinely in use, there is no consensus about the best way to manage CTS. Materials and Methods: In our study, patients were randomly allocated to three groups that received the following treatment protocols: splinting only, splinting plus US, and splinting plus LLL therapy. Patients were assessed with the Boston Questionnaire, patient satisfaction inquiry, visual analogue scale for pain, and electroneuromyography. Results and Conclusion: The study was completed with a total of 100 hands of 50 women patients with bilateral CTS at 3 mo after treatment. At the end of the follow-up period, each of the groups had improvements to varying degrees. It appeared that the combinations of US or LLL therapy with splinting were more effective than splinting alone in treating CTS. However, LLL therapy plus splinting was more advantageous than US therapy plus splinting, especially for the outcomes of lessening of symptom severity, pain alleviation, and increased patient satisfaction.

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http://www.ncbi.nlm.nih.gov/pubmed/?term=19196106

The effectiveness of low-level laser therapy on shoulder function in subacromial impingement syndrome.

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Purpose. To investigate the effectiveness of low-level laser therapy (LLLT) in addition to exercise programme on shoulder function in subacromial impingement syndrome (SAIS). Method. Sixty-seven patients with SAIS were randomly assigned to either a group that received laser (n = 34) or a group that received placebo Laser (n = 26). Pain, functional assessment, disability and muscle strength of shoulder were assessed before and after a 3-week rehabilitation programme. Besides Laser or placebo Laser, superficial cold and progressive exercise programme were administered to both groups, 5 days a week, for 3 weeks. A progressive exercise programme that was done daily twice under supervision in clinic and at home was given to the patients. Results. After the treatment, all outcome measurements had shown significant improvement except muscle strength in both the groups. When the parameters of the improvement were compared, there were no significant differences between the two groups after treatment. Conclusion. We concluded that there is no fundamental difference between LLLT and placebo LLLT when they are supplementing an exercise programme for rehabilitation of patients with shoulder impingement syndrome.

Disabil Rehabil 2008 Nov 21 38503

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Carpal tunnel syndrome treated with a diode laser: a controlled treatment of the transverse carpal ligament.

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OBJECTIVE: The purpose of this placebo-controlled study was to investigate the therapeutic effects of the 830-nm diode laser on carpal tunnel syndrome (CTS). BACKGROUND DATA: Many articles in the literature have demonstrated that low-level laser therapy (LLLT) may help to alleviate various types of nerve pain, especially for CTS treatment. We placed an 830-nm laser directly above the transverse carpal ligament, which is between the pisiform and navicular bones of the tested patients, to determine the therapeutic effect of LLLT. MATERIALS AND METHODS: Thirty-six patients with mild to moderate degree of CTS were randomly divided into two groups. The laser group received laser treatment (10 Hz, 50% duty cycle, 60 mW, 9.7 J/cm(2), at 830 nm), and the placebo group received sham laser treatment. Both groups received treatment for 2 wk consisting of a 10-min laser irradiation session each day, 5 d a week. The therapeutic effects were assessed on symptoms and functional changes, and with nerve conduction studies (NCS), grip strength assessment, and with a visual analogue scale (VAS), soon after treatment and at 2-wk follow-up. RESULTS: Before treatment, there were no significant differences between the two groups for all assessments ($p > 0.05$). The VAS scores were significantly lower in the laser group than the placebo group after treatment and at follow-up ($p < 0.05$). After 2 wk of treatment, no significant differences were found in grip strengths or for symptoms and functional assessments ($p > 0.05$). However, there were statistically significant differences in these variables at 2-wk follow-up ($p < 0.05$). Regarding the findings of NCS, there was no statistically significant difference between groups after treatment and at 2-wk follow-up. CONCLUSIONS: LLLT was effective in alleviating pain and symptoms, and in improving functional ability and finger and hand strength for mild and moderate CTS patients with no side effects.

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The effects of low level laser in clinical outcome and neurophysiological results of carpal tunnel syndrome.

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OBJECTIVES: Carpal tunnel syndrome (CTS) is the most common neuropathy that can be diagnosed with confidence by the nerve conduction study (NCS). One of the recent treatments of CTS is the application of low power laser (LPL) therapy. The present study evaluates the effects of LPL irradiation through NCS and clinical signs and symptoms. METHODS: A total of 80 patients were included in this study. Diagnosis of CTS was based on both clinical examination and electromyographic (EMG) findings. Patients were randomly assigned into two groups. Test group (group A) underwent laser therapy (9-11 joules/cm2) over the carpal tunnel area. Control group (group B) received sham laser therapy. Pain, hand grip strength, median proximal sensory and motor latencies, transcarpal median sensory nerve conduction (SNCV) were recorded. After fifteen sessions of irradiation (five times per week), parameters were recorded again and clinical symptoms were measured in both groups. Pain was evaluated by Visual Analog Scale (VAS; day-night). Hand grip was measured by Jamar dynometer. Paired t-test and independent sample t-test were used for statistical analysis. RESULTS: There was a significant improvement in clinical symptoms and hand grip in group A ($p < 0.001$). Proximal median sensory latency, distal median motor latency and median sensory latencies were significantly decreased ($p < 0.001$). Transcarpal median SNCV increased significantly after laser irradiation ($p < 0.001$). There were no significant changes in group B except changes in clinical symptoms ($p < 0.001$). CONCLUSIONS: Laser therapy as a new conservative treatment is effective in treating CTS paresthesia and numbness and improves the subjects' power of hand grip and electrophysiological parameters.

Electromyogr Clin Neurophysiol 2008 Jun-Jul 48(5) 229-31

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Comparison of 3 physical therapy modalities for acute pain in lumbar disc herniation measured by clinical evaluation and magnetic resonance imaging.

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OBJECTIVE: This study measures and compares the outcome of traction, ultrasound, and low-power laser (LPL) therapies by using magnetic resonance imaging and clinical parameters in patients presenting with acute leg pain and low back pain caused by lumbar disc herniation (LDH). METHODS: A total of 60 patients were enrolled in this study and randomly assigned into 1 of 3 groups equally according to the therapies applied, either with traction, ultrasound, or LPL. Treatment consisted of 15 sessions over a period of 3 weeks. Magnetic resonance imaging examinations were done before and immediately after the treatment. Physical examination of the lumbar spine, severity of pain, functional disability by Roland Disability Questionnaire, and Modified Oswestry Disability Questionnaire were assessed at baseline, immediately after, and at 1 and 3 months after treatment. RESULTS: There were significant reductions in pain and disability scores between baseline and follow-up periods, but there was not a significant difference between the 3 treatment groups at any of the 4 interview times. There were significant reductions of size of the herniated mass on magnetic resonance imaging after treatment, but no differences between groups. CONCLUSIONS: This study showed that traction, ultrasound, and LPL therapies were all effective in the treatment of this group of patients with acute LDH. These results suggest that conservative measures such as traction, laser, and ultrasound treatments might have an important role in the treatment of acute LDH.

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Low-power laser treatment in patients with frozen shoulder: preliminary results.

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OBJECTIVE: In this study I sought to test the efficacy of low-power laser therapy (LLLT) in patients with frozen shoulder. Background Data: The use of low-level laser energy has been recommended for the management of a variety of musculoskeletal disorders. MATERIALS AND METHODS: Sixty-three patients with frozen shoulder were randomly assigned into one of two groups. In the active laser group (n = 31), patients were treated with a 810-nm Ga-Al-As laser with a continuous output of 60 mW applied to eight points on the shoulder for 30 sec each, for a total dose of 1.8 J per point and 14.4 J per session. In the placebo group (n = 32), patients received placebo laser treatment. During 8 wk of treatment, the patients in each group received 12 sessions of laser or placebo, two sessions per week (for weeks 1-4), and one session per week (for weeks 5-8). RESULTS: Relative to the placebo group, the active laser group had: (1) a significant decrease in overall, night, and activity pain scores at the end of 4 wk and 8 wk of treatment, and at the end of 8 wk additional follow-up (16 wk post-randomization); (2) a significant decrease in shoulder pain and disability index (SPADI) scores and Croft shoulder disability questionnaire scores at those same intervals; (3) a significant decrease in disability of arm, shoulder, and hand questionnaire (DASH) scores at the end of 8 wk of treatment, and at 16 wk posttreatment; and (4) a significant decrease in health-assessment questionnaire (HAQ) scores at the end of 4 wk and 8 wk of treatment. There was some improvement in range of motion, but this did not reach statistical significance. CONCLUSIONS: The results suggested that laser treatment was more effective in reducing pain and disability scores than placebo at the end of the treatment period, as well as at follow-up.

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http://www.ncbi.nlm.nih.gov/pubmed/?term=18341417

Effects of Low-Level Laser Therapy and Eccentric Exercises in the Treatment of Recreational Athletes With Chronic Achilles Tendinopathy.

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BACKGROUND: Eccentric exercises (EEs) are recommended for the treatment of Achilles tendinopathy, but the clinical effect from EE has a slow onset. HYPOTHESIS: The addition of low-level laser therapy (LLLT) to EE may cause more rapid clinical improvement. STUDY DESIGN: Randomized controlled trial; Level of evidence, 1. METHODS: A total of 52 recreational athletes with chronic Achilles tendinopathy symptoms were randomized to groups receiving either EE + LLLT or EE + placebo LLLT over 8 weeks in a blinded manner. Low-level laser therapy (lambda = 820 nm) was administered in 12 sessions by irradiating 6 points along the Achilles tendon with a power density of 60 mW/cm(2) and a total dose of 5.4 J per session. RESULTS: The results of the intention-to-treat analysis for the primary outcome, pain intensity during physical activity on the 100-mm visual analog scale, were significantly lower in the LLLT group than in the placebo LLLT group, with 53.6 mm versus 71.5 mm (P = .0003) at 4 weeks, 37.3 mm versus 62.8 mm (P = .0002) at 8 weeks, and 33.0 mm versus 53.0 mm (P = .007) at 12 weeks after randomization. Secondary outcomes of morning stiffness, active dorsiflexion, palpation tenderness, and crepitation showed the same pattern in favor of the LLLT group. CONCLUSION: Low-level laser therapy, with the parameters used in this study, accelerates clinical recovery from chronic Achilles tendinopathy when added to an EE regimen. For the LLLT group, the results at 4 weeks were similar to the placebo LLLT group results after 12 weeks.

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Laser therapy in the treatment of achilles tendinopathy: a pilot study.

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OBJECTIVE: To test the feasibility of a randomized controlled trial to assess the clinical effectiveness of low-level laser therapy (LLLT) when used in addition to eccentric exercise in the management of Achilles tendinopathy. BACKGROUND DATA: LLLT has emerged as a possible treatment modality for tendon injuries. Over the past 20 years only three human studies have investigated LLLT for Achilles tendinopathy. MATERIALS AND METHODS: Twenty patients were randomized into an active laser or placebo group; all patients, therapists, and investigators were blinded to allocation. All patients were given a 12-week eccentric exercise program and irradiated three times per week for 4 wk with either an active or placebo laser at standardized points over the affected tendons. Irradiation parameters in the active treatment group were: 810 nm, 100 mW, applied to six points on the tendon for 30 s, for a total dose of 3 J per point and 18 J per session. Outcome measures were the VISA-A questionnaire, pain, and isokinetic strength. Patients were measured before treatment and at 4 and 12 wk. Analysis of covariance was used to analyze data, using the effects of baseline measurements as a covariate. RESULTS: Within groups, there were significant improvements ($p < 0.05$) at 4 and 12 wk for all outcome measures, except eccentric strength for the placebo group at 4 wk ($p = 0.11$). Based on the results of the current study, recruitment of 20 subjects per group would be required to perform an adequately powered study based on minimally important clinical differences in VISA-A scale. CONCLUSION: This study has demonstrated the feasibility of undertaking a randomized controlled trial of LLLT for Achilles tendinopathy. Conclusions regarding effectiveness cannot be made due to the low statistical power of this pilot study.

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The short-term efficacy of laser, brace, and ultrasound treatment in lateral epicondylitis: a prospective, randomized, controlled trial.

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The aims of this study were to evaluate the effects of low-level laser therapy (LLLT) and to compare these with the effects of brace or ultrasound (US) treatment in tennis elbow. The study design used was a prospective and randomized, controlled, single-blind trial. Fifty-eight outpatients with lateral epicondylitis (9 men, 49 women) were included in the trial. The patients were divided into three groups: 1) brace group-brace plus exercise, 2) ultrasound group-US plus exercise, and 3) laser group-LLLT plus exercise. Patients in the brace group used a lateral counterforce brace for three weeks, US plus hot pack in the ultrasound group, and laser plus hot pack in the LLLT group. In addition, all patients were given progressive stretching and strengthening exercise programs. Grip strength and pain severity were evaluated with visual analog scale (VAS) at baseline, at the second week of treatment, and at the sixth week of treatment. VAS improved significantly in all groups after the treatment and in the ultrasound and laser groups at the sixth week ($p<0.05$). Grip strength of the affected hand increased only in the laser group after treatment, but was not changed at the sixth week. There were no significant differences between the groups on VAS and grip strength at baseline and at follow-up assessments. The results show that, in patients with lateral epicondylitis, a brace has a shorter beneficial effect than US and laser therapy in reducing pain, and that laser therapy is more effective than the brace and US treatment in improving grip strength.

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http://www.ncbi.nlm.nih.gov/pubmed/?term=18215753

In chronic low back pain, low level laser therapy combined with exercise is more beneficial than exercise alone in the long term: a randomised trial.

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QUESTION: Is low level laser therapy an effective adjuvant intervention for chronic low back pain? DESIGN: Randomised trial with concealed allocation, blinded assessors and intention-to-treat analysis. PARTICIPANTS: Sixty-one patients who had low back pain for at least 12 weeks. INTERVENTION: One group received laser therapy alone, one received laser therapy and exercise, and the third group received placebo laser therapy and exercise. Laser therapy was performed twice a week for 6 weeks. OUTCOME MEASURES: Outcomes were pain severity measured using a 10-cm visual analogue scale, lumbar range of motion measured by the Schober Test and maximum active flexion, extension and lateral flexion, and disability measured with the Oswestry Disability Index on admission to the study, after 6 weeks of intervention, and after another 6 weeks of no intervention. RESULTS: There was no greater effect of laser therapy compared with exercise for any outcome, at either 6 or 12 weeks. There was also no greater effect of laser therapy plus exercise compared with exercise for any outcome at 6 weeks. However, in the laser therapy plus exercise group pain had reduced by 1.8 cm (95% CI 0.1 to 3.3, $p = 0.03$), lumbar range of movement increased by 0.9 cm (95% CI 0.2 to 1.8, $p < 0.01$) on the Schober Test and by 15 deg (95% CI 5 to 25, $p < 0.01$) of active flexion, and disability reduced by 9.4 points (95% CI 2.7 to 16.0, $p = 0.03$) more than in the exercise group at 12 weeks. CONCLUSION: In chronic low back pain low level laser therapy combined with exercise is more beneficial than exercise alone in the long term.

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http://www.ncbi.nlm.nih.gov/pubmed/?term=17725472

Effect of low level laser therapy in rheumatoid arthritis patients with carpal tunnel syndrome.

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OBJECTIVE: the aim of the present study was to evaluate the efficacy of low level laser therapy (LLLT) in patients with rheumatoid arthritis (RA) with carpal tunnel syndrome (CTS). MATERIAL AND METHODS: a total of 19 patients with the diagnosis of CTS in 19 hands were included and randomly assigned to two treatment groups; LLLT (Group 1) (10 hands) with dosage 1.5 J/ per point and placebo laser therapy group (Group 2) (9 hands). A Galium-Aluminum-Arsenide diode laser device was used as a source of low power laser with a power output of 50 mW and wavelength of 780 nm. All treatments were applied once a day on week days for a total period of 10 days. Clinical assessments were performed at baseline, at the end of the treatment and at month 3. Tinel and Phalen signs were tested in all patients. Patients were evaluated for such clinical parameters as functional status scale (FSS), visual analogue scale (VAS), symptom severity scale (SSS) and grip-strength. However, electrophysiological examination was performed on all hands. Results were given with descriptive statistics and confidence intervals between group means at 3 months adjusted for outcome at baseline and for the difference between unadjusted group proportions. RESULTS: clinical and electrophysiological parameters were similar at baseline in both groups. Improvements were significantly more pronounced in the LLLT group than placebo group. A comparison between groups showed significant improvements in pain score and functional status scale score. Group mean differences at 3 months adjusted at baseline were found to be statistically significant for pain score and functional status scale score. The 95% significant confidence intervals were [-15 - (-5)] and [-5 - (-2)] respectively. There were no statistically significant differences in other clinical and electrophysiological parameters between groups at 3 months. CONCLUSIONS: our study results indicate that LLLT and placebo laser therapy seems to be effective for pain and hand function in CTS. We, therefore, suggest that LLLT may be used as a good alternative treatment method in CTS patients with RA.

Swiss Med Wkly 2007 Jun 16 137(23-24) 347-52

http://www.ncbi.nlm.nih.gov/pubmed/?term=17629805

Effects of low-level laser and plyometric exercises in the treatment of lateral epicondylitis.

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OBJECTIVE: This study was undertaken to compare the effectiveness of a protocol of combination of laser with plyometric exercises and a protocol of placebo laser with the same program, in the treatment of tennis elbow. BACKGROUND DATA: The use of low-level laser has been recommended for the management of tennis elbow with contradictory results. Also, plyometric exercises was recommended for the treatment of the tendinopathy. METHODS: Fifty patients who had tennis elbow participated in the study and were randomised into two groups. Group A (n = 25) was treated with a 904 Ga-As laser CW, frequency 50 Hz, intensity 40 mW and energy density 2.4 J/cm(2), plus plyometric exercises and group B (n = 25) that received placebo laser plus the same plyometric exercises. During eight weeks of treatment, the patients of the two groups received 12 sessions of laser or placebo, two sessions per week (weeks 1-4) and one session per week (weeks 5-8). Pain at rest, at palpation on the lateral epicondyle, during resisted wrist extension, middle finger test, and strength testing was evaluated using Visual Analogue Scales. Also it was evaluated the grip strength, the range of motion and weight test. Parameters were determined before the treatment, at the end of the eighth week course of treatment (week 8), and eighth (week 8) after the end of treatment. RESULTS: Relative to the group B, the group A had (1) a significant decrease of pain at rest at the end of 8 weeks of the treatment ($p < 0.005$) and at the end of following up period ($p < 0.05$), (2) a significant decrease in pain at palpation and pain on isometric testing at 8 weeks of treatment ($p < 0.05$), and at 8 weeks follow-up ($p < 0.001$), (3) a significant decrease in pain during middle finger test at the end of 8 weeks of treatment ($p < 0.01$), and at the end of the follow-up period ($p < 0.05$), (4) a significant decrease of pain during grip strength testing at 8 weeks of treatment ($p < 0.05$), and at 8 weeks follow-up ($p < 0.001$), (5) a significant increase in the wrist range of motion at 8 weeks follow-up ($p < 0.01$), (6) an increase in grip strength at 8 weeks of treatment ($p < 0.05$) and at 8 weeks follow-up ($p < 0.01$), and (7) a significant increase in weight-test at 8 weeks of treatment ($p < 0.05$) and at 8 weeks follow-up ($p < 0.005$). CONCLUSION: The results suggested that the combination of laser with plyometric exercises was more effective treatment than placebo laser with the same plyometric exercises at the end of the treatment as well as at the follow-up. Future studies are needed to establish the relative and absolute effectiveness of the above protocol.

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http://www.ncbi.nlm.nih.gov/pubmed/?term=17603862

Laser therapy in the treatment of carpal tunnel syndrome: a randomized controlled trial.

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OBJECTIVE: This prospective, randomized, placebo-controlled trial aimed to investigate the efficacy of laser therapy in the treatment of carpal tunnel syndrome (CTS). BACKGROUND DATA: Low-level laser therapy (LLLT) has been found to have positive effects in the treatment of CTS and various musculoskeletal conditions. METHODS:A total of 81 patients were included in this study. Diagnosis of CTS was based on both clinical examination and electromyographic (EMG) study. Patients were randomly assigned into two groups. Group 1 (n = 41) underwent laser therapy (7 joules/2 min) over the carpal tunnel area. Group 2 (n = 40) received placebo laser therapy. All patients received therapy five times per week, for a total of 10 sessions. Patients also used a wrist splint each night. Patients were assessed according to pain, hand-pinch grip strength, and functional capacity. Pain was evaluated by Visual Analog Scale (VAS; day-night). Hand grip was measured by Jamar dynometer, and pinch grip was measured by pinchmeter. Functional capacity was assessed by a self-administered questionnaire for severity of symptoms. RESULTS: The mean age of the patients (70 women, 11 Men) was 49.3 +/- 11.0 (range, 26-78). After therapy there were statistically significant improvements in VAS, pinch grip, and functional capacity measurement in both groups ($p < 0.001$). Hand grip was found to have been improved in the laser group. In EMG, there were statistically improvements in sensory nerve velocity, and sensory and motor distal latancies in the laser group ($p < 0.001$). Only sensory nerve velocity was meaningful in the placebo group. CONCLUSION: In using LLLT, (1) there was no difference relative to pain relief and functional capacity during the follow-up in CTS patients; (2) there were positive effects on hand and pinch grip strengths.

Photomed Laser Surg 2007 Feb 25(1) 34-9

http://www.ncbi.nlm.nih.gov/pubmed/?term=17352635

The effect of gallium arsenide aluminum laser therapy in the management of cervical myofascial pain syndrome: a double blind, placebo-controlled study.

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The efficacy of low-level laser therapy (LLLT) in myofascial pain syndrome (MPS) seems controversial. A prospective, double-blind, randomized controlled trial was conducted in patients with chronic MPS in the neck to evaluate the effects of low-level 830-nm gallium arsenide aluminum (Ga-As-Al) laser therapy. The study group consisted of 64 MPS patients. The patients were randomly assigned into two groups. In group 1 (n = 32), Ga-As-Al laser treatment was applied over three trigger points bilaterally for 2 min over each point once a day for 15 days during a period of 3 weeks. In group 2 (n = 32), the same treatment protocol was given, but the laser instrument was switched off during applications. All patients in both groups performed daily isometric exercise and stretching exercises for cervical region. Parameters were measured at baseline and after 4 weeks. All patients were evaluated with respect to pain (at rest, movement, and night) and assessed by visual analog scale, measurement of active range of motion using an inclinometer and a goniometer, and the neck disability index. In both groups, statistically significant improvements were detected in all outcome measures compared with baseline ($p < 0.05$). However, no significant differences were obtained between the two groups ($p > 0.05$). In conclusion, although the laser therapy has no superiority over placebo groups in this study, we cannot exclude the possibility of effectivity with another treatment regimen including different laser wavelengths and dosages (different intensity and density and/or treatment interval).

Clin Rheumatol 2007 Jun 26(6) 930-4

http://www.ncbi.nlm.nih.gov/pubmed/?term=17021664

The effect of 300 mW, 830 nm laser on chronic neck pain: a double-blind, randomized, placebo-controlled study.

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A randomized, double-blind, placebo-controlled study of low-level laser therapy (LLLT) in 90 subjects with chronic neck pain was conducted with the aim of determining the efficacy of 300 mW, 830 nm laser in the management of chronic neck pain. Subjects were randomized to receive a course of 14 treatments over 7 weeks with either active or sham laser to tender areas in the neck. The primary outcome measure was change in a 10 cm Visual Analogue Scale (VAS) for pain. Secondary outcome measures included Short-Form 36 Quality-of-Life questionnaire (SF-36), Northwick Park Neck Pain Questionnaire (NPNQ), Neck Pain and Disability Scale (NPAD), the McGill Pain Questionnaire (MPQ) and Self-Assessed Improvement (SAI) in pain measured by VAS. Measurements were taken at baseline, at the end of 7 weeks' treatment and 12 weeks from baseline. The mean VAS pain scores improved by 2.7 in the treated group and worsened by 0.3 in the control group (difference 3.0, 95% CI 3.8-2.1). Significant improvements were seen in the active group compared to placebo for SF-36-Physical Score (SF36 PCS), NPNQ, NPAD, MPQVAS and SAI. The results of the SF-36 - Mental Score (SF36 MCS) and other MPQ component scores (afferent and sensory) did not differ significantly between the two groups. Low-level laser therapy (LLLT), at the parameters used in this study, was efficacious in providing pain relief for patients with chronic neck pain over a period of 3 months.

Pain 2006 Sep 124(1-2) 201-10

http://www.ncbi.nlm.nih.gov/pubmed/?term=16806710

A randomised, placebo controlled trial of low level laser therapy for activated Achilles tendinitis with microdialysis measurement of peritendinous prostaglandin E2 concentrations.

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BACKGROUND: Low level laser therapy (LLLT) has gained increasing popularity in the management of tendinopathy and arthritis. Results from in vitro and in vivo studies have suggested that inflammatory modulation is one of several possible biological mechanisms of LLLT action. OBJECTIVE: To investigate in situ if LLLT has an anti-inflammatory effect on activated tendinitis of the human Achilles tendon. SUBJECTS: Seven patients with bilateral Achilles tendinitis (14 tendons) who had aggravated symptoms produced by pain inducing activity immediately before the study. METHOD: Infrared (904 nm wavelength) LLLT (5.4 J per point, power density 20 mW/cm2) and placebo LLLT (0 J) were administered to both Achilles tendons in random blinded order. RESULTS: Ultrasonography Doppler measurements at baseline showed minor inflammation through increased intratendinous blood flow in all 14 tendons and measurable resistive index in eight tendons of 0.91 (95% confidence interval 0.87 to 0.95). Prostaglandin E2 concentrations were significantly reduced 75, 90, and 105 minutes after active LLLT compared with concentrations before treatment ($p = 0.026$) and after placebo LLLT ($p = 0.009$). Pressure pain threshold had increased significantly ($p = 0.012$) after active LLLT compared with placebo LLLT: the mean difference in the change between the groups was 0.40 kg/cm2 (95% confidence interval 0.10 to 0.70). CONCLUSION: LLLT at a dose of 5.4 J per point can reduce inflammation and pain in activated Achilles tendinitis. LLLT may therefore have potential in the management of diseases with an inflammatory component.

Br J Sports Med 2006 Jan 40(1) 76-80; discussion 76-80

http://www.ncbi.nlm.nih.gov/pubmed/?term=16371497

Symptomatic efficacy of stabilizing treatment versus laser therapy for sub-acute low back pain with positive tests for sacroiliac dysfunction: a randomised clinical controlled trial with 1 year follow-up.

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AIM: Back pain is a highly frequent condition due to many causes, although most of them cannot be established with certainty. It is also the current clinical and scientific belief that sacroiliac joint syndrome can be a specific low back pain cause. Nonetheless the existence of clinical tests aimed at highlighting the responsibility for lumbar pain secondary to sacroiliac dysfunction, it is not easy to diagnose it with either manual or instrumental means. Moreover, uncertainty is diffuse when facing a correct treatment for patients involved. The aim of this study was to verify, in patients with acute or sub-acute low back pain and positive sacroiliac signs, the efficacy of a stabilising therapy (orthosis and exercises, with previous mesotherapy) directly targeted to sacroiliac dysfunction versus a symptomatic usual care such as He-Ne laser therapy. METHODS: Over a period of 14 months, we recruited 22 patients (10 females, mean age 44+/-11) with acute and sub-acute low back pain and symptoms and signs suggesting a sacroiliac dysfunction. They were randomised in a Group laser (GL), 11 patients treated with He-Ne laser therapy targeting the sacroiliac region, and a Group stabilisation (GS), 11 patients treated with mesotherapy, a specific dynamic sacroiliac support (ILSA) and specific exercises. Outcome criteria included VAS, and Mens and Laslett sacroiliac tests. RESULTS: Out of 449 acute and sub-acute low back pain out-patients, 22 (4.9%) had symptoms and signs suggesting a sacroiliac dysfunction. A reduction of pain was achieved only in the GS. All pain-provocation and stability tests were negative both after the end of treatment and at the follow-up only in the GS. CONCLUSIONS: A targeted approach based on mesotherapy, a specific sacroiliac belt and specific stabilizing exercises proved its efficacy in acute and sub-acute low back pain patients with symptoms and signs suggesting a sacroiliac dysfunction. As soon as it will be possible to identify particular spine syndromes in the universe of non specific low back pain, there will also be the possibility to employ specific therapies.

Eura Medicophys 2004 Dec 40(4) 263-8

http://www.ncbi.nlm.nih.gov/pubmed/?term=16175148

Low level laser therapy in primary Raynaud's phenomenon--results of a placebo controlled, double blind intervention study.

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OBJECTIVE: To assess the efficacy of low level laser therapy in patients with primary Raynaud's phenomenon and predict the success of laser therapy by clinical characteristics. METHODS: Forty-eight patients were included in a randomized placebo controlled, double blind crossover study. Laser and sham therapy each were applied 5 days a week for 3 weeks. Clinical symptoms, exposure to triggers, and frequency and intensity of attacks were recorded in diaries. Results of infrared thermography before onset and at the end of both irradiation sequences were evaluated. Primary endpoint was the average intensity of attacks; secondary endpoints were average number of attacks and thermography results. Age, sex, duration of symptoms, age at onset of symptoms, evoking conditions other than cold, maximum temperature drop after cold provocation, and rewarming time after cold provocation were tested as potential predictors. RESULTS: Number of attacks and their intensity were significantly reduced during laser therapy compared to sham treatment. Thermographic parameters did not reach statistical significance. In a stepwise multiple regression analysis, evoking conditions other than cold (stress, wetness as additional triggers), rewarming time, and temperature decrease after cold provocation were significant predictors of therapeutic efficacy. CONCLUSION: Low level laser therapy reduces frequency and severity of Raynaud attacks. The effect is most pronounced in patients with signs of decreased threshold for vasospasm and less effective in patients with delayed hyperemia.

J Rheumatol 2004 Dec 31(12) 2408-12

http://www.ncbi.nlm.nih.gov/pubmed/?term=15570642

Ultrasound and laser therapy in the treatment of carpal tunnel syndrome.

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This study was designed to compare the efficacy of ultrasound and laser treatment for mild to moderate idiopathic carpal tunnel syndrome. Ninety hands in 50 consecutive patients with carpal tunnel syndrome confirmed by electromyography were allocated randomly in two experimental groups. One group received ultrasound therapy and the other group received low level laser therapy. Ultrasound treatment (1 MHz, 1.0 W/cm(2), pulse 1:4, 15 min/session) and low level laser therapy (9 joules, 830 nm infrared laser at five points) were applied to the carpal tunnel for 15 daily treatment sessions (5 sessions/week). Measurements were performed before and after treatment and at follow up four weeks later, and included pain assessment by visual analogue scale; electroneurographic measurement (motor and sensory latency, motor and sensory action potential amplitude); and pinch and grip strength. Improvement was significantly more pronounced in the ultrasound group than in low level laser therapy group for motor latency (mean difference 0.8 m/s, 95% CI 0.6 to 1.0), motor action potential amplitude (2.0 mV, 95% CI 0.9 to 3.1), finger pinch strength (6.7 N, 95% CI 5.0 to 8.2), and pain relief (3.1 points on a 10-point scale, 95% CI 2.5 to 3.7). Effects were sustained in the follow-up period. Ultrasound treatment was more effective than laser therapy for treatment of carpal tunnel syndrome. Further study is needed to investigate the combination therapy effects of these treatments in carpal tunnel syndrome patients.

Aust J Physiother 2004 50(3) 147-51

http://www.ncbi.nlm.nih.gov/pubmed/?term=15482245

Efficacy of 904 nm gallium arsenide low level laser therapy in the management of chronic myofascial pain in the neck: a double-blind and randomize-controlled trial

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BACKGROUND AND OBJECTIVES: A prospective, double-blind, randomized, and controlled trial was conducted in patients with chronic myofascial pain syndrome (MPS) in the neck to evaluate the effects of infrared low level 904 nm Gallium-Arsenide (Ga-As) laser therapy (LLLT) on clinical and quality of life (QoL). STUDY DESIGN/PATIENTS AND METHODS: The study group consisted of 60 MPS patients. Patients were randomly assigned to two treatment groups: Group I (actual laser; 30 patients) and Group II (placebo laser; 30 patients). LLLT continued daily for 2 weeks except weekends. Follow-up measures were evaluated at baseline, 2, 3, and 12 weeks. All patients were evaluated with respect to pain at rest, pain at movement, number of trigger points (TP), the Neck Pain and Disability Visual Analog Scale (NPAD), Beck depression Inventory (BDI), and the Nottingham Health Profile (NHP). RESULTS: In active laser group, statistically significant improvements were detected in all outcome measures compared with baseline ($P < 0.01$) while in the placebo laser group, significant improvements were detected in only pain score at rest at the 1 week later of the end of treatment. The score for self-assessed improvement of pain was significantly different between the active and placebo laser groups (63 vs. 19%) ($P < 0.01$). CONCLUSION: This study revealed that short-period application of LLLT is effective in pain relief and in the improvement of functional ability and QoL in patients with MPS. Copyright 2004 Wiley-Liss, Inc.

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2004 Lasers Surg Med. 2004;35(3):229-35

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Comparison of laser, dry needling, and placebo laser treatments in myofascial pain syndrome.

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OBJECTIVE: We aimed to evaluate the effectiveness of laser therapy in myofascial pain syndrome treatment. BACKGROUND DATA: Myofascial pain syndrome is a disease that is characterized by hypersensitive points called trigger points found in one or more muscles and/or connective tissues. It can cause pain, muscle spasm, sensitivity, stiffness, weakness, limitation of range of motion and rarely autonomic dysfunction. Physical therapy modalities and exercise are used in the treatment of this frequently encountered disease. METHODS: The placebo controlled, prospective, long-term follow up study was planned with 60 patients who had trigger points in their upper trapezius muscles. The patients were divided into three groups randomly. Stretching exercises were taught to each group and they were asked to exercise at home. Treatment duration was 4 weeks. Placebo laser was applied to group 1, dry needling to group 2 and laser to group 3. He-Ne laser was applied to three trigger points in the upper trapezius muscles on both sides with 632.8 nm. The patients were assessed at before, post-treatment, and 6 months after-treatment for pain, cervical range of motion and functional status. RESULTS: We observed a significant decrease in pain at rest, at activity, and increase in pain threshold in the laser group compared to other groups. Improvement according to Nottingham Health Profile gave the superiority of the laser treatment. However, those differences among the groups were not observed at 6-month follow up. CONCLUSIONS: Laser therapy could be useful as a treatment modality in myofascial pain syndrome because of its noninvasiveness, ease, and short-term application.

Photomed Laser Surg 2004 Aug 22(4) 306-11

http://www.ncbi.nlm.nih.gov/pubmed/?term=15345173

Low-level laser treatment can reduce edema in second degree ankle sprains.

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OBJECTIVE: Low-level laser therapy (LLLT) has been used for the last few years to treat sports injuries. The purpose of this study was to compare three therapeutic protocols in treating edema in second degree ankle sprains that did not require immobilization with a splint, under placebo-controlled conditions. MATERIALS AND METHODS: Forty-seven soccer players with second degree ankle sprains, selected at random, were divided into the following groups: The first group (n = 16) was treated with the conventional initial treatment (RICE, rest, ice, compression, elevation), the second group (n = 16) was treated with the RICE method plus placebo laser, and the third group (n = 15) was treated with the RICE method plus an 820-nm GaA1As diode laser with a radiant power output of 40 mW at 16 Hz. Before the treatment, and 24, 48, and 72 h later, the volume of the edema was measured. RESULTS: A three by three repeated measures ANOVA with a follow up post hoc test revealed that the group treated with the RICE and an 820-nm GaA1As diode laser presented a statistically significant reduction in the volume of the edema after 24 h (40.3 +/- 2.4 mL, $p < 0.01$), 48 h (56.4 +/- 3.1 mL, $p < 0.002$), and 72 h (65.1 +/- 4.4 mL, $p < 0.001$). CONCLUSIONS: LLLT combined with RICE can reduce edema in second-degree ankle sprains.

J Clin Laser Med Surg 2004 Apr 22(2) 125-8

http://www.ncbi.nlm.nih.gov/pubmed/?term=15165387

Usefulness of low-level laser for control of painful stomatitis in patients with hand-foot-and-mouth disease.

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OBJECTIVE: The aim of this study was to evaluate the usefulness of low-level laser therapy (LLLT) for the control of painful stomatitis in patients with hand-foot-and-mouth disease (HFMD). BACKGROUND DATA: LLLT has been successfully applied to various painful oral mucosal diseases, although there have been few reports on LLLT for HFMD patients. MATERIALS AND METHODS: Through a randomized double-blind placebo controlled trial, the painful period of HFMD stomatitis was compared between the LLLT group (n=11) and the placebo LLLT one (n=9), which had similar clinical backgrounds. The LLLT parameters supplied were as follows: wavelength of 830 nm, power of 30 mW, frequency of 30 Hz, and energy output of 1.1 J/cm2. Acceptability and safety of the treatment were also evaluated. RESULTS: The painful period was shorter in the LLLT group (4.0 +/- 1.3 days) than in the placebo LLLT one (6.7 +/- 1.6 days) with a statistically significant difference ($p<0.005$). The treatment was judged acceptable for 90.0% (18 of 20) of patients. No adverse events were observed in any cases. CONCLUSION: LLLT is a useful method to control HFMD stomatitis by shortening the painful period, with its high acceptability and lack of adverse events.

J Clin Laser Med Surg 2003 Dec 21(6) 363-7

http://www.ncbi.nlm.nih.gov/pubmed/?term=14709221

Efficacy of low level laser therapy in myofascial pain syndrome: an algometric and thermographic evaluation.

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BACKGROUND AND OBJECTIVES: The efficacy of low level laser therapy (LLLT) in myofascial pain syndrome (MPS) seems controversial. Our aim was to clarify the effect of LLLT in MPS by using algometry and thermography. STUDY DESIGN/MATERIALS AND METHODS: Sixty-two patients with MPS having an active trigger point in the neck or upper back region were randomly divided into two equal groups according to therapy applied (group 1: LLLT + stretching exercises, group 2: stretching exercises alone). The outcome measures were pain measured with visual analogue scale (VAS), algometry on the trigger point, algometric difference, thermographic difference, and thermal asymmetry. Comparison was made within and between the groups pre- and post-therapeutically and 3 weeks after therapy. RESULTS: Mean pain values decreased more significantly in group 1 from baseline to 3 weeks follow up (7.54-3.06) while these values were 7.03-5.19 in group 2 ($P < 0.05$). Group comparisons revealed significant favorable differences in group 1 patients in terms of all other parameters at the first and the second evaluation post therapeutically ($P < 0.05$). CONCLUSIONS: LLLT seemed to be beneficial for pain in MPS by using algometry and thermography.

Lasers Surg Med 2003 33(5) 339-43

http://www.ncbi.nlm.nih.gov/pubmed/?term=14677161

The effects of infrared laser and medical treatments on pain and serotonin degradation products in patients with myofascial pain syndrome. A controlled trial.

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In this controlled study of 46 patients with myofascial pain syndrome, we investigated the effects of infrared (IR) laser application to trigger points and medical treatment on pain reduction and serotonin and its degradation products. Retaining double-blind trial principles, the patients were randomly assigned to two groups. The treatment group received IR laser treatment, whereas the control group received sham laser. However, both groups received medical treatment. In the treatment group, laser was applied once a day for 10 consecutive days at a dose of 1.44 J/cm2. The effect of the laser treatment on pain was evaluated by visual analog scale. Urinary excretion of 5-hydroxy indole acetic acid (5-HIAA) and serotonin + 5-hydroxy tryptophan (5-HT+5-HTP) was studied by column chromatography. At the end of the treatment, there was a statistically significant difference between the VAS values of the treatment and control groups. The 24-h urinary excretion of the 5-HIAA and 5-HT+5-HTP was significantly higher in the laser treatment group than in the placebo group. In conclusion, IR laser is an effective modality in the treatment of MPS which increases an important mediator of pain inhibition, serotonin.

Rheumatol Int 2004 Sep 24(5) 260-3

http://www.ncbi.nlm.nih.gov/pubmed/?term=14628149

Effects of low-power laser exposure on masseter muscle pain and microcirculation.

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One possible cause of the reported positive treatment effect by low-power laser exposure in muscle pain conditions could be that it increases the local microcirculation. The aim of this study was therefore to investigate the immediate effects on masseter muscle blood flow by low-power laser exposure in patients with chronic orofacial pain of muscular origin in comparison to healthy individuals. Twelve patients with myofascial pain of orofacial muscles and 12 age and gender matched healthy individuals participated in the study. Before laser exposure the subjects were examined clinically and the patients scored their current pain intensity from the most tender masseter muscle. Intramuscular laser-Doppler flowmetry was performed unilaterally in the most tender point (patients) or in a standardized point (healthy subjects) of the masseter muscle. The muscle was first exposed with a Gallium-Aluminum-Arsenide laser (active laser) or placebo laser for 2 min in a randomized and double-blind manner. After another 8 min the muscle was treated with the other laser for 2 min and the LDF recording continued for 8 min. Finally, the patients again assessed the pain intensity. Data were analyzed blindly by one of the authors not participating in data collection. The pain intensity was not affected by laser exposure. The blood flow did not change significantly in the patients, but increased after active laser exposure and decreased after placebo exposure in the healthy individuals. The difference between active laser and placebo was significant. In conclusion, the results of this study do not support an effect of low-power laser exposure on masseter muscle microcirculation in patients with chronic orofacial pain of muscular origin.

Pain 2003 Sep 105(1-2) 89-96

http://www.ncbi.nlm.nih.gov/pubmed/?term=14499424

The effect of low level laser therapy (LLLT) on wound healing in horses.

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Laser therapy is used in many countries, including South Africa, for the treatment of skin wounds. Low level galium aluminium arsenide (GaAlAs) laser was administered to full thickness skin wounds (3 x 3 cm) induced surgically on the dorsal aspect of the metacarpophalangeal joints of 6 crossbred horses in a randomised, blind, controlled study. Treated wounds that received a daily laser dosage of 2 J/cm2 were compared with nontreated control wounds on the opposite leg. There were no wound complications. Both groups of wounds were cleaned daily using tap water. Wound contraction and epithelialisation were evaluated using photoplanimetry. There were no significant differences in wound contraction or epithelialisation between the laser treated and the control wounds. It was therefore concluded that laser therapy had no clinically significant effect on second intention wound healing in this study.

Equine Vet J 1999 May 31(3) 228-31

http://www.ncbi.nlm.nih.gov/pubmed/?term=10402136

Low-level laser therapy in ankle sprains: a randomized clinical trial.

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OBJECTIVE: To test the efficacy of low-level laser therapy on lateral ankle sprains as an addition to a standardized treatment regimen, a trial was conducted in which high-dose laser (5J/cm2), low-dose laser (0.5J/cm2), and placebo laser therapy (0J/cm2) at skin level were compared. DESIGN: Randomized, double-blind, controlled clinical trial with a follow-up of 1 year. Patients, therapists, assessors, and analysts were blinded to the assigned treatment. SETTING: An ambulatory care setting. PATIENTS: After informed consent and verification of exclusion criteria, 217 patients with acute lateral ankle sprains were randomized to three groups from September 1, 1993, through December 31, 1995. INTERVENTIONS: Twelve treatments of 904nm laser therapy in 4 weeks as an adjunct to a standardized treatment regimen of 4 weeks of brace therapy combined with standardized home exercises and advice. The laser therapy device used was a 904nm Ga-As laser, with 25-watt peak power and 5,000 or 500Hz frequency, a pulse duration of 200nsec, and an irradiated area of 1cm2. PRIMARY OUTCOME MEASURES: Pain and function as reported by the patient. RESULTS: Intention-to-treat analysis of the short-term results showed no statistically significant difference on the primary outcome measure, pain (p = .41), although the placebo group showed slightly less pain. Function was significantly better in the placebo group at 10 days (p = .01) and 14 days (p = .03) after randomization. The placebo group also performed significantly better on days of sick leave (p = .02) and at some points for hindrance in activities in daily life and pressure pain, as well as subjective recovery (p = .05). Intention-to-treat analysis showed that total days of absenteeism from work and sports were remarkably lower in the placebo group than in the laser groups, ranging from 3.7 to 5.3 and 6 to 8 days, respectively. The total number of relapses at 1 year in the low-dose laser group (n = 22) was significantly higher (p = .04) than in the other two groups (high laser, n = 13; placebo, n = 13). Subgroup analysis to correct for possible confounders did not alter these findings. CONCLUSIONS: Neither high- nor low-dose laser therapy is effective in the treatment of lateral ankle sprains.

Arch Phys Med Rehabil 1998 Nov 79(11) 1415-20

http://www.ncbi.nlm.nih.gov/pubmed/?term=9821903

A randomized controlled evaluation of low-intensity laser therapy: plantar fasciitis.

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OBJECTIVE: To determine whether low-intensity laser irradiation, a widespread but controversial physical therapy agent, is an effective treatment of plantar fasciitis. DESIGN: A randomized, double-blinded, placebo-controlled clinical study. SETTING: A sports medicine clinic. SUBJECTS: Thirty-two otherwise healthy individuals with plantar fasciitis of more than 1 month's duration. INTERVENTION: Dummy or active irradiation with a 30 mW .83 microm GaAlAs continuous-wave infrared (IR) diode laser three times a week for 4 weeks. MEASUREMENTS: Morning pain, pain with toe walking, tenderness to palpation, windlass test response, medication consumption, and orthotic use were evaluated immediately before the study, as well as at the midpoint and end of treatment. Subjects were also evaluated at a follow-up 1 month after their last treatment. RESULTS: No significant differences were found between the groups in any of the outcome measures either during treatment or at the 1-month follow-up. Treatment, however, was well tolerated and side effects were minimal. CONCLUSIONS: Low-intensity IR laser therapy appears safe but, at least within the parameters of this study, is not beneficial in the treatment of plantar fasciitis.

Arch Phys Med Rehabil 1998 Mar 79(3) 249-54

http://www.ncbi.nlm.nih.gov/pubmed/?term=9523774

The effect of spinal manipulation in the treatment of cervicogenic headache.

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PURPOSE: To study whether the isolated intervention of high-speed, low-amplitude spinal manipulation in the cervical spine has any effect on cervicogenic headache. DESIGN: Prospective randomized controlled trial with a blinded observer. SETTING: Ambulatory outpatient facility in an independent research institution. PARTICIPANTS: Fifty-three subjects suffering from frequent headaches who fulfilled the International Headache Society criteria for cervicogenic headache (excluding radiological criteria). These subjects were recruited from 450 headache sufferers who responded to newspaper advertisements. INTERVENTION: After randomization, 28 of the group received high-velocity, low-amplitude cervical manipulation twice a week for 3 wk. The remaining 25 received low-level laser in the upper cervical region and deep friction massage (including trigger points) in the lower cervical/upper thoracic region, also twice a week for 3 wk. MAIN OUTCOME MEASURES: The change from week 1 to week 5 in analgesic use per day, in headache intensity per episode and in number of headache hours per day, as registered in a headache diary. RESULTS: The use of analgesics decreased by 36% in the manipulation group, but was unchanged in the soft-tissue group; this difference was statistically significant ($p = .04$, chi 2 for trend). The number of headache hours per day decreased by 69% in the manipulation group, compared with 37% in the soft-tissue group; this was significant at $p = .03$ (Mann-Whitney). Finally, headache intensity per episode decreased by 36% in the manipulation group, compared with 17% in the soft-tissue group; this was significant at $p = .04$ (Mann-Whitney). CONCLUSION: Spinal manipulation has a significant positive effect in cases of cervicogenic headache.

J Manipulative Physiol Ther 1997 Jun 20(5) 326-30

http://www.ncbi.nlm.nih.gov/pubmed/?term=9200048

A randomized controlled trial of the effect of spinal manipulation in the treatment of cervicogenic headache.

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PURPOSE: To determine whether the isolated intervention of high-velocity, low-amplitude spinal manipulation in the cervical spine has any effect on cervicogenic headache. DESIGN: Randomized controlled trial with a blind observer. SETTING: Ambulatory outpatient facility in an independent NHS-funded chiropractic research institution. PARTICIPANTS: Thirty-nine subjects suffering from frequent headaches who fulfilled the IHS criteria for cervicogenic headache (excluding radiological criteria). These subjects were recruited from among some 400 headache sufferers who responded to newspaper advertisements. INTERVENTION: Half of the group received high-velocity, low-amplitude cervical manipulation twice/wk for 3 wk. The other half received low-level laser in the upper cervical region and deep friction massage (including trigger points) in the lower cervical/upper thoracic region, also twice/wk for 3 wk. MAIN OUTCOME MEASURE: The change from week 2 to week 6 in analgesics use per day, headache intensity per episode and number of headache hr per day. RESULTS: Despite a significant reduction in the manipulation group on all three outcome measures, differences between the two treatment groups failed to reach statistical significance. CONCLUSION: The results suggest a possible effect of manipulation on cervicogenic headache, but because of methodological problems, such an effect could not be unequivocally demonstrated.

J Manipulative Physiol Ther 1995 Sep 18(7) 435-40

http://www.ncbi.nlm.nih.gov/pubmed/?term=8568424

A double-blind study of the effectiveness of low level laser treatment of rotator cuff tendinitis.

Vecchio P, Cave M, King V, Adebajo AO, Smith M, Hazleman BL

Rheumatology Research Unit, Addenbrooke's Hospital, Cambridge.

Thirty-five patients with rotator cuff tendinitis were randomly allocated to active (CB Medico Master III 830 nm Ga As AL diode) laser or dummy laser treatment twice weekly for 8 weeks. Movement range, painful arc score, resisted movement score and responses to visual analogue scales for night pain, rest pain, movement pain and functional limitation were measured second weekly. All responses improved from baseline but there was no difference between the two groups. These results fail to demonstrate the effectiveness of laser therapy in rotator cuff tendinitis.

Br J Rheumatol 1993 Aug 32(8) 740-2

http://www.ncbi.nlm.nih.gov/pubmed/?term=8348278

[Laser therapy of ankle sprain]

Axelsen SM, Bjerno T

Fredericia Sygehus, kirurgisk afdeling.

The effect of low-power laser therapy on acute ankle sprains was evaluated in a double-blind randomised clinical study consisting of 40 patients from the casualty ward. All patients received treatment until their ankle joint was painless. No statistically significant differences regarding discolouring, pain, oedema, and use of analgetics were observed between patients treated with laser and placebo. The patients treated with active laser had a significantly longer sick leave.

Ugeskr Laeger 1993 Nov 29 155(48) 3908-11

http://www.ncbi.nlm.nih.gov/pubmed/?term=8273195

A double blind randomised trial of low power laser treatment in rheumatoid arthritis.

Heussler JK, Hinchey G, Margiotta E, Quinn R, Butler P, Martin J, Sturgess AD

Department of Rheumatology, St George Hospital, Sydney, Australia.

OBJECTIVES--To define the value of low power laser treatment in small joint rheumatoid arthritis. METHODS--Twenty five women with active disease were recruited. The metacarpophalangeal and proximal interphalangeal joints of one hand were treated with 12 J/cm2 for 30 s with a gallium-aluminium-arsenate laser. The other hand received a sham laser treatment designed so that neither therapist nor patient could distinguish the active laser from the sham laser. Each patient received 12 treatments over four weeks. The following parameters were measured: pain as assessed by visual analogue scale; range of joint movements; grip strength; duration of early morning stiffness, joint circumference, Jebsen's hand assessment; drug usage; total swollen joint counts; Arthritis Impact Measurement Scales; three phase bone scans; haematological and serological tests. RESULTS--A total of 72% of patients reported pain relief but this reduction was reported equally in both hands. No significant changes were seen in other clinical, functional, scintigraphic, or laboratory features. Neither patients nor staff were able to detect which hand was treated with the active laser. CONCLUSION--When this specific laser and dose regimen was used, low power laser treatment had no objective effect on patients with rheumatoid arthritis. It did appear to produce analgesia through a powerful placebo effect.

Ann Rheum Dis 1993 Oct 52(10) 703-6

http://www.ncbi.nlm.nih.gov/pubmed/?term=8257205

Low level laser therapy is ineffective in the management of rheumatoid arthritic finger joints.

Hall J, Clarke AK, Elvins DM, Ring EF

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Low level laser therapy (LLLT) is a relatively new and increasingly popular form of electrotherapy. It is used by physiotherapists in the treatment of a wide variety of conditions including RA despite the lack of scientific evidence to support its efficacy. A randomized, double-blind and placebo-controlled study was conducted to evaluate the efficacy of LLLT. The patient sample consisted of chronic RA patients with active finger joint synovitis. Forty RA patients with involvement of some or all of MCP or PIP joints were recruited. Following random allocation they received either active or placebo laser three times a week for 4 weeks. Measurements were taken prior to entry, after the treatment, 1 month and 3 months at follow-up. The groups were well matched in terms of age, sex, disease duration and severity. Few significant differences were noted in grip strength, duration of morning stiffness, joint tenderness, temperature of inflamed joints, range of movement or pain either within or between groups. Using these irradiation parameters the efficacy of LLLT is ineffective.

Br J Rheumatol 1994 Feb 33(2) 142-7

http://www.ncbi.nlm.nih.gov/pubmed/?term=8162479

No effect of low power laser in lateral epicondylitis.

Krasheninnikoff M, Ellitsgaard N, Rogvi-Hansen B, Zeuthen A, Harder K, Larsen R, Gaardbo H

Department of Orthopaedic Surgery, University Hospital Herlev, Denmark.

Thirty-six patients with lateral epicondylitis of the elbow (19 women, 17 men, median age 48 yrs) were treated either with active laser or placebo, 18 patients in each group. The active laser was a GA-AL-AS 30 mW/830 nm low power laser (LPL). The study design was double blind and randomized. The treatment session consisted of eight treatments, two per week. Patients were irradiated on tender points on the lateral epicondyle and in the forearm extensors. Output power was 3,6 J/point. A follow up was performed by telephone, 10 weeks after the last treatment. No difference between laser and placebo was found on lateral elbow pain (Mann Whitney test, 95% confidence limits). We conclude that low power laser offers no advantage over placebo in the treatment of musculoskeletal pain as lateral epicondylitis. Further studies with low power laser treatment of musculoskeletal pain seem useless.

Scand J Rheumatol 1994 23(5) 260-3

http://www.ncbi.nlm.nih.gov/pubmed/?term=7973480

[Laser therapy of Achilles tendinitis]

Darre EM, Klokker M, Lund P, Rasmussen JD, Hansen K, Vedtofte PE

Forsvarets Sundhedstjeneste, Jaegersborg Kaserne, Gentofte.

The effects of low level laser treatment in soldiers with achilles tendinitis were studied in a prospective, randomized and double blind trial. Eighty-nine soldiers were enrolled in the study. Forty-six were randomized to treatment with active laser and 43 to treatment with placebo laser. No statistically significant differences in the number of consultations, morning stiffness, tenderness, crepitation, swelling, redness, VAS-score of pain and degree of unfitness for duty were found between the two treatment groups.

Ugeskr Laeger 1994 Nov 7 156(45) 6680-3

http://www.ncbi.nlm.nih.gov/pubmed/?term=7839480

Effect of helium-neon laser on musculoskeletal trigger points.

Snyder-Mackler L, Bork C, Bourbon B, Trumbore D

Cold lasers have been proposed recently as a therapeutic tool for treating a wide variety of pathological conditions, including wounds, arthritis, orthopedic problems, and pain. These proposed therapeutic effects largely have been unsubstantiated by research. A randomized, double blind study was undertaken to ascertain the effect of a helium-neon (He-Ne) laser on the resistance of areas of skin overlying musculoskeletal trigger points. These areas usually demonstrate decreased skin resistance when compared with the surrounding tissue. Thirty patients with musculoskeletal trigger points were assigned randomly to either an experimental or a placebo group. In addition to standard physical therapy, each patient received three 15-second applications of a He-Ne laser or placebo "stimulation" from an identical unit that did not emit a laser. The results of a two-way analysis of covariance with one repeated measure showed a statistically significant increase (p less than .007) in skin resistance. This increase in an abnormal skin resistance pattern may accompany the resolution of pathological conditions.

Phys Ther 1986 Jul 66(7) 1087-90

http://www.ncbi.nlm.nih.gov/pubmed/?term=3523551

Effects of helium-neon laser irradiation on skin resistance and pain in patients with trigger points in the neck or back.

Snyder-Mackler L, Barry AJ, Perkins AI, Soucek MD

Department of Physical Therapy, Sargent College of Allied Health Professions, Boston University, MA 02215.

The purpose of this double-blind study was to ascertain the effects of helium-neon (He-Ne) laser irradiation on skin resistance and pain in patients with trigger points in the neck or low back. This study entailed a partial replication of a previous study by Snyder-Mackler and associates that determined the use of the He-Ne laser increased skin resistance overlying a trigger point. Twenty-four patients were randomly assigned to either a treatment or a control group and received three 20-second applications of laser irradiation or placebo "stimulation," respectively. Pretreatment and posttreatment skin resistance and pain measurements (via visual analog scale) were taken during each session. Results indicated a statistically significant increase in skin resistance (p less than .001) and a decrease in pain (p less than .005) following laser treatment. There was not a significant correlation between skin resistance and pain across subjects. These data substantiate the previous findings of Snyder-Mackler and associates and demonstrate a reduction in pain. Helium-neon laser treatment, therefore, may be an effective adjunct to conventional physical therapy of these patients.

Phys Ther 1989 May 69(5) 336-41

http://www.ncbi.nlm.nih.gov/pubmed/?term=2710815

Low power laser therapy of shoulder tendonitis.

England S, Farrell AJ, Coppock JS, Struthers G, Bacon PA

Department of Rheumatology, Coventry & Warwickshire Hospital, UK.

30 patients with supraspinatus or bicipital tendonitis were randomly allocated to active infrared laser therapy at 904 nm three times weekly for 2 weeks, dummy laser or drug treatment for 2 weeks. Objectively maximum active extension, flexion and abduction of the shoulder, and subjectively pain stiffness movement and function were measured at 0 and 2 weeks. Significant improvement of active over dummy laser was noted for all seven assessments. Active laser therapy produced significant improvement over drug therapy for all three objective measures and pain. Naproxen sodium significantly improved only movement and function compared to dummy laser. These results demonstrate the effectiveness of laser therapy in tendonitis of the shoulder.

Scand J Rheumatol 1989 18(6) 427-31

http://www.ncbi.nlm.nih.gov/pubmed/?term=2694356

Effects of the infrared laser therapy at treated and non-treated trigger points.

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For reliability of the pain threshold measurement there were measured first 390 trigger points of 22 healthy students twice at each point. The reliability of two different measurements was found to be perfect. Infrared (904 nm) laser therapy was compared to placebo laser at the trigger points. Our study tested eighteen patients (11 men and 7 women), with 31 active trigger points in the muscles of the infraspinatus, extensor carpi radialis, levator scapulae, trapezius and tibialis anterior. Trigger points were randomly managed by infrared laser (dose 1.5J/point and place laser. The study was carried out by double-blind and cross-over principle. The responses of the management were documented by the pain threshold meter measurements of these trigger points before and after the treatments, and then fifteen minutes later. The trigger points of the other side of the body were also measured from the same muscles. In the results there were observed highly significant changes between the laser and placebo groups immediately after the treatment, 0.97 (SE 0.16) kg/cm2 (p less than 0.001). The differences between these two treatments were greater after fifteen minutes of the therapy--1.87 (SE 0.30) kg/cm2 (p less than 0.001). At the non-treated trigger points, the significant increase of the values was seen after fifteen minutes (p less than 0.05). Our research study results suggest that infrared laser had an effect at the trigger points and that the treatment significantly increased the pain threshold.

Acupunct Electrother Res 1989 14(1) 40421

http://www.ncbi.nlm.nih.gov/pubmed/?term=2568075

Low-energy laser treatment and exercise for chronic low back pain: double-blind controlled trial.

Klein RG, Eek BC

Department of Medical Orthopedics, Sansum Medical Clinic, Santa Barbara, CA 93102.

Twenty patients with chronic low back pain were enrolled in a randomized double-blind trial to test the efficacy of low-energy laser biostimulation combined with exercise. Ten patients received low-energy gallium-arsenide laser treatment, and ten received placebo laser treatment. Both groups were also placed on an active exercise program. Visual analogue and disability pain scores were assessed pretreatment and one month posttreatment and showed significant (p less than .02) improvements in both groups, but no relative advantage was found for either group. Objective parameters using computerized triaxial measurements of range of motion, isometric torque, and isodynamic velocity were also performed before and after treatment. There were significant improvements in objective parameters in both the laser and placebo groups, but no relative advantage accrued to either group. Under the conditions of this study, low-energy laser stimulation plus exercise did not provide a significant advantage over exercise alone.

Arch Phys Med Rehabil 1990 Jan 71(1) 34-7

http://www.ncbi.nlm.nih.gov/pubmed/?term=2136991

[Low energy laser treatment--effect in localized fibromyalgia in the neck and shoulder regions]

Thorsen H, Gam AN, Jensen H, Hojmark L, Wahlstrom L

Frederiksberg Hospital, medicinsk blok, reumatologisk afdeling C.

The effect of low-level laser therapy (GaAlAs, 830 nm, continuous) for chronic myofascial pain in the neck and shoulder girdle was assessed in a double-blind randomized study with 36 female participants. Treatments were given six times during two weeks with a total effect of 4.5-22.5 J per treatment depending on the number of tender points. No significant effect was found, neither in pain relief nor in tablet intake between the laser and the placebo group. None of the participants reported any side-effects.

Ugeskr Laeger 1991 Jun 17 153(25) 1801-4

http://www.ncbi.nlm.nih.gov/pubmed/?term=1853462

Low level laser versus placebo in the treatment of tennis elbow.

Vasseljen O Jr, Hoeg N, Kjeldstad B, Johnsson A, Larsen S

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The effect of low level laser (GaAs) on lateral epicondylitis was investigated in a double-blind, randomized, controlled study. Thirty patients were assigned equally to a laser (n = 15) or a placebo laser (n = 15) group. All patients received eight treatments and were evaluated subjectively and objectively before, at the end of, and four weeks after treatment. Patients also completed a follow-up questionnaire on an average of five to six months after treatment. A significant improvement in the laser compared to the placebo group was found on visual analog scale (p = 0.02) and grip strength (p = 0.03) tests four weeks after treatment. In this study low level laser therapy was shown to have an effect over placebo; however, as a sole treatment for lateral epicondylitis it is of limited value. Further studies are needed to evaluate the reliability of our findings and to compare laser to other established treatment methods.

Scand J Rehabil Med 1992 24(1) 37-42

http://www.ncbi.nlm.nih.gov/pubmed/?term=1604260

The efficacy of low-level laser therapy in supraspinatus tendinitis

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Twenty-four subjects were randomly assigned to two groups to assess the effectiveness of low-power laser therapy for supraspinatus tendinitis. A low- power laser using a 820 nm, 40 mW probe operating at 5000 Hz to produce a dose of 30 J/cm2 was used to treat one group (L); the other group was treated with a similar, but dummy, laser (DL). The design of the trial was double-blind; patients, therapists and assessors being ignorant of the form of treatment used. The two groups each received a course of nine treatments and identical advice and educational material. Perceived pain was assessed and tenderness and secondary muscle weakness measured before and after the course of treatment.
The data revealed that the L group had less pain ($p < 0.05$), less secondary weakness ($p < 0.01$) and tenderness ($p < 0.05$) after the treatment than before. No such changes occurred in the DL group; indeed, secondary weakness and tenderness increased slightly in the latter group after treatment.
The degree of pain, tenderness and weakness of the two groups was similar before treatment. Comparing the two groups after treatment, L had less pain ($p < 0.05$) and less weakness ($p < 0.001$) than DL.
These data suggest that, in this small group of patients, laser therapy, advice and education improved certain symptoms of supraspinatus tendinitis, while the same advice and education but treatment with a dummy laser had no such beneficial consequences. Based on the results, low-power laser therapy with the parameters and dosage used in this study is recommended as a useful treatment for tendinitis, but the trial was limited by small numbers.

Clin Rehabil May 1995 vol. 9 no. 2 126-134

http://cre.sagepub.com/content/9/2/126.abstract

Report on a Computer-Randomized Double-Blind Clinical Trial to Determine the Effectiveness of the GaAlAs (830nm) Diode Laser for Pain Attenuation in Selected Pain Groups

Shigeo Toya, Mitsuo Motegi, Kenichiro Inomata, Toshio Ohsiro and Takashi Maeda

The efficiency of infrared (IR) diode low reactive-level laser therapy (LLLT) has been reported in a variety of pain complaints. In order to ascertain if LLLT is particularly effective in a given pain group, 115 informed and consenting patients in two institutions (Toho University and Keio University, Tokyo, same ambient environmental parameters in treatment groups) were assigned to groups according to the aetiology of their pain conditions. Each patient's name was placed against a number, and a randomization computer program selected either real or sham (placebo) irradiation for each number, and thus each patient. The computer directly controlled the laser system appropriately, and stored the information on disc for retrieval after the trial was finished. The computer was located remotely from the treatment room. Neither the patient nor the therapist knew if they were in the real or placebo group: in placebo therapy, only laser emission was absent, the visible and audible emission indicators behaving exactly as in "real" treatment. The laser used was a gallium aluminum arsenide (GaAlAs) diode laser, 60 mW output, 830 nm, continuous wave. The laser was applied in the contact technique, with an incident power density of ~3 W/cm², total exposure time per session of from 5-10 min (energy density ~900-1800 J/cm²). There were three groups: the extremity joint pain (35), cervical (39) and lumbar pain (41) groups. This gave a total of 115 patients (53 female, 62 male, ages from 18-82, mean age 49.2 +/- 15.3). 83% of those who received real treatment in the total population reported effective pain relief, compared with 42% of those who were assigned to receive sham treatment. Following the trial, the data were analyzed statistically applying the X^2 and Fisher's tests, giving a value of X^2 = 21.328 (df=1), with a value for p = <0.0001 at a level of confidence of less than 1%, a statistically significant difference for the real versus the placebo treatment. There were no statistically significant differences in the results between the individual pain groups in the two sites. No adverse side effects were reported. It was concluded that diode laser therapy, at the parameters used in the trial, was both safe and effective for alleviation of pain in the groups treated

Laser Therapy Vol 6: 1996, Pp. 143-148

PAIN SCORES AND SIDE EFFECTS IN RESPONSE TO LOW LEVEL LASER THERAPY (LLLT) FOR MYOFASCIAL TRIGGER POINTS

E Liisa Laakso Carolyn Richardson, and Tess Cramond

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Clinically, Low Level Laser Therapy - LLLT has been used successfully in the treatment of chronic pain but many have questioned the scientific basis for its use. Many studies have been poorly designed or poorly controlled. A double-blind, placebo-controlled, random allocation study was designed to analyse the effect of second daily infrared (JR) laser (820 nm, 25 mW) and visible red laser (670 nm, 10 mW) at 1 J/cm2 and 5 J/cm2 on chronic pain. Forty-one consenting subjects with chronic pain conditions exhibiting myofascial trigger points in the neck and upper trunk region underwent five treatment sessions over a two week period. To assess progress, pain scores were measured using visual analogue scales before and after each treatment. The incidence of side effects was recorded. All groups demonstrated significant reductions in pain over the duration of the study with those groups which received infrared (820 nm) laser at I J/cm2 and 5 J/cm2. demonstrating the most significant effects ($p < 0.001$). Only those subjects who had active laser treatment experi enced side effects. Results indicated that responses to LLLT at the parameters used in this study are subject to placebo and may be dependant on power output, dose and/or wavelength.

Laser Ther 1997;9(2):67 – 72.

Hyperbaric Oxygen Therapy Versus Laser Therapy On the Acceleration of Venous Leg Ulcer Healing

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Abstract
the purpose of the current study was to determine the effectiveness of hyperbaric oxygen therapy(HBOT) or laser therapy in the acceleration of chronic venous ulcer healing. Thirty hospital inpatients with venous ulcers participated in this study for a treatment period of five weeks. They were divided randomly and equally into three groups (2 treatment groups and one control group). Patients in group (1) (HBOT group) received two 90 minutes treatments daily with 2 to3 L of humidified oxygen / minute at 22 mmHg. On the other hand, patients in group (2) (laser therapy group) received 1 J/cm2 infrared laser (Ga As), three times weekly. Patients in group (3) (control group) received standard wound care only. Wound surface area (WSA) and wound volume (WV) were used to measure the outcomes before starting the study and after the 3rd and 5th weeks posttreatment. It was found that, at the 5th week post-treatment there was a significant reduction in both WSA and WV in both the HBOT group and the laser therapy group when compared to the control group ($P<0.0001$), also there was a significant reduction in WSA and WV in the laser therapy group at the 5th week post-treatment when compared to the HBOT group ($P<0.001$). the findings strongly suggest that the application of infrared laser therapy at a dose of 1J/cm2, three times/week is more effective than the application of HBOT daily in the management of chronic venous ulcers.

LASER THERAPY. 2008, Vol. 17, No. 2, p.75-81 .

http://www.jstage.jst.go.jp/article/islsm/17/2/17_75/_article

Efficacy of Low Level Laser Therapy for Treatment Myofascial Trigger Points of Shoulder Pain

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Abstract: Myofascial trigger points (MTrPs) are recognized by many clinicians to be one of the most common causes of pain and dysfunction in the musculoskeletal system. Low-level laser Therapy (LLLT) is a relatively uncommon, non-invasive treatment for musculoskeletal pain, in which non-thermal laser irradiation is applied to sites of pain. Forty patients with MTrPs of shoulder pain were randomly assigned into active laser group (ALG, n = 20) and placebo laser group (PLG, n = 20). In ALG, patients were received Gallium-Arsenide I.R laser of 904 nm wave length with 3J / point for 90 sec pulse exercise therapy and in PLG, patients were received placebo laser pulse exercise therapy. Stretching and strengthening exercises program was done daily under supervision in clinic and at home for all patients. Pain intensity by visual analogue scale (VAS), active shoulder flexion and abduction by electrogonimeter and pain pressure threshold (PPT) of trigger points by electronic digital algometer were measured before and after 4-weeks of treatment. After treatment, all the outcome measurements had shown significant improvement in both groups except PPT was significantly increased in active laser group only ($p < 0.0001$). When the improved parameters were compared between the two groups, there were significant differences after treatment in favor of active laser group ($p < 0.01$). LLLT plus exercise could be effective method to decrease pain, increase shoulder range of motion and increase PPT of trigger point of shoulder pain compared with placebo laser pulse exercise.

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http://www.idosi.org/wasj/wasj12(6)/4.pdf