Plastic Surgery **Case Report**
International Journal of Clinical and Diagnostic Research **ISSN 2395-3403**
Volume 8, Issue 5 , Sep-Oct 2020

ROLE OF LOW LEVEL LASER THERAPY AS AN ADJUNCT IN THE MANAGEMENT OF VENOUS ULCER

Shijina Koliyath[1], Ravi Kumar Chittoria[2], Saurabh Gupta[3], Chirra Likhitha Reddy[4], Padmalakshmi Bharathi Mohan[5], Imran Pathan[6], Neljo Thomas [7], Nishad K[8]

ABSTRACT

Venous ulcers form a major part of leg ulceration. The treatment of venous ulcers requires a multimodal approach. Adjuvant low level laser therapy may be useful in lesions with protracted healing course but evidence is still limited. In this study we share our experience regarding the use of low level laser therapy as adjuvant treatment modality in a patient with venous leg ulcer.

Authors Affiliations:

[1, 3-8]Department of Plastic Surgery, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Pondicherry, India-605006.

[2] Department of Plastic Surgery & Telemedicine, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Pondicherry, India-605006.

Keywords: Low level laser therapy, venous ulcer

***Corresponding Author:**

Dr Ravi Kumar Chittoria
MS, MCh, DNB, MNAMS, PhD, MBA, PGDTM, PDCR, PGDMLS
Professor & Registrar (Academic)
Department of Plastic Surgery & Head of Telemedicine
JIPMER, Pondicherry, India.
Email: drchittoria@yahoo.com
Mobile: 9442285670

INTRODUCTION

The prevalence of Venous Ulcer is increasing, coinciding with aging population. Venous ulceration is the most common type of leg ulceration and a significant clinical problem, affecting approximately 1% of the population and 3% of people over 80 years of age in westernised countries[1]. The impact of a venous leg ulcer represents social, personal, financial and psychological costs on the individual and further economic drain on the health-care system. Treatment of venous ulcer requires a multimodal approach. Various treatment options are available. This article describes our experience regarding the use of low level laser therapy as an adjunct in the treatment of venous ulcer.

MATERIALS AND METHODS

This study was conducted in plastic surgery department in a tertiary care center in the month of February-March 2020. Informed written consent was taken from the patient. Departmental ethics committee clearance was obtained. The study subject being a 50 year old lady with no known comorbidities with chronic non-healing ulcer over left lower limb. (Figure 1)

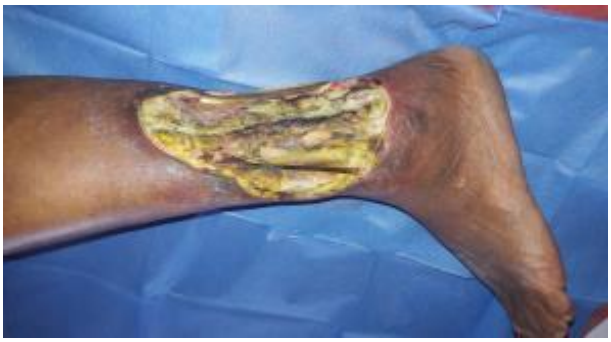

Figure 1: Venous Leg Ulcer

On evaluation she was found to have incompetent perforators of the left lower leg. Wound bed preparation was done by multiple surgical debridements and antibiotics were started according to culture sensitivity.

As an adjunct treatment modality low level laser therapy was applied over the ulcer (Figure 2) after debridement weekly twice for a period of 6 weeks.

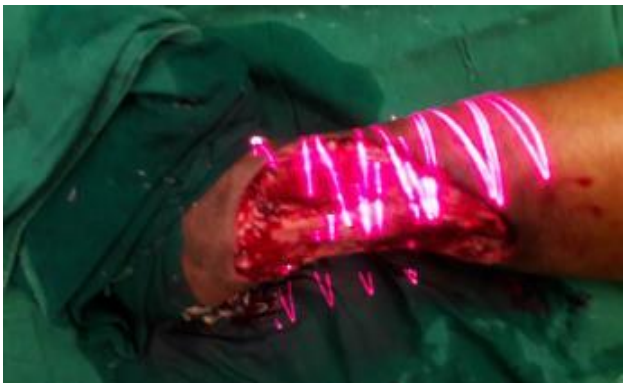

Figure 2: Low level laser therapy being applied

We used Gallium Arsenide (GaAs) diode red laser of wavelength 650 nm, frequency 10 kHz and output power 100 mW. It was a continuous beam laser with an energy density of 4 J/cm^2. Machine delivers laser in scanning mode (non-contact delivery) with 60 cm distance between laser source and wound. Wound was given laser therapy for duration of 125 second every time.

After adequate wound bed preparation, Split thickness skin graft was done.(Figure 3,4) Postoperative period was uneventful.

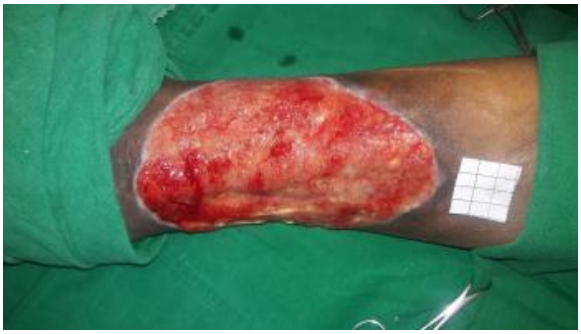

Figure 3: Ulcer with healthy granulation tissue

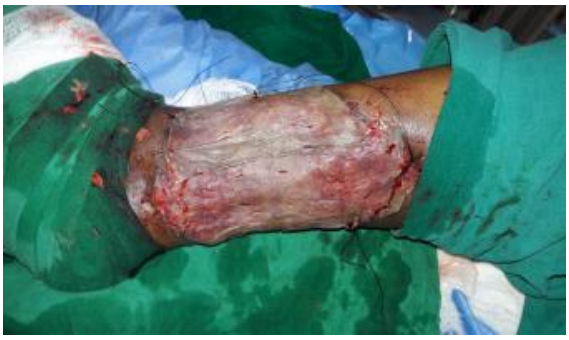

Figure 4: Ulcer after split thickness skin grafting

DISCUSSION

Chronic venous insufficiency can be defined as the set of clinical manifestations caused by reflux and/or obstruction of the peripheral venous system (superficial, deep, or both), usually affecting the lower limbs[2]. Clinical examination and taking a thorough history, which usually reveal clinical manifestations attributed to venous involvement (such as tingling, pain, burning, muscle cramps, edema, pruritus, restless legs, and fatigue), are the first steps in diagnosis. The consequences of chronic venous insufficiency include edema, hyperpigmentation of the skin, and, often, development of superficial, irregularly shaped venous ulcers.

Venous ulcers represent about 70–90% of all leg ulcers, with a lifetime prevalence of 0.1% to 2% in the Incidence is higher in individuals over 65 years of age, and women are proportionally more affected, due to their higher survival rates compared to men[3,4]. The natural history of a venous ulcer is a continuous cycle of healing and tissue derangement that can persist for a long time, with substantial morbidity and recurrence in approximately 70% of cases[3,4]. The negative impact of venous ulcers on quality of life and the high costs associated with their treatment mean there is a pressing need for new therapeutic options. Conventional venous

ulcer treatment is currently based on a combination of topical care (wound dressing) and compressive therapy, as well as educating patients on self-care, which includes wound dressing, hygiene, diet, and exercise.[5,6]

The acronym LASER can be abbreviated as "light amplification by stimulated emission of radiation". Low-level lasers are defined by a power density at less than 500 mW/cm2[7, 8]. It is defined as low level laser as the energy used is much less than that is used for cutting, ablation therapy. Low-level laser therapy (LLLT) has been used as an adjuvant to conventional therapy with promising results, especially in patients with acute and bloody ulcers.[9] LLLT is a form of phototherapy that employs electromagnetic radiation capable of generating enough energy to interact with living tissues. It produces photochemical and photophysical effects without generating heat, with the intention of reestablishing 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.[10]

Positive effects include acceleration of tissue repair, increased formation of granulation tissue, wound contraction, inflammation, modulation, and pain reduction.[10]

According to the literature, low-energy photoemissions given at a wavelength range of 600nm to 900nm accelerates cell proliferation and wound healing processes.[11] Its action is thought to:

- Stimulate respiratory chain components such as flavin and cytochromes which increase adenosine triphosphate (ATP) synthesis,[12] thus enhancing the rate of mitoses and increasing fibroblast numbers[12-17]
- Stimulate collagen and elastin production, leading to better re-epithelialisation[18]
- Stimulate microcirculation and dilatation of the capillaries and neovascularisation to increase tissue oxygenation[19]
- Liberate mediator substances such as histamine, serotonin and bradykinin to influence macrophages
- Regenerate lymphatic vessels.

CONCLUSION

In our study we found that low level laser therapy was useful in promoting healthy granulation tissue and in preparing the wound for skin grafting. The limitation of the study includes that it is a case report and a single Centre study with no statistical analysis. Further randomized controlled studies are required to validate the efficacy of the low level laser therapy in the treatment of venous ulcers.

Conflict of interest statement:

There is no conflict of interest.

REFERENCES:

1. Australian and New Zealand Clinical Practice Guideline for Prevention and Management of Venous Leg Ulcers. The Australian Wound Management Association Inc and the New Zealand Wound Care Society Inc. 201.
2. Santler B, Goerge T. Chronic venous insufficiency–a review of pathophysiology, diagnosis, and treatment. J Dtsch Dermatol Gesellschaft. 2017;15(5):538–56.
3. Rabe E, Guex JJ, Puskas A, Scuderi A, Fernandez QF. Epidemiology of chronic venous disorders in geographically diverse populations: results from the Vein Consult Program. Int Angiol. 2012;31(2):105–15.
4. Agale SV. Chronic leg ulcers: epidemiology, aetiopathogenesis, and management. Ulcers. 2013;1:9.
5. Borges EL, Caliri MHL, Haas VJ. Systematic review of topic treatment for venous ulcers. Rev Latino-Americana Enfermagem. 2007; 15(6):1163–70.
6. O'Donnell TF, Passman MA, Ennis WJ, Dalsing M, Kistner RL, Lurie F,Gloviczki P. Management of venous leg ulcers: clinical practice guidelines of the Society for Vascular Surgery® and the American venous forum. J Vasc Surg. 2014;60(2):3S–59S.
7. Karu TI. Low-power laser therapy. In: Vo-Dinh T, editor. Biomedical photonics handbook, vol. 48. London: CRC Press, 2003. p. 7–20.
8. Baxter CD. Therapeutic lasers. Theory and practice. Churchill, Livingstone, 1994.
9. Palagi S, Severo IM, Menegon DB, Lucena AF. Laserterapia em úlcera porpressão: avaliação pelas Pressure Ulcer Scale for Healing e Nursing Outcomes Classification. Rev Escola Enfermagem USP. 2015;49(5):826–33.
10. Andrade FSSD, Clark RMO, Ferreira ML. Effects of low-level laser therapy on wound healing. Rev Colégio Brasileiro Cirurgiões. 2014;41(2):129–33.
11. Lichtenstein, D., Morag, B. Low-level laser therapy in ambulatory patients with venous stasis ulcers. Laser Therapy 1998; 11: 71-78
12. Karu, T. Molecular mechanism of therapeutic effect of low intensity laser

irradiation Dokl Akad Nauk SSSR 1986; 291:1245-1249.

13. Karu, T. Photobiology of low-power laser effects. Health Phys 1989; 56: 691-704.
14. Wilden, L., Karthein, R. Import of radiation phenomena of electrons and therapeutic low-level laser in regard to the mitochondrial energy transfer. J Clin Laser Med Surg 1998; 16: 159-165.
15. Stadler, I., Evans, R., Kolb, B. et al. In vitro effects of low-level laser irradiation at 660nm on peripheral blood lymphocytes. Lasers Surg Med 2000; 27: 255-261.
16. Yu, W., Naim, J.O., Lanzafame, R.J. Effects of photostimulation on wound healing in diabetic mice. Lasers Surg Med 1997; 20: 56-63.
17. Yu, W., Naim, J.O., Lanzafame, R.J. The effect of laser irradiation on the release of bFGF from 3T3 fibroblasts. Photocem Photobiol 1994; 59: 167-170.
18. 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.
19. 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. JAm Acad Dermatol 1999;40: 481-484.