Case Report

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Role of Low-level Laser Therapy in Pediatric Scald Burn

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Abstract

Burns and related injuries are common causes of deaths and disability. The highest incidences of burn cases occur in children and adults. In children less than 2 years of age, contact with hot surfaces and scald burns are the most common presentation to the hospital. The practice of cooking at ground level or sleeping with a burning lamp are some of the causes. Early management of this type of burns results in better outcomes. In this case we describe the role of low-level laser therapy (LLLT) as an adjuvant in the management of paediatric thermal burns.

Keywords: LLLT; Burn; Injuries; Graft; Scald burn.

INTRODUCTION

Burns are one of the leading causes of morbidity and mortality in children. Basic knowledge about thermal injury is important in the management of children presenting with burns. A study by Davis in 1990 quoted 2 million incidences of burns per year in the Indian Subcontinent. Forty percent of burn victims are under 15 years of age.[1,2] Scalds and hot liquids make up 90% of burn injuries to children. Common sites are at home around the kitchen and open fire places.There are various literatures suggesting the role of low-level laser therapy (LLLT) in the management of wounds. In this case report, we assess the role of low-level laser therapy in the management of pediatric scald burns.

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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 4-years-old male, with no other known comorbidities presented with mixed second degree scald burns to the left chest, abdomen and neckconstituting 15% of total burn surface area (Fig. 1). The patient was treated according to WHO protocol. The burn wound was debrided with hydro-jet and regenerative therapies like Low-level laser therapy (Fig. 2) was done. Low level laser therapy was applied once in five days for 10 min for four sessions. Gallium Arsenide (GaAs) diode red laser (wave length 650 nm, frequency 10 kHz and output power 100 mW) was used as a

source of LLLT. It is a continuous beam laser with an energy densityof 4 J/cm.[2] Machine delivers laser in scanning mode (non-contact delivery) with 60 cm distance between laser source and wound.[3] In each session, the wound was given laser therapy for duration of 10 minutes (Fig. 3) followed by non-adherent absorbent dressing.

RESULTS

Burn wounds healed well with low level laser therapy session at 2 weeks (Fig. 4). Post therapy period was uneventful.

Fig. 1: At admission with mixed second degree superficial and deep burns

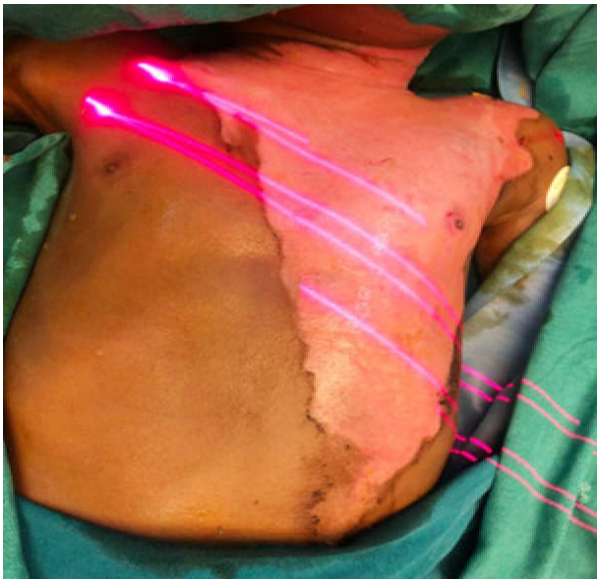

Fig. 3: Application of Low-Level Laser Therapy

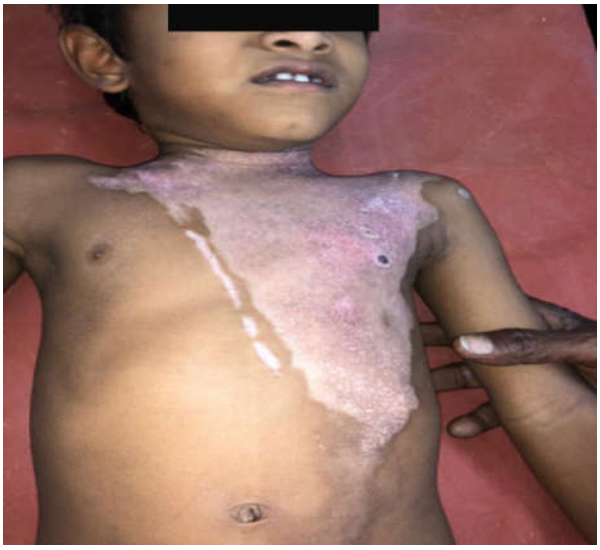

Fig. 4: Healed Burn wounds

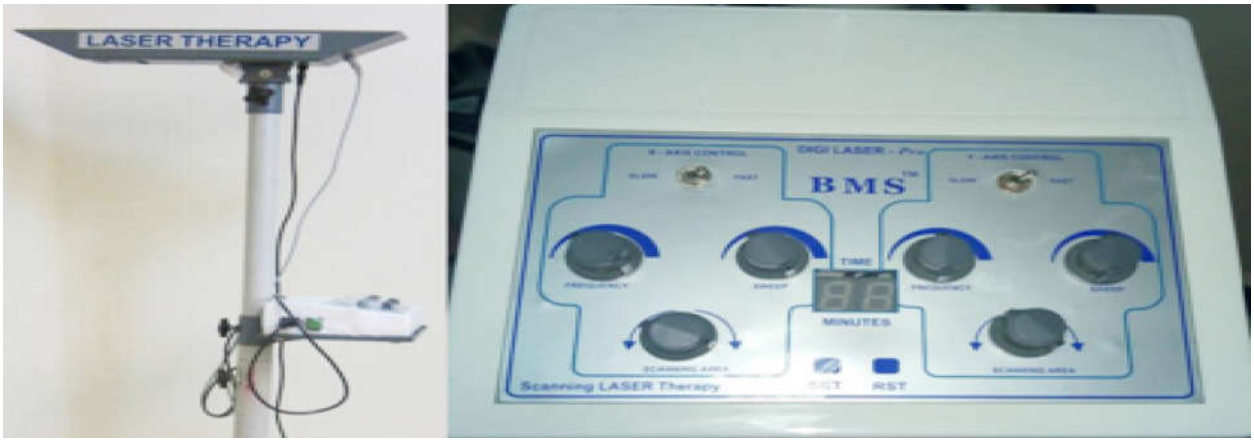

Fig. 2: Low-Level Laser machine

DISCUSSION

Low level Laser uses energy much less than that is used for cutting, ablation therapy. By definition Low-level lasers are one with power density less than 500 mW/cm.[3,4] LLLT is used as an adjuvant to conventional therapy with promising results, in patients with ulcers.[5] LLLT is a form of photo therapy that use electromagnetic radiation. LLLT does not generate heat but produces photo chemical and photo physical effects, with the intention of re-establishing cell homeostasis. Essentially, light energy is delivered topically in a controlled, safe manner and it is absorbed by photo-absorbers (chromophores) that transform it into chemical energy.[6] Positive effects of LLLT are: It accelerates tissue repair, increases the formation of granulation tissue, helps in wound contraction, decreases inflammation, modulation, and it also helps in pain reduction.[6,7,8] According to the literature, low-energy photo emissions given at a wave length range of 600nm to 900nm accelerates cell proliferation and wound healing processes.[9] Its action is thought to: Stimulate respiratory chain components such as flavin and cytochromes which increase adenosine triphosphate (ATP) synthesis, thus enhancing the rate of mitoses and increasing fibroblast numbers, stimulate collagen and elastin production, leading to better reepithelialisation, stimulate microcirculation and dilatation of the capillaries and neovascularisation to increase tissue oxygenation, liberate mediator substances such as histamine, serotonin and bradykin in to influence macrophages, regenerate lymphatic vessels.

Numerous case reports and clinical trials with humans have shown impressive wound healing outcomes using LLLT. Further work with animals has also supported the use of LLLT to facilitate wound healing.[10,11] The exact mechanism by which LLLT facilitates wound healing is largely unknown. However, several theories may help explain the enhanced wound contraction observed here. In vitro studies have shown an increase in fibroblast proliferation after therapy[11,12] suggesting that LLLT therapy may facilitate fibroplasia during the repair phase of tissue healing. Pourreau-Schneider et al, who reported that laser irradiation transforms fibroblasts into myofibroblasts. Myofibroblasts are directly involved in granulation tissue contraction, and increased numbers could lead to facilitated wound contraction. A myofibroblast is a modified fibroblast with ultrastructural and functional properties of fibroblasts and muscle cells. Cytoplasmic fibrils of actomyosin allow for contraction of myofibroblasts, pulling on the borders of the wound and reducing the size during the repair phase of soft tissue healing.[12] LLLT may have caused release of tissue growth factors into circulation, which may have affected surrounding tissues or entire systems. Indirect healing could be a very beneficial effect of this modality in treating tissue damage of large size or at multiple locations. It might also suggest that deeper tissues could be affected by light therapy.

CONCLUSION

The LLLT is an effective treatment for enhancing wound healing of second-degree burns. In this study we showed that LLLT can be used to facilitate wound healing in burn wounds.

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