The effectiveness of Fractional CO₂ laser and long-pulsed ND- YAG laser in managing striae

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Abstract

Background: Striae Distansae (SD) are a disfiguring dermal condition, characterized by linear bands of atrophic skin, occurring at sites of dermal damage caused by stretching. They affect adolescents and more than 70% of pregnant females due to stretching of the skin.

Aims: To evaluate and to compare the efficacy of 1,064 nm Long Pulsed Nd: YAG laser and Fractional CO₂ laser in the management of SD.

Patients/Methods: Thirty female patients with bilateral symmetrical SD were treated with Fractional CO₂ laser on one side and long-pulsed Nd: YAG laser on the other side. All patients received 3 sessions at 3 weeks interval. Global Aesthetic improvement scale (GAIS) and was used to evaluate improvement 3 months post treatment. Four mm punch biopsies were taken from each side before treatment and 3 months after the last session to measure epidermal and collagen thickness.

Findings: More significant clinical improvement was noted with the Nd:YAG laser than Fractional CO₂ laser. Both GAIS and satisfaction score were significantly higher in the Nd:YAG laser treated side epidermal and collagen thickness were evidently increased in the Nd: YAG laser treated lesions than those treated by Fractional CO₂ laser with no significant difference. **Conclusions:** Long pulsed Nd-YAG laser is clinically more effective than the Fractional CO₂ laser in treating SD without serious side effects, although there was no significant difference between them histopathologically.

Introduction

Striae Disatnsea(SD) are atrophic dermal scars with a linear depression and atrophy of the epidermis.¹ They occur in many physiological conditions such as rapid weight change, pregnancy and adrenocortical excess. A genetic predisposition is also present.²

Various treatment modalities are available with variable results as topical retinoids, microdermabrasion, chemical peels, radiofrequency and intense pulsed light (IPL).³

Lasers for managing SD include 308-nm excimer laser, 585-nm pulse dye laser (PDL), nonablative 1,450-nm diode laser, ablative fractional CO₂ resurfacing and 1,064-nm neodymium yttrium-aluminium garnet (Nd: YAG laser).⁴

The ablative, nonselective lasers: erbium: yttrium-aluminium-garnet (Er: YAG) laser and carbon dioxide (CO₂) were the first used for treating SD followed by different types of lasers. The 1064 nm long-pulsed (LP) Nd: YAG laser has resulted in the increase of dermal collagen when utilized in nonablative treatments of atrophic scars and facial wrinkles. In addition, ND: YAG laser has a strong affinity to vascular chromophores, so it can be used effectively in treating striae rubra.⁵ Therefore, the aim of this work was to compare and evaluate the efficacy of 1,064 nm LP Nd: YAG laser and fractional CO₂ laser clinically and histologically in the management of SD.

Patients And Methods

The study included 30 patients. Sites of affection of SD were the breast, chest, abdominal flanks and thighs. Their ages ranged from 18-35 years. Exclusion criteria were pregnant or nursing females, those taking systemic or topical corticosteroids, hormone replacement therapy or oral contraceptive pills. Also, patients with systemic diseases as hypertension, diabetes, cushing syndrome, or immunocompromised conditions; together with patients with tendency for post inflammatory hyperpigmentation or keloids were excluded from the study.

Methods

Treatment of lesions with Nd:YAG and Fractional CO₂ Laser

Two symmetrical skin lesions were selected from each patient. Fractional CO₂ laser was done for lesions on the left side of body using Pixel CO₂ machine, China at 60 mJ energy, pulse width 2 ms, and scanning area 10 mm x 10 mm. The lesions were treated with one laser pass along their entire lengths. Long-pulsed 1064 nm Nd: YAG laser was done for lesions on the right side of body using Fotona XP dynamis machine, Slovenia at 80 mJ energy, pulse width 15 ms, and spot size 4 mm. The lesions were treated with two laser passes along their entire lengths. All patients received a total of three sessions with three weeks interval.

Histopathological assessment

Four mm punch biopsies were extracted from seven randomly selected patients. Two skin biopsies were taken from each patient before treatment. Two other skin biopsies were taken from the same areas of the same patients 3 months after the last session. Skin biopsies were stained with Hematoxylin and eosin (H and E) for histological evaluation.

Photography

Photographic documentation was obtained at baseline, at the beginning of each session and three months after the last. Two blinded dermatologists evaluated the photos according to Global Aesthetic improvement scale (GAIS) after treatment.

Global Aesthetic improvement scale (GAIS)

Global Aesthetic improvement scale was used for evaluating the improvement three months after the last treatment session whereby 1 (very much improved), 2 (much improved), 3 (Improved), 4 (No change) and 5 (Worse).⁶

Findings

Global Aesthetic Improvement Score (GAIS):

Post therapy, the GAIS values were significantly higher with Nd: YAG laser therapy than fractional CO₂ laser therapy (P-value<0.001).

Histopathological Analysis

Thickness of collagen

Post treatments, an increase in mean area percent of collagen was noted with both fractional CO₂ laser and Nd:YAG laser therapies but yet again it did not reach any statistical significance pretreatment for fractional CO₂ laser.

On comparing both treatment modalities regarding the epidermal and collagen thickness, they were augmented more in Nd:YAG laser treated SD than those treated by Fractional CO₂ laser. However, the difference did not reach any statistical significance.

Discussion

In the present study, clinical improvement was observed in all patients treated with either fractional CO₂ laser or LP Nd: YAG laser. However, there was no considerable significant histopathological improvement in both treated sides three months after the last treatment session. In addition, on comparing both treatment modalities, more statistically significant clinical improvement was noted with the LP Nd:YAG laser treated side than fractional CO₂ laser treated side. Also, both the GAIS score and the satisfaction score were higher in the LP Nd:YAG laser treated side with a statistical significance.

The results of the current study are agreeing with several studies in literature that proved the efficacy of fractional lasers in the treatment of stretch marks. Yang et al. (2011)⁷ showed the effectiveness of CO₂ laser in the treatment of SD. Moreover, Cho et al., (2010)⁸ treated patients with striae alba using the 10,600-nm CO₂ fractional laser and reported a significant improvement of striae alba after the treatment. In addition, the results by Elsaie et al., (2016)⁶ support our results as regards the safety and efficacy of 1064 nm Long Pulsed Nd: YAG in the treatment of SD.

Against our results was the study performed by Güngör et al. (2014)⁹ comparing LP Nd: YAG 1064 nm versus 2940 nm tunable pulse width Er: YAG that was performed on 22 patients with striae rubra and alba. Both treatment types were randomly allocated to both sides of the body, and all subjects were treated weekly for a total of three sessions. Patients with striae alba were found to have poor response to treatment on photographic review of treatment, whereas patients with striae rubra had moderate responses on both sides. Interestingly, although clinical outcome was poor in both groups, histological improvement was still noted post treatment, in all samples, in comparison to pretreatment's skin biopsies.

The absorption of LP Nd: YAG wave length in the microvasculature within the dermal papillae and dermis increases the temperature around the vessels producing more thermal damage to the surrounding tissue, in a non-ablative manner, thereby provoking a degree of irritative dermal photothermal damage that is

sufficient to induce the various stages of the wound healing process, and finally resulting in the formation and remodeling of collagen.⁵

This study concluded that the LP Nd-YAG laser is more effective clinically than the fractional CO₂ laser in the treatment of SD without serious side effects, although there was no significant difference between them histopathologically.

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