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Role of ER:YAG Laser in Full Thickness Skin Grafting: Our Experience

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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 FTSG.

Keywords: Laser; Full thickness skin graft; 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 FTSG donor sites are usually closed primarily and form linear 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 methods

The study was conducted in a tertiary burns centre after departmental ethical committee clearance. The patient was a 23 yrs female with known tendency to hypertrophic scar formation. The patient underwent harvest of FTSG from her right groin for the purpose of allografting for her son with 20% scald buns as part of burns reconstruction. Since patient was worried about the scar, It was decided to give her fractional laser to prevent formation of hypertrophic scar.

Laser machine

The laser machine used was Quanta Q1™ 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/cm^2 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 cumber some 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.

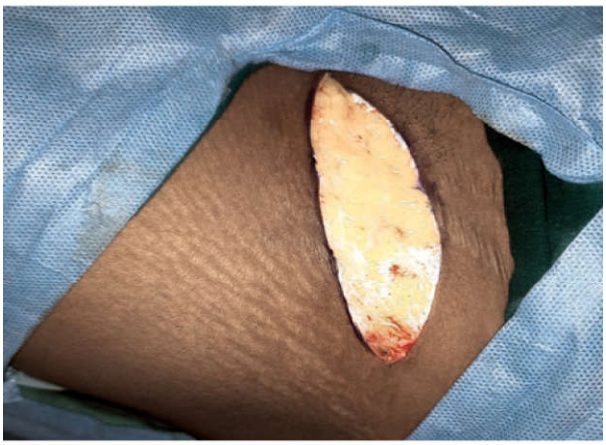

Fig. 1: FTSG harvested

Fig. 2: Erbium YAG laser applied to the scar

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.

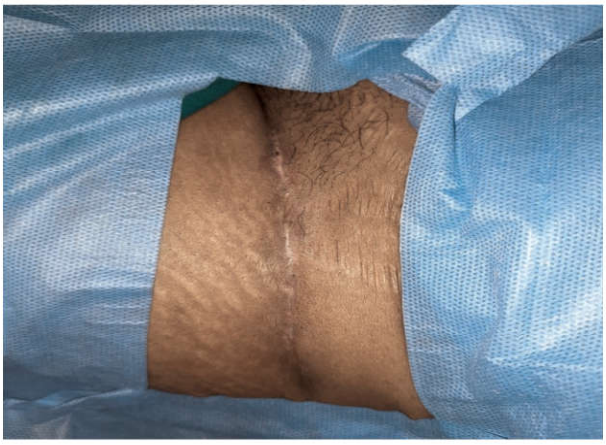

Fig. 1: Well healed scar

Discussion

A hypertrophic scar (HS) is a condition characterized by fibrosis with disordered collage deposition from skin fibroblasts[6] Major risk factors for HS formation include gender, age, genetic pre-disposition, 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.

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