

# Role of Low-Level Laser Therapy (LLLT) in Wound Bed Preparation

Shivareddy<sup>1</sup>, Ravi Kumar Chittoria<sup>2</sup>, Barath Kumar Singh. P<sup>3</sup>

## How to cite this article:

Shivareddy, Ravi Kumar Chittoria, Barath Kumar Singh. P/Role of Low-Level Laser Therapy (LLLT) in Wound Bed Preparation/Indian Journal of Medical & Health Sciences. 2023;10(1):117-119.

## Abstract

Low-Level Laser Therapy (LLLT) has role in the wound bed preparation of ulcers. The bio-stimulatory properties of Low-Level Laser Therapy (LLLT) has been found to accelerate wound healing, tissue repair. It augments tissue repair and regeneration along with its anti-inflammatory and analgesic effects. This property of low-level laser can be effectively for burn wound therapy as adjuvant treatment. In this article we sharing our experience of wound bed preparation which was showing delay in granulation, as an adjuvant therapy in electric burn wound preparation.

**Keywords:** Low-Level Laser (LLLT), Wound, Preparation.

## INTRODUCTION

Adult wound healing comprises of three stages: the inflammatory phase, the proliferative phase, and the re-modelling phase. These 3 stages have to occur sequentially to result in healing of wound. Any factors that hinder the progression of these phases can result in delay in the healing of any wound. The LLLT is a modality with known benefit in wound bed preparation of any ulcer. But the data about its role in the management of wound bed preparation of unhealthy ulcer is scanty. The LLLT was applied in 4 sessions as an adjuvant therapy

for the unhealthy wound bed for preparation of wound bed for skin grafting or wound cover in our case.

## MATERIALS AND METHODS

This study was conducted in the Department of Plastic Surgery in a tertiary care institute. Informed consent was obtained from the patient under study. Department scientific committee approval was obtained. It is a single center, non-randomized, non-controlled study. The patient under study was a 45-year-old male, with no other known comorbidities presented with electric burn after accidental contact with electric cable and presented with multiple second-degree superficial burns involving face, scalp, neck, chest and abdomen (anterior aspect), bilateral arms (anterior aspect), bilateral thighs. The wound over left foot was deep burns and underwent wound debridement of necrotic tissues (figure 1). The wound over left foot with unhealthy granulation tissue was prepared with Low-level laser therapy. We used Low level laser therapy (LLLT) application for 4 sessions for 7

**Author Affiliation:** <sup>1</sup>Junior Resident, <sup>2</sup>Senior Resident, Department of Plastic Surgery, <sup>3</sup>Professor & Registrar, Department of Plastic Surgery & Telemedicine, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER) Pondicherry, India-605006

**Corresponding Author:** Ravi Kumar Chittoria, <sup>2</sup>Professor & Registrar, Department of Plastic Surgery & Telemedicine, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER) Pondicherry -605006 India

**E-mail:** drchittoria@yahoo.com

**Received on:** 20.10.2022

**Accepted on:** 25.11.2022

minutes once in 5 days post debridement of necrotic slough to promote the healthy granulation (figure 2). We used gallium arsenide (gas) diode red laser of wavelength 650nm, frequency 10khz and output power 100mw, which was a continuous beam laser with an energy density of 4 j/cm<sup>2</sup>. Machine delivers laser in scanning mode (non-contact delivery) with 60 cm distance between laser source. Healthy granulation tissue (figure 3) starts to appear after two sessions followed by skin grafting of wound (figure 4) and post skin grafting Low level laser therapy was used (figure 5) to increase the skin graft uptake. The graft uptake was good after 10 days (figure 6).

## RESULTS

The application of Low-Level laser therapy (LLLT) helped in better wound bed preparation. The therapy was painless to the patient. Post therapy patient developed no complications. The skin graft uptake was good. Patient discharged successfully.



**Figure 1:** Ulcer after debridement of necrotic tissue.

## DISCUSSIONS

Energy used in Low Level laser therapy (LLLT) is much less than the one used for cutting, and ablation therapy. Low Level laser therapy (LLLT) is a form of phototherapy that produces photochemical and photophysical effects without generation of heat, with consideration of re-establishing cell homeostasis. Essentially, light energy is delivered topically in a controlled way which is absorbed by photo-absorbers (chromophores) that transform it into chemical energy.<sup>4</sup>

Positive effects include increased formation of granulation tissue and acceleration of tissue repair, wound contraction, inflammation, modulation, and pain reduction.<sup>4</sup> As per literature, low-energy photo-emissions given at a wavelength range of 600nm to 900nm accelerate cell proliferation and promote wound healing.<sup>5</sup> Its action is thought to stimulate respiratory chain components promoting ATP synthesis<sup>6</sup> and hence increase rate of mitoses and fibroblasts numbers, stimulate



**Figure 2:** Low level laser therapy for raw area foot



**Figure 3:** Healthy granulated wound after low level laser application



**Figure 4:** After Split thickness skin grafting



**Figure 5:** Complete graft take-10th postoperative day

collagen and elastin production<sup>7</sup>, stimulate microcirculation with dilatation of the capillaries and neovascularisation<sup>8</sup>, liberate mediator of inflammation- histamine, serotonin and bradykinin and hence activate macrophages and regenerate lymphatic vessels.<sup>8</sup> LLLT is used as an adjuvant to conventional therapy with promising results, in patients with ulcers.

## CONCLUSIONS

In our study we found that Low Level Laser therapy (LLLT) was useful in promoting healthy granulation tissue in wound bed and Skin graft uptake. The limitation of the study includes that it is a case report with a single center study with no statistical analysis.

## REFERENCES

1. Goel, Arun, and Prabhat Shrivastava. "Post-burn scars and scar contractures." *Indian journal of plastic surgery: official publication of the Association of Plastic Surgeons of India* vol. 43, Suppl (2010): S63-71. doi:10.4103/0970-0358.70724
2. Karu TI. Low-power laser therapy. In: Vo-Dinh T, editor. *Biomedical photonics handbook*, vol. 48. London: CRC Press, 2003. p. 7-20.
3. Baxter CD. *Therapeutic lasers. Theory and practice*. Churchill, Livingstone, 1994.
4. Andrade FSSD, Clark RMO, Ferreira ML. Effects of low-level laser therapy on wound healing. *2014;41(2):129-33*.
5. Lichtenstein, D., Morag, B. Low-level laser therapy in ambulatory patients with venous stasis ulcers. *Laser Therapy* 1998; 11: 71-78
6. Karu, T. Molecular mechanism of therapeutic effect of low intensity laser irradiation *Dokl Akad Nauk SSSR* 1986; 291:1245-1249.
7. Saperia, D., Glassberg, E., Lyons, R.F. et al. Demonstration of elevated type I and type III procollagen mRNA levels in cutaneous wounds treated with helium-neon laser. Proposed mechanism for enhanced wound healing. *Biochem Biophys Res Commun* 1986; 138:1123-1128.
8. Schindl, A., Schindl, M., Schindl, L. et al. Increased dermal angiogenesis after low-intensity laser therapy for a chronic radiation ulcer determined by a video measuring system. *J Am Acad Dermatol* 1999;40: 481-484.