

Perioral Rejuvenation With Ablative Erbium Resurfacing

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ABSTRACT

Background and Objective: Since the introduction of the scanning full-field erbium laser, misconceptions regarding ablative erbium resurfacing have resulted in its being largely overshadowed by ablative fractional resurfacing. This case report illustrates the appropriateness of full-field erbium ablation for perioral resurfacing.

Methods: A patient with profoundly severe perioral photodamage etched-in lines underwent full-field ablative perioral resurfacing with an erbium laser (Contour TRL, Sciton Inc., Palo Alto, CA) that allows separate control of ablation and coagulation. The pre-procedure consultations included evaluation of the severity of etched-in lines, and discussion of patient goals, expectations, and appropriate treatment options, as well as a review of patient photos and post-treatment care required. The author generally avoids full-field erbium ablation in patients with Fitzpatrick type IV and above. For each of 2 treatment sessions (separated by approximately 4 months), the patient received (12 cc plain 2% lidodaine) sulcus blocks before undergoing 4 passes with the erbium laser at 150 µ ablation, no coagulation, and then some very focal 30 µ ablation to areas of residual lines still visualized through the pinpoint bleeding. Similarly, full-field ablative resurfacing can be very reliable for significant wrinkles and creping in the lower eyelid skin – where often a single treatment of 80 µ ablation, 50 µ coagulation can lead to a nice improvement.

Results: Standardized digital imaging revealed significant improvement in deeply etched rhytides without significant adverse events.

Conclusion: For appropriately selected patients requiring perioral (or periorbital) rejuvenation, full-field ablative erbium resurfacing is safe, efficacious and merits consideration.

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INTRODUCTION

Ablative fractional resurfacing methods commonly used in the perioral area provide nowhere near the efficacy of full-field ablation.[1] The unique absorption characteristics of skin for the 2940 nm erbium wavelength make it more effective than full-field CO_2 ablation while at the same time decreasing associated recovery times, and avoiding the hypopigmentation, and unnatural textural changes commonly seen after full-field CO_2 ablation.[2,3]

During the 1990s, ablative CO_2 laser skin resurfacing largely supplanted chemical peels and dermabrasion because it gave physicians greater control over the depth of injury, and hence results.[4] While full-field CO_2 resurfacing can produce dramatic results, patients had to accept typically at least 2 weeks of healing downtime, during which they experienced erythema (which could last for months), inflammation, and edema. Long-term sequelae often included permanent hypopigmentation, which has been reported to occur in up to 40% of patients at 6 months post-treatment with CO_2.[5]

To avoid these problems, fractional photothermolysis was developed to specifically ablate only a portion of the skin's surface, creating microscopic channels of ablation separated by zones of undamaged tissue.[6] However, the enhanced safety and healing of fractional CO_2 photothermolysis comes at the price of lower efficacy than many patients desire; therefore, often a series of a few or more laser treatment sessions are performed to try to see more significant results with fractional ablative technology.

This report details the advantages of full-field erbium ablation, a modality developed to try to help avoid the pitfalls of fully ablative CO_2 resurfacing while not sacrificing results, specifically in the perioral and periorbital areas.

METHODS

For pre-procedure anesthesia, the author typically uses an infraorbital block for the peri-ocular area, and a lip sulcus ring block for the perioral area (with 2% lidocaine without epinephrine to help visualize the endpoint of pinpoint bleeding).

To treat significant photodamage etched-in lines on the upper lip, the author performs 3 to 4 passes with a dual-mode erbium: yttrium-aluminum-garnet (Er:YAG) tunable resurfacing laser (Contour TRL, Sciton, Inc.) that allows separate tuning of tissue ablation and thermal coagulation (which mediates long-term collagen remodeling). Using a computer scanned 4 mm spot, the laser is tuned to provide 150 µ of ablation, 0 µ coagulation per pass. Pinpoint bleeding that occurs at this juncture after 3-4 passes should be gently wiped off. If etched lines remain, patients may require an additional pass at 150 µ ablation, 0 µ coagulation

to be performed. At that point, any very focal residual etched-in lines are treated with the scanner set for a very small spot size (setting 3) placed directly over the line at 30 µ ablation, 0 µ coagulation, until few or no lines remain.

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In the periocular area, the author typically performs 1 pass at 80 µ ablation, 50 µ coagulation, moving from the infraorbital area to the lateral canthus and extending partially to the upper eyelid (patients must wear stainless steel internal eye shields). More severe creping on the lower eyelid can additionally be treated with focal application of a fractional ablative erbium laser (ProFractional-XC, Sciton, Inc.) using a small scan pattern size, 125 µ ablation, coagulation setting #3 and 22% surface coverage. Just prior to resurfacing the perioral area or the periocular area, we often pre-treat the area with a neuromodulator 7-14 days before the procedure to try to immobilize the area to prevent the underlying musculature from contracting and re-establishing the etched-lines during the healing process. Ten to fourteen days prior to each of the 2 peri-oral resurfacing treatments, 6 units of Onabotulinum toxin A (Botox) was injected into the peri-oral muscle columns to try to decrease movement and imprinting in the treated skin from recurring due to the underlying muscle in the post-laser recovery period.[7]

CASE

FIGURE 1. (Top) 65-year-old female patient pre-treatment, 1 week post-treatment #1, and 2 weeks post-treatment #1. (Bottom) 4 weeks post-treatment #1, 3 months post-treatment #1, and 1 month post-treatment #2. *Photo courtesy of Joel L. Cohen MD, Denver, CO.*

TABLE 1.

Perioral Settings					
		Ablation	Coagulation setting	Laser	Passes
Treatment 1	Upper lip	150 µ	0	Erbium TRL	3
	Lower lip/chin	150 µ	0	Erbium TRL	1
	Blending into cheeks	100 µ	0	Erbium TRL	1
Treatment 2	Upper lip	150 µ	0	Erbium TRL	3
	Lower lip/chin	150 µ	0	Erbium TRL	1

FIGURE 2. 65-year-old female before and after two treatments of full-field erbium resurfacing.

FIGURE 3. 65-year-old female immediate post-treatment. *Photo courtesy of Joel L. Cohen MD, Denver, CO.*

DISCUSSION

Water is the main chromophore in the skin for laser resurfacing. With the erbium (2940 nm) wavelength, water absorbs light between 10 and 18 times more efficiently than with the CO_2 wavelength (10600 nm).[8,9]

Fleming illuminated thermodynamic differences between erbium and CO_2 resurfacing by distinguishing between the ablation "crater" created by the laser, the zone of thermal necrosis (ZTN) left beneath this crater, and the total depth of thermal injury (crater depth plus ZTN).[8]

Because skin absorbs the CO_2 wavelength less efficiently, some of the laser pulse energy used with CO_2 resurfacing mains in the tissues after treatment, destroying collagen and creating a zone of necrotic tissue extending from the base of each column of tissue ablation. Estimates say that after 2 or 3 passes, this ZTN measures approximately 150 µm deep.[10-12] This necrotic tissue triggers the inflammatory response observed after full-field CO_2 ablation. The more necrotic tissue the body must dispose of, the longer the inflammatory response – as well as accompanying erythema and edema – lasts.[8]

In contrast, the erbium laser's higher absorption in water results in near-pure ablation – typical resurfacing fluences of 5-50 J/cm^2 leave virtually no residual laser pulse energy or heat within treated tissues, creating a necrotic zone too shallow to coagulate dermal capillaries.

Unfortunately, the fact that aqueous tissues absorb the erbium wavelength so efficiently has fueled a misconception that erbium lasers can only ablate to shallow depths. First-generation erbium lasers did exactly that because they offered low fluences, typically in the 5 J/cm^2 range. To ensure safer, more reliable energy application, the second generation of erbium lasers offered higher power levels, higher fluences, and computer-guided scanners for precise delivery.

With still higher power levels and more sophisticated scanners, third-generation erbium lasers offer unprecedented flexibility and versatility – from full-field ablation to fractional ablation to single-spot applications. By producing significant ablation quickly without heating tissues, today's full-field erbium laser systems leave no char, thus allowing for much faster healing than full-field CO_2 ablation does. Additionally, the lack of heat created by full-field erbium ablation leads to low rates of persistent erythema and virtually no long-term hypopigmentation.

With CO_2 lasers, ablation and coagulation remain inseparable – these devices cannot deliver one without the other. Conversely, the newer dual-mode Er:YAG TRL module available within the Sciton JOULE platform allows users to control ablation and coagulation independently. This laser combines ablative pulses capable of vaporizing tissue depths from 4 to 200 µ per pass with coagulative pulses, a train of sub-ablative pulses that heat tissue to a desired depth without vaporizing it. As such, the dual-mode erbium laser can emulate any type of ablative laser – from Er:YAG (for ablation without heat shrinkage) to 2790 nm erbium:yttrium-scandium-gallium-garnet (Er:YSGG, for a modest thermal effect) to CO_2 (for more heat and coagulation, less ablation).

The tunable erbium TRL provides up to 200 µ of full-field ablation, plus coagulation up to 100 µ if desired, in a single pass. Far from being limited to superficial resurfacing, full-field erbium resurfacing can outperform fractional CO_2 or full-field CO_2 for deep perioral wrinkles because the CO_2 usually fails to adequately address deeply etched perioral lines. In contrast, deep erbium resurfacing (without coagulation) works well for this indication. In other studies as well, erbium lasers have easily ablated sufficiently to improve deep rhytides.[5,13]

Treating scars requires deeper ablation, using the JOULE ProFractional-XC module, which can be set to fractionally ablate up to 30% of the skin's surface to depths ranging from 25 to 1500 µ per pass. This laser also can provide tunable-depth coagulation at the bottom of the ablated fractionated channel. The lack of char in and around the ablated micro-channels facilitates efficient delivery of drugs or biologic therapies.

Utilization of a 2 mm or 4 mm single-spot handpiece allows the 2940 nm TRL to also function as a surgical laser, providing up to 200 µ of ablation per pass for removing benign lesions such as solar lentigines and seborrheic keratoses. While coagulation at the bottom of CO_2-created ablation areas generally prevents users from seeing when treatment reaches the base of the structure, this is not the case with the erbium laser where degree of pinpoint bleeding and depth visualization of cutaneous structures are the key endpoints.

CONCLUSION

A far cry from early erbium lasers, the dual-mode erbium laser provides the most power and versatility of any available ablative laser, allowing for unparalleled success in treating deep perioral wrinkles.

DISCLOSURES

Dr. Cohen is a speaker and consultant for Sciton.

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