

Role of Low Level Laser Therapy in Pediatric Scald Burns

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ABSTRACT

A burn is defined as a thermally induced traumatic injury to organic tissue. The most often reported thermal injuries in children under the age of 16 were scalds and contact burns. In this case study, the usefulness of low level laser therapy was examined in relation to pediatric scald burn wounds, taking into account how it affected wound bed preparation, and time to grafting. A 1 year old male child with scald burns over 20% body surface area received low level laser therapy once per week for a total of four sessions. Low level laser therapy was found to help in better wound bed preparation, and early grafting. We conclude that low level laser treatment can be used as an adjunct to treat paediatric scald burns successfully.

Keywords: Low level laser therapy; Pediatric Scald Burns.

INTRODUCTION

A burn is defined as a thermally induced traumatic injury to organic tissue. The most often reported thermal injuries in children under the age of 16 were scalds and contact burns.¹ Burn injuries can have a major influence on health-related morbidity and mortality, as well as physical and psychological after effects. Low level laser therapy (LLLT) has become very popular as a treatment for this kind of injury, but the specifics

of its utilization are still subject to controversy. For these kinds of lesions to heal, a coordinated series of cellular activities is required, which includes dynamic interactions between cytokines and extra cellular matrix and is separated into three phases: inflammation, proliferation, and remodelling, all of which are interdependent and simultaneous.¹ Any factors that hinder the wound healing process will worsen the wound healing and will make a bad scar. Bad scar will make cosmetic problems and functional impairment of parts involved. The production of fibrous tissue, which makes up scar tissue, is reduced by low level laser therapy. It facilitates the regeneration of nerves by softening the fibrotic nodules caused by the scar tissue and restoring normal circulation. Its primary goal is to restore the skin's natural appearance after trauma, whether it occurs as a result of a burn, cut, or surgery. Monochromatic, coherent, and polarised low level laser treatment (LLLT) is distinguished by its capacity to trigger a non-thermal process (bio stimulation). This has the potential to be transmitted, reflected, bent, and absorbed. Wave lengths, power,

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irradiance, energy density, pulse duration, pulse repetition rate, area, and beam mode are used to distinguish between the numerous types of laser beams that are produced.² In this case study, the usefulness of low level laser therapy was examined in relation to paediatric scald burn wounds, taking into account how it affected scarring, hospital stay time, and wound healing.

MATERIALS AND METHODS

This study was conducted in the Department of Plastic Surgery, in a tertiary care centre in South India. Consent from the legally accepted representative was obtained. The details of the patient in the study are as follows: 1 year old male child with normal milestones presented with allegedly accidental scald burns over 20% body surface area involving right upper limb, hand and trunk (Figure 1).



Fig. 1: Patient at presentation

The wound received low level laser therapy once per week for a total of four sessions. The low level laser source we employed was a continuous beam red Gallium Arsenide (gas) diode laser with a wavelength of 650 nm, a frequency of 10 KHz, and an output power of 100 mW. With a distance of 60 cm between the laser source and the wound, the machine distributes laser energy in scanning mode (non-contact delivery). Four sessions, each lasting

15 minutes and lasting 125 seconds, were given to the wound. The sessions were spaced one week apart (Fig. 2). After every treatment, the wound is examined and dressed. After four weeks, patient underwent split thickness skin grafting over the wound with good uptake on day 15 (Fig. 3).



Fig. 2: Low level laser therapy to wound



Fig. 3: Wound after grafting post 4 weeks of low level laser therapy

RESULTS

In this study, low level laser therapy was found to help in better wound bed preparation, and better graft take in a pediatric patient of scald burns. There were no side effects noted.

DISCUSSION

The laser light triggers a chain of events that causes the biostimulation of numerous cellular processes when it enters the mitochondria and photo receptors found in cell membranes, which is the biological mechanism involved in the low level laser therapy implementation.^{8,10} The selection of the wave length, power, fluence, irradiance, and total energy, as well as the number of sessions and irradiated spots, are other crucial considerations that must be consistent with the pathology or injury that needs to be treated.^{4,9}

After assessing the effects of low level laser therapy (904 nm, 35 W, 100 Hz, and 0.4 J/pulse) on rats with third-degree burns, Gupta et al. observed an improvement in the amount of granulation tissue formation, neovascularization, and fibrotic conditions on the eighth day of therapy.⁵ In our study as well, improvement was noted from the second week of therapy.

Ranjbar et al. looked at the effects of low level laser therapy at 685 nm, 15 mW, and 3 J/cm² on rats with third degree burns. They found that the treatment had positive effects that sped up the healing process and induced the eradication of the *Staphylococcus aureus* bacteria in the lesion environment.⁶ In our study subject too, periodic exudate cultures were noted to be sterile.

Given the above, it is pertinent that low level laser therapy acts positively on burn healing process. To determine the best treatment strategy and perhaps develop an ideal therapeutic window for each type of burn, we still need more large scale future studies.¹²

Standardizing exposure and treatment times is also necessary. We delivered four low level laser therapy sessions, each one taking place a week apart. In a case of Gaida K et al, he has given twice week session for 8 weeks.⁷

CONCLUSION

We draw the conclusion that low level laser treatment can be used as an adjunct to treat paediatric scald burns successfully. However, it needs large scale randomized trial for clinical application.

Conflicts of interest: None

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REFERENCES

1. Brassolatti, P., de Andrade, A.L.M., Bossini, P.S. et al. Evaluation of the low-level laser therapy application parameters for skin burn treatment in experimental model: a systematic review. *Lasers Med Sci* 33, 1159–1169 (2018).
2. Nouri K, Vidulich K, Rivas MP. Lasers for scars: a review. *J Cosmet Dermatol*. 2006;5:14–22.
3. Hopkins JT, McLoda TA, Seegmiller JG, David Baxter G. Low-Level Laser Therapy Facilitates superficial wound healing in humans: a triple-blind, sham-controlled study. *J Athl Train*. 2004;39:223–229.
4. Lucas C, Stanborough R.W, Freeman CL, De Haan RJ. Efficacy of low-level laser therapy on wound healing in human subjects: a systematic review. *Lasers Med Sci*. 2000;15: 84–93.
5. Avci P, Gupta A, Sadasivam M, Vecchio D, Pam Z, Pam N et al (2013) Low-level laser (light) therapy in skin: stimulating, healing, restoring. *Semin Cutan Med Surg [Internet]* 32(1):41–52.
6. Ranjbar R, Ashrafzadeh M, Li T (2016) The effects of low level laser therapy on *Staphylococcus aureus* infected third-degree burns in diabetic rats. *Acta Cirúrgica Bras* 31(314):2016–2251.
7. Gaida K, Koller R, Isler C, Aytakin O, Al-Awami M, Meissl G, Frey M. Low level laser therapy—a conservative approach to the Burns. 2004;30:362–367.
8. Kitchen SS, Partridge CJ. A Review of low level laser therapy. *Physiotherapy*. 1991;77:161–168.
9. Woodruff LD, Bounkeo JM, Brannon WM, Dawes KS, Barham CD, Waddell DL, Enwemeka CS. The efficacy of laser therapy in wound repair: a meta-analysis of the literature. *Photomed Laser Surg*. 2004;22:241–247.
10. Huang YY, Chen AC, Carroll JD, Hamblin MR. Biphasic dose response in low level light therapy. *Dose Response*. 2009;7:358–383.

11. Hawkins D, Abrahamse H. Changes in cell viability of wounded fibroblasts following laser irradiation in broad-spectrum or infrared light. *Laser Chem.* 2007;2007:1–11.
12. Navratil L, Kymplova J. Contraindications in noninvasive laser therapy: truth and fiction. *J Clin Laser Med Surg.* 2002;20:341–343.

