



Subperiosteal Endotine-Assisted Vertical Upper Midface Lift

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Background: In the typical upper midface lift, tissue fixation is usually accomplished through a series of sutures that may be time consuming, technically demanding, difficult to apply, and also require frequent rearrangement and adjustment.

Objective: The use of an Endotine Midface (Coapt Systems, Palo Alto, CA) fixation device through a technique termed the subperiosteal Endotine-assisted vertical upper midface lift is described.

Methods: Twelve patients underwent subperiosteal Endotine-assisted vertical upper midface lift, which included simultaneous forehead lift, blepharoplasty and Endotine-assisted transtemporal-transoral subperiosteal upper midface tissue release, verticollateral elevation and fixation of the upper midface.

Results: The technique we used achieved a significant improvement of the eyelid-cheek complex and rejuvenation of the nasojugal groove as evaluated 6 months after surgery. Preoperative and postoperative assessments of the lower eyelid distance revealed a mean shortening of $5 \text{ mm} \pm 2 \text{ mm}$.

Conclusions: The results confirmed that vertical upper midface lifts combined with Endotine-assisted midface fixation can be safely and predictably performed over the zygomatic muscle. This technique allows for simple adjustments of tension and position, thereby providing greater aesthetic control of cheek elevation and projection. It also achieves volume enhancement and projection of the midface tissue. (Aesthetic Surg J 2007;27:276–288.)

With age, the soft tissue of the face tends to succumb to the forces of gravity, which act more vertically than obliquely.¹⁻¹⁹ When this occurs, the cheeks begin to sag or flatten, the lower eyelids can become puffy or hollow, circles begin to appear under the eyes, and the nasolabial folds deepen.^{6,20,21} Conventional face lift procedures with a lateral vector technique do not take account of the concept of the effects of gravity on the aging face, nor do they address the vertical dimension of the lower lid or the enhancement the eyelid-cheek junction.²¹ With time, patients may develop an unnatural “face lift” appearance, characterized by hollow lower eyelids and a lateral sweep of the lower face. Further, the addition of lower blepharoplasty does not shorten the vertical height of the lower eyelid or enhance the eyelid-cheek junction.²¹

During the past decade, plastic surgeons have increasingly used either an infraciliary approach or a temporal approach to improve the aging face through vertical elevation of the midface. After an infraciliary incision, subperiosteal upper midface dissection and

vertical elevation of ptotic midface tissue can be performed.^{1-6,9-15,18,19} Access to the midface through a temporal approach provides a verticollateral or oblique rather than a true vertical lift. Both approaches may be combined with an intraoral release of the midface tissue at the subperiosteal level.

Regardless of the approach chosen, adequate fixation is of paramount importance. Usually, tissue fixation is accomplished by performing a series of sutures, which may be time consuming, technically demanding, and difficult to apply, and also require frequent rearrangement and adjustment.^{2,9,10,18,22-24} These difficulties arise from the instrumentation and the limited access to and visualization of the operative area, which can hinder accurate placement of the sutures. In addition, suture loops in the soft tissues may contribute to neurologic alterations of the buccal and zygomatic facial nerves.²

To overcome these difficulties, an Endotine Midface (Coapt Systems, Palo Alto, CA) fixation device can be used that allows for simple adjustments of tension and position to achieve greater aesthetic control of cheek tis-

sue elevation, and also provides volume enhancement and projection of the midface tissue through a technique that I have called the *subperiosteal Endotine-assisted vertical upper midface lift* (SEVUM lift).

Indications

This video-assisted endoscopic transtemporal-transoral subperiosteal vertical upper midface lift (SEVUM-lift), in conjunction with an endoscopic-assisted foreheadplasty, is indicated in young patients or middle-age patients with moderate skin elasticity, for patients who do not want a more radical surgery or reject a preauricular scar, and for those patients who already have undergone a traditional face lift procedure. Patients who exhibit a vertical descent of the midface (malar flatness), including an oval configuration to the orbit with elongation of the lower eyelid skin, with concomitant ptosis of the composite flap including skin, muscle, and fat, and with prominent nasolabial folds and early jowl formation, are ideal candidates for this procedure. Patients who have previously undergone lower blepharoplasty and who exhibit lid retraction and scleral show also may benefit from this upper midface procedure.

Surgical techniques

The procedures were routinely performed with patients under general anesthesia with local anesthesia infiltration for homeostasis. Infiltration of the area was performed with a vasoconstricting solution, consisting of a 1:1,000,000 lidocaine with epinephrine solution. Preoperative markings were performed with the patient in a sitting position. The eyebrow was held at the desired level. The redundant upper eyelid skin was marked, with the brow elevated to avoid overresection. The center of the forehead at the region of the glabella was infiltrated, as were the corrugators and procerus muscle, to obtain adequate vasoconstriction in the area to be dissected. The anterior temporal crest was infiltrated to produce hydrodissection and improve visualization. The infiltration continued laterally over the superior lateral orbital rim to the lateral canthus and into the upper midface and the buccal sulcus.

For forehead and upper midface rejuvenation, six access incisions were used. The surgery was performed with a 4-mm, 30-degree down scope, with a protection sleeve and irrigation system to keep the field clean. The operation began by elevating the forehead through two 2-cm sagittal incisions 1 cm behind the anterior scalp line, and a standard subperiosteal forehead lift was performed.

Following the standard central forehead lift, the upper midface was elevated over the deep temporalis fascia (fascia temporalis profunda) in the scalp via a 3- to 4-cm transverse temporal incision 4 cm behind the anterior scalp at an open angle of about 120 degrees toward the helical rim. The incision was not parallel to the temporal hairline and was slightly perpendicular to the vector of repositioning. The lateral dissection extended over the deep temporalis fascia covering the temporalis muscle (sub-SMAS plane). This fascial layer was elevated with the forehead tissue by detaching it along the temporal crest through blunt dissection.

As the lateral supraorbital region was approached, the confluence of fascial layers and the precanthal ligament made dissection more difficult. Dissection continued toward the lateral canthus. Laterocaudally to the precanthal ligament a prominent vein comes into view, the medial zygomaticotemporal vein, or so-called *sentinel vein* (Figure 1). This sentinel vein can be found passing perpendicularly between the plane of the deep temporal fascia and the superficial temporal fascia along with the medial and lateral zygomaticotemporal nerves and the lateral zygomaticotemporal vein. A sensory branch of the zygomaticotemporal nerve travels with the sentinel vein. The rami of the temporal branch of the facial nerve within the superficial temporal fascia generally runs along the line formed by the zygomaticotemporal vessels as they pass from the deep temporal fascial plane to enter the superficial temporal fascia (Figure 2). Dissection was carried inferior medial to the sentinel vein to the level of the zygomatic arch. The subperiosteal dissection was performed to the orbital rim and carried lateral to the level of the lateral canthus.

Next, the midface was approached sub-SMAS from the temporal area over the deep temporalis fascia, dissecting subperiosteally inferolateral to the sentinel vein, between the sentinel vein and the sensitive zygomatic nerve (Figure 3), over the anterior surface of the zygomatic arch, entering the midface under the orbicularis oculi muscle. The dissection of the malar area was performed under the orbicularis oculi muscle, leaving the septum orbitalis, infraorbital rim, suborbicularis oculi fat, and zygomatic major muscle deep to the periosteal elevator.

The soft tissue of the cheek was freed from underlying bone through a buccal incision placed from the second molar to the canine to leave an adequate cuff of gingiva for closure. Subperiosteal dissection of the maxilla and zygoma was performed with a custom-made periosteal raspator. The dissection extended from the nasal spine

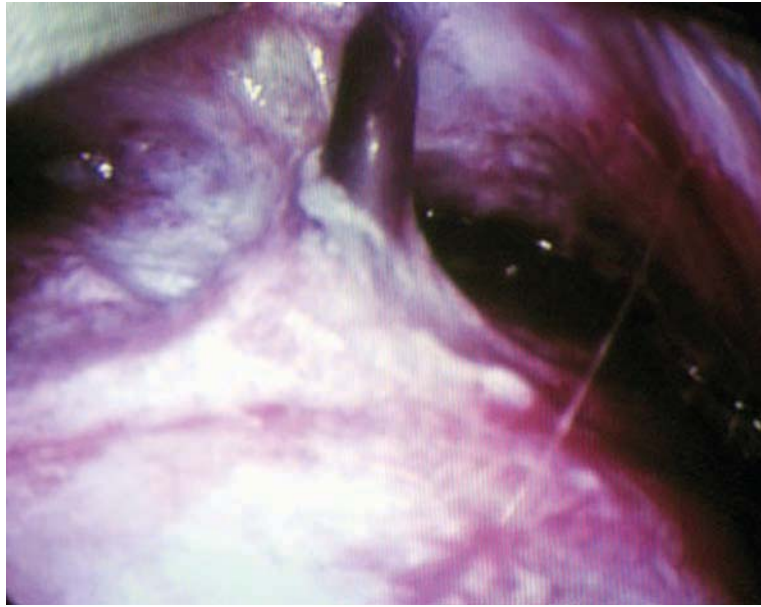


Figure 1. The sentinel vein can be identified passing perpendicular between the plane of the deep temporal fascia and the superficial temporal fascia along with the medial and sensitive zygomatic nerves and the lateral zygomaticotemporal vein. The zygomaticotemporal vein passes from the deep temporal fascial plane to enter the superficial temporal fascia (see also [Figure 2](#)).

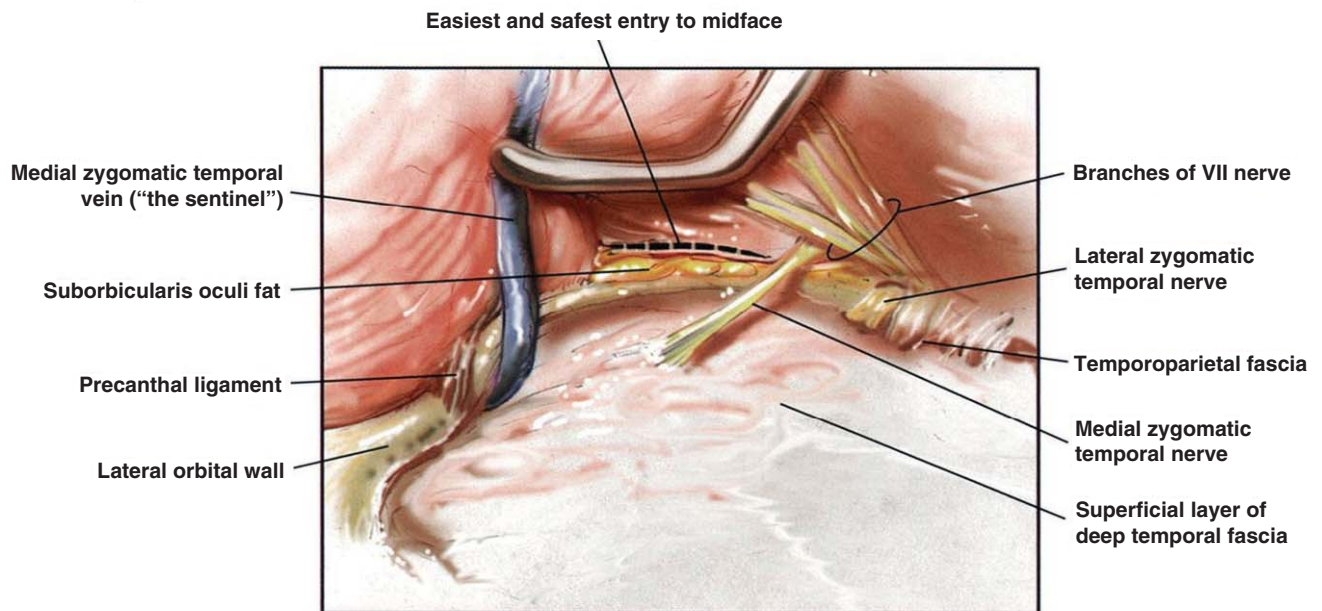


Figure 2. Illustration of the videoendoscopic view of the anatomy of the temporal fossa. (From Sayah and Isse,²⁷ with permission.)

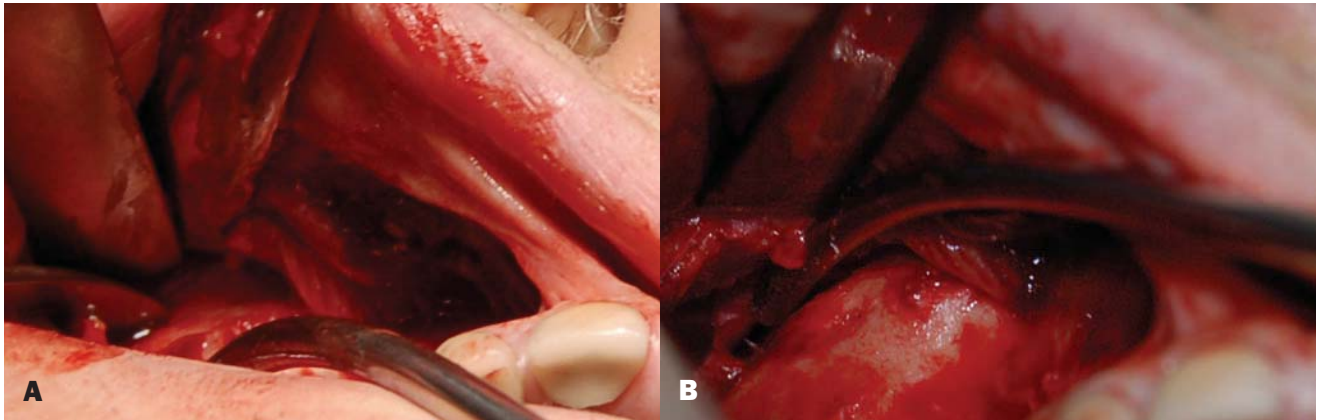


Figure 3. Intraoperative view of a patient undergoing an Endotine-assisted vertical upper midface lift (SEVUM lift); enoral view. Midface dissection was approached subperiosteal. **A,** The supraorbital nerve is seen at the right. The sentinel vein is at the middle right, under the hook. **B,** The suction cannula marks the sensitive zygomatic nerve.

to the lateral buttress of the maxilla, freeing tissues over the anterior two thirds of the zygomatic arch. Release of the arcus marginalis was especially important for correcting of the tear-trough deformity and elevation of the lid-cheek interface, just as freeing the soft tissue from the nasal spine and piriform aperture was important for elevation of the upper lip and corners of the mouth.

Once the soft tissue had been thoroughly freed, elevation of the midface was begun by insertion of the Endotine midface device (Figure 4) through an intraoral approach (Figure 5), taking care to spare the branch of the zygomaticotemporal nerve near the sentinel vein to significantly reduce postoperative numbness and paresthesias (see Figure 4, insert). The leash of the device was guided along the lateral orbital rim into the recess of the bony zygomatic divergence, making sure that the fixation platform was positioned over the maxillary antrum after elevation. The recess lay medial to the zygomatic arch. It was readily approached by placing the leash of the Endotine device over the lateral canthus and moving laterally over the bony roll of the frontal process of the zygoma, thereby dropping into the recess. The end of the device was lifted with a clamp, forcing the leash downward through the deep temporal fascia. The patient's head was turned to the side, and a retractor was inserted through the short scalp incision into the temporal fossa. The leash of the Endotine was advanced up and out of the deep temporal fascia at any point within the pocket.

The area for the cheek tissue fixation placement was marked previously. It presented as a cross in the medial cheek located at the intersection of a vertical line

dropped from the lateral canthus and a transverse line directed from the lowest aspect of the alar groove at its intersection with the lip. To ensure that the elevated midface tissue would be at the same level on both sides of the face and that the degree of traction would be equal on both sides, the degree of upward rotation of the endpoint of the horizontal line from a transverse line at the alar base to the lateral canthus was measured (Figure 6).

The vector of suspension was determined entirely by the position of the key area relative to the point of bony zygomatic divergence. Once the platform was in position and deployed, digital pressure was applied over the cheek to engage the tines in soft tissue. The patient's head was straightened again, the ends of the Endotine leashes were pulled, and the three simultaneous effects (projection, fullness, and elevation of the midface tissue) were assessed.

The midfacial tissues were elevated by applying tension to the anchoring leashes exiting at the temporal incision until incisor show (Figure 7) confirmed adequate mobilization to the desired position.

This superior vertical elevation provided a lift of the deep tissues, which were maintained in the proper position by anchoring the flap to the Endotine midface device. Most important was the achievement of a large soft tissue volumetric mass in the malar and submalar region (Figure 8). The leash was anchored to the deep temporal fascia with 2-0 Vicryl sutures and the leash was trimmed to lay flat in the incision (Figure 9).

In addition, the frontotemporal skin was lifted in a vertical direction and was also anchored to the temporal

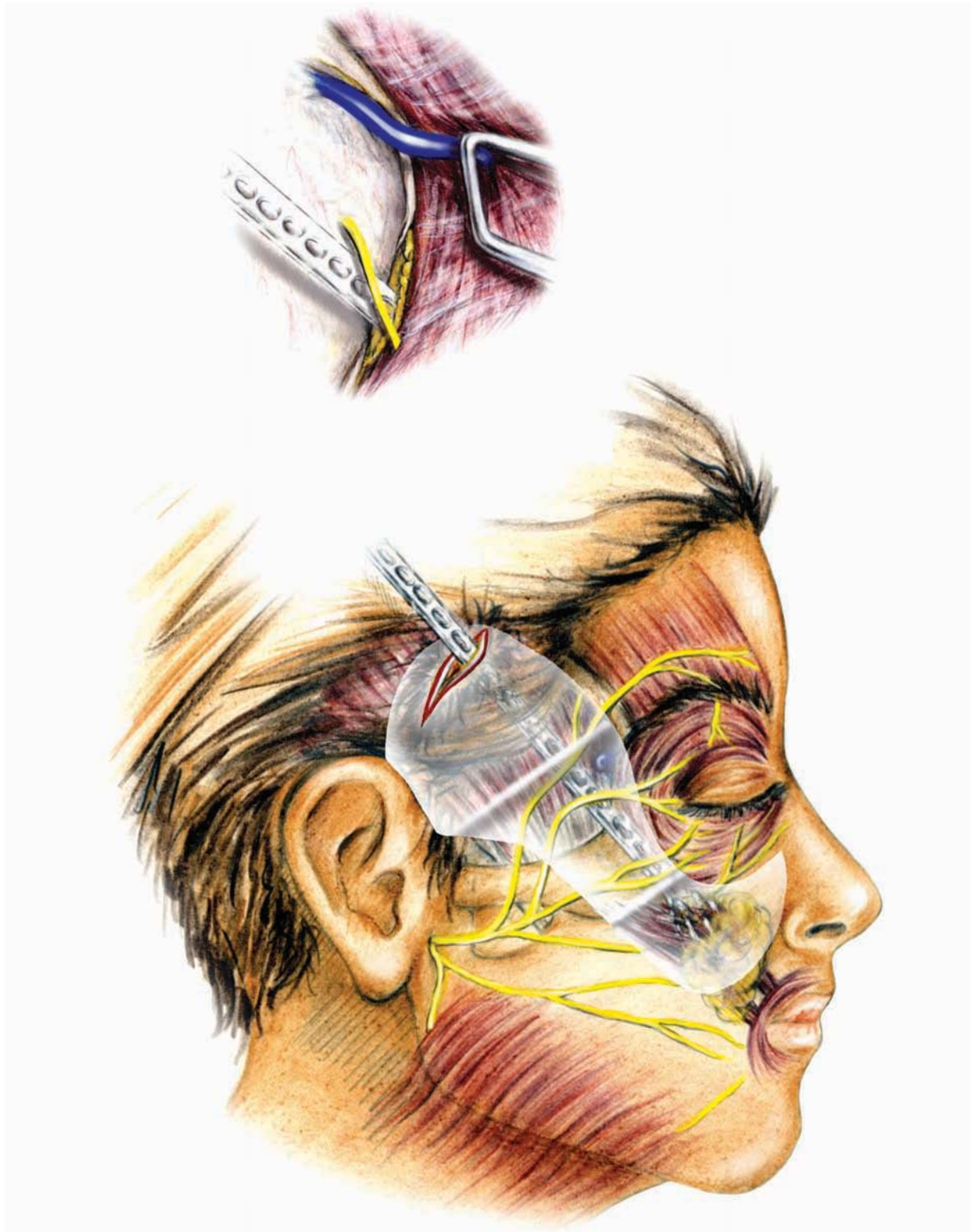


Figure 4. Schematic overview of an upper midface lift, showing the placement of the Endotine device. The device is introduced over the deep temporalis. After mobilizing the tissues over the zygomatic body, the McGregor patch is realized and the subperiosteal tissue complex is mobilized over zygoma bone caudal to the alar base. The lateral dissection extends over the deep temporalis fascia covering the temporalis muscle (sub-SMAS plane). The insert illustrates the sentinel vein and the relationship between the Endotine device and a sensory branch of the sensitive zygomatic nerve. Sparing this nerve will significantly reduce postoperative numbness and paresthesias



Figure 5. Intraoperative view of a patient undergoing a subperiosteal Endotine-assisted vertical upper midface (SEVUM) lift; enoral view. The Endotine Midface device has already been introduced; note the tines placed over the malar region.



Figure 6. Preoperative markings for performance of vertical upper midface lift. The area for the cheek tissue fixation placement is located in the medial cheek at the intersection of a vertical line dropped from the lateral canthus and a transverse line directed from the lowest aspect of the alar groove at its intersection with the lip.



Figure 7. The midfacial tissues are elevated by applying tension to the anchoring leashes exiting the temporal incision until identifying incisor show confirms adequate mobilization to the desired position. In this position, the leashes of the Endotine device are fixed at the deep temporal fascia. This superior vertical elevation provides a lift of the deep tissues, which are maintained in the proper position by anchoring the flap to the Endotine Midface device.

fascia. Several interrupted sutures, secured to the temporal fascia at the level of the access incision, allowed the use of an open knot-tying technique and secure fixation of the flap. After performing the midface elevation the buccal sulcus was closed after hemostasis with interrupted sutures (Figure 10).

Results

Twelve patients (3 men and 9 women, average age 47 ± 6 years, underwent SEVUM lift between 2004 and 2005; among them, three had undergone a conventional face lift years before. The procedures included simultaneous blepharoplasties and video-assisted transtemporal, subperiosteal, and sub-SMAS tissue release. All patients underwent a thorough, individualized preoperative evaluation to establish a correct diagnosis, to evaluate asymmetries, to estimate the degree of tissue repositioning, and to decide on the level of fixation.

In all patients, the distances of the marginal rim of the lower lid and the nasojugal groove between defined points were measured before and at 3 and 6 months after surgery (Figure 11). Measurements were taken along a perpendicular line from the lateral limbus of the eye to a horizontal line of the oral commissure (A) to analyze the preoperative and postoperative position of the most infe-

rior point of the nasojugal groove (B). The median observation time was 6 months.

All patients healed uneventfully with no postoperative problems. There were no instances of alopecia, swelling, or seromatous fluid collection that necessitated a second procedure or a prolonged drainage. Three patients experienced intraoral partial wound dehiscence, two on the left side and one on the right side, which in all cases healed by secondary intention after 7 days with the use of daily local irrigation. All patients were judged to have satisfactory cheek elevation and enhanced contour without evidence of recurrent ptosis or loss of fixation. Patients did not take painkillers for more than 2 days after surgery, and there were no complaints of pain at 3 days after surgery. The surgical outcome was evaluated according to the analysis of photographs obtained before and after surgery and by the analysis of preoperative and postoperative measurements. Significant brow elevation and rejuvenation of the nasojugal groove was achieved, although at 6 months after surgery, drooping of the lateral brow position was observed. Mean values for the distance between the oral commissure and the nasojugal groove in our 12-patient series were as follows: preoperative, $5.8 \text{ cm} \pm 0.4 \text{ cm}$; 3 months postoperative, $6.3 \text{ cm} \pm 0.3$



Figure 8. Superior vertical elevation creates a large soft tissue volumetric mass in the malar region. It is most important to assess this soft tissue volumetric mass to achieve a natural and improved facial rejuvenation.

cm; and 6 months postoperative, $6.2 \text{ cm} \pm 0.3 \text{ cm}$. The results are illustrated in [Figures 12](#) and [13](#).

Discussion

Aging in the midface area is characterized by ptosis of the malar tissues, hollowing of the infraorbital area, lengthening of the lower eyelid with attendant tear-trough deformity, deepening of the nasolabial and malar labial folds, sagging of the corners of the mouth, and more prominent jowls.^{3,6,10,20,21,25,26}

Extensive release of midface ligamentous structures and wide undermining of the orbicularis oculi muscle and upper entire and lateral midface are maneuvers that have been added to the standard endoscopic forehead approach for improvement of the midface, similar to the subperiosteal midface approach of Ramirez.^{15,23} The soft tissues of the cheek, forehead lateral canthus, and the eyebrow and lower lid can be restored to their youthful relationship with the underlying skeleton, with the various planes of release: (sub-SMAS in the temporal region; subperiosteal in the forehead, lateral orbital rim and anterior surface of the zygomatic arch; and subcutaneous in the lower lid).

After dissection of the soft tissue of cheek and fixation of the elevated tissues, tension on the suspended tissues is

reduced by use of the Endotine Midface device. This device has 5 small tines that grasp the cheek tissue gently but securely and elevate it (and all overlying cheek tissue layers) to a new position. In this way, it can reduce the skin irregularities and dimpling that commonly occur when sutures are used. The tines also distribute the tissue forces evenly, minimizing the chance of surgical failure and possible injury caused by sutures.

To minimize any relapse after adequate dissection and tissue release, we believe that the suspension should be located in the low position of the midface as reported by Little.¹⁰ The low position of this fixation area provides an underfolding of low submalar tissues beneath the higher malar ones, which augments the upper cheek. The midfacial musculature is thereby shortened, which elevates the lips, mouth, and corners of the mouth over the dentofacial skeleton.¹⁰ The suborbicular soft tissues are returned to the empty suborbital maxilla, which elevates the apparent lid-cheek interface without bringing extra skin into the lid itself. For the first 3 months after surgery, some patients may feel the device and may occasionally describe some tenderness, which will disappear during the following weeks. One patient complained of palpable lumps over the tines 8 months after surgery but



Figure 9. After the leash is trimmed, it is anchored to the deep temporal fascia with 2-0 Vicryl sutures so that it will lay flat in the incision.



Figure 10. The buccal incision is closed with interrupted sutures.

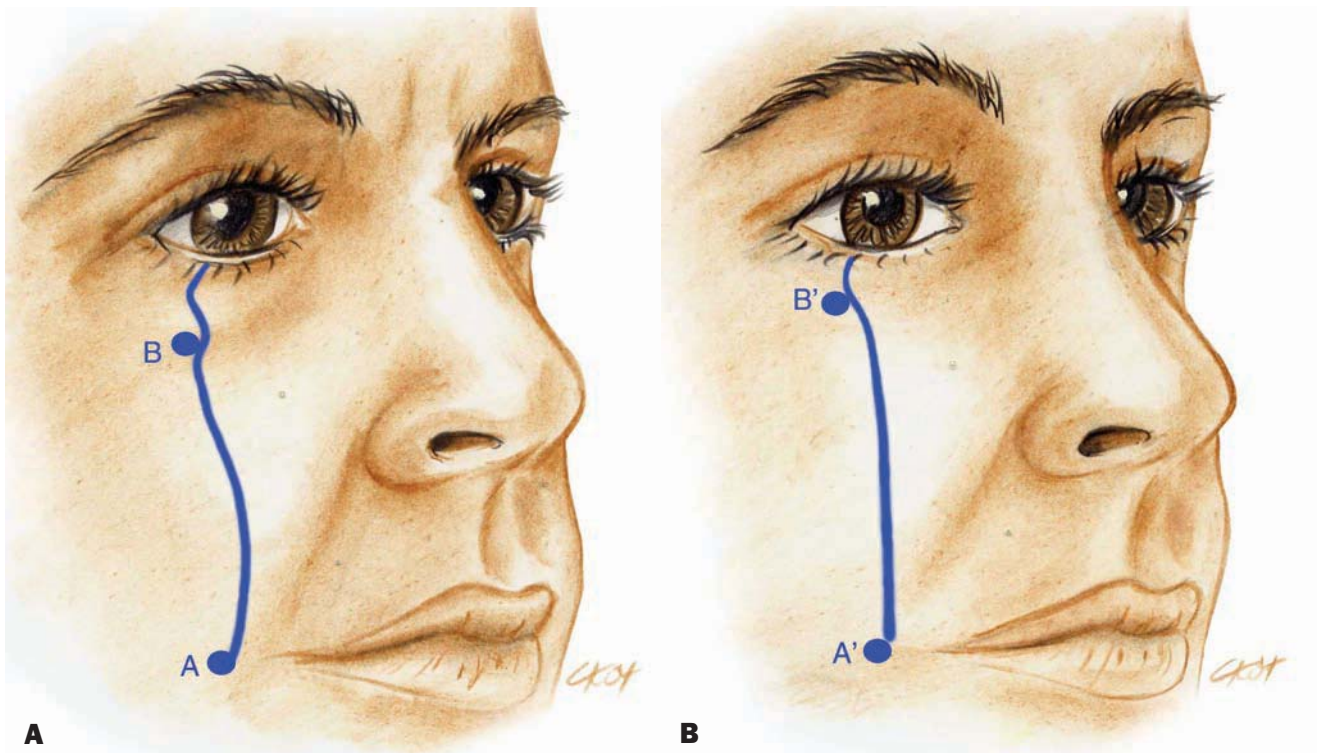


Figure 11. Schematic drawing illustrating the evaluation of the position of the nasojugal groove. Measurements were taken along a perpendicular line from the lateral limbus of the eye to a horizontal line of the oral commissure (A) to analyze the preoperative position of the nasojugal groove. **A,** Preoperative analysis. **B,** Postoperative evaluation.

rejected surgical removal of the partially reabsorbed tines, which seemed to me to be the only treatment. After 11 months most of the implants resolved, and no further treatment was required.

Conclusion

The SEVUM-lift technique presents the surgeon with the opportunity to improve facial aesthetics following greater mobilization of the anatomic layers through an additional enoral approach that facilitates a better intraoperative view and safe dissection, while avoiding damage to the zygomatic sensitive nerve. We agree with Berkowitz et al² that this procedure provides longer-lasting results without the need to apply technically demanding and difficult sutures. The tines of the device provide secure fixation and disperse the tension equally, so that in comparison to suture fixation, the “cheese-cutting” effect of sutures pulled through soft tissue is avoided, as are any neurologic alterations of the buccal and zygomatic facial nerves. It allows for simple adjustments of tension and position for greater aesthetic control of cheek elevation

and projection. The incisions can be nicely concealed in the hair-bearing area and in the buccal sulcus.

This vertical correction of the upper midface achieves harmony with the upper and lower thirds of the face and neck without requiring a preauricular incision and or laterally retracted lower lids. It addresses the underlying deep facial ptotic anatomic structures by redraping them in a more vertical direction, while shortening the vertical height of the lower eyelid and enhancing the eyelid-cheek junction. In patients who have undergone previous lower face and neck lifts, this procedure provides additional vectors to correct the ptotic tissue.

As yet, there are not sufficient data available in the literature concerning the long-term results of Endotine-assisted upper midface lift procedures. Further studies are needed to assess these effects and the complications of these procedures. ■

The author receives no compensation from and has no financial connections with the manufacturers of any products mentioned in this article.



Figure 12. **A, C, E,** Preoperative views of a 54-year-old woman with ptosis of the malar tissues, hollowing of the infraorbital cheek areas, lengthening of the lower eyelid, with attendant tear-trough deformity, marked and deep nasojugal lines, and deepening of the nasolabial and malar labial folds. **B, D, F,** Postoperative views 6 months after SEVUM lift. Note the reduced height of the lower eyelid to achieve a more youthful appearance. Note the volume enhancement of the cheeks and the projection of the midface tissue in the frontal view.



Figure 13. A, C, E, Preoperative views of a 58-year-old woman (who had undergone previous face lift procedures elsewhere) that demonstrate ptosis of the malar tissues, hollowing of the infraorbital area, lengthening of the lower eyelid, with attendant tear-trough deformity and deepening of the nasojugal grooves. B, D, F, Postoperative views 6 months after SEVUM lift. The nasojugal groove is reduced, the lower lid shortened, and malar projection increased.

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