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INVITED REVIEW

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Radiofrequency microneedling for acne, acne scars, and more

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Email: katkesty@gmail.com**Disclosure:** The views expressed in the submitted article belong to the authors and are not an official position of the institution or funder. Subjects signed consents allowing their photographs to be used.

Abstract

Background: We have employed radiofrequency microneedling devices in our practice with favorable patient results. Rejuvenation, acne, acne scars, and skin laxity are the most common concerns that we treat with radiofrequency microneedling devices. Patient selection, preparation, and post-procedure follow up can improve clinical outcomes and safety while increasing patient satisfaction.**Aims:** The purpose of this review is to highlight radiofrequency microneedling methods and present our clinical experience.**Materials and Methods:** Articles from PubMed are highlighted and our clinical experience is presented.**Results:** Radiofrequency microneedling is a safe and effective treatment for acne scars, hyperhidrosis, rosacea, skin laxity and skin rejuvenation and is a key device for any cosmetic dermatologist.**Discussion:** Dermatologists should consider adding radiofrequency microneedling devices to their treatments offered to patients for a variety of indications.

KEYWORDS

acne, microneedling, radiofrequency, rejuvenation, scar

1 | INTRODUCTION TO RADIOFREQUENCY MICRONEEDLING (RFM)

Microneedling technology, also known as collagen induction therapy, has been used by physicians since 1995. Microneedling involves the process of puncturing the skin with sterile microneedles.¹⁻³ Trauma to the dermis induces neocollagenesis through induction of the wound healing cascade, including growth factors such as transforming growth factor- α (TGF- α), TGF- β , and platelet-derived growth factor.⁴ Radiofrequency microneedling (RFM) is a type of microneedling in which each needle releases a radiofrequency current and creates small zones of neocollagenesis that are termed "radiofrequency thermal zones."⁵ A pilot study of a 35 W bipolar RFM device was published in 2009 and since then many new devices have proven to be safe and effective methods of rejuvenation.⁵ In one study of rats from Korea, the addition of radiofrequency to microneedling increased collagen type 1 and 3 and elastic fibers.⁶

According to a 2019 study done by the American Society for Dermatologic Surgery, 71% of consumers are bothered by skin texture and/or discoloration and 70% are concerned about lines and wrinkles around the eyes.⁷ Patient selection is important when considering a RFM device to reach the desired clinical outcome. Ideal patients are from 30 to 60 years old with mild to moderate skin laxity, rhytides, acne scars, or other indications for RFM devices as discussed below. Realistic expectations from treatment with RFM devices is paramount. The gold standard for moderate facial aging is still a facelift, however, considerable rejuvenation can be achieved with RFM without the surgical risk and downtime associated with traditional facelifts.

RFM devices come with either coated or uncoated (also described as insulated/noninsulated) microneedling tips. The thermal zones created with the coated tips do not affect the epidermis and are thus considered safer in darker skin types.⁸

Preprocedure photographs are necessary to obtain an accurate baseline status of the condition to be treated. All makeup must be

removed before photographs. Photographs with frontal and both side views at an angle are necessary to evaluate improvement in skin laxity, rhytides, and overall appearance. We also recommend photographs at every visit as RFM devices typically require more than one session and the full results are not often appreciated until months after the last treatment.

Topical regimens both pre- and postprocedure are worth considering and tailoring to each patients' individual needs. Several topical regimens have been studied, including a topical tri- and hexapeptide serum that was applied to the treated region for 2 weeks before and 7 days after RFM treatment. Gold et al⁹ concluded that this topical regimen enhanced the RFM device's results. Another study by the same group evaluated an antiaging multi-ingredient lotion used twice daily for 2 weeks prior and 4 weeks post one RFM treatment in 15 patients. This regimen led to significant improvement in skin radiance, texture, tone, smoothness, redness, and overall appearance.¹⁰ Another option is to apply platelet-rich plasma after an RFM treatment. This method of transepidermal drug delivery has enhanced our results after RFM treatments. Patients also report that the cooling effect of applying the platelet-rich plasma and then letting it evaporate is soothing after this procedure.

Other considerations before an RFM procedure include administering an antiviral medication, for example, valacyclovir, if appropriate. Oral antibiotics are also considered, especially in patients with active acne lesions. Proper cleansing of the skin, by removing all makeup then cleaning with 70% alcohol or chlorhexidine is necessary before any RFM procedure.

Anesthesia with topicals is a safe and effective method, including our preferred benzocaine 20%/lidocaine 6%/tetracaine 4%. Facial nerve blocks with lidocaine into the infraorbital, mental, and supraorbital/supratrochlear nerves can also safely be done to increase patient comfort during RFM procedures. Lidocaine with epinephrine can also be directly injected into any areas that are of increased sensitivity to the patient to make RFM procedures more tolerable.

For the purpose of this review, we will focus on RFM devices with a depth of penetration of 0.5 mm and deeper.

2 | DEVICES IN THE MARKET

There are many RFM devices in the market. Discussed here are those among the most widely used in the United States and have the capacity to penetrate to depths of 0.5 mm and deeper. The Genius by Lutronic (Boston, MA) is a device with 49 bipolar needles (in a 7 × 7 array) with a customizable depth of 1 to 3.5 mm and three intensity settings (Figure 1). This device also has an impedance monitoring system and uses a motor for the insertion of the coated needles. The Profound RFM device by Syneron Candela (MA) has two sets of bipolar needles for both dermal and subcutaneous penetration. The dermal set consists of five pairs of needles with 1- to 2-mm depth. The subcutaneous needles are seven pairs of 2.9 to 5.8 mm in depth. The Vivace by Aesthetics Biomedical/Cartesse (AZ) has 36 needles which are either coated and uncoated with depths between 0.5 and 3.5 mm and variable pulse durations between 100 and 800ms. The INTRAcel by Perigree (CA) has 49 coated needles



FIGURE 1 7 × 7 Arrays of needles of the Genius by Lutronic radiofrequency microneedling device

that range from 0 to 4 mm in depth. This device can function as a unipolar or bipolar device with a 1 MHz frequency and an impedance monitoring system to optimize energy delivery. The Fractora by InMode (CA) has a 24 needle tip with coated needles and a 24 or 60 tip of uncoated needles (Figure 2). The Fractora has options for depth from 0.6 to 3 mm and a frequency of 1 MHz. The Secret RF by Cutera (CA) has 0.5 to 3.5 mm depths and both coated and uncoated needle options. Tips have either 25 or 64 (coated only) needles.

3 | RFM FOR ACNE AND ACNE SCARS

RFM devices offer a safe and effective treatment for acne and acne scars in all skin types (Figures 3-5). This procedure offers minimal downtime compared to fully ablative treatments for acne scars although typically 2+ RFM treatments are necessary for full results. In multiple trials, RFM has been shown to help with active acne lesions and acne scars. RFM has also been effective at decreasing sebum production.¹¹⁻¹³ One study of 18 Korean patients demonstrated that RFM helped with acne scars in this subset of patients.¹⁴ A meta-analysis of six studies of RFM in Asian



FIGURE 2 Fractora by InMode handpiece (above) and three tip options: 60 uncoated tips, 24 uncoated tips, and 24 coated tips



FIGURE 3 A 22-year-old male with acne and scars due to acne after two sessions of radiofrequency microneedling with 24 pins to 3 mm in depth with improvement in acne and acne scars



FIGURE 4 A 35-year-old patient after four sessions of radiofrequency microneedling to a depth of 3 mm with improved appearance of stretch marks and skin laxity



FIGURE 5 A 26-year-old patient with improved acne and acne scarring after two sessions of microneedling with radiofrequency

patients showed that RFM procedures were superior to fractionated lasers for acne scars in Asian patients.¹⁵ One study of 40 patients demonstrated that the improvement in acne scars after three sessions of either RFM or 1550 Er:Glass was not statistically significant.¹⁶ Although coated needles are generally used for darker skin types, one study of 19 patients with Fitzpatrick skin types III-V was done and involved three sessions with an RFM device with uncoated needles. One hundred percent of patients' acne scars were improved 3 months after treatment without any reported postinflammatory dyspigmentation.¹⁷ Darker skin types IV-V may benefit from devices with depth less than 0.5 mm, as demonstrated by one study done on 20 Indian patients with Fitzpatrick skin types IV-V. These patients received one to three treatments with an RFM device with a maximum depth of 400 μ m. Acne scars improved with this device.¹⁸ Another study of 31 patients with Fitzpatrick skin types III-V showed significant improvement in acne scars after four treatments with an RFM device.¹⁹

4 | RFM FOR FACIAL REJUVENATION

RFM devices offer patients a safe and effective method for facial rejuvenation with minimal downtime. At our practice, we often combine a series of RFM treatments with other targeted rejuvenation procedures, including intense-pulsed light. One study that highlights this combined method examined RFM and a 1927 thulium fractionated laser for synergistic skin rejuvenation in four Korean females with favorable results.²⁰ Another study examined RFM in 15 female Asian patients with significant rejuvenation. Half of the patients had a postprocedure topical application of a medium of growth factors and cytokines which improved the results of the RFM procedure.²¹ We routinely use the coated tips on darker Fitzpatrick skin types. This reduces the risk of postinflammatory hyperpigmentation as the radiofrequency energy stays below the epidermis and does not affect the basal layer which includes melanocytes.

Skin laxity has also been shown to improve after treatment with RFM devices (Figure 6). One group of plastic surgeons presented their views in a supplement to the *Aesthetic Surgery Journal*. They combined RFM with bipolar radiofrequency devices for skin laxity improvement both of the face and body.²² One area of the face that this group presents the results of a treatment plan for is the jowls. This is notoriously difficult to treat yet the common area of concern



FIGURE 6 A 31-year-old patient with improved striae and skin laxity after two sessions of microneedling with radiofrequency

for patients. Another group presented a case report of two sessions of RFM improving skin laxity on the thighs of a 39-year-old woman after significant weight loss.²³ One study examined 12 patients with photoaging of the upper chest who underwent three sessions with an RFM device 2 mm in depth. Not only did the décolletage area undergo significant improvement in wrinkles and skin texture, but skin laxity also significantly improved.²⁴ Another study of 14 patients combined three platforms on one device: RFM, nonablative radiofrequency, and fractional skin resurfacing. This led to significant improvement in skin laxity, skin texture, and facial rhytides.²⁵

5 | OTHER APPLICATIONS OF RFM

One exciting new area of RFM device use is hyperhidrosis. One study examined 20 patients with primary axillary hyperhidrosis treated with two RFM sessions 4 weeks apart.²⁶ A biopsy from three patients showed a decrease in the number of eccrine and apocrine glands in the treated area. There was also a significant decrease in patients' sweat severity scale. Another study with an RFM device included 45 patients at three clinics in the United States. All of the patients experienced a 75% to 80% improvement in hyperhidrosis after three treatments with multiple passes with depths of 2.5 to 3.5 mm.¹⁰

Large pores are a common patient concern. In one study of 30 patients, pore size decreased in 70% of patients after one RFM session.²⁷

Rosacea is a very common dermatologic disease that affects as many as 415 million people worldwide.²⁸ In one study, 25 patients with papulopustular rosacea treated with three sessions of RFM, PDL and 10 mg isotretinoin daily for 8 weeks experienced a decrease in papules/pustules, redness, and noted overall improvement by both subjects and investigators.²⁹

Another condition reported to be helped by RFM devices is nevus comedonicus. These are traditionally treated by oral retinoids, ablative lasers, dermabrasion, and comedone extraction. In this case report, an RFM device 2 to 2.5 mm in depth was used in four sessions and led to significant improvement in the nevus comedonicus.³⁰

Cellulite, skin laxity, and striae are other conditions that have been successfully treated with RFM (Figure 6). One study of 10 patients had their buttocks treated with five pairs of microneedles (6-mm deep) with bipolar radiofrequency. At 1 month after treatment, all subjects had an improvement in their skin laxity and cellulite as measured by both treating physicians and subjects.³¹ One study of 50 subjects treated with bipolar radiofrequency delivered via seven pairs of microneedles 3.9 to 5.8 mm in depth showed improvement of posterolateral thigh cellulite in 93% of patients at 6 months. Also, 75% of patients were satisfied with this treatment at 6 months.³²

6 | COMPLICATIONS

As with any surgical procedure, there are risks that must be discussed with patients before any cosmetic procedure. Expected side effects of RFM include temporary erythema, edema, and itching.

These last for a few hours after treatment and can be treated with ice, antihistamines, and prednisone as needed. As mentioned previously, we frequently apply platelet-rich plasma after RFM and patients tend to find that this alleviates any discomfort from the expected side effects. There has been one case report of temporary greater auricular nerve paresthesia after RFM.³³ There has also been a report of a rosacea flare after three RFM sessions for facial rejuvenation. The patient was treated with topical metronidazole and ND:Yag laser and the rosacea improved.³⁴ Improved safety in darker skin tones is discussed elsewhere in this chapter, although there is an increased risk of postinflammatory dyspigmentation after RFM procedures in this patient population.¹⁹

7 | CONCLUSION

We have employed RFM devices in our practice with favorable patient results. Rejuvenation, acne, acne scars, and skin laxity are the most common concerns that we treat with RFM devices. We frequently enhance the effect of these devices by applying a layer of platelet-rich plasma after each treatment although other compounds have been studied and proven beneficial. Patient selection, preparation, and post-procedure follow-up can improve clinical outcomes and safety while increasing patient satisfaction. RFM is a safe and effective treatment for acne scars, hyperhidrosis, rosacea, skin laxity, and skin rejuvenation and is a key device for any cosmetic dermatologist.

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CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

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