92 Body Radiofrequency Fat Removal/Skin Tightening

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Abstract

Radiofrequency (RF) technology has been used in different medical specialties for nearly 100 years (i.e., surgical electrocautery, cardiac ablation, joint tightening). However, aesthetic applications of RF first began in the early 2000s with monopolar modalities (i.e., Thermage). One historic challenge with RF has been the balance between efficacy and safety. Precedent devices lacked temperature control, which led to inconsistent results and potential thermal complications. This chapter discusses use of the latest bipolar RF modalities, which allow for volumetric heating of soft tissues with continuous temperature monitoring. This technology has been shown to successfully treat the "treatment gap" patients, demonstrating approximately 30% soft tissue tightening in properly selected patients.

Keywords: Radiofrequency, bipolar radiofrequency, minimally invasive, aesthetic technology, soft tissue 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 three types of patients: (1) the younger demographic, who desire soft tissue tightening without traditional operations, scars, and downtime; (2) 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 (3) those with recurrent laxity who have already underwent traditional excisional procedure. In these populations, plastic surgeons risk under- 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 × impedance × time). For example, adipose tissue is less conductive than water (higher impedance), and leads to generation of higher temperatures than muscle. Once soft tissue temperatures reach 50 °C and skin surface reaches 40 to 42 °C there is a trigger to induce neocollagenesis, angiogenesis, and elastogenesis. Through different applications of RF energy (i.e., monopolar, bipolar, multipolar, microneedling), subdermal adipose remodeling (SAR) 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.

92.1 Preoperative Steps

92.1.1 Analysis

- A thorough history and physical examination 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.
- 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 degrees and the humerus parallel to the floor to demonstrate areas of maximal laxity in the upper posterior arm.
- Preoperative photography is essential for postprocedural analysis.
- When indicated, laboratory values including complete blood count (CBC), chemistry profile, coagulation tests, and urine pregnancy tests in women of child-bearing age are obtained.
- The patient is given oral medications including an antibiotic, sedative, and pain reliever 30 to 45 minutes preoperatively.

92.2 Operative Steps

See **Video 92.1**.

92.2.1 Tumescent Infiltration

- Following standard prep and drape, the previously identified access points are injected with 1% lidocaine with epinephrine.
- Access incision is made with either 14-gauge needle or #11 blade scalpel.
- Standard infiltration cannula is used to deliver the tumescent fluid (▶ Table 92.1) 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.

Table 92.1 Modified tumescent fluid (0.1% lidocaine concentration)

Modified tumescent fluid (0.1% lidocaine concentration)
1,000 mL normal saline
1000 mg lidocaine (50 mL of 2% plain lidocaine)
10 mL sodium bicarbonate
1.5 mL 1:1,000 concentration epinephrine

- Infiltrate “low and slow”: Begin with the tumescent injected into the less richly innervated deep subcutaneous fat space at low speed.
- Only progress to the next step once complete analgesia is achieved.

92.2.2 Application of Radiofrequency Energy

- 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 (RF) generator (typically 65–68 °C internally and 35–38 °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 (i.e., 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 external temperatures of the soft tissues in between the two 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 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 (i.e., 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). 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 prior to delivery of RF energy pulses. In patients with thinner skin or darker Fitzpatrick types, energy settings are reduced by 20%.

92.2.3 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 prior to 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 prior to RF heating which will cause lipolysis.
- If the fat aspirate portion of any single anatomic area treated exceeds on 1,000 mL, consider placement of a closed suction drain to reduce the risk of seroma formation.

92.3 Postoperative Care

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

92.4 Case Example

A 39-year-old female presented for nonsurgical RF skin tightening to her abdomen. The patient had a total of two treatments spanning over a period of 8 weeks. Settings were as follows: First pass (Body, Power 30); second pass (Face, Power 25). Subsequent treatments increased power by 5 (▶ Fig. 92.1).

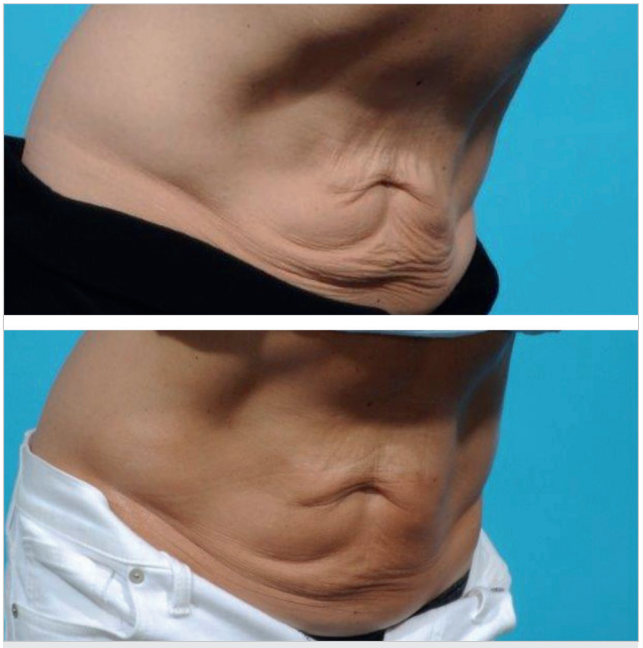

Fig. 92.1 A 39-year-old female presented for nonsurgical radiofrequency skin tightening to her abdomen. The patient had a total of two treatments spanning over a period of 8 weeks. Settings were as follows: First pass (Body, Power 30); second pass (Face, Power 25). Subsequent treatments increased power by 5.

92.5 Conclusion

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 as noncandidates due to 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.

Further Readings

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