Facial Surgery

Thirteen Years of Experience With the Endoscopic Midface Lift

Renato Saltz, MD; and Bianca Ohana, MD

Abstract

Background: Numerous techniques have been used to rejuvenate the aging midface. The Endotine midface technique involves an endoscopic temporal approach, including midface dissection and malar suspension with fixation. The Endotine device (Microaire, Charlottesville, Virginia) eliminates the intraoral incision and use of sutures, enabling multipoint fixation and fast, simple adjustability for optimal control of midface elevation and volume.

Objectives: The authors describe their preferred technique for the endoscopic midface lift and summarize their 13 years of experience.

Methods: A retrospective chart review was conducted of 183 patients who underwent endoscopic midface surgery. Patients treated from 1998 to 2003 received direct needle fixation (n = 95). Those treated later underwent fixation with the Endotine device (n = 88).

Results: Most (90%) of the patient population was female, and the average age at the time of surgery was 46 years (range, 39-54 years). Needle fixation was used in 95 patients and Endotine fixation in 88. The average follow-up period was 7 years. The authors have observed many improvements in outcomes since the introduction of the Endotine device into their practice. These include reduced swelling and bruising, more symmetric elevation of the malar fat pad, mild improvement of tear trough deformity, softening of the nasolabial folds, and, in some cases, decreased “jowling.” The asymmetry often associated with direct needle fixation has decreased, and no skin dimpling has occurred. Through their experience, the authors’ preferred technique has become the temporal-only approach with Endotine fixation.

Conclusions: The Endotine midface suspension device enhances soft-tissue fixation, provides simple adjustability for optimal elevation and projection, and maintains mechanical fixation until biologic fixation becomes adequate. The 5 tines provide multiple points of contact for secure soft-tissue fixation. Elevation forces are evenly distributed over a wide area, which eliminates skin irregularities. Insertion and deployment are accomplished easily through temporal incision.

Level of Evidence: 4

Keywords
facial surgery, facelift, midface, endoscopic, Endotine, aging process, malar fat pad

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Techniques for aesthetic rejuvenation of the face, which have continued to improve with time and experience, are a major focus of plastic surgeons, patients, and the media. In recent years, many surgical techniques have been introduced, along with modifications to existing procedures. Modern trends emphasize long-lasting results with smaller scars.

Successful midface rejuvenation depends on understanding patient concerns, establishing an accurate diagnosis, and executing a safe and appropriate treatment plan. To achieve optimal results, it is essential to have a thorough understanding of the anatomy and pathophysiology of midface aging. Many authors, including Hester et al, Paul, Ramirez, Hamra, and Mendelson et al, have clearly defined the anatomic structures and findings common to midface aging and have described various treatment options. In a 2008 publication, Downs and Wang highlighted some of these authors’ findings. For instance, Hester et al described the elements of midfacial aging as gradual ptosis of the cheek skin below the infraorbital rim (creating a skeletonized appearance with infraorbital hollowness), descent of the malar fat pad with loss of malar prominence, deepening of the tear trough, and exaggeration of the nasolabial fold. Hamra, upon reviewing his own work, believed that the only way to correct nasolabial

Dr Saltz is a plastic surgeon in private practice in Salt Lake City, Utah, and Dr Ohana is a plastic surgeon in private practice in Rio de Janeiro, Brazil.

Corresponding Author:
Dr Bianca Ohana, Oswaldo Cruz Ave. 907, ap 906, 22250060, Flamengo, Rio de Janeiro, RJ Brazil.
E-mail: Bianca_ohana@hotmail.com
folds was by direct excision. These are just examples of the many approaches to surgical rejuvenation of the midface, which include facelift, lower eyelid incision, open temporal incision, and endoscopic temporal incision with or without oral incision. Even barbed sutures have been used for fixation.

Midface aging is characterized by several anatomic changes that fundamentally affect facial appearance. The malar fat pad appears to be the key anatomic feature in this process. Gamboa et al noted that the central third of the face is defined by a triangle, with its base at the forehead hairline and its apex at the tip of the chin. As the face ages, the malar fat pad becomes loose and thin and slides downward, accentuating the aged appearance. As the tissue slowly migrates caudally, other anatomic changes occur. These include a virtual increase in the vertical length of the lower eyelid, with development of tear-trough deformity, and an increase in the “pseudoherniation” of the lower eyelid in pockets due to lack of soft-tissue support (malar fat pad deflated). Initially, pseudoherniation occurs from laxity of the lower eyelid structures (septum and fat pads) and increased prominence of the nasolabial folds.

Clinically, midface aging is easily discernible. “Flattening” of the midface is apparent in oblique facial views (Figures 1 and 2). The so-called descent of the malar fat pad has been described by Lambros, who prefers to call it a “deflation wave” of that anatomic structure. This is due to loss of fat volume, paralleling the nasolabial fold and moving obliquely from lateral to medial.

The present report summarizes our 13 years of experience with the endoscopic midface lift and describes our preferred technique for this surgery. Their approach includes careful preoperative evaluation and planning, including detailed assessment of the position, shape, and volume of the midface.

**METHODS**

**Study Design**

A retrospective chart review was conducted of 183 consecutive patients treated between 1998 and 2012 by one surgeon (RS). All patients underwent an endoscopic midface lift. Patients treated in the first 6 years of the study period (n = 95) received direct needle fixation. Those treated more recently (n = 88) underwent fixation with an Endotine midface device (Microaire, Charlottesville, Virginia).

Institutional review board approval was not obtained for this study.
Patient Selection

Inclusion criteria. Appropriate candidates for the endoscopic midface lift were those who presented with accentuation of the nasolabial groove, ptosis at the corner of the mouth, ptosis at the lateral corner of the eyelid, slidding of the orbital rim, loss of projection (flattening) of the malar area, accentuated nasojugal groove(s), and/or ptosis of the tail of the brow (without excess skin).

Contraindications for endoscopic midface lift. Patients who had any of the above features accompanied by excess skin were not considered candidates for the endoscopic midface lift. (They were considered candidates for a full facelift.) Other contraindications for endoscopic midface surgery included prominent malar bones, lack of tissue volume to restore midface fullness, and sagging of the lower face and neck, which required rhytidectomy and/or cervicoplasty.

Patient Preparation

After asepsis and antisepsis with betadine, the hair was divided with elastic ties, revealing the sample locations for the incisions. Hair was prepared without shaving. Markings were made over the hair-bearing scalp and forehead. Analgesia consisted of general anesthesia or local infiltration. A mixture of 20 mL of 2% plain lidocaine, 20 mL of 0.5% plain bupivacaine, and 1 mL epinephrine (1:1000) solution was combined with 160 mL of cold sterile saline solution.

Zone descriptions and markings. Three zones of dissection were outlined. For midface surgery, zones 1 and 3 are very important. Landmarks for the endoscopic midface lift are the inferior orbital rim, the zygomatic arch, and the nasolabial folds.

Zone 1. This zone comprises the temporal region extending medially to the temporal crest, inferiorly to the supraorbital rim, and downward along the lateral orbital rim and the superior border of the zygomatic arch. The floor of zone 1 is the temporalis muscle and the deep temporal fascia. The roof consists of the superficial temporal fascia. Dissection at this level is suprafascial (top of the deep temporal fascia).

Zone 2. This zone is limited laterally by the 2 temporal crests, inferiorly by the supraorbital rims and nose, and superiorly to the level of the incisions. Dissection in this zone is subperiosteal. Zones 1 and 2 are connected by releasing the areolar tissue at the level of the temporal crest.

Zone 3. This zone consists of the lateral and inferior orbital rim, malar bone, and the premaxilla. Dissection is subperiosteal, under the malar fat pad.

Various points and lines were drawn prior to surgery; for example, point A was 3 cm lateral to the lateral orbital rim at the level of the superior zygomatic arch. Another line, extending from the distal orbital third of the nasolabial fold, was used to define the area of subperiosteal dissection.

The anterior temporal line also was marked. A line from the inferior earlobe to the lateral corner of the lateral brow outlined the temporal branch of the facial nerve trajectory. Other lines were drawn from the superior zygomatic arch at the lateral corner of the eye to outline the transition from the temporal area to the midface. Finally, a line was made 2 cm above the superior orbital rim that crossed the frontal area and divided into 2 parts (Figure 3).

Surgical Technique

Equipment. The endoscopic system included a 4-mm 30° “angle” scope, endoscopic periosteal dissectors, subperiosteal hockey-stick elevators, an endoscopic grasper, endoscopic scissors, cautery and suction, and the Endotine midface fixation device.
Incisions. Temporal incisions were made approximately 2 cm behind the hairline, in the coronal direction, corresponding to a line of the lateral wing of the nose, passing through the lateral canthus, and reaching the hair-bearing scalp. Paramedian incisions were made at the mid-pupil line of the hair-bearing scalp (Figure 3).

Dissection. Open dissection was performed superficial to the deep temporal fascia (white glistening tissue). In the event of uncertainty about the correct plane, a small incision was placed on the fascia to visualize the temporal muscle. Blunt dissection continued downward to the point of resistance, at the level of the supraorbital rim. The endoscope was introduced in the cavity to allow better visualization, safer dissection, and adequate hemostasis. Medially, the dissection continued through the areolar tissue, connecting the deep temporal fascia with the subperiosteal plane (fusion line). Dissection continued along the areolar plane until reaching the supraorbital rim and the superior border of the zygomatic arch. (This plane is below the superficial temporal fascia and above the deep temporal fascia. The temporal branch of the facial nerve is superficial to this plane of dissection.) At this point, the sentinel veins were identified and left intact if possible. Release of the fusion line (junction of periosteum and deep temporal fascia) and the supraorbital rim periosteum allowed entry into zone 3 of the midface. (The temporal branch of the facial nerve is superficial to this plane of dissection.) The supraorbital rim was identified. The lateral dissection above the deep temporal fascia extended down along the lateral orbital rim into the malar region in a subperiosteal plane, inferiorly and medially to the infraorbital region. The infraorbital nerve was visualized medially and preserved (Figures 4 and 5). The masseter fibers attached to the malar bone were identified and divided. This facilitated suspension and prevented early relapse. The inferior border of dissection, located superior to the gingival sulcus, was the point at which complete release of the periosteum was achieved. In this location, the nasolabial folds were treated by undermining fat injection and/or suspension.

Fixation and closure. Fixation did not begin until complete undermining had been achieved. From 1998 to 2003, fixation for midface lifting was achieved using the direct needle technique. Since 2003, the Endotine device has been used for fixation. By sliding an introducer—a deployment system that protected the Endotine implant during insertion—elevation of soft tissues was achieved with a simple trigger release to engage the tines to the soft tissue. (The tines were engaged by digital pressure on the soft tissue.) The insertion tool was then removed, and the sheath of the device was fixed to the deep temporal fascia with permanent sutures (3-0 Mersilene; Ethicon, Inc, Cincinnati, Ohio; Figure 6). Excess sheath material was removed and discarded. Tissue sealant was sprayed inside the dissected pocket to seal lymphatics in the “dead space,” which decreased bruising and swelling. The scalp

Figure 4. The plane of dissection is below the superficial temporal fascia and above the deep temporal fascia. Adapted from artwork from Coapt Systems, Inc (Palo Alto, California).
incisions were closed in 2 planes using absorbable sutures (4-0 plain gut).

Postoperative instructions are summarized in Table 1.

**RESULTS**

The retrospective study population comprised 183 patients who had undergone an endoscopic midface lift between 1998 and 2012. Ninety percent were female, and the mean age at
the time of surgery was 46 years (range, 39-54 years). Needle fixation was used in 95 patients and Endotine fixation in 88. The average follow-up period was 7 years.

Needle fixation (used from 1998-2003) was associated with several disadvantages, including increased surgical time, postoperative midface asymmetry, and patient dissatisfaction owing to dimpling at the suture point of suspension to the cheek area (which occurred in some cases). The Endotine midface device (used from 2003-2012) has eliminated many problems associated with needle fixation. Individual percutaneous sutures, containing just 1 fixation point, have been replaced by a 5-prong (tine) system that engages the soft tissue to suspend and be secured in the proper position.

In patients who underwent the endoscopic approach only (without oral incisions) along with Endotine fixation, there was reduced swelling and bruising, more symmetric elevation of the malar fat pad, mild improvement of tear trough deformity, softening of the nasolabial folds, and decreased jowling (in some patients). The asymmetry that often occurred with direct needle fixation has decreased, with complete absence of skin dimpling. The reduction in swelling and bruising may be attributable in part to the tissue glue utilized in conjunction with the Endotine device. (The glue was not used with needle fixation.) It appeared that the glue played a role in decreasing postoperative hematoma and edema. In some cases, it facilitated earlier recovery and greater patient satisfaction.

The most common complication in this study was temporary paresthesia of the frontal branch nerve, which usually resolved within 6 weeks. This occurred in 50% of patients and resolved spontaneously in all of them. The

Figure 7. (A, C, E) This 38-year-old woman was an excellent candidate for forehead and midface rejuvenation. (B, D, F) One year after endoscopic brow and midface lift performed through temporal incisions only. Endotine devices were used for fixation, and fibrin glue was sprayed in the midface pocket to minimize swelling and bruising. Through elevation of the malar fat pad, the midface was rejuvenated and “jowling” was minimized.

(A, B) Figure 7. (A, C, E) This 38-year-old woman was an excellent candidate for forehead and midface rejuvenation. (B, D, F) One year after endoscopic brow and midface lift performed through temporal incisions only. Endotine devices were used for fixation, and fibrin glue was sprayed in the midface pocket to minimize swelling and bruising. Through elevation of the malar fat pad, the midface was rejuvenated and “jowling” was minimized.
incidence of paresthesia was similar for both methods of fixation. This appears to relate more to extensive pocket dissection and stretching of the soft tissues than to fixation itself. Persistent edema and ecchymosis can occur up to 3 weeks postoperatively. Patients with this complication were instructed to avoid sun exposure and continue lymphatic drainage massage. Hematoma did not occur in this study. It is avoidable by ensuring adequate surgical technique, proper hemostasis, and effective control of blood pressure during surgery and early in the postoperative period. There has been no surgical revision for asymmetry since 2003, when the Endotine device was introduced into our practices. Previously, when the intraoral approach was used, the revision rate was 10%. Some revisions and complications can be addressed and resolved endoscopically.

In the current study, Endotine fixation was superior to needle fixation. Endotine fixation was associated with fewer complications, better outcomes, longer-lasting results, and a shorter learning curve. The technique was easily reproducible. Patients recovered more quickly, and their scars were smaller and less conspicuous. Other advantages included a safe plane of dissection, easy combination with an endoscopic browlift, excellent visualization of anatomic structures, direct fixation, and avoidance of an intraoral incision (which decreases the risk of infection).

Clinical results are shown in Figures 7 and 8. Additional images are available in an online-only appendix at www.aestheticsurgeryjournal.com.

**DISCUSSION**

The initial signs of facial aging, which typically appear in a person’s late 30s or early 40s, are attributable to genetics, environmental reasons, and gravitational migration.

Patients who are relatively young (≤55 years of age) are ideal candidates for simpler, less-invasive surgical procedures such as the endoscopic midface lift. Minimally invasive surgery generally results in shorter downtime, less scarring, and faster overall recovery.

Detailed patient analysis is essential for selecting appropriate candidates for endoscopic facial surgery. In our facial rejuvenation practice, patients are classified into 1 of 3 categories to properly evaluate their facial aging and determine whether an endoscopic technique would be indicated.

**Type 1**: Younger patients (between 30 and 40 years of age) with temporal hooding, brow asymmetry, hyperactive frontalis muscle, and hyperactive corrugator muscle are ideal candidates for the endoscopic browlift.

**Type 2**: These patients have type 1 components plus descent of the malar fat pad, tear trough deformity, descent of the lid-cheek junction (with illusion of increased vertical height of the lower lid), increase in prominence of the nasolabial folds, and loss in...
cheek projection, with “flattening” of the midface. Type 2 patients are ideal candidates for an endoscopic midface lift (via temporal incisions only) and an endoscopic browlift. Some patients in this category may not require the browlift.

Type 3: These patients have some features of types 1 and 2, as well as accentuated jowls and platysmal bands, skin laxity, and excess skin on the face and/or neck. These patients benefit from rhytidectomy, the submuscular aponeurotic system (SMAS) lift, and platysmal plication through a submental incision, in combination with an endoscopic browlift.

There are many approaches to midface lifting: tear trough and lower eyelid incisions, conventional facelift with preauricular and retroauricular incision, open temporal incision, infraorbital rim, zygoma-anchor endoscopic temporal, oral incision, deep temporal lift with preperiosteal

Figure 8. (A, C) This 41-year-old woman desired facial rejuvenation. (B, D) Two years after endoscopic brow and midface lift through temporal incisions only, with Endotine devices used for fixation. Elevation of the malar fat pad resulted in facial rejuvenation.
plane,\textsuperscript{13} and endoscopic temporal-only approaches, as well as treatment with barbed sutures. Sasaki\textsuperscript{14} and Hester et al\textsuperscript{15} have described midface lift techniques, such as Sasaki’s Gore-Tex (W. L. Gore & Associates, Newark, Delaware) suture suspension, McCord’s midcheek lift, and the concentric malar lift. All of these are viable options for rejuvenating the midface. In addition, many minimally invasive and nonsurgical procedures have been used to counteract midface aging. Some authors\textsuperscript{1,16} have popularized structural fat grafting and other injectables for augmentation of the midface.

The lower eyelid approach to midface surgery has disadvantages owing to its complexity. Ectropion has been observed after removal of excess skin, and damage has occurred to the orbicularis oculi muscle. Oral incisions can lead to infection and are not indicated with use of the Endotine device. Also, dermal fillers can be unpredictable and their results are not long lasting. Fillers may appear artificial and are not capable of repositioning soft tissue. Barbed sutures provide only limited improvement.

Several advantages to Endotine fixation (vs needle fixation) were observed in the present study. These include a safe dissection plane, easy combination with the endoscopic browlift, improved visualization of anatomic structures, less bruising, and better long-term cosmetic results. Through experience, our preferred technique for midfacial rejuvenation has become the endoscopic temporal approach, with fixation by the Endotine device. This Endotine device is bioabsorbable, and its unique leash fixation mechanism provides fast and simple adjustability for optimal control of midface elevation. Patients do not feel the device, and it absorbs completely within 12 months.

Adequate fixation is the key component of the endoscopic midface lift. It prevents early recurrence and facial asymmetry and provides long-lasting results. In a study of periosteal adherence in rabbits, Romo et al\textsuperscript{1,17} demonstrated partial adherence at 6 weeks and permanent adherence at 12 weeks. In 2003, Scalafani et al\textsuperscript{18} recommended a minimum of 6 weeks for “significant readherence” of the elevated periosteum to the underlying bone. Boutros et al\textsuperscript{19} investigated periosteal adherence in guinea pigs and concluded that fixation must remain stable for at least 30 days to enable adequate adherence between bone and periosteum at the postoperative position. Some authors emphasized that the key question was not when the periosteum became “adherent” but when the fixation became “durable.”\textsuperscript{20} They indicated that, according to clinical and laboratory evidence, fixation is needed for a “substantially longer period than 2 weeks postoperatively, probably for 2 to 3 months.”

Although the use of tissue sealant proved favorable in the current study, it has been shown by others, including Marchac,\textsuperscript{21} to not reduce swelling or bruising and to increase the risk of mini-hematoma, leading to irregularities. The decreased swelling/bruising and faster recovery times noted in the present study are supported by other studies, including another study by the senior author (RS).\textsuperscript{22}

In the present study, satisfactory long-term results were achieved with Endotine absorbable fixation, as evidenced by the low reoperation rate. The Endotine device remained stable for more than the recommended 2 to 3 months required for proper adherence of the periosteum to the frontal bone.

Also, Endotine fixation was associated with greater patient satisfaction and fewer complications than needle fixation. Although better outcomes were achieved when the Endotine device was used in our hands, we are not making general claims that this technique is superior to any other method of fixation.

CONCLUSIONS

This study showed more favorable results for Endotine fixation relative to needle fixation. The Endotine device was associated with a shorter learning curve, fewer complications, better outcomes, and longer-lasting results. The device enhances soft-tissue fixation, provides simple adjustability for optimal elevation and projection, and maintains mechanical fixation until biologic fixation is adequate. The 5 tines provide multiple points of contact for secure soft-tissue fixation. The elevation forces are evenly distributed over a wide area, which eliminates skin irregularities. Insertion and deployment are easily accomplished through temporal incisions.

Disclosures

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