Advances in Cosmetic Surgery 4 (2021) 25–28
ADVANCES IN COSMETIC SURGERY

Radiofrequency for Fat Removal and Skin Tightening of the Body

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KEYWORDS
• Radiofrequency • Bipolar radiofrequency • Minimally invasive • Aesthetic technology • Body
• Soft tissue tightening • Skin tightening • Soft tissue remodeling

KEY POINTS

- Significant advancements in minimally invasive body contouring have been made over the past 10 years.
- Increasingly, patients are seeking minimally invasive methods to tighten skin and remodel adipose tissue. A large treatment gap exists among 3 types of patients: the younger demographic, who desire soft tissue tightening without traditional operations, scars, and downtime; patients with soft tissue laxity who are not "severe enough" to justify an excisional procedure, but not "mild enough" to rely on liposuction with soft tissue contraction alone; and those with recurrent laxity who already underwent traditional excisional procedure. In these populations, aesthetic surgeons risk undertreating or overtreating with traditional methods.
- Through impedance of electromagnetic current, radiofrequency (RF) waves lead to differential heating across distinct tissue types consistent with Ohm's law (energy = current^2 × impedance × time). For example, adipose tissue is less conductive than water (higher impedance) and leads to the generation of higher temperatures than muscle. Once soft tissue temperatures reach 50°C and skin surface reaches 40°C to 42°C, there is a trigger to induce neocollagenesis, angiogenesis, and elastogenesis. Through different applications of RF energy (eg, monopolar, bipolar, multipolar, and RF microneedling), subdermal adipose remodeling and long-term soft tissue contraction can be safely and consistently achieved.
- The procedure may be performed safely and effectively under local anesthesia with an excellent safety profile and return to daily activities within 24 to 36 hours.

Video content accompanies this article at http://www.advancesincosmeticsurgery.com.

PREOPERATIVE STEPS

Analysis

- A thorough history and physical examination should be performed with a focus on previous procedures, significant weight changes, pregnancy status, and a preoperative analysis to identify areas of subcutaneous excess, dermal striae, and tissue laxity [1–5].
- Areas of volume excess and areas of significant laxity are marked preoperatively with the patient in the standing position with the target areas in the dependent position to facilitate intraoperative accuracy.
- For upper extremities, the forearm is flexed at 90° and the humerus is parallel to the floor to demonstrate areas of maximal laxity in the upper posterior arm.

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https://doi.org/10.1016/j.yacs.2021.02.001
2542-4327/21/

- Preoperative photography is essential for postprocedural analysis.
- When indicated, laboratory values, including complete blood count, chemistry profile, coagulation tests, and urine pregnancy tests in women of childbearing age, are obtained.
- Thirty to 45 minutes preoperatively, the patient is given oral medications, including an antibiotic, sedative, and pain reliever.

BOX 1
Modified Tumescent Fluid (0.1% Lidocaine Concentration)

- 1000 mL normal saline
- 1000 mg lidocaine (50 mL of 2% plain lidocaine)
- 10 mL sodium bicarbonate
- 1.5 mL 1:1000 concentration epinephrine

OPERATIVE STEPS

1. Tumescent infiltration
   - Following standard preparation and drape, the previously identified access points are injected with 1% lidocaine with epinephrine.
   - Access incision is made with either a 14-gauge needle or a number 11 blade scalpel.
   - Standard infiltration cannula is used to deliver the tumescent fluid (Box 1) into the deep subcutaneous space at a low speed.
   - Once the deep and intermediate subcutaneous fat spaces are adequately infiltrated, the cannula is placed into the superficial fat space in order to obtain complete analgesia of all layers with the most densely innervated subdermal space injected last.
   - It is important to tumesce at least 1 to 2 cm beyond the marked areas to achieve full analgesia in the treatment zone.
   - In the awake patient, slow infiltration speed will achieve a comfortable state for the patient because the rate of distension correlates with discomfort.
   - Infiltrate "low and slow": begin with the tumescent injected into the less richly innervated deep subcutaneous fat space at a low speed.
   - Only progress to the next step once complete analgesia is achieved.
2. Application of radiofrequency (RF) energy (Video 1)
   - The same access incisions are used that were made for tumescent infiltration.
   - Zones of heating are identified for maximally efficient tissue heating.
   - External and internal temperature maximum values are entered on the RF generator (typically 65°C –68°C internally and 35°C –38°C externally).
   - Sterile ultrasound gel is used to maintain good conduction between the external electrode and the surface of the skin.
   - The internal electrode is carefully placed into the subcutaneous fat space at the desired depth (ie, intermediate layer) while maintaining at least 5-mm distance between the electrode tip and the underside of the dermis.
   - A fan pattern of heating from the access point is made as both the internal and the external temperatures of the soft tissues in between the 2 electrodes are gradually heated toward their respective maximum temperature goals.
   - To avoid overheating and creating "hot spots," there is no heating within 1 to 2 cm of the access point.
   - Keeping the internal electrode parallel to the skin is important when treating areas where anatomic prominences can cause unintended superficial treatment resulting in "end hits" where the electrode abuts directly against the dermis.
   - Adjust the speed of the heat application and/or the amplitude of the strokes when heating the tissues in order to gradually increase the temperatures of both the internal and the external tissues.
   - In general, the more quickly the hand piece is moved and the longer the distance of the strokes, the more quickly the external temperature will rise.
   - Conversely, the more slowly the hand piece is moved and the shorter the amplitude of the strokes, the more quickly the internal temperature will rise.
   - Once the proper cadence is found specific for the patient area treated, the more efficiently the heat can be transferred without the generator's safety features defeating the delivery of the energy.
   - Once the therapeutic temperatures both internally and externally are achieved, maintain the maximum temperatures for the clinically appropriate amount of time (typically 30–60 seconds).
   - For large volumes of fat that are subjected to the heating, such as the abdomen in large patients, it is recommended that aspiration of the emulsified fats that are liberated by the heat is

performed in order to remove excess oil and fatty acids that can slightly increase the rate of seroma formation and fat necrosis if left for too long.

- Fractional bipolar RF is commonly performed at the same stage with the Morpheus8 device (InMode, Lake Forest, CA, USA). This device achieves subdermal adipose tissue remodeling in addition to bipolar thermal injury, leading to reorganization of the reticular dermis.
- Fractional RF is subsequently used at a depth of 4 mm (double stacked) and energy of 35 with 50% overlap. The hand piece is applied firmly and perpendicular to the treatment area before delivery of RF energy pulses. In patients with thinner skin or darker Fitzpatrick types, energy settings are reduced by 20%.

3. Liposuction contouring
   - Following application of RF energy, suction-assisted lipectomy may be performed.
   - Manual or power-assisted liposuction may be used.
   - Some practitioners may wish to perform liposuction in larger patients with substantial subcutaneous fat before application of the RF energy in order to save time in heating the soft tissues.
   - If fat is to be harvested for transfer, liposuction must be done before RF heating, which will cause lipolysis.
   - If the fat aspirate portion of any single anatomic area treated exceeds 1000 mL, consider placement of a closed suction drain to reduce the risk of seroma formation.

FIG. 1 A 27-year-old woman pre-RF- and 4 months post-RF-assisted liposuction.

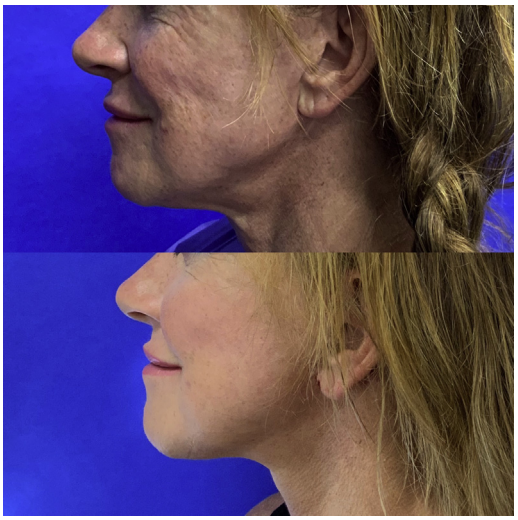

FIG. 2 A 54-year-old woman pre-RF- and 6 months post-RF-assisted liposuction of the lower face/neck.

POSTOPERATIVE CARE

- Standard compression garments following liposuction are routinely worn by the patient for 10 to 14 days.
- Patients are instructed to not use any skin products for the first 3 to 4 days after fractional RF treatment.
- Except for the avoidance of high-salt foods, there are no dietary restrictions.
- Patients are encouraged to walk as soon as possible.
- Heavy lifting and exercise should be held off for 2 to 3 weeks.
- Sutures are removed between 7 and 10 days.

SUMMARY

- Significant and reproducible soft tissue tightening may be achieved with the application of RF to the skin and underlying fibroseptal network.
- This allows inclusion of patients for minimally invasive contouring with liposuction who may otherwise be deemed noncandidates because of the risk of unacceptable laxity postoperatively.
- In patients with good elasticity, it allows more aggressive and detailed liposuction to be performed.
- The procedure may be applied to nearly limitless areas of the body in addition to the trunk and

extremities, to include the face, neck, upper and lower eyelids, forehead, and any other areas of soft tissue laxity where conventional excisional operations may not be indicated or wanted by the patient at the time. Preprocedure and postprocedure results for body (Fig. 1) and face/neck (Fig. 2) areas demonstrate satisfactory soft tissue remodeling and contraction using bipolar RF assistance.

CLINICS CARE POINTS

- Radiofrequency has emerged as a safe and reliable method for minimally invasive skin tightening in the face and body areas under local anesthesia.
- Close temperature control over a period of time is essential for optimal fibroseptal network tightening.
- Bipolar radiofrequency technology allows for superior directional volumetric heating of tissue.

DISCLOSURE

E. Dayan: Book royalties: Thieme, Elsevier; Consultant: InMode; Co-Owner: CoreAesthetics. J. Marte: none. S. Theodorou: Book royalties: Thieme; Consultant: InMode.

SUPPLEMENTARY DATA

Supplementary data related to this article can be found online at https://doi.org/10.1016/j.yacs.2021.02.001.

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