Nonablative Fractional Laser Resurfacing for Atrophic and Acne Scarring

Cameron K. Rokhsar, MD

A 38-year-old woman presented with a facial atrophic scar resulting from a shave biopsy. Previous filler treatments had only a temporary effect and were difficult to apply to the sharp-edged scar. Another woman, 54 years of age, presented with long-term facial acne scarring that had improved somewhat after CO_2 laser resurfacing 8 years earlier. The patient did not want further CO_2 laser treatment. In both cases, scarring was significantly improved after 5 or 6 treatments with a nonablative fractional resurfacing laser device. Adverse effects were minimal, and patient satisfaction was high at 1-year follow-up in both cases.

A 38-year-old woman with Fitzpatrick skin type II presented with an isolated atrophic scar on her right cheek observed during a consultation for laser resurfacing options (Figure 1A). The bothersome scar (~1.6 cm×1.2 cm) was the result of a shave biopsy performed by another dermatologist a few years earlier. Previous filler treatments (Restylane®) had only a temporary effect. In addition, the scar had sharp edges secondary to being from a surgical shave biopsy; such a scar is more difficult to fill.

The patient received 6 nonablative fractional resurfacing (FR) treatments with a laser device (Fraxel® SR Laser System) at 2- to 4-week intervals. Treatment settings were aggressive at 20 to 22 mJ pulse energy and 1500 microthermal zones (MTZ)/cm^2 treatment density. Local anesthesia (lidocaine with epinephrine) was given by injection. Adverse effects included mild swelling for 2 days and erythema for 2 to 5 days after each treatment session. Postinflammatory hyperpigmentation was not observed. Clinical evaluators noticed improvement after 6 treatments. The scarred area maintained at least 90% improvement (Figure 1B), and the treated area was nearly indistinguishable from the surrounding skin for at least 1 year after the final treatment.

A 54-year-old woman with a long history of acne scars presented with multiple scars on both cheeks, including boxcar, ice-pick, and rolling scars (Figure 2A). According to the patient's report, CO_2 resurfacing given 8 years earlier had improved scars by 20% to 25%. The patient desired additional improvement and uniformity and did not wish to undergo further CO_2 or alternative ablative laser resurfacing.

Two weeks before FR treatment, the author performed a series of 1- to 2-mm punch excisions on the patient's deeper (ice-pick) scars. Incisions were closed with 7-0 polypropylene sutures. Valcyclovir antiviral medication was prescribed for herpes simplex virus prophylaxis before laser treatments because the patient had a history of cold sores. Sutures were removed 1 week later. A week after suture removal, the patient received the first of 5 FR treatments at 2- to 4-week intervals. Treatment parameters were aggressive at 20 mJ pulse energy and 1000 to 1500 MTZ/cm^2. Topical lidocaine (6%)–tetracaine (6%) was given 1 hour before treatment. Patient-assessed improvement in facial acne scars

Dr. Rokhsar is Assistant Professor of Dermatology, Albert Einstein College of Medicine, New York, New York. He also practices privately in New York.

Dr. Rokhsar has received honoraria from Reliant Technologies for presenting educational workshops.

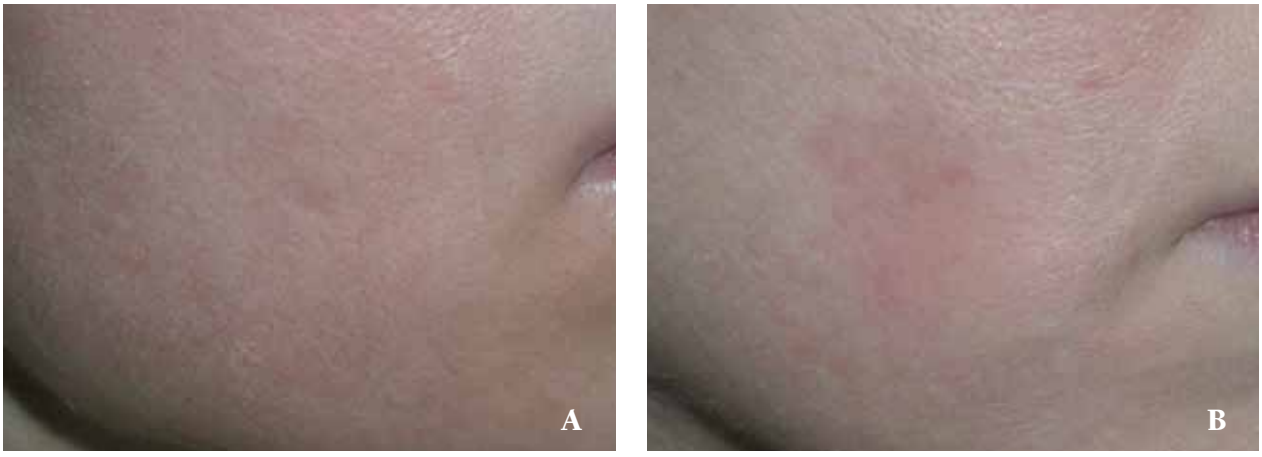

Figure 1. A 38-year-old woman with an isolated atrophic scar on her right cheek (A). The scar was the result of a shave biopsy performed several years earlier. After 6 nonablative fractional resurfacing treatments at 2- to 4-week intervals (B), the treated area has remained 90% improved for at least 1 year. Photographs courtesy of Cameron K. Rokhsar, MD.

post-FR treatment was 50%. Improvement persisted for at least 1 year (Figure 2B). Adverse effects were limited to mild swelling for 2 days and redness for 2 to 5 days after each treatment session. Postinflammatory hyperpigmentation was not observed. The patient remains extremely satisfied with the results.

COMMENT

The use of ablative and nonablative resurfacing procedures to improve atrophic scars has been reviewed.[1] Ablative procedures offer greater clinical improvement than nonablative procedures, but the risk of posttreatment complications is also greater.[1] In the author's opinion, ablative modalities are the treatment of choice in only the most serious cases of scarring.

The first use of an FR laser for the treatment of scars (surgical and acne) was reported by Rokhsar and colleagues.[2] Kim and colleagues[3] also described clinical improvement in acne scars. The clinical observations of Rokhsar and colleagues[2] were supported by histologic evidence of collagen remodeling in the scarred tissue. These investigators noted improvement in skin texture as well. Rokhsar and Fitzpatrick[4] have also treated melasma by FR laser.

Unlike conventional lasers, nonablative fractional laser treatment produces approximately 1 million superheated microscopic columns of thermal damage (MTZs). The total MTZ density in a treatment session is calculated by multiplying the density setting by the total of overlapping passes. For example, 10 passes at low density (125 MTZ/cm^2) correspond to a total density of 1250 MTZ/cm^2.

Because FR treatment does not harm surrounding skin, healing of MTZs is more rapid, and downtime is minimal compared with healing in conventional laser treatment. Multiple sessions are required with FR treatments, as with other nonablative procedures.[5,6] The Fraxel SR

Figure 2. A 54-year-old woman with boxcar, ice-pick, and rolling scars on both cheeks (A). The patient reported that CO_2 laser resurfacing 8 years earlier had improved scars by 20% to 25%. Eighteen months after the final of 5 nonablative fractional resurfacing treatments at 2- to 4-week intervals (B), patient-assessed improvement in scars was 50%. Photographs courtesy of Cameron K. Rokhsar, MD.

Laser System has been approved by the Food and Drug Administration for the treatment of acne scars, surgical scars, pigmented lesions, periorbital rhytides, skin resurfacing, melasma, and soft-tissue coagulation.

In the first case study, the 90% improvement in the atrophic scar is likely due to the patient's skin quality and young age (38 years) as well as the FR treatment. To the author's knowledge, this is the first report of such improvement in an atrophic scar after FR treatment. The second case study shows 50% improvement in acne scars according to the patient's report and clinical evaluation on a quartile-scale grading system. This higher level of acne scar improvement compared with the 20% previously achieved with the CO_2 laser may be due to the 700- to 800-micron penetration depth achieved by FR treatment, twice the depth the author normally attains with CO_2 treatment.

Since ice-pick scars are deeper than 800 microns, these scars were subjected to punch excision before FR treatment. Deep penetration for acne scars is essential to stimulate collagen remodeling. At aggressive energy settings, the FR laser device used in these treatments penetrates approximately 800 microns.

Dermatologists have combined punch excision with CO_2 laser treatment for many years, in most cases performing both procedures in the same treatment session. In these cases, the scars too deep to be removed by the laser were revealed by the raw skin visible after the outer layer was first removed by the laser. These deep visible scars then become the target of punch excision. With FR treatment, the outer layer of skin is not immediately removed, so the depth of penetration necessary to remove ice-pick scars is not known. In this case, punch excision for the deep acne scars was therefore performed 2 weeks before rather than during the first FR treatment session.

In the 2 cases presented, the author used high energy levels and the maximum densities allowed for those energy levels. The most obvious potential pitfall of this approach is making too many passes over a small scar area, causing a nonspecific rise in tissue temperature (bulk heating), leading to blistering or further scarring. To avoid this, the skin was cooled between passes. Whenever treatment density reached approximately 500 MTZ/cm^2 (125 MTZ/cm^2, 4 passes), the author paused 1 to 2 minutes to cool the treated area (Zimmer cooler). When the area felt cool to the touch, treatment was resumed. Mild swelling for 2 to 3 days accompanied by mild erythema for 3 to 5 days can be expected after each treatment session.

A study by Rokhsar and colleagues[7] describing the author's treatment of acne and other scars with FR suggests that 25% to 75% improvement in atrophic and acne scars is possible. The degree of improvement achieved may depend on one's intrinsic ability to remodel collagen and may be related to such factors as age, skin quality, genetics, and smoking behavior.

The results of the 2 cases presented suggest that FR treatment is a safe and effective procedure for the treatment of atrophic and acne scars that requires minimal downtime. Additional studies are necessary to more accurately assess the long-term benefit of this promising modality.

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