

Role of Low Level Laser Therapy in Management of Pressure Necrosis in a Child with Post Burn Contracture of Webspace

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Abstract

Pressure injuries are areas of necrosis where soft tissues are compressed between bony prominences and external hard surfaces. They are caused by unrelieved mechanical pressure in combination with friction, shearing forces, and moisture. Pressure necrosis is an unwarranted, preventable complication and can be influenced by various internal and external factors.

Low level laser therapy (LLLT) has gained its importance in medical field since it was found to have wound healing and scar modifying properties. We present an unusual case of fingertip pressure necrosis that occurred during the management of a hand burn injury for which use of Low level laser therapy (LLLT) was incorporated into the management.

Keywords: Web Space; Contracture; Low level laser therapy; Pressure Necrosis; Paediatrics.

INTRODUCTION

Pressure injuries occur where soft tissues are compressed between bony prominences and external hard surfaces. Prognosis is excellent for early-stage injuries; neglected and late-stage

injuries pose risk of serious infection and are difficult to heal.

In recent years skin regenerative techniques such as Low level laser therapy (LLLT) has been found to give better results in wound management as they reduce inflammation and aid in the healing process.

LLLT has effect on cell proliferation, metabolism, angiogenesis, apoptosis and inflammation which aids in the healing process of the wound.

MATERIALS AND METHODS

This study was conducted in Tertiary Care Centre in Department of Plastic Surgery after getting the department ethical committee approval. Informed consent was obtained. The subject was a 9 year old male child with post scald burns scar contracture of 3rd webspace for which JESS distraction and

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contracture release was done. Patient came with the complaints of blackish discolouration of left ring finger tip (fig. 1) following application of a webspace splint. It was limited to inner aspect and side of the fingertip and was nonprogressive. It was associated with decreased sensation of fingertip. Capillary refill time was delayed.

The patient managed with oxygen inhalation, heparin, pentoxifylline, topical minoxidil and limb elevation. Digital doppler showed reduced peak systolic velocity in left medial digital vessel. He underwent dermabrasion - showed viable fingertip

with bleeding (fig. 2). 2 sessions of Low Level Laser Therapy was used postoperatively. (fig. 3)

RESULTS

Intraoperative and post-operative periods were uneventful for the patient. Finger vascularity was found to be improved. Post procedure capillary refill time was found to be less than 3 secs and sensations of fingertip had improved as compared to presentation (fig. 4). No complications and side effects were noted during entire procedure.



Fig. 1: Discolouration of ring finger



Fig. 2: Removal of necrotic superficial skin with active bleeding



Fig. 3: Low level laser therapy over ischaemic site



Fig. 4: Post procedure finger vascularity improved

DISCUSSION

The National Pressure Ulcer Advisory Panel (NPUAP) defines a pressure ulcer as “localized damage to the skin and underlying soft tissue usually over a bony prominence or related to a medical or other device.as a result of intense and/or prolonged pressure or pressure in combination with shear.¹ Pressure necrosis is an unwarranted, preventable complication and can be influenced by various internal and external factors.² They

are caused by unrelieved mechanical pressure in combination with friction, shearing forces, and moisture. Risk factors include age > 65, impaired circulation and tissue perfusion, immobilization, undernutrition, decreased sensation, and incontinence. Severity ranges from nonblanchable skin erythema to full-thickness skin loss with extensive soft-tissue necrosis. Diagnosis is clinical. Treatment includes pressure reduction, avoidance of friction and shearing forces, and diligent wound care. Advanced treatments, including

negative-pressure wound therapy, laser treatment, cellular and tissue based products, and surgical intervention, are sometimes needed. Prognosis is excellent for early-stage injuries; neglected and late-stage injuries pose risk of serious infection and are difficult to heal.

Low level laser therapy is generated from G-As (gallium-arsenide) laser. Low Level Laser Therapy acts by photobiomodulation.³ It has effect on cell proliferation, metabolism, angiogenesis, apoptosis and inflammation. Effective Low Level Laser Therapy utilises wavelength of red to near infrared (600-1070 nm).⁴ Low Level Laser Therapy acts on cytochrome c oxidase, promotes nuclear factor kappa b which promotes cell proliferation and anti-apoptotic action. It also upregulates VEGF which promotes angiogenesis. Low level laser is applied by scanning mode and adjusted to cover the region of the wound. Application is for 5-10 minutes per weekly session. LLLT acts on cytochrome c oxidase, promotes nuclear factor kappa b which promotes cell proliferation and anti-apoptotic action. It also upregulates VEGF which promotes angiogenesis.^{5,6} At cellular level it acts on mitochondria and photoreceptors located in cell membranes, releasing a cascade of events that leads to the bio stimulation of various cellular processes.⁷ LLLT has been shown to reduce thickness of hypertrophic scars which was studied by comparing the skin thickness pre and post application.⁸ It softens scars by reducing fibrous tissue formation, improves blood supply and promotes nerve regeneration.

CONCLUSION

We have demonstrated an effective and

successful method to manage pressure necrosis in a patient with post burns hand injury.

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