

Combined Treatment of Rolling Acne Scars in Ethnic Skin Using Extensive Subcision, Trichloroacetic Acid Peel, and Fractional Ablative Erbium Laser

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BACKGROUND Successful treatment of acne scars in ethnic skin requires procedures that are safe and effective with a low incidence of hyper or hypopigmentation postoperatively.

OBJECTIVE In this study, the safety and efficacy of a combined treatment protocol including tumescent anesthesia, subcision, trichloroacetic acid peel, and fractional erbium laser resurfacing was evaluated.

METHODS This is a retrospective study of 56 patients (22 women and 34 men) with predominantly rolling acne scars and Fitzpatrick skin Types IV–VI who were treated using a combination of tumescent anesthesia, extensive subcision, fractional ablative erbium laser, and a blending 20% trichloroacetic acid (TCA) peel.

RESULTS The mean improvement after a single treatment, assessed by 3 independent evaluators (2 dermatologist and 1 dermatology physician assistant), was 2.52 (SD = 1.04) on a scale of 1 to 4.

CONCLUSION The combination of tumescent anesthesia, extensive subcision, fractional ablative erbium laser resurfacing, and a blending 20% TCA peel (combined procedure) is both safe and effective in the treatment of rolling acne scars in ethnic skin types with acceptable temporary adverse effects.

Acne is prevalent in over 80% of adolescents, and it persists into adulthood in approximately 12% to 14% of cases with psychological and social implications.¹ Acne is common in the ethnic skin. It is controversial whether acne is more severe in ethnic versus Caucasian skin types.² Severe inflammatory acne is the cause of rolling acne scars that are characterized by depressed skin attached to a scar band extending from the dermis into the subcutaneous tissue. This leads to superficial shadowing and a rolling or undulating appearance to the overlying skin. There are numerous therapeutic options for acne scarring. Rolling acne scars treated with subcision and ablative fractional laser have shown improvement.^{1–16}

Several sessions may be required for achievement of optimum results. A single treatment of rolling acne scars in dark skin with any modality results in variable improvement. A previously published study demonstrated the successful combined treatment of rolling acne scars using tumescent anesthesia, 20% trichloroacetic acid, extensive subcision, and

fractional CO₂ laser primarily in lighter skin types.⁸ In this study, a combined procedure was performed in the ethnic skin using a fractional ablative erbium laser. Compared with CO₂ laser, the Er:YAG laser achieves comparable clinical results with a low incidence of postinflammatory hyperpigmentation, an important consideration when treating darker skin types.¹⁶

Methods and Materials

Fifty-six patients (22 women and 34 men) with Fitzpatrick skin Type IV,¹¹ Type V (44), and Type VI¹ and rolling acne scars were treated in the study with a combined treatment that included extensive subcision, a full-face 20% trichloroacetic acid (TCA) peel, and fractional ablative erbium laser.

All patients gave informed consent. The principles of the 1975 Declaration of Helsinki were followed.

Evaluations were performed using photographs taken immediately before the procedure, approximately 1 week and 1 month postoperatively using a Canfield Mirror Suite software (Canfield Scientific, Incorporated, Fairfield, MJ) and a Nikon D-80 camera (Nikon, Konan, Minato-Ku, Tokyo, Japan). Photographs of the patients were reviewed by 3 blinded observers (2 dermatologists and 1 dermatology physician assistant), and improvement was graded on a scale of 1 to 4; 1 = 0% to 25%, 2 = 26% to 50%, 3 = 51% to 75%, and 4 = 76% to 100%.

Adverse effects were recorded at each follow-up visit.

Pretreatment Protocol

Patients were educated during a preoperative visit regarding all aspects of the combined treatment including benefits, risks, alternatives, and the strict protocol for postoperative care. Preoperative prophylaxis included valacyclovir 1 g,

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M.B. Taylor has received discounted equipment from Fotona and is the inventor of the Taylor Liberator acne scar dissector. N. Koron is an employee of Fotona d.o.o. manufacturer of the laser device used in the study.

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Figure 1. The Taylor Liberator (Cosmion, Salt Lake City, UT), a surgical instrument, used for extensive subcision at the dermal–subcutaneous junction.

p.o. once daily and cephalexin 500 mg p.o. twice daily starting the evening before surgery, and continuing for 7 days after the procedure. Topical anesthesia with 6% lidocaine/6% tetracaine/0.04% clobetasol (PCB Gel; University Pharmacy, Salt Lake City, UT) was applied to the face 45 minutes before surgery. Oral promethazine 25 mg was administered 60 minutes before the procedure followed by oxycodone/acetaminophen (10/650 mg) and diazepam 10 to 20 mg given p.o. 30 minutes before infiltrating the scarred areas with tumescent anesthesia. Rolling scars were marked with a surgical marker under harsh tangential lighting to accentuate the appearance of the depressed areas of the rolling scars before anesthesia infiltration.

Procedure Protocol

The tumescent anesthesia solution consisted of a 500 mL bag of sterile saline with 50 mL of 2% lidocaine without epinephrine, 0.5 mL of 1:1,000 epinephrine solution, 10 mL of 8.4% sodium bicarbonate solution, and 0.25 mL of 40 mg/mL triamcinolone acetonide solution. Up to 500 mL of the tumescent anesthesia solution was infiltrated into the rolling scarred areas of the face and upper neck with a 22-gauge spinal needle using an infusion pump.

A full-face 20% TCA peel was performed to an endpoint of a speckled frost. After the TCA peel, additional tumescent anesthesia was added to each scarred area to ensure firm tumescence in the scarred areas to be subcised.

Extensive subcision was performed at the dermal–subcutaneous junction using a surgical instrument (Figure 1) designed by the author. Subcision was performed through a small incision in each sideburn area for scars on the lateral cheeks, submandibular neck, and temples. Forehead scars were subcised through an incision placed a few millimeters superior to the mid-frontal hairline. An ablative fractional erbium laser (SP Dynamis, Fotona, Slovenia) was used to treat the scarred areas. Treatment parameters included using the FS01 handpiece (1 cm fixed-focused fractional handpiece with 81 microbeams in a 1 cm² fixed-focused area). Laser parameters included setting the laser to an R11 handpiece setting with a 7-mm spot size

(although the handpiece used for treatment was the FS01 hand piece), 22.8 J/cm², long-pulse, 1 Hz, turbo 6 (6 stacked pulses) double stacked to deliver 12 pulses per spot, and 5 to 6 intersecting passes. Fractional erbium laser treatment causes bleeding. Sterile saline spray and sterile gauze was used to remove excess blood from the surface of the skin in between passes with the erbium laser. At the end of the fractional erbium laser treatment sterile iced saline gauze was applied to the surface of the skin until all bleeding stopped. Clindamycin 0.5% ointment and Vaniply (Pharmaceutical Specialties, Inc.) were applied to the skin.

Postoperative Care

Postoperative care consisted of cleansing the face 4 times daily using a gentle cleanser (Vanicream Gentle Facial Cleanser—Pharmaceutical Specialties, Inc., Rochester, MN) alternately with 5% benzoyl peroxide wash, tepid water rinsing, blotting with clean paper towel, misting the face with dilute vinegar spray (1 tablespoon/quart of sterile water), application of clindamycin 0.5% in Plastibase (University Pharmacy, Salt Lake City, UT) b.i.d., followed by frequent applications of a bland dimethicone-based healing ointment Vaniply (renamed Vanicream Ointment) for the first week postoperatively.

Approximately 1 week postoperatively, patients were switched to a moisturizing cream (Vanicream cream) applied frequently to maintain good moisturization. At 2 weeks postoperatively, patients were allowed to use makeup and sunblock and were restricted from any direct sun exposure until all erythema had subsided. Patients were instructed to use a shoulder-to-shoulder hat and a UV-A/UV-B physical sunblock with an SPF of 50 or greater postoperatively subjects were advised to practice total sun avoidance until the skin had returned to normal color.

Results

Patient improvement was scored on a scale from 1 to 4. The average improvement score of 3 expert evaluators was 2.52 (SD = 1.04). Forty-one percentage of patients were graded on the Scale 1 to 2, whereas 59% of patients were graded with scores higher than 2. Sixteen percentage of patient received a score of 4. The inter-rater agreement of the blinded evaluators was excellent, 0.972 (confidence interval = 0.885–955), ICC estimates and their 95% confidence intervals were calculated using SPSS statistical package 23 (SPSS Inc., Chicago, IL) based on a mean-rating (k = 3), consistency, 2-way mixed-effects model (Table 1).

TABLE 1. Patient Grading Performed by 3 Independent Evaluators

	Evaluator 1	Evaluator 2	Evaluator 3	ICC (3, k)
Average Grading	2.70	2.24	2.59	0.927
SD	1.06	1.04	1.20	95% confidence interval (0.885–0.955)
No. of patients assessed	56	55	56	

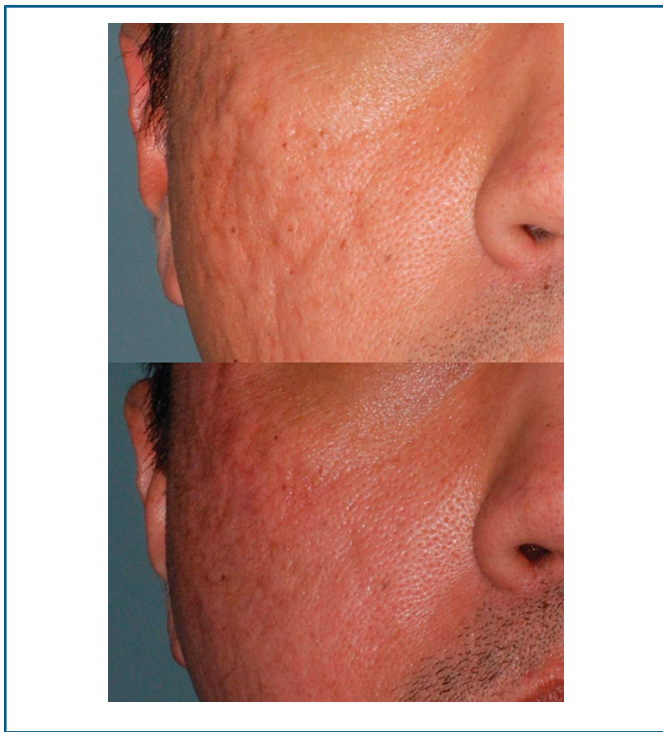


Figure 2. Patient 1—before (above) and 2 1/2 months after (bottom) procedure.

Adverse effects of the procedure included swelling, temporary post-treatment bleeding, serous transudate, erythema, dermal nodules, and hyperpigmentation. There were no cases of permanent pigment alterations. Less than 10% of the patients experienced prolonged erythema or postinflammatory hyperpigmentation, and none of the patients had either beyond 6 months. All adverse effects resolved with and without treatment.

No patient suffered hypertrophic or keloid scarring. Four patients experienced transient dermal thickening (dermal nodules), which resolved spontaneously or after 1 to 2 treatments using a nonablative 1,540 nm laser (Palomar Icon Laser, Cynosure, Westford, MA). There were no



Figure 3. Patient 2—before (left) and 2 months after (right) procedure.



Figure 4. Patient 3—before (left) and 10 months after (right) procedure.

adverse effects related to nerve or blood vessel injury in this study.

Discussion

Tumescent anesthesia is an important step in this combined procedure to expand the subdermal space, provide complete anesthesia, reduce the risk of bleeding, and stabilize the tissue for a safe and effective subcision procedure.

Subcision with full tumescence was performed at a level immediately below the dermal–subcutaneous interface to avoid injury to deeper nerves and vessels.

A combined procedure has been previously shown to be safe and effective⁸ for lighter skin types (Fitzpatrick I–III). In this study, similar results were achieved using a fractional erbium instead of a fractional CO₂ laser (Figure 2).

Combining known beneficial procedures for rolling acne scars in the ethnic skin seems to be synergistic in achieving excellent improvement in a single treatment with acceptable temporary adverse effects. Subcision releases the fibrous bands tethering the skin to the underlying subcutaneous tissue. The TCA peel was used to blend the laser treated and untreated areas of skin. Fractional Er:YAG laser resurfacing promotes skin rejuvenation without significant adverse effects.¹⁶ As seen in the photographs in Figures 3–5, subjects demonstrated an increased skin luminescence presumably because of the 20% TCA peel. In this study, excellent results were achieved after a single procedure, whereas using a single treatment modality may require multiple sessions.¹

The limitations of this study include the varying severities of rolling acne scars and a limited number of patients with Fitzpatrick skin Type VI. Unique in this study compared with a study previously published by the author,⁸ is the observation that there were more men than women in this study. It may be that men are treated less aggressively for acne than women or the inflammatory process in male ethnic skin is more severe. The reason for a higher percentage of men in this study is not known. In this study, full-face laser resurfacing was not performed in any of the patients because of the perceived risk of permanent hyperpigmentation or hypopigmentation.



Figure 5. Patient 4—before (above) and 9 months after (below) procedure.

A minimum follow-up period of only 1 month in many of the patients may not be long enough to assess the final outcome from the treatment protocol, because collagen remodeling and new collagen formation are processes that require even up to 9 months to be complete.¹⁸ Continued follow-up and assessment may have demonstrated even greater improvement (as evident on Figures 2–4). Patients rarely achieve a 100% improvement, so additional treatments with other modalities may still be undertaken if the patient so desires.

Many patients with severe acne scars suffer from significant psychological trauma which often starts in their emotionally tumultuous teenage years. We observed a visible emotional release in some patients who saw significant cosmetic improvement and once again felt acceptably attractive and confident in their appearance. It is satisfying to watch patients regain self-confidence and become more socially interactive because of this acne scar treatment.

Conclusions

A combined treatment of rolling acne scars in Fitzpatrick skin Types IV–VI using tumescent anesthesia, light chemical peeling, extensive subcision, and fractional ablative erbium laser is a highly effective and safe procedure when performed using the protocol described in this study.

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