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Case Report

A New Method of Healing (Wounds, Burns, Grafts and Scars) Through low Level Lasers (LLLT)

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Abstract:

This article is the result of six months of study and clinical work on several patients with wounds such as burns, cosmetic surgery, sutures, skin grafts or crash scars and fractures that are treated with low power laser with a power of 1 to 10J/cm2 with a maximum power of 400 mW After final evaluation, patients who had to undergo cosmetic surgery or high-power lasers were treated with this method of laser therapy.

Objective: Creating a suitable substrate for treating all kinds of wounds and scars with low power laser

Conclusion: Low power lasers can replace the old methods and tools in the treatment of wounds and scars. This method is safer and more economical for the patient and the set of medical services.

Keywords: low power lasers; lasers; low power; wounds; burns; grafts and wound healing

Wounds can be broadly categorized as having either an acute or a chronic etiology. Acute wounds are caused by external damage to intact skin and include surgical wounds, bites, burns, minor cuts and abrasions, and more severe traumatic wounds such as lacerations and those caused by crush or gunshot injuries In marked contrast, chronic wounds are most frequently caused by endogenous mechanisms associated with a predisposing condition that ultimately compromises the integrity of dermal and epidermal tissue [1].

The repair of wounds is one of the most complex biological processes that occur during human life. After an injury, multiple biological pathways immediately become activated and are synchronized to respond [2] the primary goals of the treatment of wounds are rapid wound closure and a functional and aesthetically satisfactory scar [3].

Wound healing processes are strictly regulated by multiple growth factors and cytokines released at the wound site. Although the desirable final result of coordinated healing would be the formation of tissue with a similar structure and comparable functions as with intact skin, regeneration is uncommon (with notable exceptions such as early fetal healing); healing however results in a structurally and functionally satisfactory but not identical outcome. Alterations that disrupt controlled healing processes would extend tissue damage and repair. The pathobiology states may lead to chronic or nonhealing wounds or excessive fibrosis [4].

Lasers (Light amplification by stimulated emission of radiation) are devices that typically generate electromagnetic radiation which are relatively uniform in wavelength, phase, and polarization, originally described by Theodore Maiman in 1960 in the form of a ruby laser .Laser is described as a source of light or radiation energy [5]. Low Level Laser (LLL) is a special type of laser that effects on biologic systems through non-thermal means[6]

Low Level Laser therapy (LLLT) is the application of light to a biologic system to promote tissue regeneration, reduce inflammation and relieve pain. Unlike other medical laser procedures, LLLT does not have an ablative or thermal mechanism, but rather a photochemical effect which means the light is absorbed and cause a chemical change [7]. The reason why the technique is termed low level is that the optimum levels of energy density delivered are low and it is not comparable to other forms of laser therapy as practiced for ablation, cutting, and thermal tissue coagulation [8].

Soon after the discovery of lasers in the 1960s it was realized that laser therapy had the potential to improve wound healing and reduce pain, inflammation and swelling. In recent years the field sometimes known as photobiomodulation has broadened to include light-emitting diodes and other light sources, and the range of wavelengths used now includes many in the red and near infrared. The term “low level laser therapy” or LLLT has become widely recognized and implies the existence of the biphasic dose response or the Arndt-Schulz curve. This review will cover the mechanisms of action of LLLT at a cellular and at a tissular level and will summarize the various light sources and principles of dosimetry that are employed in clinical practice. The range of diseases, injuries, and

conditions that can be benefited by LLLT will be summarized with an emphasis on those that have reported randomized controlled clinical trial [9]

Low level laser therapy (LLLT) or more simply known as soft laser therapy, is adramatic therapy that has become progressively more popular in the management ofa wide variety of medical conditions, such as soft tissue injuries (including sportsinjuries), low back pain, arthritis, and skin traumas. Unlike the higher poweredlasers employed in medicine, these low level lasers do not deliver enough power todamage tissue, but they do deliver enough energy to stimulate a response from thebody tissues to initiate healing. Laser radiation has a wavelength-dependent capabil-ity to alter cellular behavior in the absence of significant heating. Light radiationmust be absorbed to provide a biological response. The visible red and infrared por-tions of the spectrum have been shown to have highly absorbent and unique thera-peutic effects in living tissues [10].

Effects Low-Level-Laser-Therapy of the BloodOne under laser blood irradiation, anti-inflammatory effects was observed that improved the immunologic activity of the blood 1.2. A fundamental finding was the positive influence on rheological properties of the blood which is of greatest interest to surgery, angiology and cardiology in par-ticular 2. A diminishing tendency of aggregation of thrombocytes and an improved deformability of erythrocytes result in an improved oxygen sup-ply and with that to a decrease of partial carbon dioxide pressure, which is particularly relevant to wound healing 3. Furthermore, the activation of phagocytic activity of macrophages was proved in conjunction with struc-tural modifications. A positive effect on the proliferation of lymphocytes and B and T-cell sub populations could be verified too [11]

LOW LEVEL LASER THERAPY FOR WOUND HEALINGLLLT, when used appropriately, can stimulate the healing of injured tissues suchas those of the dermis. Investigations into the mechanisms involved have shown thatmany of the types of cells whose interaction results in dermal repair can be affectedin a therapeutically advantageous manner by treatment with LLLT both in vitro andin vivo. Mast cells and macrophages can be stimulated to release growth factors andother substances, whereas the proliferation of fibroblasts, endothelial cells, andkeratinocytes maintained in adverse conditions can also be stimulated. The develop-ment of granulation tissue is mainly controlled by growth factors released from mac-rophages.Wound healing involves the following phases:• Hemostasis: platelets, endothelial cells, fibrin, and fibronectin act throughgrowth factors and cytokines.• Inflammation: blood clots form, bacteria are attacked, and there is an orderlyrecruitment of key cells into the wound site.• Proliferation: cells necessary for wound closure multiply at the wound site tomake new tissue and blood vessels.• Remodeling: the wound is healed and the initial scar tissue is restructured.Any device that can accelerate any of these processes (transition from hematomato fibroplasias, development of new blood vessels, production of collagen, or eventhe remodelling process) could accelerate the healing process of wounds. Earlylaser studies were confined to in vitro studies because little was known about the sideeffects of laser irradiation.10Wound healing studies have focused on several types of cells including fibro-blasts, lymphocytes, monocytes, macrophages, epithelial cells, and endothelial cells.The wide diversity of experimental protocols and parameters such as cell line, dose,waveform, treatment time, penetration distance, treatment area, and treatmentfrequency make comparison of these studies difficult. Literature indicates that laserphotobioactivation accelerates inflammation, modulates the level of prostaglandin,enhances the action of macrophages, promotes fibroblast proliferation, facilitatescollagen synthesis, fosters immunity, and even accelerates the healing process.[12]

In the clinical situation, LLLT is an accepted, efficient, noninvasive, and painlessmethod of treating edema, inflammation, and pain and it is used to increase circula-tion and promote wound healing. [13]

Method:

Patients between the ages of 7 and 70 years with various wounds and scars were referred to the clinic for treatment and after receiving the consent form, they underwent laser therapy.

Treatment sessions were determined 2 to 4 sessions per week depending on the type of wound and scar. Each of them was treated with laser therapy with low power laser with wavelengths of 600 to 905 nm depending on the type of tissue.

Among all the patients for wound healing and scarring, all of them received appropriate therapeutic response to the low-power laser method.

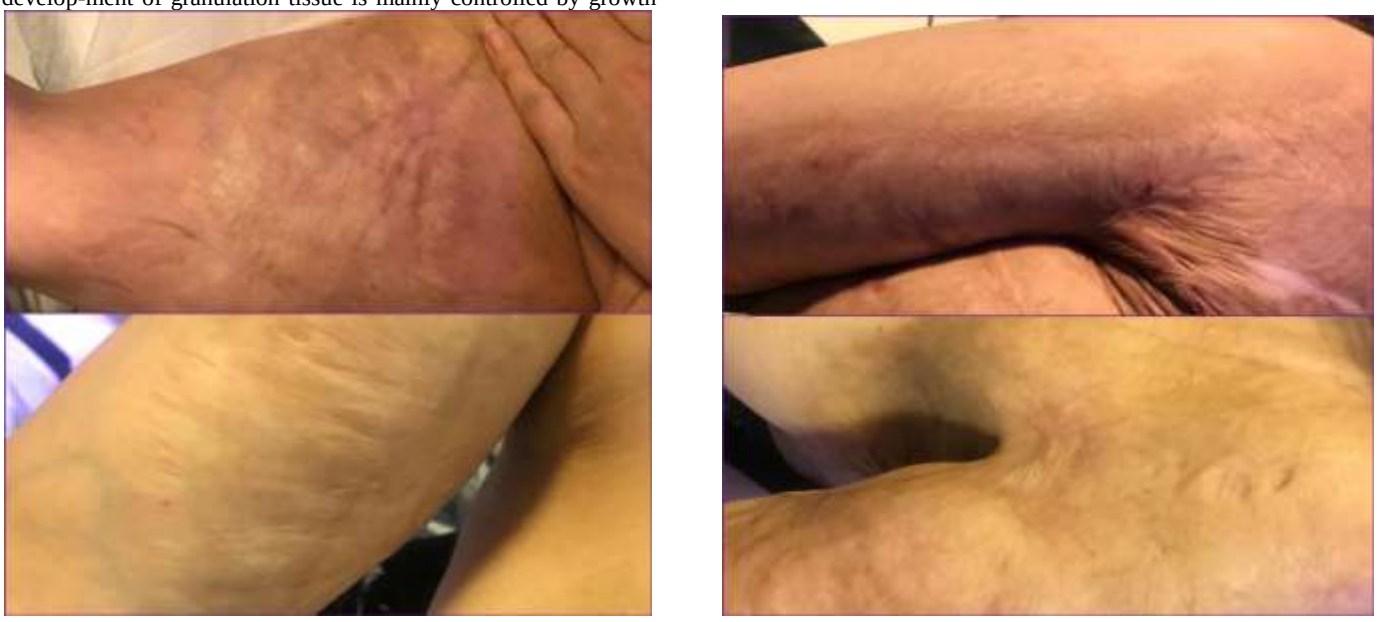

Figure 1: *A patient with second- and third-degree burns who did not change well after one year and 14 sessions of high-power laser (CO2), but underwent low-power laser treatment with very good changes in 10 sessions.*

Figure 2: *A patient with a skin graft presented for repair after a long session of new dressings, which was treated with a low-power laser, and in 15 sessions good results were observed.*

Figure 3: *A patient with a suture scar and a fracture presented 15 years ago, when doctors introduced him to treat and repair fat and gel injections, but with low-power lasers, this repair was completed in 12 sessions.*

Conclusion:

Although low power lasers have low energy and are not capable of some treatments, they have a high ability to heal wounds, burns and scars, which requires laser knowledge.

Using the appropriate energy and power of the laser, the treatment can be done well

This method is better to replace the old methods in wound hospitals and wound clinics for wound healing.To prevent physical complications, psychological damage and economic costs of patients in the future

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