FRACTIONAL RF WITH MICRONEEDLING TO TREAT ACNE AND ACNE SCARS

Ashraf Badawi, Belkais Marwan, and Soheila Tirzan discuss the use of this procedure, its mechanism of action, efficacy, and treatment outcomes for acne scars and active acne.

ABSTRACT
The demand for safe and effective rejuvenation technology has increased tremendously over the last few years. The reasons behind this may be the increased awareness of the different products and procedures used for rejuvenation. A large part of this increased awareness can be credited to the marketing activities of service providers and the manufacturers of products. A significant challenge and a large part of the rejuvenation market are acne scars. Proper management of active acne to prevent scar formation, as well as therapeutic modalities to improve existing scars, are a big concern for aesthetic service providers. One of the new methods of rejuvenation, which gathers both the efficacy and relative safety, is a technology involving fractional radiofrequency and microneedling.

In 2008, the FDA approved fractional RF for skin rejuvenation which can achieve fractional and contiguous treatment patterns while sparing the epidermis and key adnexal structures that contribute to rapid healing. In addition to skin rejuvenation, fractional RF has been reported to induce textural improvement with regard to skin smoothness and tightness.

Fractional radiofrequency with microneedling in acne scars

Acne can result in a variety of subtypes of scars, depending on the depth and severity of the inciting inflammation. Atrophic scarring limited to the epidermis and papillary dermis results in superficial macular scarring which may be erythematous or hyperpigmented. Involvement of the reticular dermis can result in ice-pick scars, boxcar scars, rolling...

KEYWORDS
fractional radiofrequency, microneedling, acne vulgaris, acne scars
> scars, hypertrophic scars, and keloids. Ice-pick scars have a narrow aperture and penetrate deep into the dermis or subcutaneous tissue. Boxcar scars have sharp cliff-drop-like vertical margins and a larger, flatter base. Boxcar scars can be further subdivided into superficial and deep boxcar scars. Rolling scars occur from dermal tethering to the underlying superficial musculoaponeurotic system, with the appearance of gently sloping edges.

Chemical peels, subcision, augmentation using dermal fillers, ablative and non-ablative lasers, dermabrasion, dermal grafting, punch excision, punch elevation, punch grafting, and surgical excision are all available for the treatment of acne scars. The following lasers have all been applied for acne scars:
- Pulsed dye laser
- Non-ablative 1064 nm Nd:YAG
- Non-fractionated 1320 nm Nd:YAG
- Non-fractionated 1450 nm diode
- Erbium-doped lasers 0.94/1.55/1.55/1.55 nm
- Fractionated 1320/1450 nm
- Fractionated 1320 nm Er:YAG laser
- Fractionated 1352 nm CO2 laser

The standard treatment for acne scarring is traditional, full-face CO2 or Er:YAG laser resurfacing, with studies showing more favourable results with CO2 lasers. The non-fractionated, high-energy pulsed CO2 laser improves acne scars by an average of 80% with a single treatment. Although ablative laser resurfacing produces the most dramatic improvement in acne scarring and texture, there is a significant risk of dyspigmentation, scarring, infection, and prolonged healing.

The first publication on fractionated laser resurfacing was by Marin et al. in 2004. Fractional photothermolysis had the advantage over ablative laser resurfacing owing to a shorter recovery, lack of general anesthesia, and lower risk of scarring, dyspigmentation, and infection. Although originally described for rejuvenation of the ageing face, this concept was soon applied to acne scarring. In a small cohort of skin types IV-VI, 80% of patients had a minimum of 50-70% improvement in acne scarring after five treatments over a 1-month period using the fractionated 1550 nm erbium-doped laser.

A meta-analysis reported that acne scars improved at least 50% with four to five treatments per month using a fractionated non-ablative laser. After the development of fractionated non-ablative lasers, fractionated ablative lasers emerged. Cho et al. found an average of 60% improvement after a single treatment with a fractionated CO2 laser, and in a study by Chudasama et al., two to three treatments with a fractionated CO2 laser improved acne scarring by an average of 66.8%.

Peterson et al. reported improvements in acne scarring and texture of more than 60% with five treatments per month using a combination of fractionated laser with RF device. The improvement of scarring is comparable with those of other non-ablative fractionated lasers. Rolling scars and boxcar scars improved more dramatically than ice-pick scars.

**Advantages of MFR**

One of the greatest advantages of MFR is its application in all skin types. Patients with Fitzpatrick skin type IV-VI, which makes up 75% of the Caucasian population, are prime candidates for this treatment. MFR is a subjectively well-tolerated treatment with minimal downtime. There is also less risk of scarring, dyspigmentation, infection, and prolonged healing.
Types IV-VI have limited options for the improvement of acne scarring because of a greater incidence of post-inflammatory hypopigmentation (PIH), which most commonly appears 3-4 weeks after laser surgery. Non-fractionated CO₂ and Er:YAG lasers are indicated in skin types I-IV, but up to 36% of patients (primarily skin types III and IV) can have PIH after non-fractionated ablative lasers. The incidence of PIH varies greatly after laser treatment, ranging from 0-40% with non-ablative fractionated lasers, and 0-15-4% with ablative fractionated lasers. Differences in the energies, densities, number of treatments, number of passes, and Fitzpatrick skin types between studies influence this large variance in PIH.

All currently available fractionated lasers must be used conservatively in skin types IV and V, and are generally not advisable in skin type VI unless in the hands of an advanced laser surgeon. It is advisable to decrease the fluence, density, and number of passes when treating darker skin types. The epidermis sustains two-to-four times as much damage with other available non-ablative and ablative fractionated lasers compared with fractional RF, leading to a higher incidence of dyspigmentation. No subjects treated with fractional RF displayed PIH.

In another study, there was a significant improvement in investigator-rated acne scar, texture, and pigmentation. Patient satisfaction scores did not improve, although overall patient improvement scores did. It was speculated that the patients had higher expectations of the device on study entry. Although patients showed improvement, these high expectations were not met, as reflected in the lack of significant improvement in patient satisfaction scores. The fractionated bipolar RF device was better tolerated than the fractionated laser with RF device. Five treatments were administered every 30 days, but more treatment sessions may be required to produce more substantial clinical and patient-perceived results. Treatments every 5-6 months may be needed to achieve patient satisfaction in cases of acne scarring.

**Fractional radiofrequency with microneedling in active acne**

MRF systems deliver energy directly to the dermis via a number of microneedle electrodes and create a microthermal zone (MTZ) providing untouched areas between MTZs. With the advantages of the fractional energy delivery system of MRF devices—
References


**Conclusions**

Treatment of acne and post-acne scars is considered a significant challenge in the field of aesthetic services in general, and in patients with darker skin in particular. The technology of micro-needling with fractional RF might be a good step forward owing to efficacy and safety of the procedure in all skin types. Different mechanisms of action of this technology have been proven, such as new collagen synthesis shown in the histopathological studies mentioned earlier (others are still in the phase of speculation). However, a number of studies are ongoing to clarify further mechanisms of action, as well as further indications.

The authors are currently studying the effect of MRF in stretch marks alone and in combination with topical hyaluronic acid to evaluate its efficacy. In addition, the authors are conducting a study on enlarged pores to evaluate the efficacy of MRF. Both studies have had very good initial outcomes. The authors are now in the follow-up phase to evaluate the long-term efficacy of MRF.

**Declaration of Interest**

Name

**Figures 1-3 © Ashraf Badawi**