

Arthritis – Osteoarthritis

ACTION OF 904 NM DIODE LASER IN ORTHOPAEDICS AND TRAUMATOLOGY

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

Summary Background Data: Low power density laser acts on the Prostaglandins synthesis, increasing the change of PGG₂ and PGH₂ Peroxidos into PGI₂ (also called Prostacyclin or Endoprostol). The last one is the main product of the Arachidonic acid into the endothelial cells and into the smooth muscular cells of the vessel walls having a vasodilating and anti-inflammatory action.

Methods: Treatment was carried out on 447 cases and 435 patients (250 women and 185 men) in the period between 20.05.1987 and 31.12.1999. The patients, whose age ranged from 25 to 70, with a mean age of 45 years, were suffering from rheumatic, degenerative and traumatic pathologies as well as cutaneous ulcers. The majority of the patients had been seen by orthopaedists and rheumatologists and had undergone x-ray examination. All patients had received drug-based treatment and/or physiotherapy, with poor results. Two thirds were experiencing acute symptomatic pain, while the others presented a chronic pathology with recurrent crises. We used a pulsed diode laser, GaAs 904 nm wavelength. Frequency of treatment: 1 application per day for 5 consecutive days, followed by a 2-day interval. In the evaluation of the results the following parameters have been considered: disappearance of spontaneous and induced pain, anatomic and functional evaluation of the joints, muscular growth, verbal rating scales, hand dynamometer, patient's pain diary.

Results: Very good results were achieved especially with cases of symptomatic osteoarthritis of the cervical vertebrae, with sport-related injuries, with epicondylitis, and with cutaneous ulcers; also, last but not of least importance, with cases of osteoarthritis of the coxa.

Conclusions: Treatment with 904 nm diode laser has substantially reduced the symptoms as well as improved the quality of life of the patient, thus postponing the need for surgery.

J Am Geriatr Soc. 1992; 40: 23-26.

Laser therapy is effective for degenerative osteoarthritis

Stelian J, Gil I, Habot B et al. Improvement of pain and disability in elderly patients with degenerative osteoarthritis of the knee treated with narrow-band light therapy.

In an Israeli study the effect of laser therapy in degenerative osteoarthritis (DOA) of the knee was investigated in a double blind study among 50 patients. One group received infrared (GaAlAs) and one red (HeNe) laser. Only the first group could be blinded, while the latter was open. Patients were treated twice daily, 15 minutes each time, for 10 days. The patients treated themselves after instruction. Total dose for each session was 10.3 J for red and 11.1 for infrared. Continuous mode was used for 7.5 minutes, pulsed for 7.5 minutes, rationale not stated. There was a significant pain reduction in the laser groups as compared to the placebo groups. There was no significant difference between the red and the infrared group. The Disability Index Questionnaire also revealed an improvement in the laser groups. All patients in the

placebo group required analgesics within two months after laser therapy while the patients in the laser group were pain free ranging from 2 months to 1 year.

Physiotherapy Research International. 1999; 4 (2): 141-57.

Clinical efficacy of low power laser therapy in osteoarthritis.

Review article: Marks R, de Palma F.

Of the various physical interventions used to relieve the symptoms of osteoarthritis, a common degenerative joint disease causing considerable pain and disability, low power laser therapy has been reported to be extremely successful in Russia and Eastern Europe. Although the overall number of studies was small, this literature review and analysis highlights the relevant controlled clinical trials and related basic research in English-language publications. This review indicates that, despite their shortcomings, the six studies analysed did report post-treatment improvements in a variety of osteoarthritic problems, including pain, mobility, tenderness and function, with few adverse effects. Possible mechanisms documented for the observed results included peripheral nerve stimulation, resolution of inflammation, enhanced chondrocyte proliferation and increased matrix synthesis. Not all studies were affirmative and few detailed how reliable their measurements were. Clearly, much more work is needed in this area.

THE EFFECT OF LOW POWER LASER THERAPY ON OSTEOARTHRITIS OF THE KNEE

Basirnia A., Sadeghipoor G., Esmaeeli Djavid G. et al.

Treatment was performed on 20 patients, aging from 42 to 60 years. All patients had received conservative treatment with poor results. Laser device used for this treatment was pulsed IR diode laser; 810 nm wavelength once per day for 5 consecutive days, followed by a 2-day interval. The total number of applications was 12 sessions. Irradiation was performed on 5 periarticular tender points, each for 2 min. The treatment outcome (pain relief and functional ability) was observed and measured according to the following methods: 1) Numerical rating scales (NRS), 2) Self assessment by the patient, 3) Index of severity for osteoarthritis of the knee (ISK), 4) Analgesic requirements. We achieved significant improvement in pain relief and quality of life in 70% of patients, comparing to their previous status ($p < 0.05$). There was no significant change in range of motion of the knee.

Radiol Med (Torino). 1998 Apr;95(4):303-9.

[Low-level laser therapy in osteoarticular diseases in geriatric patients]

[Article in Italian]

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INTRODUCTION: Laser light absorption through the skin causes tissue changes, targeting the nervous, the lymphatic, the circulatory and the immune systems with an antalgic, anti-inflammatory, anti-edemic effect and stimulating tissue repair. Therefore low level laser therapy is now commonly used in numerous rehabilitation centers, including the "Istituto Gerontologico Pio Albergo Trivulzio", Milan, Italy. However, to activate the treatment program, the basic medical research results must always be considered to choose the best optical wavelength spectrum, technique and dose, for rehabilitative laser therapy. We analyzed the therapeutic effects of different wavelengths and powers in various treatment schedules. In particular, a protocol was designed to test such physical parameters as laser type, doses and individual schedule in different pathologic conditions. We report the results obtained with low level laser therapy in the

rehabilitation of geriatric patients, considering the various physical and technical parameters used in our protocol. MATERIAL AND METHODS: We used the following laser equipment: an HeNe laser with 632.8 nm wavelength (Mectronic), a GaAs Laser with 904 nm wavelength (Mectronic) and a CO₂ Laser with 10,600 nm wavelength (Etoile). To evaluate the patient clinical status, we use a different form for each involved joint; the laser beam is targeted on the region of interest and irradiation is carried out with the sweeping method or the points technique. Irradiation technique, doses and physical parameters (laser type, wavelength, session dose and number) are indicated on the form. The complete treatment cycle consists of 5 sessions per week--20 sessions in all. At the end of the treatment cycle, the results were scored on a 5-grade semiquantitative scale--excellent, good, fair, poor and no results. We examined 3 groups of patients affected with gonarthrosis (149 patients), lumbar arthrosis (117 patients), and algodystrophy (140 patients) respectively. RESULTS: In gonarthrosis patients, the statistical analysis of the results showed no significant differences between CO₂ laser and GaAs laser treatments ($p = .975$), but significant differences between CO₂ laser and HeNe laser treatments ($p = .02$) and between GaAs laser and HeNe laser treatments ($p = .003$). In lumbar arthrosis patients treated with GaAs or HeNe laser, significant differences were found between the two laser treatments and the combined sweeping-points techniques appeared to have a positive trend relative to the sweeping method alone, especially in sciatic suffering. In the algodystrophy syndrome, in hemiplegic patients, significant differences were found between CO₂ and HeNe laser treatments ($p = .026$), between high and low CO₂ laser doses ($p = .024$), and between low CO₂ laser dose and high HeNe laser dose ($p = .006$). CONCLUSIONS: Low level laser therapy can be used to treat osteoarticular pain in geriatric patients. To optimize the results, the diagnostic picture must be correct and a treatment program defining the physical parameters used (wavelength, dose and irradiation technique) must also be designed.

Cochrane Database Syst Rev. 2000;(2):CD002046.

Low level laser therapy (classes I, II and III) for the treatment of osteoarthritis.

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BACKGROUND: Osteoarthritis (OA) affects a large proportion of the population. Low Level Laser Therapy (LLLT) is a light source that generates extremely pure light, of a single wavelength. The effect is not thermal, but rather related to photochemical reactions in the cells. LLLT was introduced as an alternative non-invasive treatment for OA about 10 years ago, but its effectiveness is still controversial. OBJECTIVES: To assess the effectiveness of LLLT in the treatment of OA. SEARCH STRATEGY: We searched MEDLINE, EMBASE, the Cochrane Musculoskeletal registry, the registry of the Rehabilitation and Related Therapies field and the Cochrane Controlled Trials Register up to January 30, 2000. SELECTION CRITERIA: Following an a priori protocol, only controlled clinical trials of LLLT for the treatment of patients with a clinical diagnosis of OA were eligible. Abstracts were excluded unless further data could be obtained from the authors. DATA COLLECTION AND ANALYSIS: Two reviewers independently selected trials and abstracted data using predetermined forms. Heterogeneity was tested with Cochran's Q test. A fixed effects model was used throughout for continuous variables, except where heterogeneity existed, in which case, a random effects model was used. Results were analyzed as weighted mean differences (WMD) with 95% confidence intervals (CI), where the difference between the treated and control groups was weighted by the inverse of the variance. Standardized mean differences (SMD) were calculated by dividing the difference between treated and control by the baseline variance. SMD were used when different scales were used to measure the same concept (e.g. pain). Dichotomous outcomes were analyzed with odds ratios. MAIN RESULTS: Five trials were included, with 112 patients randomized to laser, 85 patients to placebo laser. Treatment duration ranged from 4 to 10 weeks. Pain was assessed by four trials. The pooled estimate (random effects) of three trials showed no effect on pain measured using a scale (SMD: -0.2, 95% CI: -1.0, +0.6), but there was statistically significant heterogeneity ($p > 0.05$). Two of

the trials showed no effect and one demonstrated very beneficial effects with laser. In another trial, with no scale-based pain outcome, significantly more patients reported pain relief (yes/no) with laser with an odds ratio of 0.05, (95% CI: 0.0 to 1.56). Other outcomes of joint tenderness, joint mobility and strength were not significant. REVIEWER'S CONCLUSIONS: For OA, the results are conflicting in different studies and may depend on the method of application and other features of the LLLT application. Clinicians and researchers should consistently report the characteristics of the LLLT device and the application techniques used. New trials on LLLT should make use of standardized, validated outcomes. Despite some positive findings, this meta-analysis lacked data on how LLLT effectiveness is affected by four important factors: wavelength, treatment duration of LLLT, dosage and site of application over nerves instead of joints. There is clearly a need to investigate the effects of these factors on LLLT effectiveness for OA in randomized controlled clinical trials.

[Photomed Laser Surg.](#) 2005 Oct;23(5):453-8.

Can Cochrane Reviews in controversial areas be biased? A sensitivity analysis based on the protocol of a Systematic Cochrane Review on low-level laser therapy in osteoarthritis.

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OBJECTIVE: The aim of this study was to test if a conclusion in a systematic review of low-level laser therapy (LLLT) for osteoarthritis from the Cochrane Library was valid and robust. **BACKGROUND DATA:** Health policy decisions often rely on conclusions from the Cochrane Database of Systematic Reviews for approval of new therapies, although their validity for controversial non-pharmacological treatment has been questioned. **METHODS:** Validity was tested against a nine-item checklist for systematic reviews. Review selections were analyzed for possible discrepancies between trial and review reports, and omissions of relevant trials and data. Alternative data from discrepancies and omissions were then imputed in a sensitivity analysis, to test if review conclusions were robust. **RESULTS:** Only clinicians who had performed LLLT trials with negative results were invited into the review group. Review quality was sound in areas of literature search and methodological assessments, and some of the limitations were mentioned. The statistical analysis held 18 questionable selections such as omissions of trials, data, and subgroup analyses. These selections systematically favored the negative review conclusion. Without altering the review protocol, the sensitivity analysis of combined results changed to significantly positive for continuous and categorical data when data from all included trials were combined. Further sensitivity analyses with inclusion of valid non-included trials, performance of missing follow-up, and subgroup analyses revealed consistent and highly significant results in favor of active LLLT. **CONCLUSIONS:** In this example, the Cochrane review conclusion was neither robust nor valid. Representation of experts and different views on efficacy in the review group and extensive use of sensitivity analyses could probably improve quality control of reviews in areas of controversy.