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Endoscopic Forehead Lift: Is It Effective?

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Abstract

Background: Descent of the brow postoperatively after endoscopic forehead lift may diminish the results of surgery.

Objective: We describe the causes of postoperative forehead descent, our techniques for endoscopic forehead lift, and the keys to obtaining long-lasting results.

Methods: Forehead lift using an endoscopic technique was performed in 207 patients. Dissection was carried out in the subperiosteal plane, accompanied by wide periosteal, galeal, and retro-orbicularis fat pad release plus selective myotomies and neurotomies to achieve a tension-free lift. Suspension was undertaken to maintain tissues at the desired position until periosteal and fascial adhesion took place. Measurements between the alar crease of the nose to the tail, midportion, and head of the brow were taken preoperatively and at 1, 3, 6, and 12 months after surgery.

Results: The average brow lift achieved was approximately 10 to 12 mm initially for the lateral brow and 6 mm for the medial part of the brow. These results persisted in most patients at 12 months of follow-up. There was relaxation (2–4 mm) in some patients after 4 to 6 weeks, without further progression. There were few complications.

Conclusions: The endoscopic forehead lift is an excellent technique. Satisfactory results with this technique depend mainly on a tension-free lift, which is accomplished through adequate dissection and tissue release.

Topic: endoscopy, adhesions, tissue dissection, follow-up, forehead, lifting, surgical procedures, operative, suspensions, fascia, fat pad, nose, surgery specialty, browlift

Issue Section: Scientific Forum

Facial rejuvenation using endoscopic techniques has undergone substantial modifications during the last 10 years. The first communication about endoscopic techniques for facial rejuvenation was presented by Vasconez[1] at the 61st Annual Scientific Meeting of the American Society of Plastic and Reconstructive Surgeons in Washington, DC, in 1992. Another related presentation was made by Liang and Narayanan[2] at the same meeting.

One of the earliest presentations of Isse's "Endoforehead" operative techniques took place at the November 1992 meeting of the Los Angeles Society of Plastic Surgeons.[3]

During the 1993 annual meeting of the American Society for Aesthetic Plastic Surgery in Boston, Hamas[4] presented his paper about endoscopic resection of the corrugator-procerus muscles. Aiache was the first to perform a subcutaneous face lift of the midface and neck without skin excision, and Ramirez was the first to present a case of a total endoscopic face lift that included forehead, midface, lower face, and neck.[4]

Similarly, since 1994 the approach to correction of brow ptosis in our group has evolved into the use of an endoscopic procedure either alone or in combination with

conventional techniques for facial rejuvenation.[5,6] The endoscopic forehead techniques are all based on limited skin incisions without cutaneous resection and extended dissection at the subperiosteal level for better visualization and release.

The indications for endoscopic forehead lift are the same as indications for conventional methods: ptosis of the brows, wrinkles of the forehead, and glabellar lines or furrows. The advantages of endoscopic methods include decreased scarring, less hypesthesia, reduced risk of alopecia and hematomas, less edema, and easier patient acceptance. However, whereas a number of studies have shown that endoscopic forehead lift produces good results with minimal complications, other studies suggest that longer follow-up periods are necessary before the long-term efficacy of this approach can be assessed.[7–11] Because of gravity and animation, tissues of the forehead tend to descend postoperatively and could diminish the results of surgery. In fact, early studies of endoscopic brow lifting reported numerous patients in whom intraoperative brow elevation was followed by postoperative brow descent.[9]

In this article, we describe the results obtained using our technique for endoscopic forehead lift whereby wide dissection and tissue release are emphasized to obtain a tension-free lift before fixation. We also discuss the different reasons for postoperative brow descent and the means to achieve good long-lasting results when using the endoscopic technique.

Materials and Methods

Patients

We reviewed the medical records and outcomes of patients who had forehead lift procedures performed at the Plastic Surgery Unit of the Hospital Ruber Internacional between

September 1994 and October 2000. All patients underwent a thorough, individualized preoperative evaluation to establish an accurate diagnosis, evaluate asymmetries, estimate the desired degree of elevation, and decide on the level of fixation. In all patients, the distances between the following points were measured preoperatively and at 1, 3, 6, and 12 months after surgery: point A, located at the alar crease of the nose, in the intersection between a line going through the lower part of the base of the nose and a perpendicular line crossing the most lateral part of the ala nasi; point L, located at the most lateral end of the eyebrow; point C, located at the highest portion of the mid-section of the eyebrow; and point M, located at the most nasal and inferior point (head) of the eyebrow. The top of the eyebrow hairline was always used for these measurements (Figure 1).

Figure 1

A, Preoperative view of a 58-year-old patient with measurements taken from the alar crease of the nose to the tail, midportion, and head of the brow. **B**, Postoperative view 1 year after endoscopic forehead lift and cervicofacial rhytidoplasty, upper-lid blepharoplasty, and CO2 laser treatment of the forehead and periorbital areas. Evaluation compares the pre- and postoperative distances from the alar crease with the eyebrow (tail, midportion, and head).

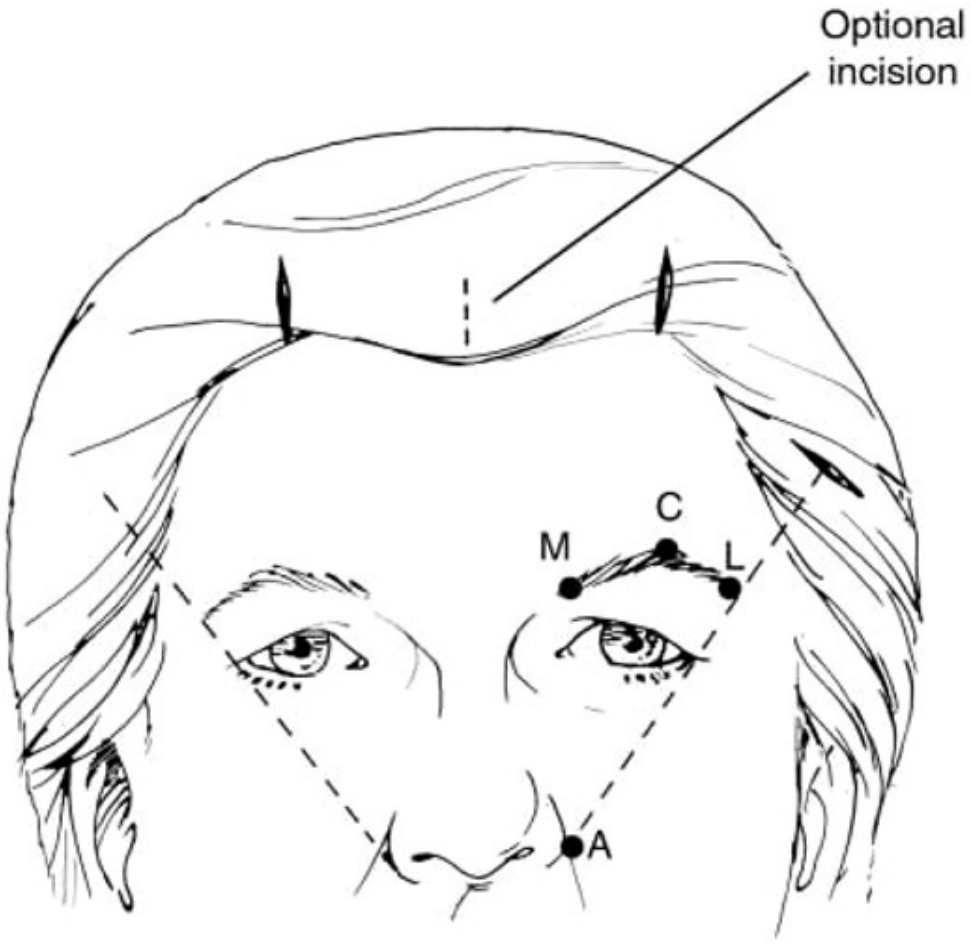
Forehead lift technique

The technique was performed in most cases under intravenous sedation and local anesthesia; general anesthesia was used in patients who requested it or for patients who had other surgical procedures done at the same

time. In all cases, 1% lidocaine and epinephrine (1:300,000) were used to infiltrate the area of the incision, the dissection planes, and the supraorbital plane. This local anesthetic decreased the need for intraoperative and postoperative analgesia.

For endoscopic-assisted forehead lift, 5 incisions were made in the scalp, just behind the anterior hairline: a single, 15-mm vertical incision in the midline of the frontal area (medial incision); 2 bilateral, 15-mm vertical incisions at the level of the superior projection of the middlebrow (lateral incisions); and 2 bilateral, 25-mm vertical incisions in the temporal area, perpendicular to a line going from the alar crease to the lateral canthus (temporal incisions) (Figure 2). In special circumstances, such as in patients with a receding hairline or sparse hair, these incisions were modified on a case-by-case basis.

Figure 2

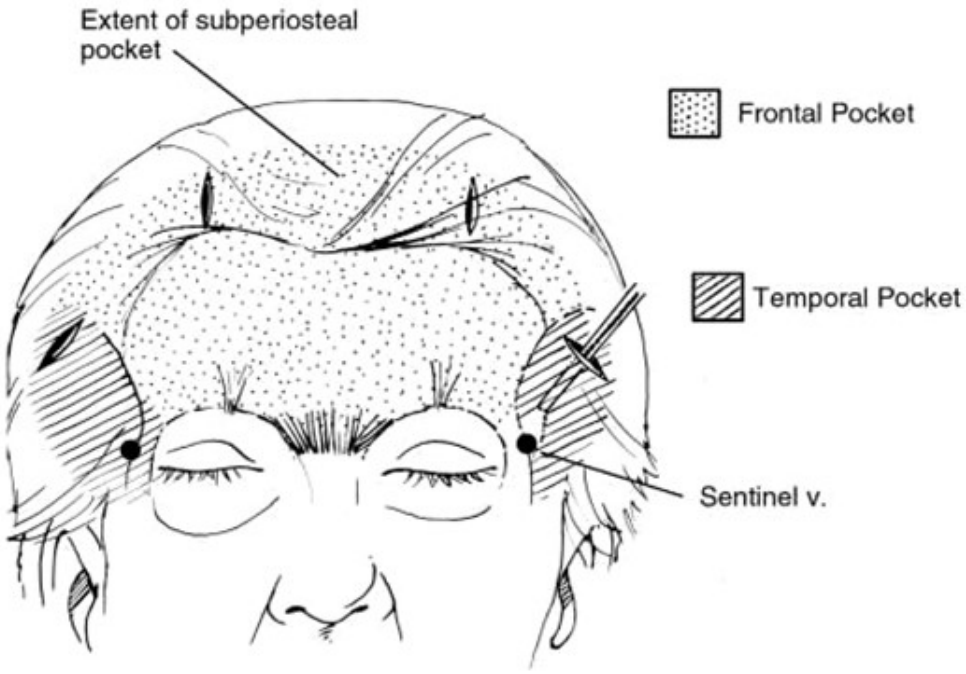


The endoscopic lift included 4 or 5 incisions, 1 medial, 2 temporal, and 2 lateral, that were made in the scalp just behind the hairline. The temporal incisions were not parallel to the temporal hairline but were just slightly perpendicular to the direction of the vector of pull and to a line going from the alar crease of the nose (point A) to the lateral canthus. Points L, the most lateral point of the eyebrow; C, the highest point of the mid-section of the eyebrow; and M, the inferior point of the most medial part of the eyebrow represent the measurement's references.

Next, a wide, blind dissection was performed to connect the medial and lateral incisions at the subperiosteal plane; this frontal dissection was halted at least 3 cm above the orbital rim. At the temporal incisions, a small cut of the deep temporal fascia was made, resulting in herniation of the temporal muscle. These incisions served to confirm the plane of dissection and as a reference point to determine the amount of advancement. The blind temporal dissection was limited to avoid injuring the frontal branch of the facial nerve. Using a rigid endoscope (4 mm in diameter with a 30-

degree down orientation), the dissection was advanced medially from the lateral incisions. At the temporal area, the dissection followed down against the deep temporal fascia or temporal fascia), not pushing the overlying tissues (Figure 3). The loose areolar tissue under the superficial fascia (or temporoparietalis fascia) that corresponds with the superficial fat pad and protects the frontal branch of the facial nerve was left intact.

Figure 3



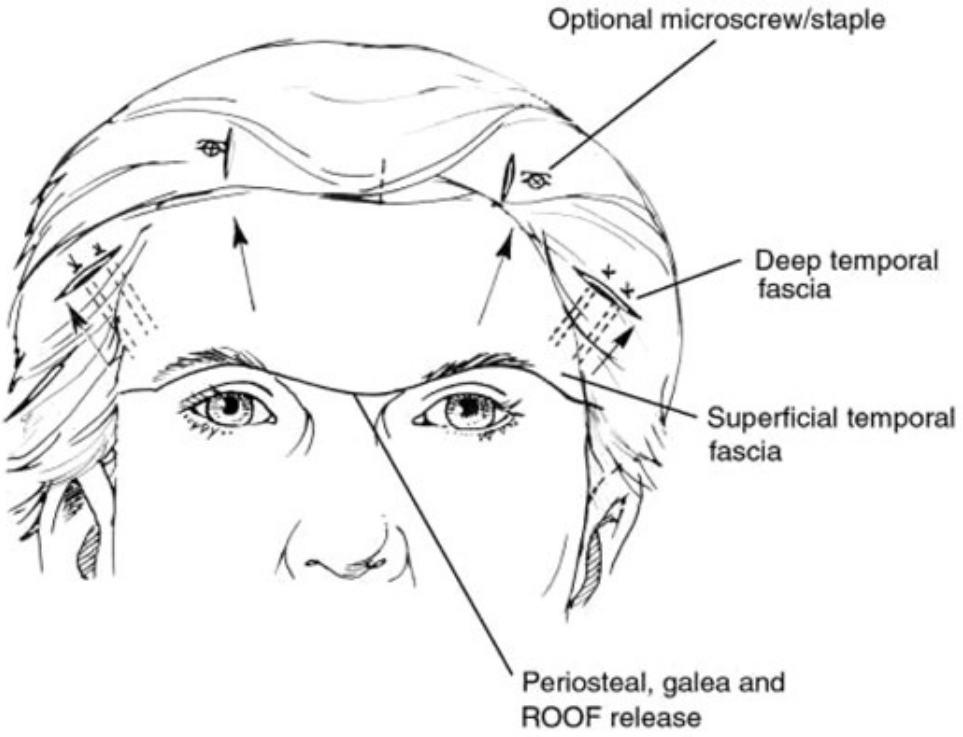
The dissection was performed subperiosteally in the frontal area, whereas in the temporal area, it was performed between the temporoparietalis fascia (or superficial temporal fascia) and the temporal fascia (or deep temporal fascia) down to the edge of the zigomatic arch, and medially over the lateral orbital rim up to the orbital edge of the rim, thus avoiding damage to the frontal branch of the facial nerve.

Initially, the dissection was stopped at the level of the first anterior temporal vein (sentinel vein of the lateral wall of the orbit), approximately 1 cm from the supraex-ternal angle of the orbit.[12,13] More recently, the dissection was extended toward the periorbital area and into the midface in order to improve these areas and facilitate the lift of the tail of the brow. As reported by others,[14] it is critical to transect the

orbital ligament at the zygomati-cofrontal suture line. The dissection was also extended along the superficial temporal crest line (separating the temporal and frontal pockets). At this fascial junction, 4 anatomic structures meet: the galea and the superficial temporal fascia, above, and the periosteum and the deep temporal fascia, below.

Once all the attachments that could restrain a tension-free lifting were removed, we proceeded with periosteal, galeal, and retro-orbicularis fat pad (ROOF) release at the level of the orbital rim, dividing and spreading its edges at least 1.5 cm, but avoiding injury of the supraorbital nerve. This permitted the forehead to be lifted superiorly.[3,7] The periosteal release allowed elevation of the forehead 4 mm to 5 mm, which can be increased to 10 mm to 12 mm by extending the dissection to the periorbital attachments.[6] Selective myotomies and neu-rotomies were performed, depending on the individual patient and degree of muscle hyperactivity, to complete the surgical procedure. In most cases, the orbital portion of the orbicularis oculi muscle was weakened laterally to elevate the tail of the brow. Myotomy of the medial part of the orbicularis oculi muscle and the depressor supercilii muscle was indicated if the head of the brow had to be moved upward. Resection of the corrugator muscle was reserved for cases in which the muscle was hypertropic or for those patients who required widening of the eyebrows or a special lift of the medial part of the brow. After the desired lift of the brow was achieved, fixation was performed to maintain the desired position until periosteal and fascial adhesion occurs (Figure 4). First, the temporal flaps were advanced to "open" the lateral portion of the eye. Two stitches of 2-0 vicryl between the superficial temporal fascia on the undersurface of the inferior flap and the deep temporal fascia superiorly were used to suspend the temporal skin posterosuperiorly. This main point of fixation was performed in all cases.

Figure 4



Once all the depressor muscles and the remaining periosteum and ligaments were released, the frontalis muscle exerted a superior and posterior pull, repositioning the tissues at a higher level. Fixation was performed to maintain the desired position until periosteal and fascial adhesion occurred. In all cases, temporal fixation was performed between the temporoparietalis fascia (or superficial temporal fascia) and the temporal fascia (or deep temporal fascia). Depending on the particular case, a staple resting over a microscrew fixed to the parietal cortex was used in an independent incision adjacent to both lateral incisions.

A titanium 12 × 15–mm microscrew fixed to the parietal cortex at the central part of the brow constituted the second point of fixation. A staple was also placed over the screw to maintain the lift during the initial postoperative period. This screw was removed after 3 weeks, when periosteum fixation had taken place. Finally, all the dissection area was taped for 6 days after surgery to maintain the position of the forehead and eyebrows and decrease the swelling.

Results

Medical records and outcomes of 207 patients were reviewed. All patients underwent surgery at the Plastic Unit of the Hospital Ruber Internacional. With the exception of 3 patients, all were Caucasian. Their mean age was 48 years (range, 34 to 66 years). Ten patients were men. All patients were followed for a minimum of 6 months.

Results were evaluated according to the authors' clinical observations, the analysis of photographs obtained before and after surgery, the analysis of pre- and postoperative measurements (Table), and patients' satisfaction. Overall, the results obtained were good and long-lasting, and in our opinion did not differ from those achieved when using an open coronal approach. We observed some degree of relaxation (2-4 mm) in 30% of patients after 4 to 6 weeks, without further progression (Figures 1 and 5).

Table Pre- and postoperative brow measurements

Time of measurement	A-M	A-C	A-L
Preoperative	6 cm	7.3 cm	7.8 cm
Immediate postoperative	6.3 cm (3 mm)	8.5 cm (12 mm)	9.3 cm (15 mm)
Six months postoperative	6.2 cm (2 mm)	8.1 cm (8 mm)	8.8 cm (10 mm)

A-L, Medium distance from point A, alar crease of the nose, to point L located at the most lateral end of the eyebrow. *A-C*, Medium distance from point A at alar crease of the nose to point C, highest portion of the midsection of the eyebrow. *A-M*, medium distance from point A at alar crease of the nose to point M, located at the head of the brow.

Figure 5

A, C, Preoperative frontal and lateral views of a 54-year-old man with heavy brows and receding hairline. B, D, Postoperative views 1 year after endoscopic forehead lift and upper-lid blepharoplasty.

There were few complications. Because a different incision was used for screw fixation instead of using the former "lateral incisions," small areas of alopecia at the microscrew area were eliminated, although 6 cases of alopecia at the microscrew fixation area occurred before this technical modification was used. There were 3 cases of transient paresia of the temporal branch of the facial nerve; all patients recovered fully within 3 months. No hematomas were observed, and morbidity was minimal.

Discussion

Facial rejuvenation has benefited from the incorporation of endoscopy-assisted techniques, especially for forehead and midface procedures. The incorporation of these minimally invasive techniques has changed the approach for forehead lift from the need for long incisions and concomitant skin

excision to wide undermining with release of periosteal attachments.[3,15] Although there are no contraindications for using this method, technical difficulties are greatest in patients with broad and convex foreheads. Patients with baldness or alopecia can also benefit from this technique where incisions are adjusted according to the hair distribution. In these cases, a small incision localized in the central part or 2 pretrichial lateral incisions can be used. However, for patients with high foreheads that require narrowing, an open approach through a precapillary incision is preferred. Presently, this constitutes the only indication that we find for the open approach.[4]

Figure 6

A, C, Preoperative views of a 56-year-old woman. **B, D**, Postoperative result 1 year after endoscopic forehead lift, conventional face and neck lift, and full-face CO2 laser resurfacing. No blepharoplasty was performed. Note the overall improvement in the forehead and brow position.

Patient and doctor satisfaction and acceptability are greater with endoscopic techniques because they are minimally invasive, require smaller incisions, have less morbidity, and shorten the convalescence period. Nevertheless, earlier

studies included numerous patients in whom endoscopic intraoperative brow elevation was followed by postoperative brow descent.9

In our opinion, the results are dependent on proper technique, specifically, adequate dissection, tissue release, and myotomies plus neurotomies. Fixation is used only to maintain the position of the tissues while healing takes place and must be performed without tension. We believe that inadequate liberation of the attachments and absence of a tension-free closure are the reasons for postoperative descent.

Most patients who have significant brow ptosis or low positioning of the eyebrows require constant contraction of the frontalis muscle to unburden the upper eyelids and enhance vision. Based on our experience and Flowers and Connell's ideas, proper repositioning of the brows and forehead results in marked reduction of the frontalis activity and a pleasing improvement of the frontalis wrin-kles.16–17 Although interruption of the restrictive forces of the corrugator supercilii and procerus muscle against the upward action of the occipitofrontalis muscle is strongly advised by some authors,3,4,15 we reserve excision of cor-rugator muscles for those cases with hypertrophy of the corrugator muscle. Deformities of the forehead are frequently seen after corrugator muscle resection. Still photographs show little of such deformity, but facial animation and expression reveal parts of muscle working, whereas excised areas appear flat and expressionless. The “surprise look” caused by overcorrection of the central brow or overwidened distance between both eyebrow heads may also be seen after the resection of corrugator muscles. In our opinion, a wide release and spread of periosteum, galea and ROOF, plus the liberation of periorbital tissue attachments, is all that is needed in most cases. These maneuvers correct both the contour and position of the eyebrow and thereby improve the aesthetic of the upper lid. Botulinum toxin is a useful complement in indicated cases. We reserve maximal

resection of the corrugator muscle for those cases with hypertrophy of the corrugator muscle and/or pronounced glabellar wrinkles or for patients who need a significant lift of the medial portion of the eyebrow.

Obviously, there are patients with a tendency to relapse caused by gravitational and intrinsic factors, especially among individuals with heavy foreheads, although these factors will also affect results obtained with the open approach. Our results and those from other authors reveal that after 1 year of follow-up, both methods achieved brow elevation without significant differences.[18] Once dissection and tissue release have been accomplished, fixation must be performed without tension. The most important suspension is located at the temporal incision, between the temporoparietalis fascia and the temporal fascia. The 2 microscrews fixed at the parietal cortex help to maintain the position during the initial postoperative period, until tissue adhesion occurs. Experimental work with rabbits suggests that 6 weeks is necessary to secure periosteal adherence to the calvarium, with complete adherence taking place by 12 weeks.[19]

Another factor to consider is the distance between the point of fixation and the brow. The closer the point of fixation, the more effective is the advancement and stability of the postoperative result. Subsequently, we place our incisions as close as possible to the hairline.

Finally, the vector of correction is of great importance to obtain a natural appearance and a good result. At the central and midportion of the brow, the pulling vector is cephalic. In the temporal area, the lateral vector is both cephalic and lateral to elevate and expand the tail of the brow. This creates an “open look” effect.

Conclusion

Endoscopic forehead lifting provides effective and long-lasting results. These results are dependent on technique. Specifically, adequate dissection and tissue release are necessary to achieve a tension-free lift. Proper fixation provides temporary support while tissue adhesion occurs. Intrinsic and gravitational factors are responsible for forehead relapse during the postoperative period, but once adhesion has occurred, there should be no difference between the results obtained with endoscopic techniques compared with results obtained by a coronal approach.

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