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PHOTOMEDICINE SYSTEM

LOW LEVEL LASER THERAPY

FOR THE RAPID RECOVERY OF SPORTS INJURIES

Contents

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Update on Low Level Laser Therapy in sport medicine

James Carroll FRSM

For over a decade Low Level Laser Therapy has been used by physiotherapists on sports injuries, sometimes to very good effect and sometimes not. A systematic review and meta-analysis of 20 RCTs confirmed that half of tendinopathy trials failed to produce a positive result [1, 2], so why did the other half succeed? The answer is in the laser parameters and dose [3-6]. If either too much, or too little laser power density was applied, there would be no beneficial effect [7-9]. Recent advances in research at NASA and Harvard Medical School [10-15] have clarified the mechanism enabling the better design of successful treatment regimes. THOR have participated in this research and incorporated this research into our latest training courses and are making this available to all physiotherapists who want to ensure optimum treatment for their patients.

Another reason to use LLLT is the adverse effects of NSAIDs. Laboratory research shows that use of steroids and Non Steroidal Anti-Inflammatories (NSAIDs) reduce healing, doubles the risk of sudden heart failure and is not tolerated by some people. Laser on the other hand improves healing, achieves better pain relief when compared in clinical trials and has no side effects. With over 200 randomised double blind placebo controlled clinical trials (RCTs) published in peer reviewed scientific journals, LLLT has a very strong evidence base in rehabilitation medicine and should be used as the first therapeutic intervention after injury and instead of NSAIDs.

The following articles are a small sample of what are available. There is now not only proof of effectiveness but also explanations as to why LLLT works so well when the correct dosimetry is applied.

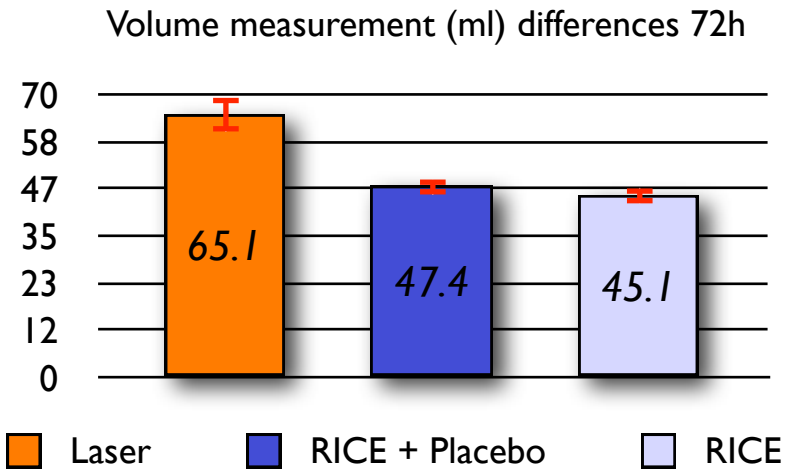
Please contact THOR at www.thorlaser.com for more information and details of the latest training courses.

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

Stergioulas, A
Faculty of Human Motion, University of Peloponnese, Attica, Greece

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

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

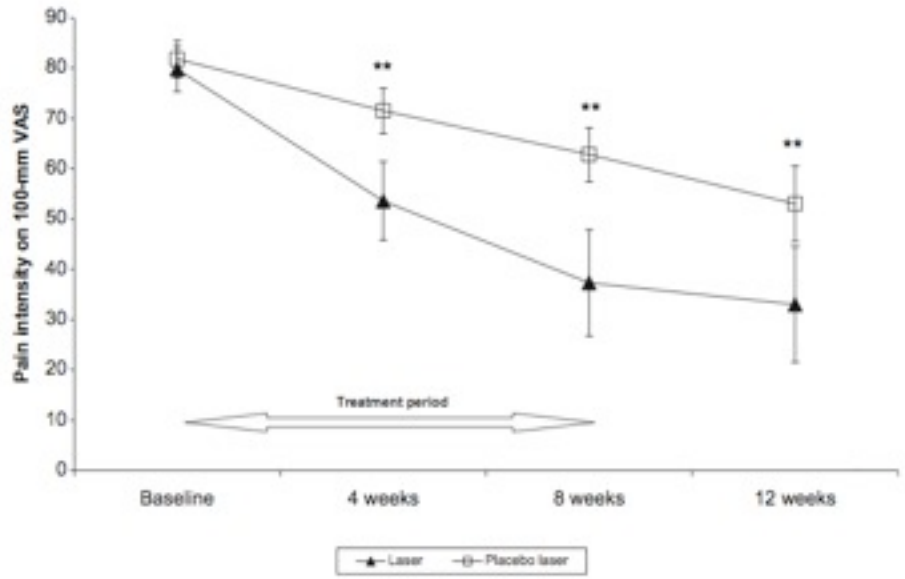


Effects of Low-Level Laser Therapy and Eccentric Exercises in the Treatment of Recreational Athletes With Chronic Achilles Tendinopathy.

Stergioulas A, Stergioula M, Aarskog R, Lopes-Martins RA, Bjordal JM
Peloponnese University, Sparta, Laconia, Greece.

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

Am J Sports Med 2008 Feb 13



Laser Versus Ultrasound In The Treatment Of Supraspinatus Tendinosis Randomised Controlled Trial

Liz Saunders PhD MS MCSP Clinical specialist physiotherapist
Derby City General Hospital, Uttoxeter Road, Derby DE22 3NE

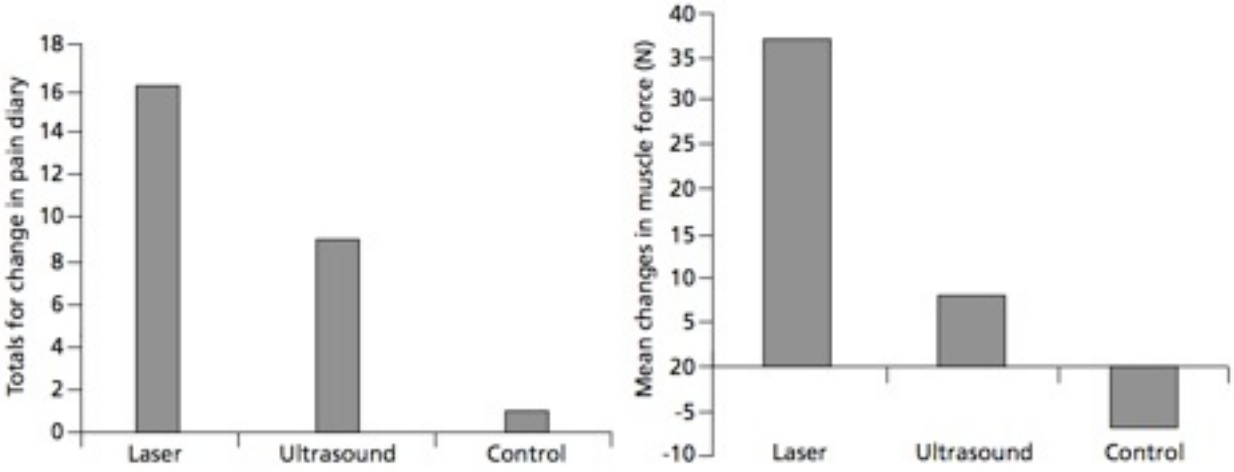
Summary Thirty-six patients were randomly assigned to three groups to compare the effectiveness of low power laser therapy, ultrasound and no therapy for supraspinatus tendinosis. All three groups were given the same advice and educational material.

Measurements were taken before and after treatment for muscle weakness secondary to pain, disability and tenderness. Treatment for the experimental groups comprised nine therapeutic doses over a three-week period of either laser therapy or ultrasound; the control group had no treatment for three weeks.

The degree of muscle weakness, pain functional disability and tenderness for the three groups, was similar before treatment. Comparisons after treatment showed that the laser group had less muscle weakness ($p<0.01$) and pain ($p<0.01$) than the ultrasound and control groups and had less disability ($p<0.05$) and tenderness ($p<0.01$) after treatment than the control group.

These data suggest that the dose if laser therapy used in the study, advice and education improve the symptoms of supraspinatuc tendinosis. Ultrasound also improved the control group that received advice only. Based on these results laser therapy should be the treatment of choice for suraspinatus tendinosis rather than ultrasound.

Physiotherapy 2003, 89, (6), 365-73

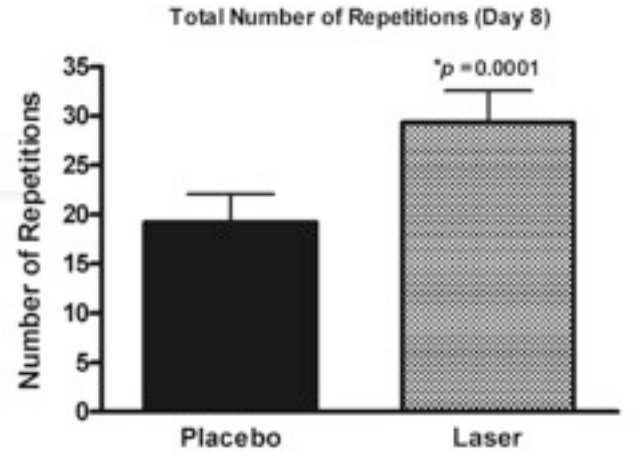


Effect of 655-nm low-level laser therapy on exercise-induced skeletal muscle fatigue in humans.

Leal Junior EC, Lopes-Martins RA, Dalan F, Ferrari M, Sbabo FM, Generosi RA, Baroni BM, Penna SC, Iversen VV, Bjordal JM
Laboratory of Human Movement, University of Caxias do Sul, Caxias do Sul, RS, Brazil.

OBJECTIVE: To investigate if development of skeletal muscle fatigue during repeated voluntary biceps contractions could be attenuated by low-level laser therapy (LLLT). BACKGROUND DATA: Previous animal studies have indicated that LLLT can reduce oxidative stress and delay the onset of skeletal muscle fatigue. MATERIALS AND METHODS: Twelve male professional volleyball players were entered into a randomized double-blind placebo-controlled trial, for two sessions (on day 1 and day 8) at a 1-wk interval, with both groups performing as many voluntary biceps contractions as possible, with a load of 75% of the maximal voluntary contraction force (MVC). At the second session on day 8, the groups were either given LLLT (655 nm) of 5 J at an energy density of 500 J/cm2 administered at each of four points along the middle of the biceps muscle belly, or placebo LLLT in the same manner immediately before the exercise session. The number of muscle contractions with 75% of MVC was counted by a blinded observer and blood lactate concentration was measured. RESULTS: Compared to the first session (on day 1), the mean number of repetitions increased significantly by 8.5 repetitions (+/- 1.9) in the active LLLT group at the second session (on day 8), while in the placebo LLLT group the increase was only 2.7 repetitions (+/- 2.9) ($p = 0.0001$). At the second session, blood lactate levels increased from a pre-exercise mean of 2.4 mmol/L (+/- 0.5 mmol/L), to 3.6 mmol/L (+/- 0.5 mmol/L) in the placebo group, and to 3.8 mmol/L (+/- 0.4 mmol/L) in the active LLLT group after exercise, but this difference between groups was not statistically significant. CONCLUSION: We conclude that LLLT appears to delay the onset of muscle fatigue and exhaustion by a local mechanism in spite of increased blood lactate levels.

Photomed Laser Surg 2008 Oct 26(5) 419-24



Effect Of Phototherapy On Delayed Onset Muscle Soreness

Douris P, Southard V, Ferrigi R, Grauer J, Katz D, Nascimento C, Podbielski P.
Department of Physical Therapy, School of Health Professions, Behavioral and Life Sciences, New York Institute of Technology, Old Westbury, New York 11568-8000, USA.

OBJECTIVE: The purpose of this study was to investigate the effects of phototherapy on delayed onset muscle soreness (DOMS) as measured using the Visual Analog Scale (VAS), McGill Pain Questionnaire, Resting Angle (RANG), and girth measurements. BACKGROUND DATA: Previous research has failed to prove the beneficial effects of phototherapy on DOMS. METHODS: This was a randomized double-blind controlled study with 27 subjects (18-35 years) assigned to one of three groups. The experimental group received 8 J/cm2 of phototherapy each day for five consecutive days using super luminous diodes with wavelengths of 880 and visible diodes of 660 nm at three standardized sites over the musculotendinous junction of the bicep. The sham group received identical treatment from a dummy cluster. The controls did not receive treatment. The study was completed over five consecutive days: on day one baseline measurements of RANG and upper arm girths were recorded prior to DOMS induction. On days 2-5, RANG, girth, and pain were assessed using VAS and the McGill Pain Questionnaire. RESULTS: The experimental group exhibited a significant decrease in pain associated with DOMS compared to the control ($p=0.01$) and sham groups ($p=0.03$) based upon the VAS at the 48-h period. The McGill Pain Questionnaire showed a significant difference in pain scores at the 48-h period between the experimental and the sham groups ($p=0.01$). There were no significant differences day to day and between the groups with respect to girth and RANG. CONCLUSION: The results of this study provide scientific evidence that phototherapy as used in this study provides a beneficial effect to patients who may experience DOMS after a novel exercise session.

Photomed Laser Surg. 2006 Jun;24(3):377-82.

Efficacy of low-level laser therapy in the management of neck pain: a systematic review and meta-analysis of randomised placebo or active-treatment controlled trials

Roberta T Chow, Mark 'Johnson, Rodrigo A B Lopes-Martins, Jan M Bjordal

Summary

Background Neck pain is a common and costly condition for which pharmacological management has limited evidence of efficacy and side-effects. Low-level laser therapy (LLLT) is a relatively uncommon, non-invasive treatment for neck pain, in which non-thermal laser irradiation is applied to sites of pain. We did a systematic review and metaanalysis of randomised controlled trials to assess the efficacy ofLLLT in neck pain.

Methods

We searched computerised databases comparing efficacy ofLLLT using any wavelength with placebo or with active control in acute or chronic neck pain. Effect size for the primary outcome, pain intensity, was defined as a pooled estimate of mean difference in change in mm on 100 mm visual analogue scale.

Findings

We identified 16 randomised controlled trials including a total of820 patients. In acute neck pain, results of two trials showed a relative risk (RR) of1·69 (95% CI 1· 22-2.33) for pain improvement ofLLLT versus placebo. Five trials of chronic neck pain reporting categorical data showed an RR for pain improvement of 4·05 (2.74-5.98) of LLLT. Patients in 11 trials reporting changes in visual analogue scale had pain intensity reduced by 19·86 mm (10.04-29.68). Seven trials provided follow-up data for 1-22 weeks after completion of treatment, with short-terIll pain relief persisting in the medium tenn with a reduction of22· 07 mm (17.42-26.72). Side-effects from LLLT were mild and not different from those of placebo.

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

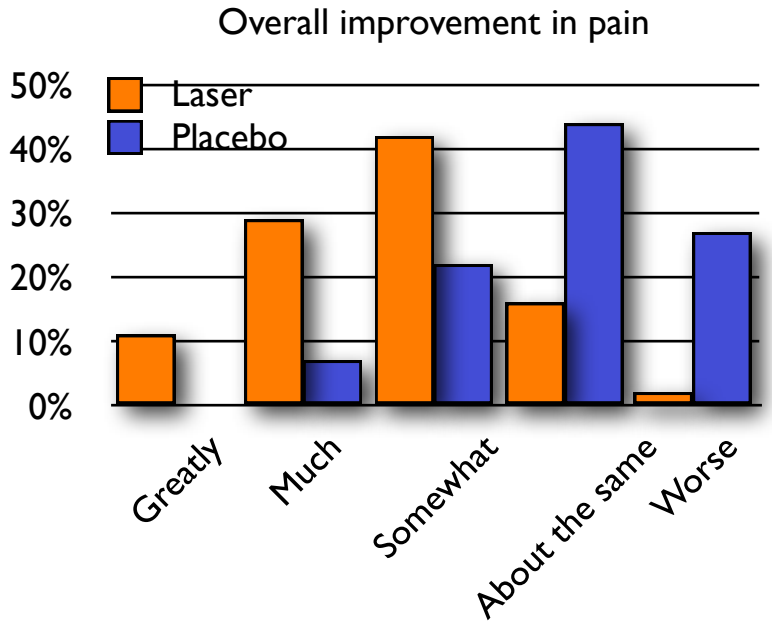
Lancet. 2009 Dec 5;374(9705):1897-908.

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

Chow RT, Heller GZ, Barnsley L.
Castle Hill Medical Centre, 269-271 Old Northern Road, Castle Hill, NSW 2154, Australia.

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

Pain. 2006 Sep;124(1-2):201-10. Epub 2006 Jun 27

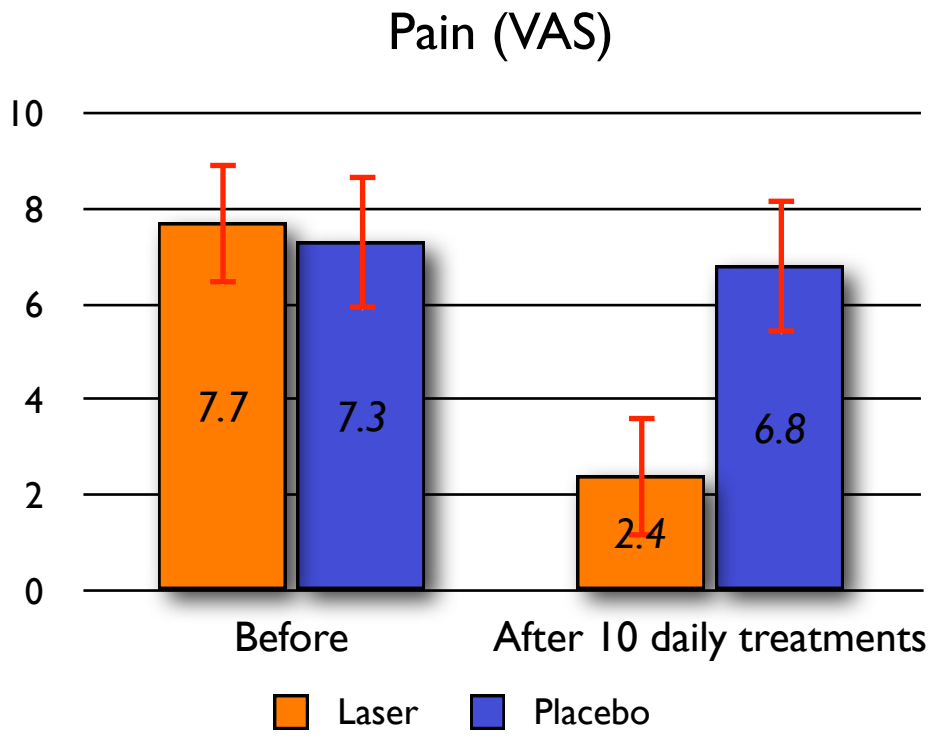


The clinical efficacy of low-power laser therapy on pain and function in cervical osteoarthritis.

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 (LPL) 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

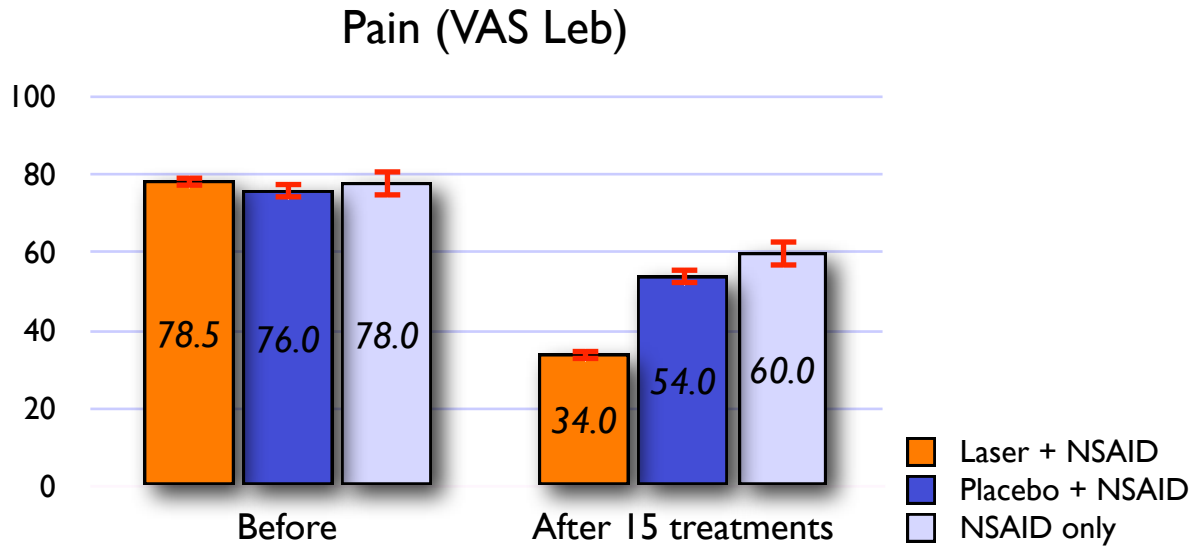


Acute Low Back Pain with Radiculopathy: A Double-Blind, Randomized, Placebo-Controlled Study.

Konstantinovic LM, Kanjuh ZM, Milovanovic AN, Cutovic MR, Djurovic AG, Savic VG, Dragin AS, Milovanovic ND.

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

Photomed Laser Surg.. [Epub ahead of print]



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

Gur A, Karakoc M, Cevik R, Nas K, Sarac AJ, Karakoc M

Physical Medicine and Rehabilitation, School of Medicine, Dicle University, Diyarbakir, Turkey.

BACKGROUND AND OBJECTIVES: The aim of this study was to determine whether low power laser therapy (Gallium-Arsenide) is useful or not for the therapy of chronic low back pain (LBP). STUDY DESIGN/MATERIALS AND METHODS: This study included 75 patients (laser + exercise-25, laser alone-25, and exercise alone-25) with LBP. Visual analogue scale (VAS), Schober test, flexion and lateral flexion measures, Roland Disability Questionnaire (RDQ) and Modified Oswestry Disability Questionnaire (MODQ) were used in the clinical and functional evaluations pre and post therapeutically. A physician, who was not aware of the therapy undertaken, evaluated the patients. RESULTS: Significant improvements were noted in all groups with respect to all outcome parameters, except lateral flexion ($P < 0.05$). CONCLUSIONS: Low power laser therapy seemed to be an effective method in reducing pain and functional disability in the therapy of chronic LBP.

Lasers Surg Med 2003 32(3) 233-8

Is Low Level Laser Therapy overtaking ultrasound?

From Sports & Medicine Today

Manual therapy is the treatment of choice, but often an electrotherapy is used to augment a hands on approach to aid tissue repair and give pain relief.

Ultrasound is the most commonly used electrotherapy, it is however limited in its effectiveness and limited in its range of applications (ultrasound should not be used over bony prominences, pins, plates and very acute injuries).

Physiotherapists are now turning to laser therapy (which can be used safely in these areas) and finding they are using it more and more. Says Sue Bunn, MCSP, SRP, physio to the British Paragliding Team, " I would not like to be faced with all the acute injuries we see without a laser. Since I've had a laser I can not be bothered with ultrasound and all that gel".This is a comment heard from many physios who find laser easy to learn and simple to use.

Laser Therapy works differently from ultrasound, it works quickly from within the cell and often resolves conditions that have not responded to manual therapy or ultrasound treatments.

Matt Jevon, Chief Executive of The British Association of Sports Trainers and visiting lecturer in Sports Rehabilitation at the University of Salford is very excited about this modality. "Laser therapy is now our most commonly used electrotherapy apparatus, particularly in acute cases. We have used it in our support of over 300 players in the Student Rugby League World Cup with considerable success when compared against other electrotherapy and mechanical modalities.

It is used as an adjunct to many of the manual therapies practised by our physiotherapists, all of whom appreciate the benefits of accuracy in application. We currently have two laser units and it will be first on our purchasing list after plinths as we expand into new clinics."

With modern higher power laser components, Laser Therapy is a better analgesic than in the past. Simpler laser treatment protocols have now been developed that enable users to give fast, effective treatments for both acute injuries and difficult conditions.
Says Sarah Cooper, physio to the British Athletic Team "I use laser immediately on acute injuries, it is a very useful adjunct to have at major sporting games, treating acute and chronic injuries alongside manual therapy for pain relief and reduction of inflammation.".

Laser Therapy is considered to be one of the safest forms of electrotherapy and has more published research evidence supporting it than any other electrotherapy. It is used by physiotherapists for pain relief, resolution of inflammation and tissue repair. A survey by Queenstwon University NI showed it to be the most effective electrotherapy for pain relief and tissue healing - since then many ultrasound users have become laser enthusiasts.

Is Low Level Laser Therapy overtaking ultrasound? Seems likely!

Sarah Cooper treating Colin Jackson with THOR laser

Laser Sorts Harrington Out

by Philip Reid

The Irish Times

KNOWN AS quite a talented operator in his Gaelic football youth, and with a father, Paddy, who starred in All-Ireland finals with his native Cork, Padraig Harrington might have felt that injuries sustained on the pitch were a thing of the past. Yesterday morning however, just hours before his final tee-time in the Smurfit European Open, Harrington woke with a tendon injury in his wrist. "I played about 45 minutes of football a couple of nights ago. I don't remember getting injured, but that's the only time it could have happened," said the Dubliner. And, so, an SOS was issued to Eamonn O' Muircheartaigh, son of broadcaster Michael, and physio to the Kildare football team. The medic responded to Harrington's plight. He applied friction, used laser treatment and strapped up the wrist. "Eamonn did a fine job" remarked Harrington who went on to shoot 68, his best round of the tournament for a seven-under-par.

Bibliography

1. Tumilty, S., et al., *Low Level Laser Treatment of Tendinopathy: A Systematic Review with Meta-analysis* Photomed Laser Surg, 2009. **Ahead of print**.
2. Bjordal, J.M., et al., *A systematic review with procedural assessments and meta-analysis of low level laser therapy in lateral elbow tendinopathy (tennis elbow).* BMC Musculoskelet Disord, 2008. **9**: p. 75.
3. Aimbire, F., et al., *Low-level laser therapy induces dose-dependent reduction of TNFalpha levels in acute inflammation.* Photomed Laser Surg, 2006. **24**(1): p. 33-7.
4. Bjordal, J.M. and G.D. Baxter, *Ineffective dose and lack of laser output testing in laser shoulder and neck studies.* Photomed Laser Surg, 2006. **24**(4): p. 533-4; author reply 534.
5. Bjordal, J.M., et al., *A systematic review of low level laser therapy with location-specific doses for pain from chronic joint disorders.* Aust J Physiother, 2003. **49**(2): p. 107-16.
6. Bjordal, J., C. Couppé, and A. Ljunggreen, *Low level laser therapy for tendinopathy. Evidence of a dose-response pattern.* Physical Therapy Reviews, 2001. **6**(2): p. 9.
7. Castano, A.P., et al., *Low-level laser therapy for zymosan-induced arthritis in rats: Importance of illumination time.* Lasers Surg Med, 2007. **39**(6): p. 543-50.
8. Gur, A., et al., *Efficacy of different therapy regimes of low-power laser in painful osteoarthritis of the knee: a double-blind and randomized-controlled trial.* Lasers Surg Med, 2003. **33**(5): p. 330-8.
9. Hashimoto, K., et al., *Efficacy of laser irradiation on the area near the stellate ganglion is dose-dependent: a double-blind crossover placebo-controlled study.* Laser Therapy, 1997. **7**: p. 5.
10. Eells, J.T., et al., *Mitochondrial signal transduction in accelerated wound and retinal healing by near-infrared light therapy.* Mitochondrion, 2004. **4**(5-6): p. 559-67.
11. Liang, H.L., et al., *Near-infrared light via light-emitting diode treatment is therapeutic against rotenone- and 1-methyl-4-phenylpyridinium ion-induced neurotoxicity.* Neuroscience, 2008. **153**(4): p. 963-74.
12. Sommer, A.P., et al., *Biostimulatory windows in low-intensity laser activation: lasers, scanners, and NASA's light-emitting diode array system.* J Clin Laser Med Surg, 2001. **19**(1): p. 29-33.
13. Whelan, H.T., et al., *Effect of NASA light-emitting diode irradiation on molecular changes for wound healing in diabetic mice.* J Clin Laser Med Surg, 2003. **21**(2): p. 67-74.
14. Whelan, H.T., et al., *Effect of NASA light-emitting diode irradiation on wound healing.* J Clin Laser Med Surg, 2001. **19**(6): p. 305-14.
15. Ying, R., et al., *Pretreatment with near-infrared light via light-emitting diode provides added benefit against rotenone- and MPP+-induced neurotoxicity.* Brain Res, 2008. **1243**: p. 167-73.