

Clinical Data

Conditions that Respond Well to TerraQuant LOW LEVEL LASER THERAPY

-Spinal diseases comprising early

- osteochondriosis
- scoliosis
- intervertebral disk hernia
- post-traumatic pain
- carriage disorders
- radiculitis
- ischialgia

-Joint disease, such as

- arthritis
- arthrosis
- coxarthrosis
- contractures
- calcaneal spurs
- myositis.

-Sunburn

- Acute (traumatic) & chronic pain, neck & back pain
- Tendonitis, carpal tunnel syndrome, tennis/golfer elbow
- Acne, eczema
- Non-healing ulcers
- Sinusitis, tonsillitis
- Fibromyalgia
- Migranes
- Tinnitus

Therapy with TerraQuant does not exclude other conventional medical treatment. Combining TerraQuant with other treatment may result in rapid recovery and may enable the reduction in doses of conventional drug consumption.

Reported Contra-indications:

- Direct Irradiation Of The Eyes

Class 3b lasers are potentially harmful to the retina - though retinal damage is highly unlikely. Safety goggles must, however, be worn by both patient and practitioner.

- Pregnancy

Laser is contra-indicated for use over the pregnant uterus. It may be used on the pregnant woman as an adjunct to the other modalities being used for the treatment of back pain or other complaints.

- Carcinoma

Do not use laser over any known primary or secondary lesions. Laser treatment may be given for pain relief during the terminal stages of the illness - we recommend this be done only with the full consent of both patient and consultant involved. • Thyroid Laser should not be used over the thyroid gland.

- Haemorrhage

It is conceivable that laser-mediated vasodilation may worsen the haemorrhage.

- Immune Suppressant Drugs

Laser Therapy is contra-indicated for patients on these drugs.

Treatment Over Sympathetic Ganglia, The Vagus Nerves & Cardiac Region In Patients With Heart Disease.

Laser therapy may significantly alter neural function, and is therefore contra-indicated over these regions in patients with heart disease.

Related articles.

Efficacy of laser irradiation on the area near the stellate ganglion is dose-dependent: double-blind crossover placebo-controlled study.

Toshikazu Hashimoto, Osamu Kemmotsu, Hiroshi Otsuka, Rie Numazawa, and Yoshihiro Ohta, Department of Anaesthesia, Hokkaido University Hospital, Sapporo, Japan

In the present study we evaluate the effects of laser irradiation on the area near the stellate ganglion on regional skin temperature and pain intensity in patients with postherpetic neuralgia. A double blind, crossover and placebo-controlled study was designed to deny the placebo effect of laser irradiation.

Eight inpatients (male 6, female 2) receiving laser therapy for pain attenuation were enrolled in the study after institutional approval and informed consent. Each patient received three sessions of treatment on a separate day in a randomised fashion. Three minutes irradiation with a 150 mW laser (session 1), 3 minutes irradiation with a 60 mW laser (session 2), and 3 minutes placebo treatment without laser irradiation. Neither the patient nor the therapist was aware which session type was being applied until the end of the study. Regional skin temperature was evaluated by thermography of the forehead, and pain intensity was recorded using a visual analogue scale (VAS). Measurements were performed before treatment, immediately after (0 minutes) then 5, 10, 15, and 30 min after treatment. Regional skin temperature increased following both 150 mW and 60mW laser irradiation, whereas no changes were obtained by placebo treatment. VAS decreased following both 150 mW and 60 mW laser treatments, but no changes in

VAS were obtained by placebo treatment. These changes in the temperature and VAS were further dependent on the energy density, i.e. the dose.

Results demonstrate that laser irradiation near the stellate ganglion produces effects similar to stellate ganglion block. Our results clearly indicate that they are not placebo effects but true effects of laser irradiation.

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The effect of infra-red laser irradiation on the duration and severity of postoperative pain: a double blind trial.

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*Department of Anaesthesia, The Royal Hallamshire Hospital, Sheffield, U.K.,
General Practitioner, Pennymeadow Clinic, Ashton-under-Lyne, U.K.

This trial was designed to test the hypothesis that LLLT reduces the extent and duration of post-operative pain. Twenty consecutive patients for elective cholecystectomy were randomly allocated for either LLLT or as controls. The trial was double blind. Patients for LLLT received 6-8-min treatment (GaAlAs: 830 nm: 60 mW CW: CM) to the wound area immediately following skin closure prior to emergence from GA. All patients were prescribed on demand post-operative analgesia (IM or oral according to pain severity). Recordings of pain scores (0-10) and analgesic requirements were noted by an independent assessor. There was a significant difference in the number of doses of narcotic analgesic (IM) required between the two groups.

Controls n = 5.5: LLLT n = 2.5.

No patient in the LLLT group required IM analgesia after 24 h. Similarly the requirement for oral analgesia was reduced in the LLLT group.

Controls n = 9: LLLT n = 4.

Control patients assessed their overall pain as moderate to severe compared with mild to moderate in the LLLT group.

The results justify further evaluation on a larger trial population.

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Successful management of female office workers with "repetitive stress injury" or "carpal tunnel syndrome" by a new treatment modality- application of low level laser

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Abstract

Female office workers with desk jobs who are incapacitated by pain and tingling in the hands and fingers are often diagnosed by physicians as "repetitive stress injury" (RSI) or "carpal tunnel syndrome" (CTS). These patients usually have poor posture with their head and neck stooped forward and shoulders rounded; upon palpation, they have pain and tenderness at the spinous processes C5 - T1 and the medial angle of the scapula. In 35 such patients we focused the treatment primarily at the posterior neck area and not the wrists and hands. A low level laser (100 mW) was used and directed at the tips of the spinous processes C5 - T1.

The laser rapidly alleviated the pain and tingling in the arms, hands and fingers, and diminished tenderness at the involved spinous processes. Thereby, it has become apparent that many patients labelled as having RSI or CTS have predominantly cervical radicular dysfunction resulting in pain to the upper extremities which can be managed by low level laser.

Successful long-term management involves treating the soft tissue lesions in the neck combined with correcting the abnormal head, neck and shoulder posture by taping, cervical collars, and clavicle harnesses as well as improved work ergonomics.

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Physiological responses in chronic pain patients. LLLT protocol.

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Use of Low Reactive Level Laser Therapy (LLLT) utilising helium-neon lasers has increased lately especially in pain control. New protocols are being developed aimed at a complex of primary and secondary symptomologies. One of these protocols Stellate Ganglion Stimulation has shown in our research a unique set of developments. Targeting the area of the stellate ganglion is showing great promise in the rehabilitation of patients with a history of chronic musculoskeletal pain syndromes, but several patients with pre-existing psychological symptomology have exacerbated during the initial stages of utilization of this protocol.

Patients with a history of psychological diagnosis for dysthymia, anxiety, post traumatic stress disorder or minor diffuse brain injury have shown an exacerbation of these symptomologies during the initial phases of stimulation treatment. Overall, response to this form of therapy seems to be positive but some patients require dermatomal and/or site-specific therapy to maximize outcome. With specific psychological treatment combined with a more conservative amount of stimulation initially the increase in these symptoms shows a tendency to remit with the pain response. Our continued research is currently focusing on the mechanisms for this type of response as well as protocol refinement to maximize its effectiveness.

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Mechanisms of the analgesic effects of therapeutic lasers in vivo.

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2: Department of Functional Anatomy, Second Medical Faculty and Faculty of Physical Education Charles University, Prague, Czech Republic

The analgesic effects in the course of application of therapeutic lasers to affected tissue have been described in a number of works in the literature. Although a few scientific-based reports have appeared, those on laser-induced analgesia are mainly clinical works describing the effect of the therapy which, however, do not study the mechanism of the laser action. There are several different possible responses induced by non-invasive low level laser therapy (LLLT).

The purpose of the present communication is to review the arrangement and characterisation of these responses. By being aware of these effects, the laser therapist can acquire a physiological and morphological scheme making possible the appropriate choice of the site of application of LLLT, choice of the irradiation technique, and selection of appropriate doses.

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Experimental Physiology (1994) 79. 227-234 Printed in Great Britain

Can low reactive-level laser therapy be used in the treatment of neurogenic facial pain? A double-blind, placebo controlled investigation of patients with trigeminal neuralgia.

Arne Eckerdal and Lehmann Bastian

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Neurogenic facial pain has been one of the more difficult conditions to treat, but the introduction of laser therapy now permits a residual group of patients hitherto untreatable to achieve a life free from or with less pain. The present investigation was designed

as a double-blind, placebo controlled study to determine whether low reactive-level laser therapy (LLLT) is effective for the treatment of trigeminal neuralgia. Two groups of patients (14 and 16) were treated with two probes. Neither the patients nor the dental surgeon were aware of which was the laser probe until the investigation had been completed. Each patient was treated weekly for five weeks.

The results demonstrate that of 16 patients treated with the laser probe, 10 were free from pain after completing treatment and 2 had noticeably less pain, while in 4 there was little or no change. After a one year follow-up, 6 patients were still entirely free from pain. In the group treated with the placebo system, i.e. the non-laser probe, one was free from pain, 4 had less pain, and the remaining 9 patients had little or no recovery. After one year only one patient was still completely free from pain. The use of analgesics was recorded and the figures confirmed the fact that LLLT is effective in the treatment of trigeminal neuralgia. It is concluded that the present study clearly shows that LLLT treatment, given as described, is an effective method and an excellent supplement to conventional therapies used in the treatment of trigeminal neuralgia.

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Double-blind crossover trial of low level laser therapy in the treatment of post-herpetic neuralgia.

Kevin C Moore, Naru Hira. Parswanath S. Kramer, Copparam S. Jayakumar and Toshio Ohshiro

Post herpetic neuralgia can be an extremely painful condition which in many cases proves resistant to all the accepted forms of treatment. It is frequently most severe in the elderly and may persist for years with no predictable course.

This trial was designed as a double blind assessment of the efficacy of low level laser therapy in the relief of the pain of post herpetic neuralgia with patients acting as their own controls. Admission to the trial was limited to patients with established post herpetic neuralgia of at least six months duration and who had shown little or no response to conventional methods of treatment. Measurements of pain intensity and distribution were noted over a period of eight treatments in two groups of patients each of which received four consecutive laser treatments.

The results demonstrate a significant reduction in both pain intensity and distribution following a course of low level laser therapy.

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Efficacy of low-level laser therapy for pain attenuation of post-herpetic neuralgia.

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The efficacy of low reactive-level laser therapy (LLLT) for pain attenuation in patients with postherpetic neuralgia (PHN) was evaluated in 63 patients (25 males, 38 females with an average age of 69 years) managed at our pain clinic over the past four years. A double blind assessment of LLLT was also performed in 12 PHN patients. The LLLT system is a gallium aluminium arsenide (GaAlAs) diode laser (830 nm, 60 mW continuous wave). Pain scores (PS) were obtained using a linear analogue scale (1 to 10) before and after LLLT.

The immediate effect after the initial LLLT was very good (PS: <3) in 26, and good (PS: 7-4) in 30 patients. The long-term effect at the end of LLLT (the average number of treatments 36 + 12) resulted in no pain (PS: 0) in 12 patients and slight pain (PS: 1-4) in 46 patients. No complications attributable to LLLT occurred. Although a placebo effect was observed, decreases in pain scores and increases of the body surface temperature by LLLT were significantly greater than those that occurred with the placebo treatment. Our results indicate that LLLT is a useful modality for pain attenuation in PHN patients and because LLLT is a non-invasive, painless and safe method of therapy, it is well acceptable by patients.

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Mechanistic approach to GaAlAs diode laser effects on production of reactive oxygen species from human neutrophils as a model for therapeutic modality at cellular level.

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There have been many reports on the applications of low reactive level laser (LLL) therapy for pain attenuation or pain removal. Our group has reported previously on the effects of in vitro irradiation of LLLT particularly on the phagocytic activity of human Neutrophils, using luminol-dependent chemiluminescence (LmCL) for measurement of reactive oxygen species (ROS) production from human Neutrophils. However, the mechanisms of the

attenuation of phagocytic activity of NEUTROPHILS by LLL irradiation is not yet full understood.

In this study. we used luminol-dependent and lucigenin-dependent chemiluminescence (LgCL) for detection of affected ROS producing process of human Neutrophils by LLL irradiation. Two soluble action stimuli, N-formyl-Met-Leu-Phe (fMLP) and phorbol myristate acetate (PMA) were used to avoid the possible influence of lag-time from recognition to uptake of particles at the ROS production.

In case of using fMLP as a stimulus, the maximum luminescence intensity of LULL was increased but LgCL luminescence was decreased by LLL irradiation. When PMA was used as a stimulus, the times to reach the maximum luminescence intensity of LmCL and LgCL were shortened by LLL irradiation, but there was no effect on the maximum luminescence intensity of both.

These results suggest that LLL irradiation enhances the ROS production activity of human Neutrophils by the activation of the superoxide converting system, the active element in which is mainly myeloperoxidase. LLL irradiation enabled a more rapid activation of the superoxide production system, NADPH -oxidase.

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LASER THERAPY 1993: 5: 111-116

Laser Therapy in Post Herpetic Neuralgia.

Dr K C Moore

The clinical application of low incident power density laser radiation for the treatment of acute and chronic pain is now a well established procedure. This paper reviews the currently available English speaking literature and summarises a selection of serious scientific papers which report a beneficial effect following the treatment of a wide variety of acute and chronic syndromes whose main presenting symptom is pain.

Low Intensity Laser Therapy (LILT) for Head, Neck and Facial Pain.

Prof P.F. Bradley

Head and Neck Clinical Applications of LILT

LILT is proving useful in a wide variety of painful conditions in the Head and Neck but the following are particular applications:

1. TM Joint Pain Dysfunction
2. Post Herpetic Neuralgia
3. Trigeminal Neuralgia
4. Painful Ulcerative Conditions
5. Pain of Advanced Oro Facial Cancer

The Ability of Low Level Laser Therapy (LLLT) to Mitigate Fibromyalgic Pain.

The CFIDS Chronicle Physicians' Forum Fall 1993
Douglas Ashendorf, MD, FAAPMR Newark, New Jersey

Results have suggested that the pain relieving properties of LLLT have been the most consistent benefit. The duration of benefit has varied from one hour to one week, and seems to increase as treatment progresses. In no case has pain relief been permanent.

Other areas of improvement were not as clear. Improvement in sleep was observed with some regularity although this was undoubtedly due in part to decreased pain. The "non-restorative" sleep complaints were less regularly improved. Improvement with regard to abnormal sensations in the limbs (paresthesia and subjective swelling) appears to be fairly consistent. Improvements in fatigue, mood and headache.

Although the pilot study is incomplete, I believe that these early findings warrant the further investigation of laser therapy for patients with fibromyalgia. This is further supported by the relatively few and harmless side effects of this therapy, the fact that equipment and operating costs are reasonable, and the reality that there are few effective alternative treatments for fibromyalgia patients.

Carpal Tunnel Study Results Released

Laser Focus World

A physician at UMDNJ-Robert Wood Johnson Medical School is evaluating a "cold" laser to treat patients with carpal tunnel syndrome, a debilitating nerve condition that causes severe pain and numbness in the hand.

Clinical results of a double-blind study of 11 patients afflicted with carpal tunnel syndrome who were treated with a diode-laser device manufactured by Lasermedics (Missouri City, TX) showed that after six to 15 treatments, nine of the 11 patients experienced relief of pain and other associated symptoms as well as normalization of abnormal latencies.

The study was conducted by Michael L. Weintraub, a neurologist from Briarcliff, NY, and reported in the February 1996 issue of Neurology.

The patients all used a 30mW 830nm, a hand-held, battery-operated, nonsurgical laser device that employs the process of photo-biostimulation.

Dr. Weintraub concluded that the results of his study support the efficacy and safety of laser-light treatment in carpal tunnel syndrome.

Physiotherapist Shows Lasers Relieve Pain.

A physiotherapist at Royal Brisbane Hospital (Australia) recently received a PhD from the University of Queensland for demonstrating that laser treatment prompts the release of

endorphins into the bloodstream. Endorphins are a type of natural morphine that dulls pain. Physiotherapist Liisa Laakso studied the effects of lasers on 56 people who suffered myofascial pain syndrome, a chronic hypersensitivity often secondary to a person's primary painful affliction, such as arthritis. Previous experiments linking endorphin release and lasers have only been done on rats.

In the study, Laakso applied different doses and wavelengths of a laser diode to "trigger points" on the body and took blood samples measuring endorphin levels in these subjects and a control group. The control group reported some pain relief - most likely a placebo effect - but endorphins were present. Those patients that underwent laser treatment reported pain reduction of up to 78%, and endorphins were present in their blood.

Laser therapy takes pain, discomfort out of post-cancer condition

LOW-LEVEL laser therapy promises to be a valuable weapon in the fight against lymphoedema, the painful and permanent swelling of an arm which frequently follows breast cancer operations. Doctors at Adelaide's Flinders University (FU) have conducted trials which have produced the first clinical evidence that infra-red laser can improve tissue conditions rapidly in the affected area.

Associate professor Neil Piller told the university magazine, Flinders Journal, that loosening the tissue encouraged the regrowth of lymph vessels. The results are very exciting," Dr Piller said. "This is the first time anyone specifically has set out to trial lasers in this way. Previously, information about the possible efficacy of lasers has come as a by-product of research into such areas as wound treatment and arthritic conditions, and even then there has been very little work done."

Lymphoedema results from deliberate or accidental removal of lymph nodes or vessels. It affects about 15 per cent of women sometime after a breast cancer operation. In the FU trials, 15 women with prolonged or severe lymphoedema were given 16 half-hour laser treatments over 10 weeks. " All had arms swollen to between 140 and 180 per cent of normal volume. A scanning laser, focusing 2-4 joules of power to each square centimetre, was applied to the entire arm.

In all cases, the treatment reduced the amount of oedema, the volume of fluid and the circumference of the arm above the elbow. Tissues in the upper and lower arm were softened and patients reported less pain, tightness and heaviness, and far greater mobility. "Giving them 16 treatments actually was overkill," Dr Piller said. "Since the trial ended, we have achieved significant results from just three or four treatments, or in some cases one or two."

Diode Laser in Cervical Myofascial Pain: A Double-Blind Study versus Placebo

* F. Ceccherelli, * L. Altafini, * G. Lo Castro, * A. Avila, *F. Ambrosio, and * G. P. Giron

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Padua, and the Associazione Italiana per la Ricerca e, l'Aggiornamento Scientifico, Padua, Italy

Summary

We present a double-blind trial in which a pulsed infrared beam was compared with a placebo in the treatment of myofascial pain in the cervical region. The patients were submitted to 12 sessions on alternate days to a total energy dose of 5 J each. At each session, the four most painful muscular trigger points and five bilateral homometameric acupuncture points were irradiated. Those in the placebo group submitted to the same number of sessions following an identical procedure, the only difference being that the laser apparatus was nonoperational. Pain was monitored using the Italian version of the McGill pain questionnaire and the Scott-Huskisson visual analogue scale.

The results show a pain attenuation in the treated group and a statistically significant difference between the two groups of patients, both at the end of therapy and at the 3-month follow-up examination.

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The Clinical Journal of Pain 5:301-304
copyright 1989 Raven Press, Ltd., New York
Wave-length Power Energy Density Power Density Energy per point Pulses 904nm 5mW av (25Wpeak) (not given) (not given) 1 J 1KHz x 200nS

Pain scores and side effects in response to low level laser therapy (LLLT) for physical trigger points.

E Liisa Laakso Carolyn Richardson, and Tess Cramond
1: Physiotherapy Department, Royal Brisbane Hospital, Brisbane;
2: Physiotherapy Department, University of Queensland, Brisbane;
and 3: Pain Clinic, Royal Brisbane Hospital, Brisbane, Queensland, Australia.

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 (IR) 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 1 J/cm² and 5 J/cm². demonstrating the most significant effects (p < 0.001). Only those subjects who had active

laser treatment experienced 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.

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Two wavelengths studied.

Best results with the higher powered infrared laser compared with the lower powered red laser Wave- length Average Power Energy Density Power Density Energy Pulses Time Beam Spot size 820 25mW 5 J/Cm² 0.89 W/Cm² 0.14 J 5,000Hz 5.62 secs 0.89Cm²

Low level laser therapy(LLLT) of tendinitis and myofacial pains a randomized, double-blind, controlled study.

Mimmi Logdberg-Andersson (1), Sture Mutzell (2), and Ake Hazel (3)

1: Akersberga Health Care Centre,
2: Danderyd University Hospital, Danderyd, and
3: Vaxholm Health Care Centre, Stockholm, Sweden.

The purpose of this randomised, double-blind study was to examine the effect of GaAs laser therapy for tendonitis and myofascial pain in a sample from the general population of Akersberga in the northern part of Greater Stockholm.

176 patients (of an original group of 200) completed the scheduled course of treatment. The patients were assigned randomly to either a laser group (92 patients, of whom 74 had tendonitis, completed the study) or a placebo group (84 patients, of whom 68 had tendonitis, completed the study). All 176 patients received six treatments during a period of 3-4 weeks. Their pain was estimated objectively using a pain threshold meter, and subjectively with a visual analogue scale before, at the end of, and four weeks after the end of treatment.

Laser therapy had a significant, positive effect compared with placebo measured from the first assessment to the third assessment, four weeks after the end of treatment. Laser treatment was most effective on acute tendonitis.

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03/07 Rep US 10-12-14, 1997 By LT Publishers, U.K., Ltd. LASER THERAPY, 1997:9: 79-86 Wave- length Power Energy Density Power Density Energy per point Pulses 904nm 8mW av (10Wpeak) 0.5-1.0 J/Cm² (not given) 1J 4KHz x 180nS

The efficacy of laser therapy for musculoskeletal and skin

disorders: a criteria-based meta-analysis of randomized clinical trials.

Beckerman H, de Bie RA, Bouter LM, et al.

The efficacy of laser therapy for musculoskeletal and skin disorders has been assessed on the basis of the results of 36 randomized clinical trials (RCTs) involving 1,704 patients. For this purpose, a criteria-based meta-analysis that took into account the methodological quality of the individual trials was used. The studies with a positive outcome were generally of a better quality than the studies with a negative outcome. No clear relationship could be demonstrated between the laser dosage applied and the efficacy of laser therapy, or between the dosage and the methodological score.

In general, the methodological quality of these studies appeared to be rather low. Consequently, no definite conclusions can be drawn about the efficacy of laser therapy for skin disorders. The efficacy of laser therapy for musculoskeletal disorders seems, on average, to be larger than the efficacy of a placebo treatment. More specifically, for rheumatoid arthritis, post-traumatic joint disorders, and myofascial pain, laser therapy seems to have a substantial specific therapeutic effect.

Further RCTs, avoiding the most prevalent methodological errors, are needed in order to enable the benefits of laser therapy to be more precisely and validly evaluated.

Physical Therapy. 72(7):483-91, 1992 Jul. (60 ref)

LLLT using a diode laser in successful treatment of a herniated lumbar/sacral disc, with magnetic resonance imaging(MRI) assessment: a case report.

Tatsuhide Abe

Abe Orthopaedic Clinic Futuoka City Fukuoka Prefecture Japan
X12' A 40-year-old woman presented at the Abe Orthopedic Clinic with a 2-year history of lower back pain and pain in the left hip and leg diagnosed as a ruptured disc between the 5th lumbar/1st sacral vertebrae. The condition had failed to respond to conventional treatment methods including pelvic traction, nonsteroid anti-inflammatory drugs and aural block anesthetic injections.

MRI scans were made of the affected disc, showing it protruding on the left side through the aural membrane. The gallium aluminum arsenide (GaAlAs) diode laser (830 nm, 60 mW) was used in outpatient therapy and after 7 months, the patient's condition had dramatically improved demonstrated by motility exercises. This improvement was confirmed by further MRI scans, which showed clearly the normal condition of the previously herniated L5/S1 disc.

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Physiological responses in chronic pain patients LLLT

protocol.

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Use of Low Reactive Level Laser Therapy (LLLT) utilising helium-neon lasers has increased lately especially in pain control. New protocols are being developed aimed at a complex of primary and secondary symptomologies. One of these protocols, Stellate Ganglion Stimulation, has shown in our research a unique set of developments.

Targeting the area of the stellate ganglion is showing great promise in the rehabilitation of patients with a history of chronic musculoskeletal pain syndromes, but several patients with preexisting psychological symptomology have exacerbated during the initial stages of utilization of this protocol. Patients with a history of psychological diagnosis for dysthymia, anxiety, post traumatic stress disorder or minor diffuse brain injury have shown an exacerbation of these symptomologies during the initial phases of stimulation treatment.

Overall, response to this form of therapy seems to be positive but some patients require dermatomal and/or site-specific therapy to maximize outcome. With specific psychological treatment combined with a more conservative amount of stimulation initially the increase in these symptoms shows a tendency to remit with the pain response. Our continued research is currently focusing on the mechanisms for this type of response as well as protocol refinement to maximize its effectiveness.

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Clinical application of GaAIAs 830 NM diode laser in treatment of rheumatoid arthritis.

Kanji Asada, Yasutaka Yutani, Akira Sakawa and Akira Shimazu
Department of Orthopaedic Surgery, Osaka City University Medical School, Japan

The authors have been involved in the treatment of rheumatoid arthritis (RA), in particular chronic poly-arthritis and the associated pain complaints. The biggest problem facing such patients is joint contracture, leading to bony ankylosis. This in turn severely restricts the range of motion (ROM) of the RA-affected joints, thereby seriously restricting the patient's quality of life (QOL). The authors have determined that in these cases, daily rehabilitation practice is necessary to maintain the patient's QOL at a reasonable level.

The greatest problem in the rehabilitation practice is the severe pain associated with RA-affected joints, which inhibits restoration of mobility and improved ROM. LLLT or low reactive level laser therapy has been recognized in the literature as having been effective in pain removal and attenuation. The authors accordingly

designed a clinical trial to assess the effectiveness of LLLT in RA related pain (subjective self-assessment) and ROM improvement (objective documented data).

From July 1988 to June 1990, 170 patients with a total of 411 affected joints were treated using a GaAlAs diode laser system (830 nm, 60 mW C/W). Patients mean age was 61 years, with a ratio of males: females of 1: 5.25 (16%: 84%). Effectiveness was graded under three categories: excellent (remarkable improvement), good (clearly apparent improvement), and unchanged (little or no improvement).

For pain attenuation, scores were: excellent - 59.6%; good - 30.4%; unchanged - 10%.

For ROM improvement the scores were: excellent - 12.6%; good - 43.7%; unchanged - 43.7%. This gave a total effective rating for pain attenuation of 90%, and for ROM improvement of 56.3%.

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Mechanisms of the analgesic effect of therapeutic lasers in vivo.

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The analgesic effects in the course of application of therapeutic lasers to affected tissue have been described in a number of works in the literature. Although a few scientific-based reports have appeared, those on laser-induced analgesia are mainly clinical works describing the effect of the therapy which, however, do not study the mechanism of the laser action.

There are several different possible responses induced by non-invasive low level laser therapy (LLLT). The purpose of the present communication is to review the arrangement and characterisation of these responses. By being aware of these effects, the laser therapist can acquire a physiological and morphological scheme making possible the appropriate choice of the site of application of LLLT, choice of the irradiation technique, and selection of appropriate doses.

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Laser's Effect on Bone and Cartilage Change Induced by

Joint Immobilization An Experiment with Animal Model.

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Objective:

Influence of low-level (810nm, Ga-Al-As semiconductor) laser on bone and cartilage during joint immobilization was examined with rats' knee model.

Materials and Methods:

The hind limbs of 42 young Wistar rats were operated on in order to immobilise the knee joint. One week after operation they were assigned to three groups; irradiance 3.9W/cm², 5.8W/cm², and sham treatment. After 6 times of treatment for another 2 weeks both hind legs were prepared for 1) indentation of the articular surface of the knee (stiffness and loss tangent), and for 2) dual energy X-ray absorptiometry (bone mineral density) of the focused regions.

Results and Conclusions:

The indentation test revealed preservation of articular cartilage stiffness with 3.9 and 5.8W/cm² therapy. Soft laser treatment has a possibility for prevention of biomechanical changes by immobilisation.

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Histological and Clinical Responses of Articular Cartilage to Low-level Laser Therapy: Experimental Study.

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Abstract

This study was carried out to evaluate the effects of low-level laser irradiation on experimental lesions of articular cartilage.

A standard lesion was practiced on the femoral trochlea of both hind limbs of 20 clinically normal Californian rabbits. These

animals were divided into two groups of 10 individuals each, depending on the laser equipment used for treatment. One group was treated with HeNe laser (8 J cm⁻², 632.8 nm wavelength) and the other with infra-red (IR) laser (8 J cm⁻², 904 nm wavelength). In both groups, five points of irradiation to the right limb alone were irradiated per session for a total of 13 sessions, applied with an interval of 24 h between sessions. These points were the following: left and right femoral epicondyles, left and right tibial condyles and the centre of articulation. The distance between these points was approximately 1 cm. The untreated left limb was left as a control. During treatment, extension angle and periarticular thickness were considered. At the end of the treatment, samples were collected for histopathological study and stained with: Haematoxylin-Eosin, PAS and Done.

The results show a statistically higher anti-inflammatory capacity of the IR laser ($p < 0.0001$). The functional recovery was statistically similar for both treatments ($p < 0.176$). Histological study showed, at the end of the treatment, hyaline cartilage in the IR group, fibrocartilage in the HeNe group and granulation tissue in the control limbs. Clinical and histological results indicated that this laser treatment had a clear anti-inflammatory effect that provided a fast recuperation and regeneration of the articular cartilage.

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Successful management of female office workers with "repetitive stress injury" or "carpal tunnel syndrome" by a new treatment modality- application of low level laser.

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Abstract

Female office workers with desk jobs who are incapacitated by pain and tingling in the hands and fingers are often diagnosed by physicians as "repetitive stress injury" (RSI) or "carpal tunnel syndrome" (CTS). These patients usually have poor posture with their head and neck stooped forward and shoulders rounded; upon palpation. They have pain and tenderness at the spinous processes C5 - T1 and the medial angle of the scapula. In 35 such patients we focused the treatment primarily at the posterior neck area and not the wrists and hands. A low level laser (100 mW) was used and directed at the tips of the spinous processes C5 - T1. The laser rapidly alleviated the pain and tingling in the arms, hands and fingers and diminished tenderness at the involved spinous processes.

Thereby, it has become apparent that many patients labeled as having RSI or CTS have predominantly cervical radicular dysfunction resulting in pain to the upper extremities which can be managed by low level laser. Successful long-term management involves treating the soft tissue lesions in the neck combined with correcting the abnormal head, neck and shoulder posture by taping. Cervical collars, and clavicle harnesses as well as improved

work ergonomics.

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Mechanistic approach to GaAIAs diode laser effects on production of reactive oxygen species from human neutrophils as a model for therapeutic modality at cellular level.

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There have been many reports on the applications of low reactive level laser (LLL) therapy for pain attenuation or pain removal. Our group has reported previously on the effects of in vitro irradiation of LLLT particularly on the phagocytic activity of human Neutrophils. using luminol-dependent chemiluminescence (LmCL) for measurement of reactive oxygen species (ROS) production from human Neutrophils. But the mechanisms of the attenuation of phagocytic activity of NEUTROPHILS by LLL irradiation is not yet full understood

In this study we used luminol-dependent and lucigenin-dependent chemiluminescence (LgCL) for detection of affected ROS producing process of human Neutrophils by LLL irradiation. Two soluble action stimuli. N-formyl-Met-Leu-Phc (fMLP) and phorbol myristate acetate (PMA) were used to avoid the possible influence of lag-time from recognition to uptake of particles at the ROS production.

In case of using fMLP as a stimulus, the maximum luminescence intensity of LULL was increased hut LgCL luminescence was decreased by LLL irradiation. When PMA was used as a stimulus, the times to reach the maximum luminescence intensity of LmCL and LgCL were shortened by LLL irradiation but there was no effect on the maximum luminescence intensity of both.

These results suggest that LLL irradiation enhances the ROS production activity of human Neutrophils by the activation of the superoxide converting system, the active clement in which is mainly myeloperoxidase. LLL irradiation enabled a more rapid activation of the superoxide production system, NADPH -oxidase.

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