# LLLT Research Abstracts

## LIGHT THERAPY (LLLT) ALTERS GENE EXPRESSION AFTER ACUTE SPINAL CORD INJURY

K.R. Byrnes [1], R.W. Waynant [2], I.K. Ilev [2], B. Johnson [1], Pollard H. [1], Srivastava M. [1], Eidelman O. [1], Huang, W. [1], J.J. Anders[1]

1. Department of Anatomy, Physiology and Genetics, Uniformed Services University, Bethesda, MD, USA;
2. Center for Devices and Radiological Health, Food and Drug Administration, Rockville, MD, USA

Secondary injury in the spinal cord, which results in axonal degeneration, scar and cavity formation and cell death, occurs around the site of the initial trauma and is a primary cause for the lack of axonal regeneration observed after spinal cord injury (SCI). The immune response after SCI is under investigation as a potential mediator of secondary injury. Treatment of SCI with 810 nm light suppresses the immune response and improves axonal regeneration.

We hypothesize that these beneficial effects observed in the injured spinal cord are accompanied by alterations in gene expression within the spinal cord, particularly of those genes involved in secondary injury and the immune response. To test this hypothesis, a dorsal hemisection at vertebral level T9 was performed. The injured spinal cord from rat was then exposed to laser light (810nm, 150mW, 2,997 seconds, 0.3cm2 spot area, 1589 J/cm2) and spinal cord samples, including the injury site, were harvested at 6 and 48 hours and 4 days post-injury. Total RNA was extracted and purified from the lesioned spinal cord and cDNA copies were either labeled with [32P] for microarray analysis or amplified and analyzed with a polymerase chain reaction (PCR).

Microarray results revealed a suppression of genes involved in the immune response and excitotoxic cell death at 6 hours post-injury, as well as cell proliferation and scar formation at 48 hours post-injury in the light treated group. Analysis of the PCR products revealed that light treatment resulted in a significant suppression of expression of genes that normally peak between 6 and 24 hours post-injury, including the pro-inflammatory cytokine interleukin 6 (IL6), the chemokine monocyte chemoattractant protein 1 (MCP-1) and inducible nitric oxide synthase (iNOS; $p<0.05$). Genes expressed earlier than 6 hours post-injury, such as IL1b, tumor necrosis factor a (TNFa) and macrophage inflammatory protein 1a (MIP-1a) were not affected by light treatment.

Although the precise role some of these genes play in axonal regeneration after spinal cord injury is currently unclear, these data demonstrate that light therapy has an anti-inflammatory effect on the injured spinal cord, and may reduce secondary injury, thus providing a possible mechanism by which light therapy may result in axonal regeneration.

[World Association for Laser Therapy]

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## EFFECTS OF PHOTOTHERAPY (LLLT) ON PRESSURE ULCER HEALING IN ELDERLY PATIENTS AFTER A FALLING TRAUMA. A PROSPECTIVE, RANDOMIZED, CONTROLLED STUDY.

Schubert V. - Karolinska Institute, Department of Clinical Neuroscience, Occupational Therapy and Elderly Care Research, Huddinge University Hospital, Stockholm, Sweden.

BACKGROUND: The effects of infrared and red pulsed monochromatic light, with varied pulsations and wavelengths, on the healing of pressure ulcers were evaluated in this prospective, randomized, controlled study.

METHODS: Elderly patients (> or =65 years) with Stage 2 or 3 skin ulcers were enrolled and assigned to one of two groups. Both groups were given the same standard ulcer therapy. One group was also given phototherapy with pulsed monochromatic infrared (956 nm) and red (637 nm) light.

Treatments lasted 9 min each time using a regimen with pulse repetition frequency varied between 15.6 Hz and 8.58 kHz. Patients were followed for 10 weeks or until the ulcer was healed, whichever occurred first. The ulcer surface area was traced weekly.

RESULTS: Patients treated with pulsed monochromatic light had a 49% higher ulcer healing rate, and a shorter time to 50% and to 90% ulcer closure compared with controls. Their mean ulcer area was reduced to 10% after 5 weeks compared with 9 weeks for the controls.

CONCLUSION: The results are encouraging as pulsed monochromatic light increased healing rate and shortened healing time. This will positively affect the quality of life in elderly patients with pressure ulcer.

Photodermatol Photoimmunol Photomed. 2001 Feb;17(1):32-8.

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## 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

1: Physiotherapy Department, Royal Brisbane Hospital, Brisbane; 2: Physiotherapy Department, University of Queensland, Brisbane; and 3: Pain Clinic, Royal Brisbane Hospital, Brisbane, Queensland, Australia.

A double-blind, placebo-controlled, random allocation study. 41 subjects, chronic myofascial trigger points in the neck and upper trunk region, five treatment sessions over a two week period, All groups demonstrated significant reductions in pain over the duration of the study.

Addressee for Correspondence: E Liisa Laakso BPhty PhD, Physiotherapy Department, Royal Brisbane Hospital, Herston, (Queensland, Australia, 4029.

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LASER THERAPY. 9: 67-72 67

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 |

## Diode Laser (LLLT) 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

*Institute of Anesthesiology and Intensive Care, University of Padua, and the Associazione Italiana per la Ricerca e, l'Aggiornamento Scientif co, Padua, Italy

Double-blind, pulsed infrared, treatment of myofascial pain in the cervical region. 27 subjects, 12 LLLT sessions, alternate days, at each session the four most painful muscular trigger points and five bilateral homometameric acupuncture points were irradiated with 1J. Pain was monitored using McGill pain questionnaire andScottHuskisson visual analogue scale, pain attenuation in the treated group and a statistically significant difference between the two groups of patients, both at end of therapy and at the 3-month follow-up examination.

Address correspondence and repent requests to Dr. F. Ceccherelli at the Istituto di Anestesiologiae Rianimazione, via C. Battisti 267, 35121 Padova, Italia.

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 |

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## Low Level Laser Therapy (LLLT) Of Tendinitis And Myofascial Pains A Randomized, Double-Blind, Controlled Study

Mimmi Logdberg-Anderssont1, Sture Mutzell2, and Ake Hazel3

1: Akersberga Health Care Centre, 2: Danderyd University Hospital, Danderyd, and

3: Vaxholm Health Care Centre, Stockholm, Sweden.

A double-blind study, laser therapy for tendinitis and myofascial pain,176 subjects, 6 treatments during a period of 3-4 weeks.Pain estimated objectively using a pain threshold meter, and subjectively with a visual analogue scale. Laser therapy had a significant, positive effect compared with placebo. Laser treatment was most effective on acute tendinitis.

Addressee for Correpondance, Sture Mutzell, Danderyd University Hospital 5-182 87 Danderyd, Sweden.

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 | Treatment Time |
|---|---|---|---|---|---|---|
| 904nm | 8mW av (10Wpeak) | 0.5-1.0 J/Cm2 | (not given) | 1J | 4KHz x 180nS | 2 mins |

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## LOW LEVEL LASER THERAPY (LLLT) IN AMBULATORY PATIENTS WITH VENOUS STASIS ULCERS

D. Lichtenstein FICA, B Morag, Maccabi Health Care Services and Department of Vascular Surgery, Sourasky Medical Center, Sakler Faculty of Medicine, Tel Aviv Israel

The effectiveness of Laser Therapy (LLLT) in accelerating wound healing has been clinically well documented. We used two devices: one, a He-Ne laser with a wavelength of 632.8nm and power output of 120mW. The indication for treatment was stasis ulcers (Ulcer cruris) due to chronic venous insufficiency syndrome. Sixty-two patients were treated in this study. The challenge of obtaining good results when treating patients with long-standing vascular ulcers and wounds caused us to explore this technique. We achived complete healing, classified as good, in 53 patients (85.48%) of the patients during a two week period of treatment, and moderate partial wound closure with clinical improvement in 4 patients (6.46%) with chronic long-term venous leg ulcers. The efficacy of the treatment was (91.94%). No patient had to stop treatment because of adverse side effects. Two patients (3.2%) had recurrent ulcers. These findings indicate that appropriate doses of laser can be beneficial in promoting tissue repair.

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## THE USE OF INFRARED LASER THERAPY (LLLT) IN THE TREATMENT OF VENOUS ULCERATION

M.E. Sugrue, FRCSI, J. Carolan, BSc, E.J. Leen, MB, T.M. Feeley, FRCSI, D.J. Moore, FRCSI, G.D. Shanik, FRCSI, Dublin Ireland.

Management of intractable venous ulceration remains an unrewarding task, which is increasingly delegated to the realm of the vascular surgeon. The purpose of this pilot study was to assess the ulcer-healing effects of the newest form of biostimilation—the low power laser (LLLT). Twelve patients with chronic venous ulcers unresponsive to conservative measures were treated with infrared laser irradiation for twelve weeks. Two ulcers healed completely and there was a 27% ($p<0.01$) reduction in size of the remaining ulcers. Treatment resulted in a 44% ($p<0.01$) increase in ulcer floor area occupied by healthy granulation tissue. The most dramatic effect of laser treatment was the reduction in ulcer pain, from 7.5 to 3.5 (linear analogue scale) ($p<0.001$). Laser irradiation had no effect on TcPO2, number of skin capillaries of pericapillary fibrin deposition in the lipodermatosclerotic area around the ulcer. The results of this pilot study are encouraging and a carefully controlled randomized study is indicated to compare low power laser irradiation to conventional treatment in the management of venous ulcers.

(Ann Vasc Surg 1990;4:179-181).

## THE USE OF LOW INTENSITY LASER THERAPY (LLLT) FOR THE TREATMENT OF OPEN WOUNDS IN PSYCHOGERIATRIC PATIENTS: A PILOT STUDY.

Physical and Occupational Therapy in Geriatrics. 2000, 18/2 (1-19) Verdote-Robertson-R, Munchua-M-M, Reddon-J-R.

The effect of low intensity laser therapy (LLLT) on wound healing in a largely psychogeriatric population was assessed over a period of 6 years (1991-1996). In total, 84 psychiatric patients were referred for the treatment of open wounds of varying severity and etiology. The wound status, nutritional status, walking status, and psychiatric condition of each patient were assessed prior to the administration of laser therapy treatment. Traditional wound care management was also used in addition to laser therapy. According to laser therapy treatment protocol for open wounds, a single

diode laser probe was used for biostimulation of the wound bed and the wound periphery. Pre- and post-treatment measurements of wound size were obtained periodically for a total of 188 open wounds. 84% of these wounds completely healed, 11.2% partially healed, 2.1% did not change, and 2.7% got worse. The number of treatments for the 158 completely-healed wounds ranged from 3 to 133 (mean 18.5) and the treatment period ranged from 5 to 383 days (mean 47.7). Wound healing was found to be related to nutritional status but neither walking status nor wound size. Results indicate that LILT is effective in the treatment of open wounds when it is used as a component of a total wound management program.

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## A SYSTEMATIC REVIEW OF LOW LEVEL LASER THERAPY (LLLT) WITH LOCATION-SPECIFIC DOSES FOR PAIN FROM CHRONIC JOINT DISORDERS.

Bjordal JM, Couppe Roberta C, Chow RT, Tuner J, Ljunggren EA. Section of Physiotherapy Science, University of Bergen, Bergen, 5020, Norway. jmb@hib.no

We investigated if low level laser therapy (LLLT) of the joint capsule can reduce pain in chronic joint disorders. A literature search identified 88 randomised controlled trials, of which 20 trials included patients with chronic joint disorders. Six trials were excluded for not irradiating the joint capsule. Three trials used doses lower than a dose range nominated a priori for reducing inflammation in the joint capsule. These trials found no significant difference between active and placebo treatments. The remaining 11 trials including 565 patients were of acceptable methodological quality with an average PEDro score of 6.9 (range 5-9). In these trials, LLLT within the suggested dose range was administered to the knee, temporomandibular or zygapophyseal joints. The results showed a mean weighted difference in change of pain on VAS of 29.8 mm (95% CI, 18.9 to 40.7) in favour of the active LLLT groups. Global health status improved for more patients in the active LLLT groups ( relative risk of 0.52; 95% CI 0.36 to 0.76). Low level laser therapy with the suggested dose range significantly reduces pain and improves health status in chronic joint disorders, but the heterogeneity in patient samples, treatment procedures and trial design calls for cautious interpretation of the results.

Aust J Physiother 2003;49(2):107-16

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## THE CLINICAL EFFICACY OF LOW-POWER LASER THERAPY (LLLT) ON PAIN AND FUNCTION IN CERVICAL OSTEOARTHRITIS.

Ozdemir F, Birtane M, Kokino S.

Department of Physical Therapy and Rehabilitation, Medical Faculty of Trakya University, Edirne, Turkey.

Pain is a major symptom in cervical osteoarthritis (COA). Low-power laser (LLLT) therapy has been claimed to reduce pain in musculoskeletal pathologies, but there have been concerns about this point. The aim of this study was to evaluate the analgesic efficacy of LPL therapy and related functional changes in COA. Sixty patients between 20 and 65 years of age with clinically and radiologically diagnosed COA were included in the study. They were randomised into two equal groups according to the therapies applied, either with LPL or placebo laser. Patients in each group were investigated blindly in terms of pain and pain-related physical findings, such as increased paravertebral muscle spasm, loss of lordosis and range of neck motion restriction before and after therapy. Functional improvements were also evaluated. Pain, paravertebral muscle spasm, lordosis angle, the range of neck motion and function were observed to improve significantly in the LPL group, but no improvement was found in the placebo group. LPL seems to be successful in relieving pain and improving function in osteoarthritic diseases.

Clin Rheumatol 2001;20(3):181-4

## IMPROVEMENT OF PAIN AND DISABILITY IN ELDERLY PATIENTS WITH DEGENERATIVE OSTEOARTHRITIS OF THE KNEE TREATED WITH NARROW-BAND LIGHT THERAPY (LLLT).

Jean Stelian, MD, Israel Gil, MD, Beni Habot, MD, Michal Rosenthal, MD, Iulian Abramovici, MD, Nathalia Kutok, MD, and Auni Khahil, MD

Objective: To evaluate the effects of low-power light therapy (LLLT) on pain and disability in elderly patients with degenerative osteoarthritis in the knee.

Design: Partially double-blinded, fully randomized trial comparing red, infrared, and placebo light emitters.

Patients: Fifty patients with degenerative osteoarthritis of both knees were randomly assigned to three treatment groups: red (15 patients), infrared (18 patients) and placebo (17 patients). Infrared and placebo emitters were double-blinded.

Interventions: Self-applied treatment to both sides of the knee for 15 minutes twice a day for 10 days.

Main Outcome Measures: Short-Form McGill Pain Questionnaire, Present Pain Intensity, and Visual Analogue Scale for pain and Disability Index Questionnaire for disability were used. We evaluated pain and disability before and on the tenth day of therapy. The period from the end of the treatment until the patient's request to be retreated was summed up 1 year after the trial. Results: Pain and disability before treatment did not show statistically significant differences between the three groups. Pain reduction in the red and infrared groups after the treatment was more than 50% in all scoring methods ($P < 0.05$). There was no significant pain improvement in the placebo group. We observed significant functional improvement in red and infrared treated groups ($p < 0.05$), but not in the placebo group. The period from the end of treatment until the patients required retreatment was longer for red and infrared groups than for the placebo group (4.2 ± 3.0, 6.1 ± 3.2, and 0.53 ± 0.62 months, for red, infrared, and placebo respectively)

Conclusions: Low-power light therapy is effective in relieving pain and disability in degenerative osteoarthritis of the knee. Degenerative osteoarthritis (DOA) is the most common rheumatic disorder of man and causes pain and disability especially in elderly people.1 Autopsy surveys show that degenerative changes in joints begin as early as the second decade of life. 2 Roentgenographic studies conducted in the United States showed osteoarthritic changes in 4 percent of persons under 24 years of age in 85 percent at 75 to 79 years of age. Symptomatic manifestations of osteoarthritis increase with ageing, reflecting disease changes that begin in early life and progress slowly over a period of many decades. 3-4

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

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## INFARED DIODE LASER IN LOW REACTIVE-LEVEL LASER THERAPY (LLLT) FOR KNEE OSTEOARTHROSIS

M. A. Trelles, J. Rigau, P. Sala, G. Calderhead and T. Ohshiro

Degenerative joint disease (DJD) in particular in the knee. is difficult to, cure successfully at present often requiring surgical intervention. In addition the chronic DJD patient often exhibits symptoms cl both a physiological and psychological nature. A study is presented using high reactive-level laser therapy (LLLT) with an 830 nm infra red continuous wave gallium aluminium (or aluminium) arsenide (GaAlAs) diode laser with an output power of 60 mW. in light contact Laser therapy for a population of 40 patients (power density of approximately 3 W/cm2). Four points around the patella were irradiated for 60 s each (energy density of 18 J/cm2 per point. total of 72 J/cm2 per session) two sessions per week for eight weeks. Radiological, pain score and joint mobility assessments were

made before the first session, immediately after at 4 months after the final LLT session. All other medication and physical therapy was discontinued at least 15 days prior to the first treatment session. Thirty-three patients (82%) reported significant removal of pain and recovery of articular joint mobility. The remaining seven patients felt there was no significant effect following LLLT and returned to their original pretherapy medication. The side effects were minimal LLLT is concluded to to be safe, effective and non-invasive alternative to conventional surgical and medical treatment modalities for DJD patients.

Laser Therapy 1991, 3:149-153

## CLINICAL APPLICATION OF GaAlAs 830 NM DIODE LASER (LLLT) IN TREATMENT OF RHEUMATOID ARTHRITIS

Kanji Aoada, Yasutaka Ytani, 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 recognised 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 CIW). 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, pam 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 Yo. This gave a total effective rating for pain attenuation of 90%, and for ROM improvement of 56.3%.

## DOUBLE BLIND CROSSOVER TRIAL OF LOW LEVEL LASER THERAPY (LLLT) IN THE TREATMENT OF POST HERPETIC NEURALGIA

Kevin C Moore MB ChB FRCA Naru Hira. Parswanath Kramer, Copparam Jayakumar & Toshio Ohshiro

Department of Anaesthesia, The Royal Oldham Hospital,

Post herpetic neuralgia can be an extremely painful condition which in many cases proves resistant lo 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 (LLLT) 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 the pain intensity and distribution following a course of low level laser therapy.

Laser Therapy. 1988; 1: 7.

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## EFFICACY OF LOW REACTIVE-LEVEL LASER THERAPY (LLLT) FOR PAIN ATTENUATION OF POSTHERPETIC NEURALGIA

Osamu Kemmotsu, Kenichi Sato, Hitoshi Furumido, Koji Harada, Chizuko Takigawa, Sigeo Kaseno, Sho Yokota, Yukari Hanaoka and Takeyasu Yamamura

Department of Anaesthesiology, Hokkaido University School of Medicine, N-15, W-7, Kita-ku, Sapporo 060, Japan

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 4 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 analog scale (0 to 10) before and after LLLT. The immediate effect after the initial LLLT was very good (PS: 0-3) 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.



## EFFICACY OF LASER IRRADIATION (LLLT) 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 (LLLT) 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 session s 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). Measurement 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.

Laser Therapy 1997:9:7-- 12

## THE EFFECT OF INFR-ARED LASER IRRADIATION (LLLT) ON THE DURATION AND SEVERITY OF POSTOPERATIVE PAIN: A DOUBLE BLIND TRIAL

Kevin C. Moore, Naru Hira, Ian J. Broome* and John A. Cruikshank Departments of Anaesthesia and General Surgery, The Royal Oldham Hospital, Oldham, U.K *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 postoperative 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 postoperative 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.

0898-5901/92/040145-05$07.50 @) 1992 by John Wiley & Sons, Ltd.

## CAN LOW REACTIVE-LEVEL LASER THERAPY (LLLT) BE USED IN THE TREATMENT OF NEUROGENIC FACIAL PAIN? A DOUBLE-BLIND, PLACEBO CONTROLLED INVESTIGATION OF PATIENTS WITH TRIGEMINAL NEURALGIA

ArneEckerdal and and Lehmann Bastian

Department of Oral and Maxillofacial Surgery and Oral Medicine,
Odense University Hospital, Denmark

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 doubleblind, 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.

Laser Therapy, 1996:: 8: 247-252

## THE USE OF LOW ENERGY PHOTON THERAPY (LEPT) IN VENOUS LEG ULCERS: A DOUBLE BLIND, PLACEBOCONTROLLED STUDY

Adltya K. Gupta, MD, FRCP(C)), Natalia Filonenko, PhD, Norman Salansky, PhD, flms, Daniel N. Sadder, MD, FRCP(C)

BACKGROUND. Venous ulcers are estimated to be present in 0.2 to 0.4% of the population. Although new therapies have significant promise, nonhealing ulcers still represent a significant problem. Objective. To evaluate the efficacy of low energy photon therapy (LEPT) in the treatment of venous leg ulcers.

METHODS. A placebo-controlled, double-blind study using low energy photon therapy was performed in nine patients with 12 venous ulcers. Treatment was given three times a week for 10 weeks, using two monochromatic optical sources. One source provided a wavelength (A) of 660 nm (red) while the second source delivered a wavelength of 880 nm (infrared). Two optical probes were used, one consisted of an array of 22 monochromatic sources, operating at a wavelength of 660 nm and covering an area 6 x 10 cm2. The second probe had seven infrared sources, operating at a wavelength of 880 nm and covering an area of 4 cm2 The above configuration of optical probes was selected to cover the majority of the ulcer area being treated. The patients who were randomized to placebo treatment received sham therapy from an identical-appearing light source from the same delivery system.

RESULTS. Nine patients with 12 venous ulcers were randomized to receive LEPT or placebo therapy. At the conclusion of the study, the percentage of the initial ulcer area remaining unhealed in the LEPT and placebo groups was 24.4% and 84.7%, respectively (P = 0.0008). The decrease in ulcer area (compared to baseline) observed in the LEPT and placebo groups was 193.0 mm2 and 14.7 222, respectively (P = 0.0002). One patient dropped out of the study, complaining of lack of treatment efficacy; he was found to be randomized to the placebo group. There were no adverse effects.

CONCLUSION. In this placebo-controlled, double-blind study LEPT was an effective modality for the treatment of venous leg ulcers.  Dermatol Surg 1998;24:1383-1386. From the Division of Dermatology, Department of Medicine, University of Toronto; International Medical Instruments Inc.; and Selye-Toffler University, Toronto, Ontario, Canada.

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