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SPECIAL COMMUNICATION

The Role of Subcutaneous Radiofrequency-Assisted Liposculpture in the Facial Plastic Surgeon's Practice

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Abstract

Importance: Percutaneous radiofrequency-based skin tightening procedures can offer patients an option to undergo a potential treatment for skin laxity and excess adipose of the face and neck with less downtime, lower cost, and decreased risk of complications compared with more aggressive open procedures such as neck lift, face and neck lift, and platysmaplasty.

Observations: FaceTite and AccuTite can safely yet effectively deliver energy into the subdermal space, targeting the dermal collagen network and deeper fascial layer. Ideal candidates have early jowl formation, mild to moderate skin laxity, and submental adiposity.

Relevance & Conclusions: From the perspective of facial plastic surgeons, these procedures can enhance the volume of an aesthetic practice by welcoming patients who may not otherwise present for face and neck rejuvenation out of fear from surgery. Furthermore, many of these minimally invasive patients will ultimately return for surgical rejuvenation later in life.

Background and History

Over the past decade, there has been a dramatic increase in demand for less invasive treatments within aesthetic medicine. Several factors have contributed to this trend including the fear of surgical stigmata, rising costs related to surgery and anesthesia, influence of social media, and the desire for less postprocedural downtime. The lower face and neck represent prime areas of interest to patients that lead them to seek rejuvenation procedures.

Historically, noninvasive face and neck rejuvenation options have included chemical ablation, light- or laser-based technologies, ultrasonic energy, or transcutaneous radiofrequency (RF) devices. However, these technologies failed to address subdermal adipose tissue, which hinders their overall effectiveness. Cervical liposuction can be offered as a minimally invasive stand-alone procedure to remove submental fat, yet many patients also have poor skin tone and quality. The failure of the skin to recoil and fill the dead space after fat removal can lead to an overall unfavorable aesthetic outcome.

Finally in 2009, Paul and Mulholland introduced RF-assisted lipolysis (RFAL) as a novel method to simultaneously ablate subcutaneous fat and tighten the skin. When it was compared with a competing technique (subdermal laser-assisted lipolysis), the RFAL device reached therapeutic levels quicker and more uniformly, allowing for longer treatment times at the targeted temperature.[1] The purpose of this article is to review the indications

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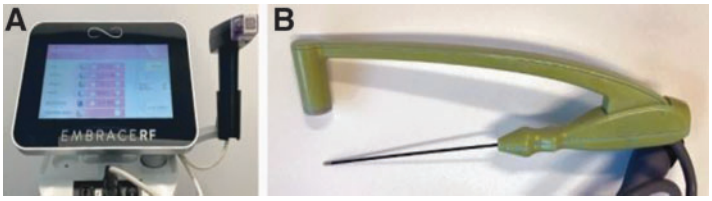

Fig. 1. **(A)** Embrace RF console. **(B)** FaceTite handpiece.

for FaceTite/AccuTite, cover the steps to performing these procedures, showcase actual results, and provide a discussion of potential complications and their management.

Technological Overview

Collagen consists of polymers bound together by hydrogen bonds. The strength of collagen is directly related to the degree of hydrogen bond cross-linking. Thermal energy delivered to collagen results in its denaturation, however, the heat-stable intramolecular cross-links are preserved.[2] After this energy is delivered, collagen fibrils undergo contraction, which increases fibril size and its strength. In addition, thermal injury activates wound-healing pathways and the recruitment of fibroblasts. This further increases the amount of new collagen formation.[3]

Histological studies have demonstrated that the papillary and reticular dermis in the neck contain a complex collagen network intermixed with subcutaneous fat and underlying fibrous fascia.[4] Tone, quality, and durability of our skin relate to the interplay of these deeper tissue layers. Furthermore, the thermal energy that is delivered to the subcutaneous fat leads to necrosis of the adipocytes.[5] This is safely achieved by temperature-controlled disruption of the subdermal fibroseptal network while avoiding collateral damage to unintended tissues.[6] This results in an improved cervicomental angle, jawline definition, and skin texture.

The Embrace RF workstation (InMode, Irvine, CA) includes two subdermal treatment modalities, FaceTite and AccuTite, as well as the transcutaneous Morpheus8. FaceTite consists of a solid, silicon-coated, 1.8-mm diameter, 10-cm long, 18-gauge RF-emitting probe with a plastic tip. The two differences with the AccuTite probe are the length, it being only 6 cm long, and the size of the thermistor, which is 22 gauge. Both can be connected to the Embrace RF console containing the RF card and a central processing unit (CPU) with a digital user interface. The RF current flows from the internal/subdermal probe out to the external electrode, which glides along the skin surface in tandem with the RF-emitting internal electrode (Fig. 1).

The external electrode possesses a series of sensors that relay information to the console and CPU. This includes high and low soft tissue impedance sensors as well as epidermal contact and thermal sensors (Fig. 2). The epidermal temperature is monitored 10 times per millisecond. When the pretreatment selected therapeutic end point is achieved, the RF energy is automatically turned off. When the epidermis decreases to 0.1°C below the target epidermal temperature, then it will resume. One of the main safety features provided by Embrace RF is audio feedback. Loud bell signals occur when the temperature is within 2°C of goal temperature and when goal temperature has been reached.

Indications

Patient selection is critical to achieving optimal outcomes with percutaneous and transcutaneous RF

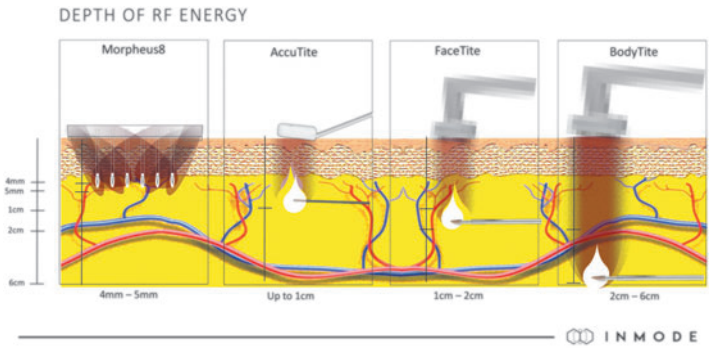

Fig. 2. Comparison of depth penetration between RFMN and RFAL devices.

Fig. 3. Contraindications to RF device usage.

Fig. 4. Photograph of proposed treatment areas and "no fly" zone.

treatments. In our experience, FaceTite proves most effective for patients in their 30s and early 40s with mild to moderate skin laxity or those looking for fat reduction to the submentum, lateral neck, or jowls lateral to the nasolabial fold. Setting patient expectations before treatment is very important. During the consultation, we recommend thoroughly explaining the FaceTite technology and that it works by contracting the underlaying fibroseptal network rather than actual skin or fat removal.

Realistically we can expect ~40% tightening of the lower face and neck that for some patients can be dramatic. Many patients presenting for facial rejuvenation are willing to accept less significant results with fewer complications and shorter downtime, realizing that a surgical approach may yield a more dramatic result.

Contraindications

Unsuitable candidates include patients with a pacemaker or other implants, cochlear or neurostimulator implants; women during pregnancy; patients with collagen vascular diseases, autoimmune diseases, or acute infections; and patients with morbid conditions that could make them unsuitable for the procedure (Fig. 3). All implanted devices should be evaluated for contraindications from the manufacturer. Patients with abundant subplatysmal fat should be properly identified and counseled that percutaneous RFAL procedures do not address this layer and may be better managed surgically. Patients with tremendous skin laxity should be recommended to undergo surgical rhytidectomy as heat and loss of fat without skin excision may actually exacerbate their condition.

Technique

The patient is first evaluated in a seated position with the lower face and neck exposed. A full facial assessment is performed with the patient in repose and in animation. Any asymmetries, static or dynamic, are documented and reviewed with the patient. Treatment markings include a line drawn from lobule to the corner of the mouth and then from the lobule along the border of the mandible. The depressor anguli oris muscle is outlined and flagged as a ''no fly'' zone of treatment to minimize potential injury to the marginal mandibular branch of the facial nerve that can be quite superficial in this region (Fig. 4). The lowest cervical crease is also marked as the most inferior extent of treatment.

Next, a wheal of 1% lidocaine with 1:100,000 epinephrine is raised underneath each earlobe and in the central submental crease. Either an 18 or 16-gauge needle is used to create three small port site openings in the skin at the sites where the wheal was made. The lower face and neck area are then sterilely prepped and draped in the usual manner. Tumescent anesthesia (10 mL lidocaine, 1%; 1.5 mL sodium bicarbonate, 8.4%; and 0.4 mL epinephrine 1:1000 in 100 mL 0.9% normal saline) is infiltrated through the three previously made

needle openings using a fluid infusion cannula. One gram of tranexamic acid can be added to this tumescent mixture to minimize bruising, particularly if manual liposuction is going to be performed.

Typically, 200–250 mL of tumescence is used to treat the entire lower face and neck and serves as a critical aid to the procedure. Not only does the tumescent fluid enhance proper RF conductivity but it also hydrodissects the subcutaneous space. This allows for easier penetration of the FaceTite probe during treatment. In addition, the turgor of the overlying soft tissues from tumescence enhances coupling of the external probe to the skin.[7]

Once the face and neck are fully anesthetized, a liposuction cannula is inserted into the right infralobular port hole and advanced subcutaneously to further dissect this layer. Subcutaneous tunnels are created first to then allow the FaceTite probe to travel with ease and avoid contact injury to the distal part of the probe. The RF probe is inserted completely to its hub and the device is activated through the foot pedal. The probe is withdrawn slowly, delivering energy for ~3–5 s in each area before moving to an adjacent area. It is critical to maintain the probe very subcutaneous in this area and not go deeper into the jowl fat because terminal branches of the marginal mandibular branch of the facial nerve are in proximity.

Once the right jowl is completed, then the right neck area is treated. Once the right jowl and neck areas are completed, the probe is inserted into the submental area. Treatments are best performed in a consistent sequence. Lastly, the left jowl and neck are addressed in a similar manner.

Treatment time is ~8 to 10 min per lateral neck area, 2 to 3 min per jowl area, and 4 to 5 min in the central neck area. It is important for a beginner user to understand that subdermal and epidermal surface temperatures, not time, will dictate the treatment durations within each area.[8] Usually, the epidermal temperature limit is set between 38°C and 42°C, whereas the subdermal temperature goal is set between 65°C and 70°C depending on the user and the treatment area.

Once the procedure is completed, the liposuction cannula is reused to aspirate any liquefied fat from the treatment areas. A single 5-0 fast-absorbing gut suture is used to close the port holes if a 15-blade was used to create the access site. Otherwise, if a 16- or 18-gauge needle was used, they are allowed to heal by secondary intention. Almost always RF microneedling (Morpheus8) is performed at the end for enhanced skin contraction. Treatment depths and energies will depend on patient skin type, thickness, and goals of the procedure (i.e., more lipolysis or more skin tightening). The patient is released home with a neck compression garment to be worn for 72 h, then nightly for 1 week. In our experience, postprocedural opiate pain medications are not required and pain is well controlled with over-the-counter analgesics.

Results

Fig. 5. Treatment settings.
FaceTite: 38/68, 11 kJ (4 kJ delivered to R face/neck, 3 kJ to submentum, 4 kJ to left L face neck)
Morpheus 8:
3 mm/30 energy, 200 pulses
4 mm/30 energy, 200 pulses
2 mm/20 energy, 100 pulses

Fig. 6. Treatment settings.
FaceTite: 38/68, 11 kJ (4 kJ delivered to R face/neck, 3 kJ to submentum, 4 kJ to left L face neck)
Morpheus 8:
3 mm/30 energy, 200 pulses
4 mm/30 energy, 200 pulses
2 mm/20 energy, 100 pulses

Fig. 7. Before treatment, 1 year and 5 months after microliposuction and EmbraceRF treatments.

Fig. 8. Before treatment, 1 year and 5 months after microliposuction and EmbraceRF treatments.
Treatment 1: EmbraceRF
FaceTite: internal: 65, external: 39, time: 120 s, Joules: submandibular 1.3 kJ per side, superior neck 1.3 kJ per side, submentum 3 kJ.
Morpheus8: first pass: lower third, 41 pulses per side. Submental + submandible: 50 pulses per side, depth: 4 mm, mode: cycle, energy: 25, repetition: single.
Second pass: lower third, submental & submandible: 85 pulses, depth: 3 mm, mode: cycle, energy: 25, repetition: single.
Treatment 2: Morpheus8 (24 pin)
Submentum: 4 mm/35 J/3 mm/30 J/2 mm/20 J on cycle/1.0 pps; total number of pulses = 165.
Treatment 3: Morpheus8 (24 pin)
Submentum: 4 mm/35 J/3 mm/30 J/2 mm/25 1 mm/20 J on cycle/1.0 pps; total number of pulses = 178. Cheeks: 3 mm/30 J, 2 mm/25 J, 1 mm/20 J
Treatment 4: Morpheus8 (24 pin)
Submentum/jawline, tip: 4 mm, energy: 35 energy, pulse rate: single cycle, pulses: 44.
Submentum/jawline—first pass: tip: 3 mm, energy: 30, pulse rate: single cycle, pulses: 47.
Submentum/jawline—second pass: tip: 3 mm, energy: 30, pulse rate: single cycle, pulses (no.): 37

Fig. 9. Before treatment, 2 months after treatment.
Treatment settings:
FaceTite settings: internal: 40, external: 60, time: 120 s, Joules: 3.3 kJ to submentum
Area 1: energy: 30, 24 pin, 4.0 mm, mode: fixed, No. of pulses: 66, repetition: 1.5
Area 2: energy: 30, 24 pin, 3.0 mm, mode: fixed, No. of pulses: 40, repetition: 1.5
Area 3: energy: 25, 24 pin, 2.0 mm, mode: fixed, No. of pulses: 50, repetition: 1.5

Fig. 10. Before treatment, 2 months after AccuTite/EmbraceRF treatment.

Fig. 11. Before treatment, 2 months after AccuTite/EmbraceRF treatment.
Treatment settings: external: 39°C, internal: 65°C, time: 120 s, Joules: submentum 0.5 kJ, nasolabial folds 0.3 kJ/side

Complications

Excessive heat can cause postprocedural epidermal hyperpigmentation, blistering, and even scarring. As such, it is critical to maintain the external skin surface temperature <44°C to 45°C.[9] Studies demonstrate that subdermal temperatures from 65°C to 68°C and skin surface temperatures from 38°C to 42°C are required for optimal contraction.[10] Temperature regulation provided by the Embrace RF platform is essential during these procedures. Skin blisters can be managed with topical antibiotic ointment and topical steroid cream if hyperpigmentation is experienced. Marginal mandibular nerve neuropraxia is rare, but when experienced, it typically does not last beyond 3 months. Alopecia in the beard of men can occur—this can be temporary from shock loss or permanent. Numbness and tingling, lumpy-bumpy irregularity, and other skin and surface irregularities are often temporary and can be managed with massage.

Conclusion

Percutaneous RF-based skin tightening procedures can offer patients an option to undergo a potential treatment for skin laxity and excess adipose of the face and neck with less downtime, lower cost, and decreased risk of complications compared with more aggressive open procedures such as neck lift, face and neck lift, and platysmaplasty. FaceTite and AccuTite can safely yet effectively deliver energy into the subdermal space, targeting the dermal collagen network and deeper fascial layer. Ideal candidates have early jowl formation, mild to moderate skin laxity, and submental adiposity.

From the perspective of facial plastic surgeons, these procedures can enhance the volume of an aesthetic practice by welcoming patients who may not otherwise present for face and neck rejuvenation out of fear from surgery. Furthermore, many of these minimally invasive patients will ultimately return for surgical rejuvenation later in life.

Author Disclosure Statement

K.K. and D.A. were consultants for InMode but did not receive compensation for this project. For all other authors, no competing financial interests exist.

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