Original Article

Journal of Global Public Health (JGPH)
Volume 3 Number 1, January–June 2021

Role of Er-Yag in Split Thickness Skin Graft (STSG)

Neljo Thomas[1], Ravi Kumar Chittoria[2], Padmalakshmi Bharathi Mohan[3], Shijina Koliyath[4], Imran Pathan[5], Nishad Kerakkada[6]

Author's Affiliation: [1,3,4,5,6]Senior Resident, [2]Professor, Department of Plastic Surgery, Jawaharlal Institute of Post Graduate Medical Education and Research, Pondicherry 605006, India.

Corresponding Author: Ravi Kumar Chittoria, Professor, Department of Plastic Surgery, Jawaharlal Institute of Post Graduate Medical Education and Research, Pondicherry 605006, India.

E-mail: drchittoria@yahoo.com

How to cite this article:

Neljo Thomas, Ravi Kumar Chittoria, Padmalakshmi Bharathi Mohan et al./Role of Er-Yag in Split Thickness Skin Graft (STSG)/Journal of Global Public Health. 2021; 3(1):9–11.

Abstract

Numerous revision procedures such as surgical excision, intralesional steroid injection, cryotherapy, dermabrasion, soft tissue augmentation, chemical peeling and laser therapy are available for the correction of various types of scars. Erbium:YAG lasers are successfully used to treat a variety of epidermal and dermal lesions, including rhytides, dyschromias, and certain types of scar. Recently we came across the usage of Erbium :YAG laser for the management of scar following the harvest of STSG

Keywords: Laser; Electric burns; Erbium:YAG.

Introduction

Erbium:YAG lasers are systems in which the rare earth element Erbium 3+constitutes the active ion in a matrix such as YAG (yttrium aluminum garnet). Er:YAG lasers with the wavelength 2.9 µ m have been used for laser resurfacing of human skin, treating of acne scarring, deep rhytides, and melasma. The Er:YAG laser, with a 2940-nm wavelength, has high absorption in water, so it is almost totally absorbed in a very thin, superficial layer of skin and can be used for precise and superficial tissue ablation. 1-3. The STSG donor sites are usually healed secondary intention form scars. The use of ablative lasers based on the fractional approach has become a novel strategy for the treatment of scars 4,5 and we have used the same .

Materials and Method

Fig. 1: wound at presentation.

The study was conducted in the department of plastic surgery in a tertiary care hospital. The patient was a 7 yr female child who had history of accidental spillage of hot rassam on her while playing in the kitchen to involve the chest abdomen,

axilla, left upper arm and forearm a total of about 20 %TBSA. (Figure 1) The patient was admitted in a tertiary hospital and was treated with regular dressing. The patient was reassessed after 48 hours and the 2nd degree deep and 3rd degree burns was treated with tangential excision and skin grafting. Patient was examined after post operative day 3 and was found to have satisfactory graft take. (Figure 2). The donor site of the skin graft was given Er-YAG laser for prevention of hypertrophic scar formation, 6 sitting were given 3 weeks interval and assessed after the 6 cycles.

Fig. 2: Er YAG applied to stsg donor area.

Laser Machine

The laser machine used was Quanta Q1TM laser with the Twain handle delivering at 2940 nm wavelength laser after taking necessary safety precautions. We had used a 4 mm tip with a pulse width of 0.3 J/cm2 and a fluence of 4. The lesion was initially precooled and ablated along it's length without stacking. The overall procedure took 25 minutes and the patient was comfortable during the procedure, after the procedure the site was cooled for 5 minutes. The patient was advised to avoid direct sunlight exposure and to use sunscreen with >30 SPF. The patient was given regular sessions six in total with 3 weeks interval.

There were no adverse effects noted except for post treatment erythema which resolved within 5 to 7 days. Other modalities like silicone sheet and compression garments are expensive and are cumbersome to use. Laser treatment could be given on outpatient basis and is allowed for patient to continue with activities of daily life with out any limitation. However one limitation was that the patient had to come regulary to hospital for the laser treatment.

Results

After a follow up period of 5 months no adverse effects was noted, the scar was soft and supple and did not show any tendency for hypertrophic scar formation.

Discussion

A hypertrophic scar (HS) is a condition characterized by fibrosis with disordered collage deposition from skin fibroblasts6 Major risk factors for HS formation include gender, age, genetic predisposition, immunological responses of the patient, type of injury, wound size and depth, anatomical site and mechanical tension on the wound.[7] HS formation is considered a result of the imbalance between ECM synthesis and degradation during wound healing.[8]

Scar revisions with variable methods have been reported including pressure garment application, silicone sheet application, steroids, resection and radiation, botulinum toxin type A. No one treatment is effective in correcting all types of scars. Recently, carbon dioxide and Er:YAG laser resurfacing have been found to be safe and effective tools for scar revision.[9,10]

Clinically, it has been widely accepted that pulsed dye laser (PDL) treatment reduces HS formation mainly by decreasing angiogenesis. PDL has been reported to improve the pliability and erythema of immature scar by destruction of small blood vessels by photothermolysis.[11] Other theories of the mechanism by which PDL may achieve clinical efficacy in the treatment of scars include the decreased cellular activity resultant from laser-induced anoxia or through collagenolysis by laser stimulation of cytokine release.[12] Although CO_2 laser has been widely sued for the management of scars, Erbium: YAG laser.in contrast to the CO_2 laser, laser ablation attained through 3 to 6 passes provides all the benefits of the former such as efficient and controlled tissue ablation, and time-efficiency in preparing skin over large areas and irregularly-contoured regions. Since the depth of penetration with the 2940 mm erbium: YAG laser is only one-sixth that of CO_2 lasers, its use pre-empts the possibility of thermal necrosis and allows for more precise tissue ablation.[13] One unique advantage of using this laser is the lack of requirement for recipient site anesthesia owing to minimal pain associated with the shots of Er: YAG laser.[14] Thus, this laser offers the convenience of operator-use, and also provides a relatively bloodless field for easier surgery by the specialist.[15]

Conclusion

In this report we have found the Erbium YAG laser useful for the prevention of hypertrophic scar, but it needs large scale randomised control trial to bring it to clinical practice.

References

1. Weinstein C. Computerized scanning erbium:YAG laser for skin resurfacing. Dermatol Surg 1998; 24: 83±9.
2. Kaufmann R, Hibst R. Pulsed Er:YAG and 308 UV excimer laser: an in vitro and in vivo study of skin ablative effects. Laser Surg Med 1989; 9: 132±40.
3. Walsh JT, Deutsch TF. Er:YAG laser ablation of tissue: measurement of ablation rates. Laser Surg Med 1989; 9: 327±37.
4. Jung JY, Jeong JJ, Roh HJ, Cho SH, Chung KY, Lee WJ, et al. Early postoperative treatment of thyroidectomy scars using a fractional carbon dioxide laser. Dermatol Surg. 2011;37:217–23.
5. Kim SG, Kim EY, Kim YJ, Lee SI. The efficacy and safety of ablative fractional resurfacing using a 2,940-nm Er:YAG laser for traumatic scars in the early posttraumatic period. Arch Plast Surg. 2012;39:232–7.
6. Gauglitz GG, Korting HC, Pavicic T, Ruzicka T, Jeschke MG. Hypertrophic scarring and keloids: Pathomechanisms and current and emerging treatment strategies. Mol Med. 2011;17:113–25.
7. Niessen FB, Spauwen PH, Schalkwijk J, Kon M. On the nature of hypertrophic scars and keloids: A review. Plast Reconstr Surg. 1999;104:1435–58.
8. Spyrou GE, Naylor IL. The effect of basic fibroblast growth factor on scarring. Br J Plast Surg. 2002;55:275–82.
9. Alster TS, Lewis AB, Rosenbach A. Laser scar revision: comparision of CO2 laser vaporization with and without simultaneous pulsed dye laser treatment. Dermatol Surg 1998; 24: 1299±302.
10. Nehal KS, Levine VJ, Ross B, et al. Comparision of high-energy pulsed carbon dioxide laser resurfacing and dermabrasion in the revision of surgical scars. Dermatol Surg 1998; 24: 647±50.
11. Alster TS, Nanni CA. Pulsed dye laser treatment of hypertrophic burn scars. Plast Reconstr Surg. 1998;102:2190–5.
12. Dierickx CC, Casparian JM, Venugopalan V, Farinelli A, Anderson RR. Thermal relaxation of port-wine stain vessels probed in vivo: The need for 1–10-millisecond laser pulse treatment. J Invest Dermatol. 1995;105:709–14.
13. Kaufmann R,Greiner D,Kippenberger S,Bernd A, Grafting of in vitro cultured melanocytes onto laser-ablated lesions in vitiligo. Acta dermato-venereologica. 1998 Mar [PubMed PMID: 9534893]
14. Guerra L,Primavera G,Raskovic D,Pellegrini G,Golisano O,Bondanza S,Kuhn S,Piazza P,Luci A,Atzori F,De Luca M, Permanent repigmentation of piebaldism by erbium:YAG laser and autologous cultured epidermis. The British journal of dermatology. 2004 Apr [PubMed PMID: 15099368]
15. Al-Hadidi N, Griffith JL, Al-Jamal MS,Hamzavi I, Role of Recipient-site Preparation Techniques and Post-operative Wound Dressing in the Surgical Management of Vitiligo. Journal of cutaneous and aesthetic surgery. 2015 Apr-Jun.