Fractional Lasers for Acne Scarring in Patients With Skin of Color

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The advent of fractional photothermolysis has broadened the range of therapeutic options for scars, pigmentary disorders, and textural irregularities in patients with Fitzpatrick skin types IV to VI. Growing experience and published studies involving fractional nonablative lasers have confirmed the safety and efficacy of these devices for use in darker skin phototypes when physicians employ conservative parameters and treatment precautions. Conversely, fractional ablative lasers are associated with a considerably higher risk for dyspigmentation in darkly pigmented skin types and published data in this population are limited. This article will review the use of fractional lasers for the treatment of acne scarring in Fitzpatrick skin types IV to VI and provide treatment recommendations.

Fractional Ablation in Skin of Color

There is a paucity of literature regarding the use of fractional ablative lasers in Fitzpatrick skin types IV to VI. Hu et al¹ utilized the fractional 2940-nm erbium:YAG laser in the coagulation mode for the treatment of atrophic facial acne scars in Asian patients with Fitzpatrick skin types III and IV. Each participant received 1 treatment and was followed for 3 months. Of the 34 participants, 25 (73.5%) reported good to excellent postoperative satisfaction, and there was only a 3% incidence of postin-flammatory hyperpigmentation (PIH) reported.¹

In a Chinese study, Li et al² utilized a fractional ultrapulsed CO₂ laser (ActiveFX, Lumenis Aesthetic)

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for the treatment of facial photoaging. Twenty patients underwent a single treatment session with a single pass on a split-face comparison. They were clinically and quantitatively evaluated with a 3-dimensional in vivo imaging modality. The authors reported a significant decrease in periorbital rhytides (P<.0001), and blinded rater and patient assessments showed consistent improvement.²

A fractional ablative CO₂ laser (Fraxel re:pair, Solta Medical, Inc) was studied by Chan et al³ for skin rejuvenation and acne scar treatment in Asian patients. Nine participants with Fitzpatrick skin types III and IV underwent a single full-face treatment. The reported energy levels ranged from 30 to 70 mJ with coverage percentages ranging from 30% to 45%. Statistically significant improvements were reported in skin texture, skin laxity, rhytides, and acne scars (1 month: skin texture, P=.010; skin laxity, P=.026; rhytides, P=.016; acne scars, P=.042)(3 months: skin texture, P=.017; skin laxity, P=.070; rhytides, P=.008; acne scars, P=.041), but these improvements were rated as mild to moderate. The rate of PIH was 55.5% (5/9) at 1 month posttreatment. Of note, 11.1% (1/9) of participants were reported to have residual PIH at 6 months posttreatment. Although this study only utilized 1 treatment and demonstrated mild to moderate improvement, it highlighted the possibility of residual PIH when treating with these devices.³

Manuskiatti et al 4 also studied a fractional ablative CO_2 laser in Asian patients with atrophic acne scars and reported a 25% to 50% improvement in 12 participants (85%). They also reported mild PIH as the most commonly observed adverse effect in 92% of participants, which was reported to be completely resolved in an average of 5 weeks. 4

Fractional Nonablative Lasers

Multiple studies on the use of fractional nonablative laser technology for acne scarring in the skin of color population have included Asian patients. In a study by Hu et al,⁵

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45 Asian patients with Fitzpatrick skin types III to IV and atrophic facial acne scars were enrolled and split into 2 groups. Group 1 included 32 participants. Before treatment, a water-soluble OpticGuide Blue (Reliant Technologies, Inc) dye was applied to the cheeks and nose. Participants then were treated with a 1550-nm erbium-doped fiber laser (Fraxel SR750, 1st generation, Reliant Technologies, Inc) at a setting of 15 mJ/MTZ (microscopic thermal zone) (682-mm depth; 146-mm width/spot) to 20 mJ/MTZ (754-mm depth; 160-mm width/spot) and a density of 1000 to 2000 MTZ/cm². The average total energy in group 1 was 1.55 kJ. There were 13 participants in group 2. In this group, petrolatum was used as a lubricant for the roller handpiece. These participants were treated with a newer model 1550-nm erbium-doped fiber laser (Fraxel SR1500, 2nd generation, Reliant Technologies, Inc) at a setting of 30 mJ/MTZ (980-mm depth; 180-mm width/spot) to 40 mJ/MTZ (1120-mm depth; 190-mm width/spot) and a density of 392 to 520 MTZ/cm². The average total energy was 1.9 kJ in group 2. A single treatment session using a 15-mm handpiece included 8 passes of the device; 4 passes were done in one direction on the cheeks and nose, and the other 4 were done perpendicular to that direction. Significant improvement in atrophic scars and texture were reported (no P value given) and notably there was no significant difference between the 2 devices. The side effects that were noted, including dryness, roughness, PIH, and a posttreatment acneform eruption, were limited in duration. The mean duration of PIH was 7.5 days.⁵

A study conducted by Mahmoud et al⁶ utilized the same second-generation 1550-nm erbium fractional laser for the treatment of atrophic acne scars; in this study, however, the authors specifically evaluated its use in Fitzpatrick skin types IV to VI and included black patients. Fifteen patients were divided into 2 groups; group 1 was treated at 10 mJ and group 2 at 40 mJ, while the treatment density was kept constant for both groups at 17% coverage (treatment level 6). Five monthly laser sessions were performed. Participants included 4 patients with Fitzpatrick type IV, 10 with type V, and 1 with type VI. There were statistically significant improvements in overall appearance (P < .001), but there was no statistically significant difference between treatment results at 10 and 40 mJ in either acne scarring or overall appearance (P=.20 and P=.54, respectively). Mild erythema was reported in all participants after an average of 3 days posttreatment. Six participants developed moderate PIH; 2 developed symptoms only after the last 2 treatment sessions. The pigmentation score at the end of the treatments was statistically significantly higher when compared with pigmentation before treatment (P=.004); however, the difference in PIH induced by the 10-mJ treatment was not statistically significant compared with the 40-mJ treatment (P=.24). Pain levels were reportedly higher in the 40-mJ group (P=.04), and the pain levels increased with the number of passes. It also was reported that pain level increased with skin type, as participants with Fitzpatrick skin types V and VI reported significantly higher average pain scores (5.66) than those with Fitzpatrick skin type IV (4.16)(P=.01). Pain was highest on the forehead and temples.

Graber et al⁷ also reported the incidence of complications of 961 consecutive 1550-nm erbium-doped laser treatments (Fraxel 1550, Solta Medical, Inc) performed on 422 consecutive patients with Fitzpatrick skin types I to V. They cited that of the 961 treatments, 73 (7.6%) resulted in development of complications. The most frequent complications were acneform eruptions (1.87%), outbreaks of herpes simplex virus (1.77%), and erosions (1.35%). Less frequent side effects included prolonged erythema (0.83%), PIH (0.73%), prolonged edema (0.62%), and dermatitis (0.21%). Impetigo and purpura each occurred once. Although side effects were equally distributed among all patients, PIH was an exception and occurred with increased frequency in patients with darker skin phototypes.⁷

Alexis et al⁸ reported a preliminary analysis of a prospective, split-face, randomized, controlled study of participants with Fitzpatrick skin types IV to VI with acne scarring on the face bilaterally. Each side was treated with the 1550-nm erbium-doped fractional laser (Fraxel 1500, Solta Medical, Inc) at 40 mJ and randomized to receive either a high-density (392 MTZ/cm²; treatment level 7) or low-density (200 MTZ/cm²; treatment level 4) treatment. Both groups showed improvement from baseline, with the higher-density treatment group showing greater improvement according to ratings by a blinded investigator. No increase in PIH was seen in the higher-density treatment group.⁸

Based on our experience, fractional nonablative lasers are effective treatment options for acne scarring in patients with Fitzpatrick skin types IV to VI. When treating patients with skin of color, the following steps should be taken to minimize the risk for hyperpigmentation. A pretreatment regimen of hydroquinone cream 4% should be initiated 2 to 4 weeks prior to the start of treatment. Conservative treatment densities should be utilized, which includes treatment levels ranging from 4 (200 MTZ/cm²) to 8 (456 MTZ/cm²) at 40 mJ of energy. Alexis et al⁸ showed safe and

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effective responses using 40 mJ and treatment level 7 (392 MTZ/cm²) without an increased risk for PIH compared to treatment level 4 (200 MTZ/cm²). When higher energies and treatment densities are utilized with this specific device, a "pawing" method is recommended to deliver 8 passes. This method includes applying 2 consecutive parallel passes in the same direction, allowing for cooling between passes (as opposed to a backtracking method in which 1 pass is applied, then a subsequent pass in the reverse direction along the same linear track). Again, this process helps to ensure a lesser risk for overheating and subsequent excessive thermal damage. It is recommended that adequate cooling with a forced air skin cooling system at a setting of 5 to 6 be maintained throughout the procedure as well as the use of posttreatment ice packs. Sun avoidance is always advised as well as a broad-spectrum sunscreen (sun protection factor 30 or higher) with UVA protection. Patients are advised to resume treatment with the hydroquinone cream 4% twice daily starting 7 days posttreatment. If a patient experiences any posttreatment hyperpigmentation or if more aggressive settings are used (posing a higher risk for PIH), a longer interval between treatments (approximately 4-6 weeks) should be allotted. Although treatment responses are variable, typically 4 treatment sessions are needed to achieve clinically significant improvement.

Patient selection always is paramount; contraindications to fractional therapy include oral retinoid use in the last 12 months, a history of keloids, and recently tanned skin.

Summary

Fractional laser technology has become an increasingly utilized treatment of acne scarring. Although the fractional ablative lasers are appropriate for lighter skin types, fractional nonablative lasers are better suited for

Fitzpatrick skin types IV to VI given the lower risk for posttreatment dyspigmentation. Utilizing conservative treatment parameters, proper patient selection, and pretreatment steps as described above, successful treatment of acne scarring in darker skin phototypes can be achieved. More clinical studies are needed and encouraged, as a growing proportion of patients seeking such treatments have Fitzpatrick skin types IV to VI.

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