

# Cold-Induced Urticaria After Fractional Carbon Dioxide Laser Resurfacing of the Face

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*The authors have indicated no significant interest with commercial supporters.*

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The high-energy, short-pulse carbon dioxide (CO<sub>2</sub>) laser became one of the mainstays of cosmetic resurfacing after its introduction in the late 1980s. Its popularity is related to its unparalleled ability to treat deep facial rhytides, furrows, fine lines, scars, photodamage, and textural irregularities.<sup>1</sup> Although these findings are impressive, it also came with well-documented risks such as dyspigmentation, erythema, edema, infection, scarring, and significant downtime—from weeks to even months.<sup>1,2</sup>

The introduction of fractional ablative photothermolysis has decreased the side effects associated with CO<sub>2</sub> laser resurfacing by limiting laser damage to microscopically small areas, each surrounded by normal untreated skin. Unlike the traditional CO<sub>2</sub> lasers, fractional lasers treat only a small focus of skin by inducing columns of thermal damage or ablation known as microscopic thermal zones (MTZs). The extremely small beam diameters (100–300 μm) of the fractional lasers create deep penetration of the skin, up to 1,500 μm.<sup>1,3</sup> If a treatment density of 5% is chosen, this would leave 95% of the skin unaffected, promoting rapid reepithelialization and repair by the migration of nearby undamaged cells, with shorter recovery periods and fewer side effects.<sup>1,3</sup>

CO<sub>2</sub> fractional lasers combine the technique of fractional photothermolysis with the CO<sub>2</sub> wave-

length of 10,600 nm at extremely high fluencies, which creates a uniform cylindrical ablative event from the stratum corneum down to the dermis.<sup>4,5</sup> This differs from nonablative fractional techniques, which induce nonablative heating in a similar focal manner, involving the epidermis and dermis down to approximately 1.5 mm at a maximum.<sup>4,6</sup> Fractional ablation induces greater clinical improvement and the lower risk and shorter downtime than with traditional ablative CO<sub>2</sub> laser resurfacing.<sup>2,5,7</sup>

Despite its favorable safety profile, a number of complications have been reported with fractional CO<sub>2</sub> lasers. It is important to recognize complications to improve the safety of these new treatment modalities. We present the first reported case of persistent cold-induced urticaria in a patient treated with a fractional ablative CO<sub>2</sub> laser on the face.

## Case Report

A 44-year-old Caucasian woman with Fitzpatrick skin type II and an unremarkable past medical history was referred to our clinic with a history of cold-induced urticaria of the cheeks. Two years before presentation to our facility, she had undergone resurfacing of her face at an outside facility using a fractional CO<sub>2</sub> laser (Active FX) for cosmetic rejuvenation of rhytides and photo-damage. At the time of treatment, the patient's entire face was

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treated using a single 125-mJ pass and a scan rate of 75 Hz; a double-pass was limited to the region of her upper lip. Computer pattern generator (Ultra Scan CPG) settings were set at shape 3, size 5, and density 3. Pretreatment with a topical anesthetic (unspecified) was applied for 60 minutes. Postoperative care included 30-minute oxygen mist treatments for 3 consecutive days after the procedure, sun protection factor (SPF) 30, and a moisturizer (not specified by medical records). There was no documentation of any use of cold air during the fractional CO<sub>2</sub> treatment.

Two months after the procedure, the patient began to experience intermittent erythematous and edematous plaques on both cheeks (Figure 1) induced by cold weather or chilled drinks and food. There were no other triggers such as new topical treatments, medications, or changes in diet associated with the onset of the urticarial lesions. The lesions remained persistent over 2 years while exhibiting transient behavior, lasting less than a minute at a time, and affecting only the cheeks; other treated areas of her face and untreated areas of the body remained unaffected. There were no associated symptoms with the lesions. Despite two subsequent treatments with intense pulsed light by her outside physician several weeks after the onset of the lesions, she had no resolution of the urticarial episodes. She has no family history of urticaria or other skin disorders and denied having prior laser procedures performed on her face.

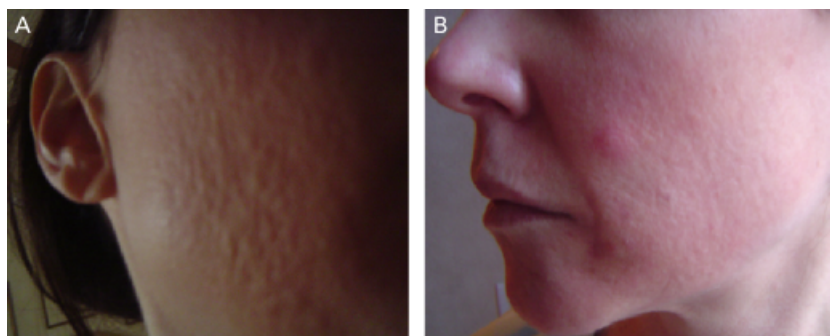
The lesions continued to be persistent for the 2 years before her presentation to our university clinic.

During this time, her symptoms failed to subside with the two trials of intense pulsed light mentioned above, so treatment was aimed at symptom control with antihistamines and trigger avoidance, with no long-term relief obtained in preventing the urticarial episodes. In our clinic, the patient was able to reproduce this phenomenon, and the lesions appeared after exposure to a cold beverage. They lasted less than 1 minute and then completely resolved.

### Discussion

Since their introduction to the field of laser surgery, fractional ablative CO<sub>2</sub> lasers have been used in a myriad of cosmetic and medical applications, including photodamage, dyschromia, rhytides, acne scarring, surgical and traumatic scars, textural abnormalities, melasma, actinic cheilitis, and poikiloderma of Civatte.<sup>6,8-10</sup> Cho and colleagues demonstrated the utility of ablative CO<sub>2</sub> lasers in suppurative diseases such as acne vulgaris, hidradenitis suppurativa, and chronic recurrent furunculosis.<sup>7</sup> Although we do not necessarily understand the mechanism of improvement of active acne, we nevertheless applaud any study that helps to define the long-term benefits of these fractionated lasers.

Reported cases of side effects of fractional CO<sub>2</sub> lasers are limited, in part because of their recent



**Figure 1.** Cold urticaria of the cheeks after fractional ablative carbon dioxide (CO<sub>2</sub>) laser resurfacing of the face. Two months after a full-face single-pass treatment using a fractional CO<sub>2</sub> laser to repair signs of photodamage, the patient experienced sudden and transient episodes of erythematous and edematous bumps on the right (A) and left (B) cheeks upon exposure to cold weather or drinks.

development and good safety profile. Well-documented, short-term, immediate effects of fractionated CO<sub>2</sub> lasers include erythema, edema, oozing, bronzing, crusting, and pinpoint bleeding at sites where high energy was applied.<sup>11</sup> Reepithelialization occurs within 48 hours, and crusting usually subsides at 4 to 5 days. The skin is generally pink and swollen at 5 to 7 days, and most patients can use makeup and return to work at that time. Erythema usually resolves over 2 to 4 weeks or longer and is worse in fair-skinned patients or after aggressive treatments.<sup>4,6</sup>

Less common side effects also include acneiform eruptions, petechiae, ectropion, and herpes simplex virus reactivation.<sup>11,12</sup> Although these side effects can also be associated with traditional CO<sub>2</sub> lasers, their incidence with fractional lasers is much less. Other reported cases of adverse events with fractional CO<sub>2</sub> lasers include hypertrophic scarring and delayed pinpoint purpura in the setting of postoperative ibuprofen use.<sup>2,3,12</sup> Pigmentary changes are common in darker skin types. The risk of postinflammatory hyperpigmentation with fractional ablative lasers is greatest in patients with Fitzpatrick skin types IV to VI but can be easily prevented with the use of hydroquinone 4% cream applied shortly after treatment.<sup>1,13</sup> With conventional CO<sub>2</sub> lasers, delayed-onset permanent hypopigmentation occurs in approximately 25% of cases but to our knowledge has not been seen yet with fractionated ablative lasers.<sup>6</sup>

Although the recovery time for ablative techniques (3–6 days) is less than that associated with traditional CO<sub>2</sub> laser resurfacing (2–3 weeks), it is still greater than that of nonablative procedures, which have a downtime of approximately 1 to 3 days.<sup>1</sup> The rapid reepithelialization associated with fractional CO<sub>2</sub> lasers is associated with fewer infections and less need for lengthy occlusive ointments. This, in turn, decreases the incidence of contact dermatitis and acneiform eruptions, which are common short-term effects of traditional CO<sub>2</sub> lasers. It is believed that side effects, as well as the degree of

improvement, correlate with the depth of dermal vaporization and the density of microablative zones, as well as the expertise of the operator.<sup>9,14</sup>

Overall, fractional CO<sub>2</sub> laser resurfacing is a safe and effective method to achieve photorejuvenation. Hunzeker and colleagues used ablative fractional resurfacing for more than 2,000 cases over a period of 4 years, with no cases of scarring or hypopigmentation.<sup>6</sup> There are no reports associating acquired cold urticaria with the use of lasers on the skin.

We present the first case of cold-induced urticaria after fractional CO<sub>2</sub> laser resurfacing of the face. There are no reports of urticaria or anaphylactic reactions occurring with fractionated devices or other types of lasers. It remains unclear why the urticaria affected only the patient's cheeks and not other areas of the face that were also treated; this may be because of the greater sensitivity of the cheeks or possibly to the greater amount of subcutaneous tissue and vascularity on that portion of the face. Although her outside medical records did not indicate the details of her pre- and postprocedure products, we do not suspect that these factors correlated with the development of her skin lesions.

Despite the distressing nature of these urticarial episodes, no long-term sequelae are anticipated. Although fractional CO<sub>2</sub> lasers remain an efficacious and safe modality for photorejuvenation, their use is new, and thus it is important to recognize potential associated adverse events.

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