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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.

Introduction

Hypertrophic scars and keloids result from an abnormal fibrous wound-healing process in which tissue repair and regeneration regulating mechanism control is lost. These abnormal fibrous growths present a major therapeutic dilemma and challenge to the plastic surgeon because they are disfiguring and frequently recur.[1] Approximately 100 million people per year acquire new scars, caused by traumas, burns, and surgery. According to literature data, the prevalence of hypertrophic scars among Caucasians ranges from 15% to 63%.[1]

The final aspect of the scar can have various consequences, such as aesthetic discomfort, psychological problems, pain and difficulty in the activities of daily life, and lowered self-esteem and quality of life.[2,3] The study of therapies that promote better wound healing attenuate these problems and improve the aesthetic aspects, both morphological and functional. Scar is one of the main tasks for researchers that work in this area.

The classical inflammatory process of wound healing consists of four phases: hemostasis, inflammation, proliferation, and remodeling. These phases are initiated when tissue injury occurs and can last from a few hours to a few years.[4,5]

Studies in tissue cultures and animal experiments with LLLT in the near-infrared spectra have demonstrated an increase in the proliferation of fibroblasts, endothelial cells, and keratinocytes, increases in collagen deposition, and stimulation of angiogenesis after application laser radiation in optimal doses. All of these effects seem to be related to the acceleration of the wound-healing process, ulcers, and skin flaps.[6–9]

LLLT in human postoperative wounds has shown beneficial effects, especially visible spectra.[10–13] The only use of an 830-nm diode laser found in the literature was the study carried out by Lagan et al.[14] on small scars. However, in larger postsurgical cuts, no data were found in the literature.

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