

PBM Laser Therapy- Pain, Neck, Musculoskeletal Pain

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Meta-analysis of pain relief effects through laser irradiation on joint surfaces

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short version

Background: Laser therapy has been proposed as physical therapy for musculoskeletal disorders and has gained popularity because no side effects have been reported after treatment. However, their true effectiveness remains controversial as several clinical studies have reported the ineffectiveness of lasers in treating pain.

The methods: In this systematic review we examine the clinical effectiveness of low-level laser therapy (LLLT) for joint pain. Includes clinical studies of joint pain that meet the following conditions: the laser is shone on the joint area, the PEDro scale score is at least 5, and study effectiveness is measured using a visual analog scale (VAS). A mean weighted difference in pain change on the VAS was used to estimate the overall effectiveness of all included clinical studies.

Results: MEDLINE is the primary source for literature research. After a literature search, 22 studies on the topic of joint pain were selected. The average methodological quality score of the 22 studies with 1014 patients was 7.96 on the PEDro scale; 11 studies reported positive effects and 11 studies reported negative effects. The mean weighted difference in the change in pain on the VAS was 13.96mm (95% CI, 7.24-20.69) in favor of the active LLLT groups. If we only considered the clinical studies in which the absorbed dose was within the dose range given in the review by Bjordal et al. in 2003 and proposed in the World Association for Laser Therapy (WALT) dose recommendation, the mean effect sizes were 19.88 and 21.05mm in favor of the true LLLT groups.

Conclusion: The overview shows that laser therapy at the joint alleviates pain in patients. In addition, if we limit the energy doses of laser therapy to the dose window recommended in the previous study, we can expect more reliable pain treatments.

Efficiency of low level laser therapy to reduce pain induced by orthodontic forces

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short version

OBJECTIVE: The aim of this study was to evaluate the effect of low-level laser therapy (LLLT) on the reduction of orthodontic pain after adjustment by evaluating changes in the composition of the gingival crevicular fluid (GCF) at the level of Examine prostaglandin E2 (PGE2) and the visual analog

scale (VAS). Background data: LLLT has been shown to be effective in providing pain relief. PGE2 has the greatest influence on the process of pain signals and can be detected in the GCF to study the reaction of tooth and periodontal tissue in a biochemical way.

The Methods: Nineteen patients (11 women and 8 men; mean age 13.9 years) were included in this study. Upper jaw molars were bandaged and then a randomly selected first molar was irradiated on one side (820 nm; continuous wave; output power: 50 mW; focal point: 0.0314 cm²; exposure time: 5 s; power flux density : 1.59 W / cm²; absorbed dose: 0.25 J; energy flux density: 7.96 J / cm² for each exposure), while the molar on the other side served as a placebo control. The GCF was taken from the gingival space of each molar to assess PGE2 concentrations prior to band placement and 1 and 24 hours after laser irradiation. The pain intensity was analyzed 5 min, 1 h and 24 h after the band placement using VAS.

Results: Although no difference in pain perception was found after 5 minutes and 1 hour, a significant reduction in pain intensity was observed 24 hours after the application by the laser treatment ($p < 0.05$). The mean PGE2 values were significantly increased in the control group, while a gradual decrease occurred in the laser group. The difference in PGE2 concentrations both 1 and 24 hours after treatment was statistically significant between two groups ($p < 0.05$).

Conclusion: The significant reductions in both pain intensity and PGE2 concentrations showed that LLLT effectively reduced orthodontic pain after the fitting.

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Effectiveness of low-level laser therapy in the treatment of neck pain: a systematic review and meta-analysis of randomized, placebo-, or active-treatment-controlled studies

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short version

Background: Neck pain is a common and costly condition for which pharmacological treatment has limited evidence of effectiveness and side effects. Low-level laser therapy (LLLT) is a relatively rare, non-invasive treatment for neck pain that uses non-thermal laser radiation on the painful areas. We performed a systematic review and meta-analysis of randomized controlled trials to assess the effectiveness of LLLT for neck pain.

The Methods: We searched computerized databases and compared the effectiveness of LLLT using any wavelength with placebo or with the active control for acute or chronic neck pain. The effect size for the primary result, pain intensity, was defined as the pooled estimate of the mean difference in change in mm on a visual analog scale of 100 mm.

Findings: We identified 16 randomized controlled trials with a total of 820 patients. For acute neck pain, the results of two studies showed a relative risk (RR) of 1–69 (95% CI 1–22–2–33) for pain relief with LLLT compared to placebo. Five studies of chronic neck pain with categorical data showed a RR for pain relief from LLLT of 4–05 (2–74–5–98). In patients in 11 studies who reported changes in the visual analog scale, the pain intensity was reduced by 19–86 mm (10–04–2929–68). Seven studies provided follow-up data for 1–22 weeks after the end of treatment, with short-term pain relief lasting over the medium term with a decrease of 22–07 mm (17–42–26–72).

Interpretation: We show that LLLT reduces pain immediately after treatment for acute neck pain and for up to 22 weeks after completion of treatment in patients with chronic neck pain.

The effects of a 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 effectiveness of a 300 mW, 830 nm laser in the treatment of chronic neck pain. The subjects were randomized to receive a course of 14 treatments over 7 weeks with either active or sham lasers on sensitive areas in the neck. The primary outcome measure was the change in a 10 cm Visual Analogue Scale (VAS) for pain. Secondary outcome measures included the Short-Form 36 Quality of Life Questionnaire (SF-36), Northwick Park Neck Pain Questionnaire (NPNQ), Neck Pain and Disability Scale (NPAD), McGill Pain Questionnaire (MPQ), and self-assessment pain relief (SAI) using VAS. The measurements were taken at the start of the study, at the end of a seven-week treatment and 12 weeks after the start of the study. 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 in 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) was effective for pain relief in patients with chronic neck pain over a period of 3 months for the parameters used in this study.

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Photoradiation in Acute Pain: A Systematic Review of Possible Mechanisms of Action and Clinical Effects in Randomized, Placebo-Controlled Studies

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short version

Objective: The aim of this study was to examine the biological and clinical short-term effects of photoradiation in acute pain due to soft tissue injuries.

Background data: It is unclear whether and how photoradiation can reduce acute pain.

The Methods: literature review of (i) controlled laboratory studies examining potential biological mechanisms for pain relief, and (ii) randomized placebo-controlled clinical trials that measure results within the first 7 days after acute soft tissue injury.

Results: From 19 of 22 controlled laboratory studies there is strong evidence that photoradiation can modulate inflammatory pain by increasing levels of biochemical markers (PGE₂, mRNA Cox 2, IL-1^β, TNF^α), the influx of neutrophils, oxidative stress and the formation of edema and bleeding are reduced in a dose-dependent manner (mean dose 7.5 J / cm², range 0.3-19 J / cm²). Four animal comparisons with non-steroidal anti-inflammatory drugs (NSAIDs) showed that optimal doses of photoradiation and NSAIDs are equally effective. Seven randomized placebo-controlled studies found no significant results after irradiating even a single point on the skin over the injury site or after using a total dose of less than 5 joules.

The results in these nine studies were significantly in favor of the photo radiation compared to the placebo groups in 15 of 18 results comparisons. Bad and heterogeneous data presentation made it difficult to statistically merge continuous data. The categorical data of the subjective improvement were homogeneous (Q value = 7.1) and could be calculated from four studies (n = 379), which shows a significant relative risk for an improvement of 2.7 (95% confidence interval [CI], 1.8-3.9) in a model with fixed effects.

Conclusion: Photoradiation can modulate inflammatory processes in a dose-dependent manner and can be titrated to significantly reduce acute inflammatory pain in the clinical setting. Further clinical studies with adequate photoradiation doses are required in order to accurately estimate the size of the effect of photoradiation in acute pain.

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Evaluation of the anti-inflammatory effects of 830 nm laser light using C-reactive protein levels.

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The anti-inflammatory effects of non-surgical lasers have been suggested before but have not been scientifically proven. One method of assessing the degree of inflammation is to measure the C-reactive protein (CRP), which increases with the course of the inflammation. The aim of this study was to assess the effect of 830 nm laser irradiation after the removal of impacted third molars using the CRP as a marker of inflammation.

Twelve patients were irradiated with 4.8 J laser light per session 24 and 48 hours after the operation. A control group (N = 12) was treated with a sham laser. Blood samples were taken before and 48 and 72 hours after surgery. The CRP values for the irradiated group (0.320 mg / dl) were more symmetrical and better distributed than for the control group (0.862.mg/dl) 48 h after the operation, but there was no statistically significant difference. After 72 h, both groups had statistically similar CRP values (0.272 and 0.608 mg / dl), which is due to the normal tendency towards decreasing CRP values.

EFFECT OF THE 904 NM DIODE LASER IN ORTHOPEDICS AND TRAUMATOLOGY

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Objective: The semiconductor or laser diode (GaAs, 904 nm) is the most suitable choice in pain reduction therapy.

Background data summary: Low power density laser acts on the synthesis of prostaglandins and increases the conversion of PGG2 and PGH2 periossidos to PGI2 (also called Prostaciclín or Endoprostol). The latter is the main product of arachidonic acid in the endothelial cells and in the smooth muscle cells of the vascular walls, which have a vasodilator and anti-inflammatory effect.

The methods: In the period from May 20, 1987 to December 31, 1999, 447 cases and 435 patients (250 women and 185 men) were treated. The patients, aged between 25 and 70 years, with an average age of 45 years, suffered from rheumatic, degenerative and traumatic pathologies as well as skin ulcers. The majority of the patients had been examined by orthopedists and rheumatologists and examined radiologically. All patients had received drug treatment and / or physical therapy with poor results. Two thirds suffered from acute symptomatic pain, while the others had chronic pathology with recurring crises. We used a pulsed diode laser with a wavelength of GaAs 904 nm. Treatment frequency: 1 application per day for 5 consecutive days, followed by a 2-day interval. When evaluating the results, the following parameters were taken into account: disappearance of spontaneous and induced pain, anatomical and functional assessment of the joints, muscle growth, verbal evaluation scales, hand-held dynamometer, the patient's pain diary.

Results: Very good results were achieved above all in cases of symptomatic osteoarthritis of the cervical spine, sports injuries, epicondylitis and skin ulcers; not least in cases of osteoarthritis of the coxa.

Conclusions: Treatment with the 904 nm diode laser has significantly reduced symptoms and improved the quality of life for patients, so that the need for surgery could be postponed.

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

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short version

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. The LLLT has shown significant anti-inflammatory effects in many studies.

Materials and Methods: A randomized, double-blind, placebo-controlled study 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 with nimesulide only and group C (182 patients) was treated with nimesulide and placebo LLT. The LLLT was applied behind the affected spinal column segment using a stationary skin contact method. The patients were treated 5 times a week 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 / cm² and dose of 3J / cm²; Treatment time 150 seconds for whole doses of 12J / cm². The results were the pain intensity measured with a visual analog scale (VAS), Lumbar movement with a modified Schober test, pain relief with the Oswestry disability score, and quality of life with a 12-point short-form health survey questionnaire (SF-12). The subjects were evaluated before and after treatment. Statistical analyzes were performed with SPSS 11.5.

Results: Statistically significant differences were found in all measured results ($p < 0.001$), but were greater 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 an adjunct therapy.

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Effectiveness of low power laser therapy and exercise on pain and functions in chronic low back pain

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Background and objectives: The aim of this study was to determine whether laser therapy with low power lasers (gallium arsenide) is useful for the therapy of chronic low back pain (LBP) or not.

Study design / materials and methods: 75 patients (laser þ exercise - 25, laser alone - 25, and exercise alone - 25) with LBP were included in this study. The visual analog scale (VAS), Schober test,

flexion and lateral flexion measurements, Roland Disability Questionnaire (RDQ) and Modified Oswestry Disability Questionnaire (MODQ) were used in the clinical and functional evaluations pre- and post-therapeutic. A doctor, unaware of the therapy being carried out, assessed the patients.

Results: Significant improvements were seen in all groups with respect to all outcome parameters with the exception of lateral flexion ($P < 0.05$).

Conclusions: Low-power laser therapy appeared to be an effective method for reducing pain and functional limitations in the treatment of chronic LBP. *Laser surgery. Med.* 32: 233-238, 2003. 2003 Wiley-Liss, Inc. Keywords: lower back pain; Exercise; Low power laser; therapy
