

Safe and Effective One-Session Fractional Skin Resurfacing Using a Carbon Dioxide Laser Device in Super-Pulse Mode: A Clinical and Histologic Study

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Abstract Carbon dioxide (CO₂) laser ablative fractional resurfacing produces skin damage, with removal of the epidermis and variable portions of the dermis as well as associated residual heating, resulting in new collagen formation and skin tightening. The nonresurfaced epidermis helps tissue to heal rapidly, with short-term postoperative erythema. The results for 40 patients (8 men and 32 women) after a single session of a fractional CO₂ resurfacing mode were studied. The treatments included resurfacing of the full face, periorcular upper lip, and residual acne scars. The patients had skin prototypes 2 to 4 and wrinkle degrees 1 to 3. The histologic effects, efficacy, and treatment safety in various clinical conditions and for different phototypes are discussed. The CO₂ laser for fractional treatment is used in super-pulse mode. The beam is split by a lens into several microbeams, and super-pulse repetition is limited by the pulse width. The laser needs a power adaptation to meet the set fluence per microbeam. Laser pulsing can operate repeatedly on the same spot or be moved randomly over the skin, using several passes to achieve a desired residual thermal effect. Low, medium, and high settings are preprogrammed in the device, and they indicate the strength of resurfacing. A single treatment was given with the patient under topical anesthesia. However, the anesthesia was injected on areas of scar

tissue. Medium settings (2 Hz, 30 W, 60 mJ) were used, and two passes were made for dark skins and degree 1 wrinkles. High settings (2 Hz, 60 W, 120 mJ) were used, and three passes were made for degree 3 wrinkles and scar tissue. Postoperatively, resurfaced areas were treated with an ointment of gentamycin, Retinol Palmitate, and DL-methionine (Novartis; Farmaceutics, S.A., Barcelona, Spain). Once epithelialization was achieved, antipigment and sun protection agents were recommended. Evaluations were performed 15 days and 2 months after treatment by both patients and clinicians. Treatment improved wrinkle aspect and scar condition, and no patient reported adverse effects or complications, irrespective of skin type, except for plaques of erythema in areas that received extra laser passes, which were not seen at the 2-month assessment. The results evaluated by clinicians were very much in correlation with those of patients. Immediately after treatment, vaporization was produced by stacked pulses, with clear ablation and collateral heat coagulation. An increased number of random pulses removed more epidermis, and with denser pulses per area, a thermal deposit was noted histologically. At 2 months, a thicker, multicellular epidermis and an evident increase in collagen were observed. Fractional CO₂ laser permits a variety of resurfacing settings that obtain safe, effective skin rejuvenation and correct scar tissue in a single treatment.

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Skin rejuvenation

Skin resurfacing is a prevalent and acceptable means of inducing an improvement in the skin's appearance. Carbon dioxide (CO₂) laser resurfacing produces controlled skin