LASER THERAPY FOR SCAR FORMATION

Ortop Traumatol Rehabil. 2010 Jan-Feb;12(1):67-79.

The role of laser biostimulation in early post-surgery rehabilitation and its effect on wound healing.

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Abstract

BACKGROUND:

The aim of this paper is to investigate whether laser biostimulation starting on the first day after surgery of the brachial plexus or peripheral nerves has a positive therapeutic effect on wound healing.

MATERIAL AND METHODS:

Surgical procedures were carried out on 44 male Wistar rats. The animals were divided into a control group (Group 1), where the surgical wounds were allowed to heal spontaneously, and an experimental Group 2, where the wounds were exposed to laser irradiation with the following parameters: wavelength 810 nm, power 100 mW, energy 15 J, laser exposure surface 3 cm(2), single application time 2 min. 30 sec., continuous mode. The results were assessed with pathomorphological tests (gross appearance of the wound, light and electron microscopy studies) and breaking strength examination. Statistical analysis used arithmetic means, standard deviations and Student's t test for independent samples.

RESULTS:

Low energy infrared laser radiation had a beneficial effect on the covering of the scar with stratified squamous cornifying epithelium and intensified wound healing.

CONCLUSIONS:

The gross and microscopic findings indicated a beneficial effect of laser stimulation on wound healing. These results underscore the utility of biostimulation lasers in the early post-operative period. Physicomechanical investigations did not reveal an effect of infrared laser biostimulation on the breaking strength of the cutaneous scar.

Dermatol Ther. 2015 Jul-Aug;28(4):201-9. doi: 10.1111/dth.12240. Epub 2015 Jun 2.

Comparison of quality of facial scars after single low-level laser therapy and combined low-level with high-level (PDL 595 nm) laser therapy.

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Abstract

The main goal of our study was to compare the quality of resulting facials scar 12 weeks after single and combined laser therapy. Forty-one children from age 1.5 to 5 years with facial scars after injury participated in the study. Thirty-one underwent laser therapy, 14 were treated using single low-level laser therapy (670 nm, fluence 3-5 J/cm(-2)), and 17 underwent combined high-level laser therapy with non-ablative pulsed dye laser (PDL; 595 nm, spot size 7 mm, delay 0.45 ms or 1.5 ms, fluence 9-11 J/cm(-2) , cryogen spray/delay 20/30 ms) and low-level laser therapy. The control group consisted of 10 untreated children. Before treatment and at week 4, 8, and, 12 the scars were evaluated using the POSAS questionnaire. A statistically significant improvement in scars (between ratings before treatment and 4 weeks after therapy, before treatment and 8 weeks after therapy and before treatment and 12 weeks after therapy) was observed in all parameters in both treatment groups ($p < 0.0001$). For the HLLT+LLLT group the most significant enhancement in the quality of scars was found for all items and at all evaluations, except pigmentation and pliability. There was no improvement observed in quality of facial scars in the control group.

Photomed Laser Surg. 2010 Jun;28(3):417-22. doi: 10.1089/pho.2009.2548.

Effects of low-level laser therapy on pain and scar formation after inguinal herniation surgery: a randomized controlled single-blind study.

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Abstract

OBJECTIVE:

The aim of this study was to investigate the efficacy of an infrared GaAlAs laser operating with a wavelength of 830 nm in the postsurgical scarring process after inguinal-hernia surgery.

BACKGROUND:

Low-level laser therapy (LLLT) has been shown to be beneficial in the tissue-repair process, as previously demonstrated in tissue culture and animal experiments. However, there is lack of studies on the effects of LLLT on postsurgical scarring of incisions in humans using an infrared 830-nm GaAlAs laser.

METHOD:

Twenty-eight patients who underwent surgery for inguinal hernias were randomly divided into an experimental group (G1) and a control group (G2). G1 received LLLT, with the first application performed 24 h after surgery and then on days 3, 5, and 7. The incisions were irradiated with an 830-nm diode laser operating with a continuous power output of 40 mW, a spot-size aperture of 0.08 cm(2) for 26 s, energy per point of 1.04 J, and an energy density of 13 J/cm(2). Ten points per scar were irradiated. Six months after surgery, both groups were reevaluated using the Vancouver Scar Scale (VSS), the Visual Analog Scale, and measurement of the scar thickness.

RESULTS:

G1 showed significantly better results in the VSS totals (2.14 +/- 1.51) compared with G2 (4.85 +/- 1.87); in the thickness measurements (0.11 cm) compared with G2 (0.19 cm); and in the malleability (0.14) compared with G2 (1.07). The pain score was also around 50% higher in G2.

CONCLUSION:

Infra-red LLLT (830 nm) applied after inguinal-hernia surgery was effective in preventing the formation of keloids. In addition, LLLT resulted in better scar appearance and quality 6 mo postsurgery.

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Keloids and Hypertrophic Scars Can Now Be Cured Completely: Recent Progress in Our Understanding of the Pathogenesis of Keloids and Hypertrophic Scars and the Most Promising Current Therapeutic Strategy.

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Abstract

Keloids and hypertrophic scars are fibroproliferative disorders of the skin that are caused by abnormal healing of injured or irritated skin. It is possible that they are both manifestations of the same fibroproliferative skin disorder and just differ in terms of the intensity and duration of inflammation. These features may in turn be influenced by genetic, systemic, and local risk factors. Genetic factors may include single nucleotide polymorphisms, while systemic factors may include hypertension, pregnancy, hormones, and cytokines. The most important local factor is tension on the scar. Over the past 10 years, our understanding of the pathogenesis of keloids and hypertrophic scars has improved markedly. As a result, these previously intractable scars are now regarded as being treatable. There are many therapeutic options, including surgery, radiation, corticosteroids, 5-fluorouracil, cryotherapy, laser therapy, anti-allergy agents, anti-inflammatory agents, bleaching creams and make-up therapies. However, at present, we believe that the following combination of three therapies most reliably achieves a complete cure: surgery, followed by radiation and the use of steroid tape/plaster.

Photomed Laser Surg. 2016 Nov;34(11):580-584.

Beneficial Effects of Applying Low-Level Laser Therapy to Surgical Wounds After Bariatric Surgery.

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Abstract

BACKGROUND:

Bariatric surgery is a successful method for weight loss in cases of morbid obesity; however, as an invasive procedure, surgical complications may occur. Low-level laser therapy (LLLT) has been increasingly used due to its effectiveness in controlling the inflammatory response, accelerating tissue repair, and reducing pain. The objective of this study was to investigate photobiomodulation effects after bariatric surgery and determine the laser actions during the inflammatory process, wound healing (clinical observation), and analgesia.

METHODS:

This study was a randomized, placebo-controlled, clinical trial in which 85 patients underwent Roux en-Y gastric bypass (RYGB) by conventional techniques (i.e., open surgery). Patients were divided into two groups and were irradiated with LLLT at 10 different points through the surgical scar in three sessions of applications: the laser group (laser-on) consisted of 43 patients who received the CW diode laser (MMOptics), while the placebo group (laser-off) consisted of 42 patients who were treated by the same protocol but with a disabled laser. Temperature was measured by a digital thermometer in both groups, and pain was evaluated using the visual analogue scale for pain. Biochemical analysis and digital images were used to document and evaluate the inflammatory response as well as tissue repair process at the surgical wound site.

RESULTS:

Patients in the laser group demonstrated diminished wound temperature as erythrocyte sedimentation rate (ESR) compared with the placebo group, indicating better inflammatory process control as well as improved wound healing and reduced pain.

CONCLUSIONS:

LLLT applied with the described protocol led to a decrease by biochemical markers and wound temperature compared with the placebo, which indicated that LLLT was able to control the inflammatory process; in addition, seroma and pain were reduced and cicatrization was improved by this preventive procedure.

Dermatol Surg. 2016 Apr;42(4):526-34. doi: 10.1097/DSS.0000000000000680.

Prevention of Thyroidectomy Scars in Asian Adults With Low-Level Light Therapy.

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Abstract

BACKGROUND:

Abnormal wound-healing after thyroidectomy with a resulting scar is a common dermatologic consultation. Despite many medical and surgical approaches, prevention of postoperative scars is challenging.

OBJECTIVE:

This study validated the efficacy and safety of low-level light therapy (LLLT) using an 830/590 nm light-emitting diode device for prevention of thyroidectomy scars.

METHODS AND MATERIALS:

Thirty-five patients with linear surgical suture lines after thyroidectomy were treated with 830/590 nm LLLT. Daily application of 60 J/cm (11 minutes) for 1 week starting on postoperative day 1 was followed by treatment 3 times per week for 3 additional weeks. The control group (n = 15) remained untreated. Scar-prevention effects were evaluated 1 and 3 months after thyroidectomy with colorimetric evaluation using a tristimulus-color analyzer. The Vancouver Scar Scale (VSS) score, global assessment, and a subjective satisfaction score (range: 1-4) were also determined.

RESULTS:

Lightness (L*) and chrome values (a*) decreased significantly at the 3-month follow-up visit in the treatment group compared with those of controls. The average VSS and GAS scores were lower in the treatment group, whereas the subjective score was not significantly different.

CONCLUSION:

LLLT treatment suppressed the formation of scars after thyroidectomy and could be safely used without noticeable adverse effects.

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Low-Level Laser Therapy to the Bone Marrow Reduces Scarring and Improves Heart Function Post-Acute Myocardial Infarction in the Pig.

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Abstract

OBJECTIVE:

Cell therapy for myocardial repair is one of the most intensely investigated strategies for treating acute myocardial infarction (MI). The aim of the present study was to determine whether low-level laser therapy (LLLT) application to stem cells in the bone marrow (BM) could affect the infarcted porcine heart and reduce scarring following MI.

METHODS:

MI was induced in farm pigs by percutaneous balloon inflation in the left coronary artery for 90 min. Laser was applied to the tibia and iliac bones 30 min, and 2 and 7 days post-induction of MI. Pigs were euthanized 90 days post-MI. The extent of scarring was analyzed by histology and MRI, and heart function was analyzed by echocardiography.

RESULTS:

The number of c-kit+ cells (stem cells) in the circulating blood of the laser-treated (LT) pigs was 2.62- and 2.4-fold higher than in the non-laser-treated (NLT) pigs 24 and 48 h post-MI, respectively. The infarct size [% of scar tissue out of the left ventricle (LV) volume as measured from histology] in the LT pigs was 3.2 ± 0.82%, significantly lower, 68% ($p < 0.05$), than that (16.6 ± 3.7%) in the NLT pigs. The mean density of small blood vessels in the infarcted area was significantly higher [6.5-fold ($p < 0.025$)], in the LT pigs than in the NLT ones. Echocardiography (ECHO) analysis for heart function revealed the left ventricular ejection fraction in the LT pigs to be significantly higher than in the NLT ones.

CONCLUSIONS:

LLLT application to BM in the porcine model for MI caused a significant reduction in scarring, enhanced angiogenesis and functional improvement both in the acute and long term phase post-MI.