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Role of High Level Laser in Scar Management

Jacob Antony Chakiath[1], Ravi Kumar Chittoria[2]

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Abstract

Aim of this study was to assess the role of High level laser therapy like Er-YAG Laser in the management of scar. In our study, High level laser therapy like Er-YAG Laser helped in improving the scar which was objectively assessed by Vancouver scar scale(VSS) and clinical photography. The study shows that high level laser therapy like Er-YAG Laser therapy is an effective method in the management of scar.

Keyword: Laser; Scar; Vancouver scar scale.

INTRODUCTION

Scar management is a typical issue that people seek advice from a plastic surgeon about. Abnormal scars can be uncomfortable, itchy, and can make it difficult for the sufferer to move their joints, neck eyelids, or lips. Because of their location, colour, consistency, or size, scars can become ugly (height). Scars can be prevented and managed in a variety of ways. While scars cannot be totally avoided, they can be significantly improved with careful wound treatment. There is no one-size-fits-all approach to scar management. Scar massage with emollients, compression garments, intralesional steroids, surgical scar revision, and laser therapy are all common scar treatment techniques. Low-level laser therapy and high-level laser therapy are also available.

For many years, high-level laser therapy has been used; the first lasers used were CO2 and pulsed dye lasers.Because of the negative consequences, there is always a search for better and newer lasers that are equally effective but have less side effects and require less downtime to produce the desired therapeutic change. Alterations in size (height), consistency, colour (pigmentation), and vascularity are all desirable clinical changes that might make a scar less unattractive.[1]

Though the Erbium YAG (Er-YAG) laser has been utilised in western countries for many years, it is a relatively new addition to the scar treatment arsenal in India, hence research on its success in treating unattractive scars in Indian skin types is

Author Affiliation: [1]Senior Resident, Department of General Surgery, [2]Professor, Department of Plastic Surgery, Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry 605006, India.

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

E-mail: drchittoria@yahoo.com

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limited. We used the Er YAG laser for fractional ablative resurfacing of post burn scars in this study, and we investigated the influence of the laser on each scar parameter.

MATERIALS AND METHODS

This study was conducted in the Department of Plastic Surgery at a tertiary care center after getting the departmental ethical committee approval. Informed written consent was taken from the patient for Er YAG therapy as well as the clinical photography (Fig. 1). The subject was 22yr old female with post burn scar on her face caused by an accidental kerosene flame burn 20yrs back. The scars were evaluated twice using the Vancouver scar scale scoring system and clinical photography twice once pre-treatment and next one month after the completion of the laser therapy. The laser therapy was given for four sessions each at a one-month interval (Fig. 2). The laser used was Er: YAG Laser, Twain 2940, Quanta System S.p.A., Italy, in ablative as well as thermal mode, at a wavelength of 2,940nm, fluence was set to 1 to 2 J/ cm2, pulse width used was 300 microseconds using spot diameter of 4mm. During each session, two laser passes of 400 mJ in short pulse mode (pulse duration 0.30ms) and one pass of 800 mJ in long pulse mode (pulse duration 1 ms) were performed. Post-therapy VSS score and clinical photography results were analyzed.

Fig. 1: Pre procedural.

Fig. 2: Er-YAG laser therapy.

Fig. 3: After four sessions of Er-YAG each at a one-month interval.

RESULTS

The pre-procedural and post-procedural Vancouver

scar scale(VSS) parameters are comparisons showed that there was a significant difference after laser application. The pre-procedural VSS score was 5/13. The post-procedural VSS score was 2/13. Post therapy clinical photograph also showed improvement.

DISCUSSION

After an injury or disease, the scar is defined as fibrous tissue that replaces the wound. During the healing process, the wound produces a collagen fibre bridge with a thin epithelium, resulting in an immature scar.[2] An juvenile scar is red, elevated, hard, and hypopigmented. As the scar matures, it becomes more flexible, flatter, and less vascular, and its colour returns to normal. Any deviation causes the scar to be unnatural or ugly. The difference in extracellular matrix composition between a normal scar, an immature scar, and a hypertrophic scar is that Type-III collagen is prevalent during the proliferation phase of normal wound healing and is subsequently replaced by Type-I collagen during the remodelling phase. A developed scar is composed of 80 percent type-I collagen, 10-15 percent type-III collagen, and a little amount of type-V collagen. An aberrant scar has a different composition, with a higher ratio of type-III to type-I collagen. Around 33% type-III collagen, 10% type-V collagen, and around 60% type-I collagen make up the atypical scar.[3] In addition to the collagen composition, the organisation of fibrils and interfibrillar space in an aberrant scar differs from that of a mature scar.In an aberrant scar, the cellular function of fibroblasts and keratinocytes is also changed, rendering them profibrotic. In an aberrant scar, the expression of cytokines is also changed.

The balance between matrix metalloproteinases (MMPs) and tissue inhibitors of metalloproteinases (TIMPs) has shifted in favour of profibrosis. TGF-ß, connective tissue growth factor (CTGF), plateletderived growth factor (PDGF), and insulin-like growth factor 1 (ILGF-) are upregulated, while interferon (IFN-) and interferon (IFN-) are downregulated.

Maimon invented the first LASER machine in 1960, which was a Ruby laser. Dermatologist Dr. Leon Goldman is known as the "Father of Laser Medicine." Pulsed Dye Laser (PDL), which was utilised for port-wine stains, was the first laser that was particularly intended for use in a medical condition. Since then, more concepts such as pulsed therapy, fractionated laser therapy, Q-switched mode, and others have been added to the list. Any laser works on the principle of photothermolysis, which was initially postulated by Anderson.[4]

Each laser has a chromatophore, which is a specific target on which it functions. The laser acts on its chromatophore selectively, causing thermal ablation of the target tissue. Fluence, pulse width, spot size, and stacking are variables that must be modified to meet the needs of each individual. The mechanism by which a laser influences scar remodelling is unknown, however ablative fractional resurfacing may stimulate a range of not-yet-understood cellular responses, resulting in the creation of different cytokines and growth factors. Fractional photothermolysis causes controlled and limited dermal heating, which sets in motion a chain of events that leads to the normalisation of the collagenesis-collagenolysis cycle.

The Vancouver Scar Scale (VSS) was used to compare the results. Characteristic includes vascularity, pigmentation, Pliability, Height. Total score out of 13. The clinical photograph was also used for comparison.

CONCLUSION

The study shows that high level laser therapy like Er-YAG Laser therapy is an effective method in the management of post-burn scar. The pigmentation and height of the scar showed significant improvement after the application of the Er YAG Laser. No adverse effects were noted during the study. Large volume and multi-center study may give a better picture of the effect of Er YAG laser.

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