

# Treatment of various skin conditions using a high-energy fractionated CO<sub>2</sub> laser with automated scanner

**Nariaki Miyata, M.D.**

**Miyata Plastic Surgery and Skin Clinic, Tokyo, Japan**

## Background

Tissue ablation using resurfacing lasers has been a very common practice in the treatment of photo-damaged skin and acne scars in the 1990's. Non-ablative resurfacing lasers took an important role in treating wrinkles or acne scars in patients for whom downtime was not acceptable, but their main drawback was limited clinical efficacy. There are several wavelength options for ablative resurfacing from 2,790nm to 10,600nm; however, the risk of post-inflammatory hyperpigmentation, hypopigmentation, scarring, or infection has always been a concern when ablating the entire skin's surface.

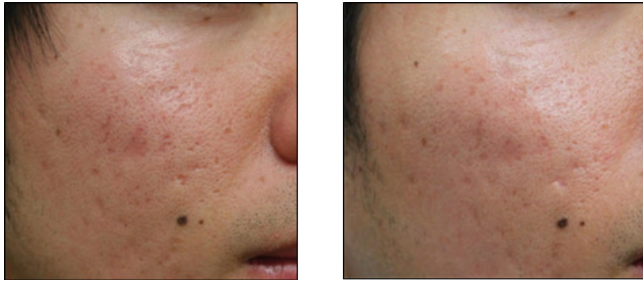
Recently, a new concept based on fractionated laser resurfacing leaves healthy tissue around small ablated zones unaffected, therefore minimizing post treatment complications. This is important especially for Asian skin, as darker skin types are more vulnerable to thermal damage.<sup>1</sup> Efforts to improve fractional ablative laser systems have led to the development of the traditional fractional CO<sub>2</sub> lasers, which can penetrate deeper than the mid-infrared lasers and, therefore, are predicted to lead to better clinical results. A new high power CO<sub>2</sub> laser with a unique scanning technology is intended for procedures requiring the excision, incision, ablation, coagulation and resurfacing of soft tissue in dermatology and plastic surgery. Fractional resurfacing results in deep microscopic ablated zones surrounded by undamaged tissue, allowing for the control of depth and the level of heating around the small spot columns. High-energy CO<sub>2</sub> lasers can also provide superficial tissue ablation with minimal residual heat and sufficient coagulation thus avoiding bleeding. In this report, the efficacy and safety of a high-energy fractionated CO<sub>2</sub> laser for treating rhytides, pigmentation, scarring, and textural irregularities will be discussed.

## Method

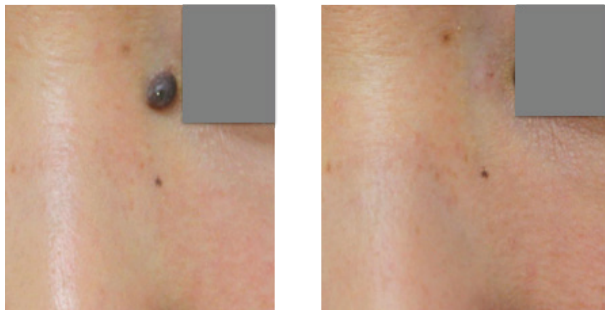
A high power CO<sub>2</sub> laser with digital scanner (CO<sub>2</sub>RE; Syneron Medical) was used. For fractional resurfacing, 4 different operational modes are available (Light, Mid, Deep, and Fusion). Light and Mid modes provide superficial to moderate tissue ablation to treat pigmentation or textural irregularities. Deep mode offers the deepest penetration and is used for the treatment of fine wrinkles or other textural changes. Typical laser setting for Deep mode is 50-60mJ in energy and 4-5% in density. Fusion mode consists of a combination of the dot-like Deep mode and ring-shape Mid mode used particularly for acne scars. Typical laser setting for the Fusion mode is 50mJ in energy per dot with 4-5% density and 60-65mJ in energy per ring with 20-35% density (Figure 1). Treatment is repeated 1-2 months apart, if necessary. For the removal of small benign skin tumors, full resurfacing mode (Classic mode) must be selected. For skin dissection or tissue ablation, the freehand Surgical mode can be selected with optimal on time/off time setting in the repeat pulse mode.

## Results

All patients (skin type III) confirm improvement to some extent. Using the Fusion mode setting, I found the most significant results in acne scar treatment especially after multiple sessions (Figure 1). Associated downtime was 5-14 days depending upon the laser settings used. Post-inflammatory hyperpigmentation was noted in some patients only when the Fusion mode was used, but was resolved in less than 3 months. No case of skin atrophy was found after removal of small melanocytic nevus (Figure 2). All patients tolerated well the fractional resurfacing modes with the use of topical anesthesia and full resurfacing mode with local anesthesia administered prior to the treatment.



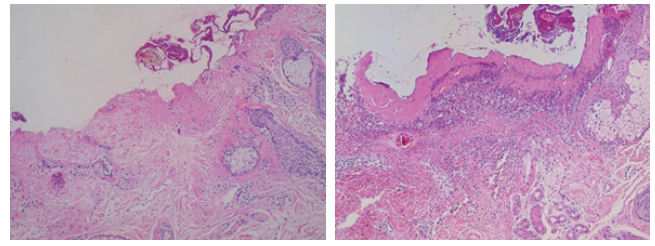
**Figure 1:** Acne scar patient before treatment (left) and after 2 treatments (right). Significant improvement was noted using Fusion mode. Fusion mode settings used were 50mJ in energy per dot with 5% density and 60-65mJ in energy per ring with 20% density.



**Figure 2:** Melanocytic nevus before treatment (left) and after 1 treatment (right). Complete clearance was noted without skin atrophy using the Classic mode. Classic mode settings used were 8mJ in energy with a 2mm spot size.

## Discussion

In this report, all patients were Asian skin types and the author did not see any post-inflammatory hyper-pigmentation using Deep mode. According to a previous report, Manuskiatti found high incidences of mild post-inflammatory hyperpigmentation in 92% of the subjects using a different CO<sub>2</sub> laser device.<sup>2</sup> In that report, subjects' skin types were all skin type IV, and the laser setting used was comparatively high (up to 105mJ in energy and 9.6% coverage). Using Fusion mode, however, relatively longer downtime may occur and the risk of prolonged erythema and PIH may increase, according to my experience. For surgical-like full ablation mode, histopathological findings show precise tissue ablation resulting in faster wound healing process after the treatment (Figure 3).



**Figure 3:** Histopathological image was taken immediately after ablation (left) and 24 hours after (right). Laser setting is 9mJ in energy with 1.5mm spot size in Classic mode.

## Conclusion

Fractional resurfacing using the high-energy fractionated CO<sub>2</sub> laser, CO<sub>2</sub>RE, was proven to be safe and effective in the treatment of photodamaged skin and acne scars. In addition, full resurfacing mode, Classic mode, can offer precise ablation of small skin tumors without skin atrophy.

## Reference

1. Manstein E, Herron GS, Sink RK et al. Fractional photothermolysis: a new concept for cutaneous remodeling using microscopic patterns of thermal injury. *Lasers Surg Med* 2004; 34:426-38.
2. Manuskiatti W, Triwongwanat D, Varothai S et al. Efficacy and safety of a carbon-dioxide ablative fractional resurfacing device for treatment of atrophic acne scars in Asians. *J Am Acad Dermatol* 2010; 63:274-83.