

## ORIGINAL ARTICLE

# Application of subcutaneous radiofrequency after liposuction on midface: A minimally invasive technique for midface rejuvenation

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## Abstract

**Background:** Popular demand for minimally invasive soft tissue tightening is continuously on the rise. In recent years, subcutaneous radiofrequency or radiofrequency-assisted liposuction (RFAL) has been reported to produce the desired surgical outcome on lower-face and body tightening. However, few studies are found using subcutaneous radiofrequency for midface rejuvenation.

**Aims:** This study was performed to review our surgical method for the midface rejuvenation using subcutaneous radiofrequency combined with liposuction and to evaluate the clinical outcomes.

**Patients/Methods:** This retrospective observational study involved 31 patients with mild-to-moderate mid-face laxity. All patients received liposuction combined with subcutaneous radiofrequency on midface from June 2020 to June 2022. Clinical results were assessed objectively using photographs and subjectively by a patient satisfaction survey.

**Results:** All patients recovered well without major complications. High patient satisfaction was attained. The mean score of midface laxity (GGS) as evaluated by jury decreased from 3.3 preoperatively to 1.6 postoperatively.

**Conclusions:** Our midface tightening technique is safe and effective for patients with a mild-to-moderate midface aging appearance.

**Level of Evidence:** Therapeutic IV.

## KEYWORDS

midface liposuction, midface rejuvenation, subcutaneous radiofrequency

## 1 | INTRODUCTION

Treatment of the aging midface is increasingly deemed a primary part of facial rejuvenation. One key feature of midfacial aging shows a pronounced nasolabial fold formed by excess and ptosis of nasolabial and cheek fat mound. Combination with other aging

features such as nasojugal fold often result in a profoundly aged appearance.

Traditionally, the gold standard to improve mid-face laxity is incisional facelift. However, quite a number of patients may not have skin laxity severe enough to warrant an excisional surgery. Moreover, popular demand for soft tissue tightening has become

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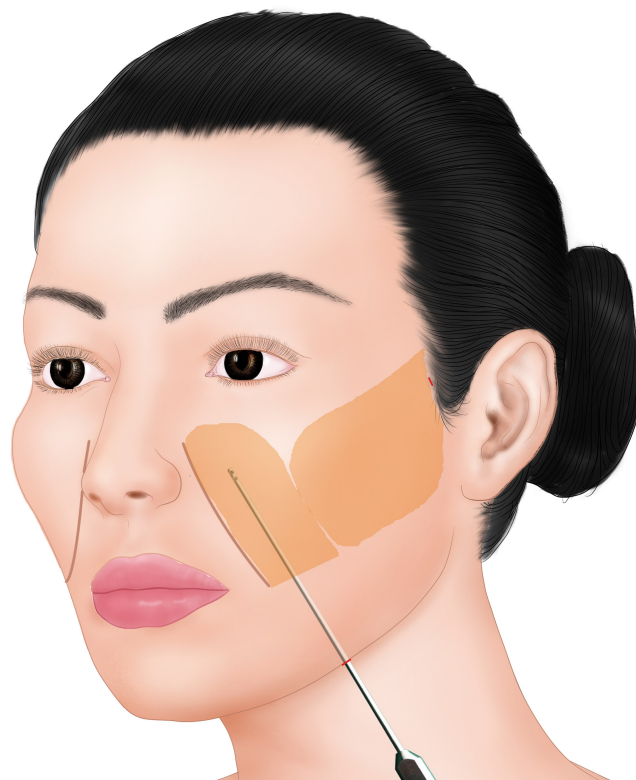
as minimally invasive as possible.<sup>1</sup> As a matter of fact, non-invasive treatments such as radiofrequency (RF) and laser light, infrared light, or high-frequency focused ultrasound have been used for skin tightening effects since the mid-1990s. They had larger acceptance, but the aesthetic outcomes are relatively modest compared with those of the excisional surgeries.<sup>2-7</sup> Radiofrequency-assisted liposuction (RFAL) was first introduced in 2009 for body contouring and skin tightening. The major principle of RFAL is to use radiofrequency's effect on the fibro-septal network to achieve skin tightening and soft tissue contraction.<sup>8,9</sup> In recent years, subcutaneous radiofrequency or radiofrequency-assisted liposuction (RFAL) has been reported to produce the desired surgical outcome on lower face and body tightening.<sup>1-5</sup> However, few studies are found using subcutaneous radiofrequency for midface rejuvenation.

The purpose of this study is to evaluate the safety, effectiveness, and patient satisfaction with our surgical technique for midface rejuvenation using subcutaneous radiofrequency combined with liposuction.

## 2 | MATERIALS AND METHODS

A consecutive series of 31 patients aged 26–51 years (average age,  $36.0 \pm 6.3$  years) who had undergone subcutaneous radiofrequency after liposuction on midface from June 2020 to June 2022 were included in this retrospective observational study. The inclusion criterion was mild-to-moderate skin laxity in the mid face. The exclusion criteria include pregnancy or breast-feeding, significant chronic illness, presence of a pacemaker or internal defibrillator, or titanium plate on the facial bone, recent surgery within 6 months in the treatment area. Patients who had undergone previous facelift procedures or augmentation with fillers or fat of the specific anatomical areas within 6 months to 1 year were also excluded. The patients' medical records were reviewed to correlate them with the surgical outcomes. The following data were collected: age, body mass index, operative duration, volume of fat aspirated, amount of energy delivered, and number and type of complications. Photographs were obtained preoperatively and 6 months postoperatively. The principles of the 1975 Declaration of Helsinki were followed. The authors confirm that the ethical policies of the journal, as noted on the journal's author guidelines page, have been adhered to and the appropriate ethical review committee approval has been received. We obtained verbal informed consent for using clinical data for professional medical purposes deemed appropriate from all patients.

All operations were designed and performed by the first author (C.Z.). We used the BodyTite RF apparatus (Invasix, Ltd., Yokneam, Israel) for midface tightening, which can deliver energy to trigger the immediate and extended contraction of dermal and subdermal collagen. The special FaceTite™ was used as the hand piece for treatment. The radiofrequency current travels from the internal electrode cannula up to the external electrode and back, generating heat in the treatment zone, allowing significant contraction of the



**FIGURE 1** Simplified schematic of the authors' method illustrating the surgical incisions and range on midface.

subdermal fibro-septal network tissue when the desired temperature is reached.

### 2.1 | Surgical techniques

The operation was carried out under local anesthesia. If the patients underwent additional area tightening such as lower face and neck tightening, intravenous sedation was usually conducted. The concentration of lidocaine for local anesthesia is 0.06%. The tumescent solution was composed of 400mg of lidocaine and 1 mg of epinephrine per liter of normal saline. The procedure was performed through two puncture incisions: one behind temporal hair line for the lateral midface and one under the mandible for the medial midface. The puncture incisions were made by using a 14-gauge needle; then, subcutaneous plane of midface was infiltrated with the tumescent solution until appropriate turgor was achieved. Approximately 40–80mL of solution was employed in the midface. Usually, we conducted extensive liposuction on nasolabial fold area and conservative liposuction on the lateral midface. (Figure 1) Following liposuction, subcutaneous radiofrequency was conducted immediately. The area we applied invasive subcutaneous RF was exactly the same area we applied the liposuction. The border of nasolabial fold was not passed through. (Figure 2) Settings were 10 W, with an endpoint epidermal skin temperature of 38°C. The internal electrode is placed above the SMAS to avoid potential injury

to the facial nerve. The radiofrequency cannula was maneuvered in a repeated slide movement at the plane created by liposuction; the subdermal fibro-septal network tissue contracts when the desired temperature is reached. The handle was maneuvered on the treatment area for several seconds. The surgical duration of liposuction and RF procedure was about 40min and 20min, respectively. Postoperatively, the patient's skin was cleansed with normal saline, and compression garments was applied. All patients were required to wear compression garments 24h for 5 days and at night only for an additional 2 weeks. Patients were instructed to report any complications or adverse effects during or following the treatment. At 6-month follow-up visit, patients were asked to assess their satisfaction with the surgical outcomes.

## 2.2 | Subjective and objective evaluations

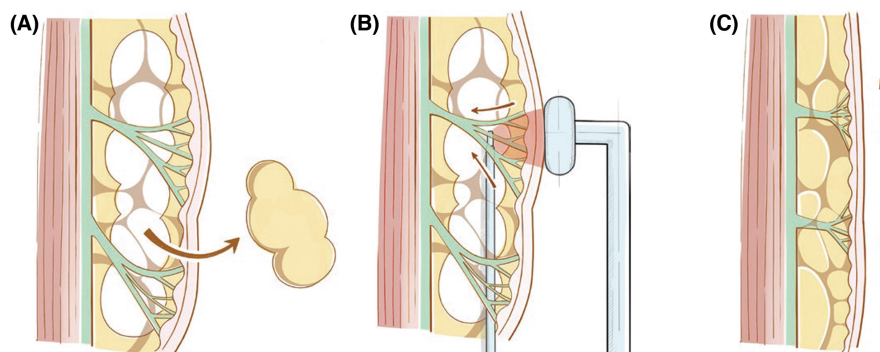
Both subjective and objective methods were adopted to assess the surgical results. With regard to the subjective assessment, patient satisfaction and surgical complications were evaluated by a self-assessment questionnaire after a 6-month follow-up period. Patient satisfaction with the surgical outcome was classified as follows: "very much satisfied," "very satisfied," "rather satisfied," "neutral," and "dissatisfied". The objective assessment was conducted by three trained physicians blinded to each other as well as to the study's relevant data. The surgical outcomes were measured by a 6-point grading scale (GGS) that showed the degree of improvement.<sup>10</sup> The observers were asked to give a score from 0 to 5 for the overall appearance of the nasolabial fold: no wrinkles,

just perceptible wrinkles, shallow wrinkles, moderately deep wrinkles, deep wrinkles with well-defined folds, very deep wrinkles with redundant fold.

## 3 | RESULTS

A total of 31 patients who received treatment of midface liposuction combined with subcutaneous radiofrequency comprised the study group, with the following data collected: mean age 36 years (range, 26–51 years), mean body mass index  $20.4 \pm 2.1$  (range, 17.4–25.3 kg/m<sup>2</sup>), mean volume of fat aspirated per side  $3.6 \pm 1.2$  mL, mean amount of energy delivered per side  $0.5 \pm 0.1$  kJ (Table 1). All the patients were subsequently followed up at least for half a year after receiving the surgery.

According to the photographic evaluation given by the independent observers, the mean score of midface laxity (GGS) decreased from  $3.3 \pm 0.9$  to  $1.6 \pm 0.6$  (Table 2), indicating a marked improvement. The overall patients' satisfaction was also positive: 83.8% of the patients were "rather" to "very much" satisfied with the rejuvenation of midface, 9.7% of the patients considered the results neutral, and 6.5% of the patients considered the results poor or without any changes (see Table 2). All the patients recovered successfully without major complications (Figures 3 and 4). Two patients developed a local facial skin bruise after the operation, which faded away in 1–2 weeks postoperatively. One patient developed stiffness of the subcutaneous tissue after the operation, which was softened at 2 months. No patient experienced hematoma, infection, or seroma after the treatment.



**FIGURE 2** Liposuction helps lessen the volume of fat issue and lower its insulation. The fibro-septal network (FSN) tissue thus becomes slack and more directly exposed to heat (A), which enables subcutaneous radiofrequency treatment to achieve a more significant contraction effect (B). With fibro-septal network gets constricted, the subdermal septal and fascial tissue alter positions and provide a tightening and rejuvenating effect on the mid face area (C). (From Han X, Yang M, Yin B, et al. The efficacy and safety of subcutaneous radiofrequency after liposuction: A new application for face and neck skin tightening. *Aesthet Surg J*. 2021. 41(3): NP94-NP100; with permission.)

**TABLE 1** Patient's treatment summary.

	Age, year	BMI, kg/m <sup>2</sup>	Fat aspirated, mL (per side)	Energy, kJ (per side)
Mean $\pm$ SD	$36.0 \pm 6.3$	$20.4 \pm 2.1$	$3.6 \pm 1.2$	$0.5 \pm 0.1$

Abbreviation: BMI, body mass index.

TABLE 2 Surgical outcome evaluation and patient satisfaction.

Patients' satisfaction scale		Observers' GGS rating scale (6-point grading scale for nasolabial fold.)		
Grade	N (%)	Grade	Preoperative	Postoperative
Very much satisfied	4 (12.9%)	0: No wrinkles	3.3±0.9	1.6±0.6
Very satisfied	9 (29%)	1: Just perceptible wrinkles		
Rather satisfied	13 (41.9%)	2: Shallow wrinkles		
Neutral	3 (9.7%)	3: Moderately deep wrinkles		
Dissatisfied	2 (6.5%)	4: Deep wrinkles with well-defined folds		
		5: Very deep wrinkles with redundant fold		

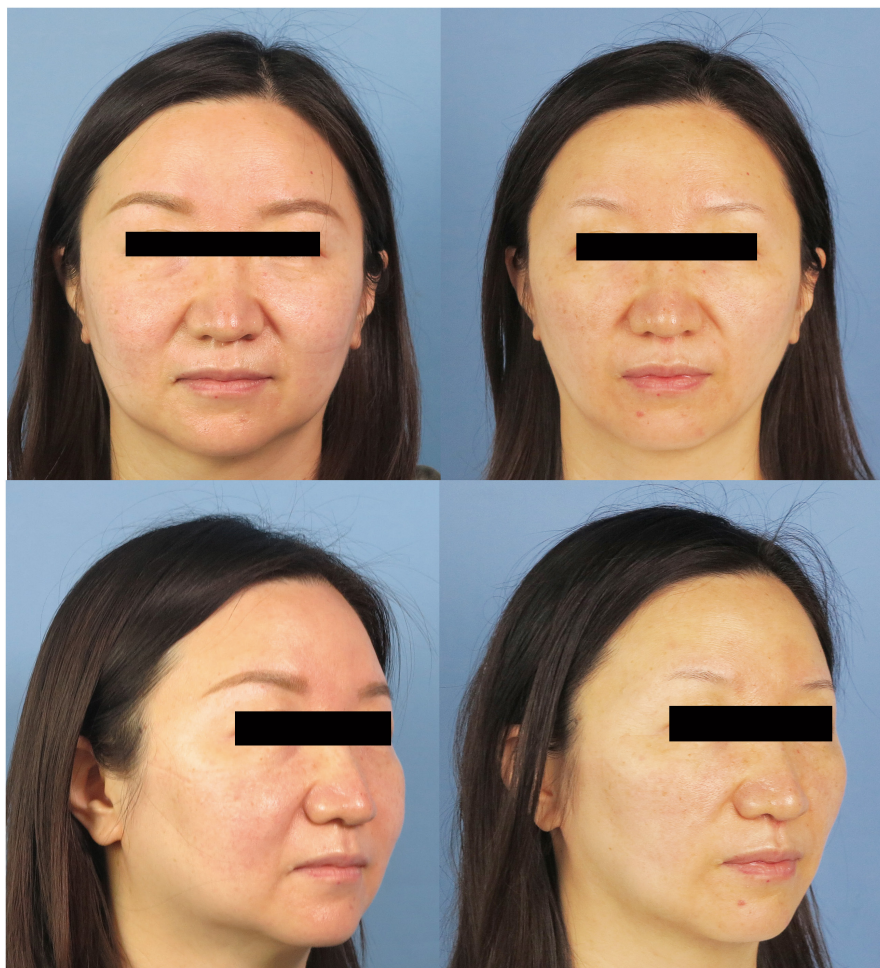


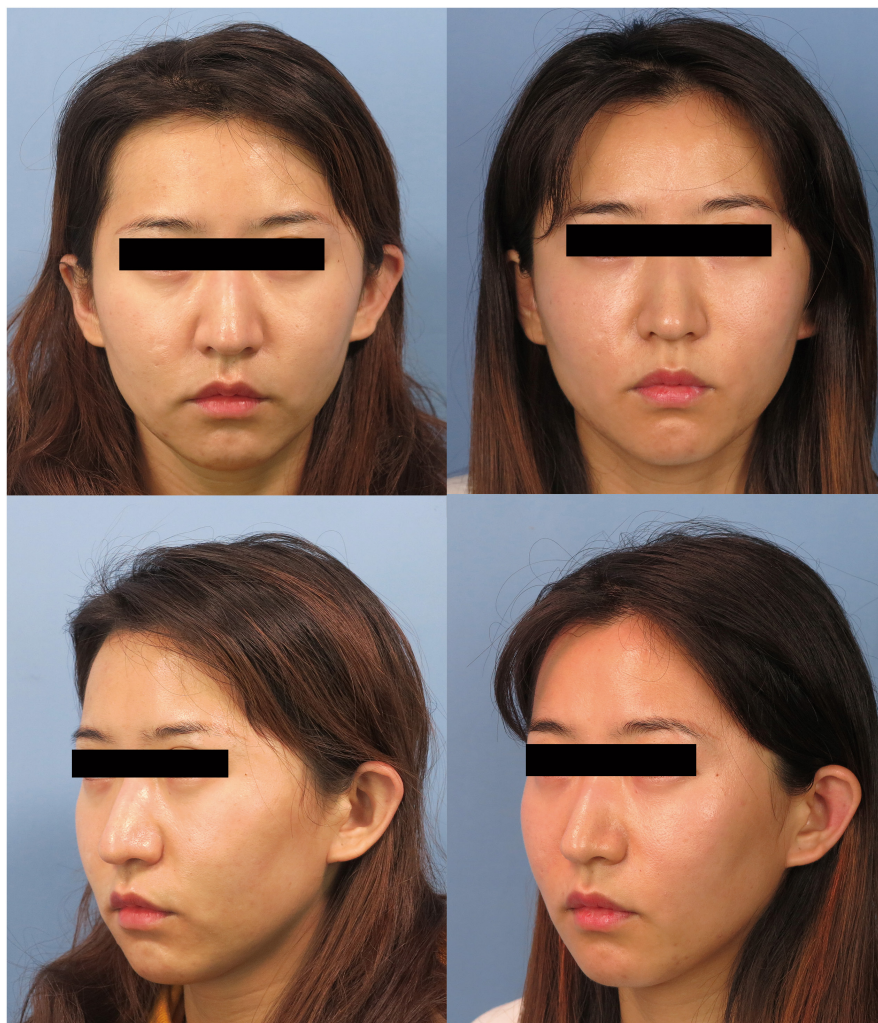
FIGURE 3 Preoperative and postoperative clinical photographs of a 42 years old patient who underwent mid-face subcutaneous radiofrequency after liposuction. Lower-face and neck was also operated simultaneously. Left Preoperative frontal (above) and oblique (bottom) views. Right Frontal (above) and oblique (bottom) views 6 months after surgery.

#### 4 | DISCUSSION

Although existing composite facelift techniques such as the high superficial muscular aponeurotic system (SMAS) facelift or vertical midface lift are able to deliver noticeable results, they also might incur incisional scar, lengthy recovery, and associated morbidity and numbness.<sup>11</sup> These disadvantages have significantly limited the popularity of the procedures in patients who have no severe conditions and actually do not need to undergo such treatment. Moreover, it is the desire of most of the younger demographic that midface rejuvenation can be carried out without traditional operations, scars, and downtime.

Most recently, laser-assisted lipolysis (LAL) has been popularized with the postulation that laser-induced thermal damage could decrease intraoperative blood loss, postoperative ecchymoses, and improve skin tightening. However, a prospective, randomized, double-blind controlled trial comparing LAL and SAL (suction-assisted lipoplasty) shows no appreciable clinical advantage with the use of LAL. In another randomized controlled trial, LAL has failed to demonstrate enhanced cosmesis compared with traditional liposuction method.<sup>12</sup> Other studies also suggest it is not possible to confirm that LAL is superior to traditional liposuction for any type of outcome.<sup>13,14</sup> What is more, the major disadvantages of laser-assisted lipolysis cannot be overlooked. The

**FIGURE 4** Preoperative and postoperative clinical photographs of a 29 years old patient who underwent mid-face subcutaneous radiofrequency after liposuction. *Left* Preoperative frontal (*above*) and oblique (*bottom*) views. *Right* Frontal (*above*) and oblique (*bottom*) views 6 months after surgery.



application of LAL remains limited by relatively slow treatment speed, poor control of heating uniformity, risk of tissue burns, and scars.<sup>13,15</sup> Compared with LAL, the RFAL technique have the advantages such as faster treatment, reduced tissue trauma, improved safety, uniform heating of the skin and the subcutaneous layer, and potential skin contraction.<sup>8</sup>

Inspired by the increasing popularity of subcutaneous radiofrequency or radiofrequency-assisted liposuction (RFAL) and its reported optimal results in lower face and body contouring,<sup>1-6</sup> we have designed and carried out the aforementioned study. Our experience suggests this technique can be applied safely and satisfactorily on the midface as well. It is able to reduce volume of nasolabial fold and tighten the soft tissue at the same time.

We performed liposuction before applying RF for the following reasons:

1. Liposuction helps create subcutaneous working channels, which enables subcutaneous RF to be executed with less difficulty and more accuracy.
2. With liposuction carried out before subcutaneous radiofrequency, the amount of insulation caused by fat can be effectively reduced, the collagen of the fibro-septal network (FSN) tissues is then more directly exposed to heat, and

a more strongly and rapidly response of FSN to radiofrequency heating could be generated, thus creating more visible and significant subcutaneous tissue tightening.<sup>16</sup> Fewer complications occur as a result of applying less energy on RF procedure based on lower insulation of fat by liposuction.

3. Liposuction helps directly reduce nasolabial fat pad. Combined with skin tightening, better contouring of the facial curve and rejuvenating effect on the mid face can be achieved.

Moreover, the distribution of heat during subcutaneous radiofrequency is also important. To maintain smooth tissue contraction and avoid facial nerve damage, it is advisable that the internal heating should be kept above the SMAS layer. If a specific area of skin surface tightening is needed, two shorter sessions of superficial heating with a maximum external skin temperature of 38°C is safer for reducing the risk of thermal skin injury. With this protocol, burns or other complications should be avoided. This study is a worthy testament to the subcutaneous radiofrequency after liposuction as a non-incisional, minimally invasive treatment, an alternative option for midface-aging patients not severe enough to receive an extensive facelift surgery or afraid of traditional surgery or scars.

## 5 | CONCLUSIONS

Our method of the midface tightening technique using subcutaneous radiofrequency combined with liposuction is a safe and effective surgical technique for patients with mild-to-moderate midface aging features. This procedure has the advantages of a natural effect, fast recovery, and lower risk of scar formation on the face. There certainly is room for improvement in the study of this procedure, with larger samples, different ethnicities, and longer-term follow-up to better evaluate and optimize the surgical outcomes.

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### CONFLICT OF INTEREST STATEMENT

None of the authors have any financial interest in any of the products, devices, or drugs mentioned in this manuscript.

### DATA AVAILABILITY STATEMENT

Research data are not shared.

### ETHICAL APPROVAL

The authors confirm that the ethical policies of the journal, as noted on the journal's author guidelines page, have been adhered to and the appropriate ethical review committee approval has been received. The study was approved by the Medical Ethics Review Board of Plastic Surgery Hospital, Chinese Academy of Medical Sciences on January 20, 2023, with the approval number of 2023 (7). We obtained verbal informed consent for using clinical data for professional medical purposes deemed appropriate from all patients.

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