Suture Fixation Technique for Endoscopic Brow Lift

Andreas Foustanos, M.D.¹

ABSTRACT

Endoscopic brow lift has become widely accepted as a procedure for restoring a youthful brow, as only three, hardly noticeable incisions of the scalp are needed for this subperiosteal dissection and final repositioning of the brow. It has become an acceptable technique, an alternative to the conventional technique or transcoronal browpexy. Endoscopic brow lift allows separation and repositioning of the periosteum of the orbital rims and zygomaxilla. In a 7-year period beginning September 1999, 350 patients underwent endoscopic brow lift. In these patients, we used our fixation approach, which was accomplished with an absorbable suture subperiosteally. Satisfactory forehead rejuvenation was obtained in all patients with correct eyebrow movement. Long-term results over 7 years confirm the strength and durability of our fixation approach. We consider this approach to be a simple, fast, and reliable fixation technique that establishes precise, secure, and direct brow fixation that allows satisfactory and long-lasting cosmetic results.

KEYWORDS: Suture fixation, endoscopic brow lift

Endoscopic brow lift (EBL) is a safe and effective technique for increasing mean pupil to brow height. Vasconez et al first described the endoscopic coronal lift in 1992.¹ In 1994, Isse et al described that the EBL consists of a subperiosteal dissection, ablation of the brow depressor muscles, and fixation of the brow at an elevated position.² Ablation of the depressor muscles may be accomplished through release, division, or resection of the corrugator supercilii procerus and depressor supercilii.³ EBL is gaining acceptance as a method of elevating the brow without the morbidity of a bicoronal incision.⁴ As it is becoming a well-established procedure for restoring a youthful brow, considerable debate has arisen over the various fixation techniques. The various available techniques have been comprehensively reviewed by Rohrich and Beran.⁵ They include bolsters,⁶ posts,⁷ resorb-

able screws,⁸⁻¹⁰ pins¹¹ and tacks,¹² K-wires,¹³ frontal periosteum and galea to occipital periosteum and galea suturing,¹⁴ tissue adhesives,¹⁵ transcalvarial suture fixation,¹⁶ lateral spanning suspension/subperiosteal pulling sutures,¹⁷ fibrin glue,¹⁸ cortical V-shaped tunnels,¹⁹ lateral fixation from the galea to the deep temporal fascia and central bony fixation in the parasagittal position,²⁰ the use of skin staples secured behind screws anchored in the calvarium,²¹ V-Y suture techniques of the linear wound, direct approximation of the anterior scalp to the posterior scalp, and finally no fixation at all. In the current article, we present our experience in EBL. We describe a simple, secure, and reliable forehead fixation method using an absorbable suture subperiosteally that establishes a precise, secure, and direct brow fixation alternative to other fixation methods.

¹Associate Professor of Plastic Surgery, Athens, Greece.

Address for correspondence and reprint requests: Andreas Foustanos, M.D., Associate Professor of Plastic Surgery, 32, Kifisias Avenue, Megaro "ATRINA," 151 25 Paradeisos Amarousiou, Athens, Greece.

Frontiers in Endoscopic Plastic Surgery; Guest Editor, Geoffrey G.

Hallock, M.D.

Semin Plast Surg 2008;22:43-50. Copyright © 2008 by Thieme Medical Publishers, Inc., 333 Seventh Avenue, New York, NY 10001, USA. Tel: +1(212) 584-4662.

DOI 10.1055/s-2007-1019142. ISSN 1535-2188.

Figure 1 Lateral incision over the temporalis muscle. It is a posterior and parallel to the hair line 2- to 3-cm incision in the scalp.

Figure 3 Through a 2-mm skin incision (at the level of the tail of the eyebrow), with an endoscopic grasper, one suture is passed throughout the periosteum and galea. We use coated Vicryl 2-0 (polyglactin 910).

TECHNIQUE

Preoperative assessment is initially performed to define the adequate brow elevation vectors and their location in the forehead. The operation is performed with the patient under general anesthesia. The hair is not cut or shaved. Taping the hair into bundles away from the incisions facilitates operative exposure. Infiltration is administered subperiosteally over the incisions, over the frontal region, and beneath the temporoparietal fascia laterally to provide hydrodissection. According to the elevation vectors that we defined preoperatively, we make three posterior and parallel to the hairline incisions in the scalp of 2 to 3 cm (Fig. 1). Two incisions are made laterally each over the temporalis muscle and one medially. We perform the EBL: subperiosteal release and elevation of the tissues.^{12,22,23} Most of the surgical dissection is achieved using specially designed elevators. We begin the procedure from the temporal site. Temporally, the surgical plane is beneath the subgaleal fascia on the superficial leaf of the deep temporal fascia. The fascia confluence of the

temporal crest is broken from the lateral aspect. Dissection of the temporal crest is completed and extended subperiosteally along the zygomatic process of the frontal bone. In the frontal bone, the dissection is beneath the pericranium and carried down to the orbital rims and the zygomatic arch anteriorly (Fig. 2). The subperiosteal frontal dissection is blind to 2 cm above the orbital margin. The lateral and superolateral orbit is also dissected in the same plane with a curved elevator, and supraorbital nerves are identified. The arcus marginalis is divided and the corrugator, procerus, and depressor supercillii muscles are debulked while the supratrochlear nerve branches are protected.

At this point, the brows are elevated and fixation is achieved. Through a 2-mm skin incision (at the level of the tail of the eyebrow), with an endoscopic grasper, one suture is passed throughout the periosteum and galea (Fig. 3). The suture is placed through the skin, in and out of the same puncture hole, through the skin but encircling the fascia above the orbital rim (Fig. 4). This Vicryl stitch (coated Vicryl 2-0 [polyglactin 910]) is secured to the galea of the posterior edge of the lateral incision (Fig. 5). Depending on the case, the brow is pulled superiorly and laterally in the most aesthetic position and thus overcorrected by 1 to 1.5 cm. The whole anterior frontal area is elevated, because this pull is exerted on the nondistensible frontal periosteum and retracts the eyebrow, thus opening the periosteum. When the knots have been made leaving enough stitch, the excess tissue is resected in an inverted-T way and the skin is closed with staples (Fig. 6). When we finish the fixation of the opposite brow, we resect the excess tissue in the medial incision in an inverted-T way, and the skin is also closed with staples. We generally fix the brow at the lateral endoscopic incision sites, but additional fixation may be used for the head of the brow at the median incision site, if necessary, as well (Fig. 7).

Figure 2 Subperiosteal release and elevation of the tissues. Dissection is beneath the pericranium and carried down to the original rims and the zygomatic arch anteriorly.

Figure 4 The suture is placed through the skin in and out of the same puncture hole, through the skin but encircling the fascia above the orbital rim.

Figure 6 When the knots have been made, leaving enough stitch, the excess tissue is resected in an inverted-T way.

The lateral sutures are tied first and then the central, judging how tight to tie the suture by direct observation of the elevated brow. To ensure reliable fixation, the suture should "grab" at least 1.5 cm of the galea. In this way, precise positive positioning is maintained until wound healing and reattachment of the suture is complete. Usually, we do not have to open the incision to remove the suture. If we have to open the incision, this is done under local anesthesia. Even though we remove the stitch 2 weeks after the operation, we use an absorbable

one, in case it accidentally stays inside the forehead flap. The skin incisions at the tail of the eyebrows are closed with Nylon 6-0. Micropore provides gentle compression to minimize swelling, and a loose gauze bandage is placed around the head.

DISCUSSION

EBL is a predictable procedure for rejuvenation of the upper third of the face with minimal complications.³

Figure 5 The stitch is secured to the galea of the posterior edge of the lateral incision.

Figure 7 If necessary, additional fixation may be used for the head of the brow at the median incision site.

The instruments, which are specific for this procedure, include endoscope, contoured elevators, angled scissors, clamps, and combined suction/cauteries. It is a minimally invasive procedure with reduced tissue trauma that avoids extensive incisions, bleeding, edema, large scars, and obtains satisfactory aesthetic results. Minimal alopecia or numbness are important advantages of the procedure.^{6,10} As a result, a greater acceptance is achieved among those patients who are hesitant to more extensive surgery. We prefer the subperiosteal dissection.^{2,9} Troilius found that subperiosteal lifts are more stable. Moreover, the reflective properties of the periosteum allow for lower-wattage light (~ 150 W), and the visualization pocket is more easily maintained.¹¹ The endoscopic technique allows the separation and repositioning of the periosteum of the orbital rims and zygoma-maxilla. Important technical details include complete release of the orbital rims, release of the nasal radix periorbital, and release of the corrugator-procerus muscles. Correct brow fixation to achieve the desired position depends on forehead fixation and maintenance of skin redraping until healing is complete.⁵

There has been much debate about fixation methods in endoscopic brow lift. The criticisms against most methods of fixation include failure to provide long-term results and alopecia. The best technique is yet to be determined. There is some evidence that fixation, longer than a few days or weeks, is needed.²⁴ The bolster techniques may lead to alopecia, presumably due to excessive tension and circulatory impairment. The external bolster has the disadvantage of applying its pull on the surface of the scalp rather than on the periosteal/galeal layer, where the long-term fixation of periosteum to bone will take place. It also prevents patients from washing their hair for many days postoperatively (~ 10 days). The screw technique is costly and requires patients to accept hardware protruding from their wounds. There is a possibility of placing the miniscrews too deeply, through the inner table, and if placed in the midline, into the sagittal sinus. When incisions are placed on either side of the midline to avoid sagittal sinus, an additional scar is created, and another screw is required. Brow suspension methods that place the tension of the lift on the hair-bearing scalp may result in wider scars and alopecia. McKinney et al described an approach involving a tunnel drilled in the outer cortex of the calvarium through which a suspension suture can be anchored.²⁵ Later on they described a modification to this technique. They used lateral fixation from the galea to the deep temporal fascia and central bony fixation in the parasagittal position.¹² Guyuron and Michelow²⁶ introduced a new tool specifically designed to make this tunnel drilling less problematic. Unfortunately, drilling a tunnel in the calvarium has some disadvantages (i.e., the associated concern and expense of implanted hardware and the concern of the surgeons that they are uncom-

Figure 8 Preoperative appearance (above) and 1-year postoperative appearance (below) after EBL using our fixation technique and upper and lower blepharoplasty.

fortable with neurosurgical procedures). The blind passage of a drill into the calvarium has the potential risk of perforating the inner calvarial table. It can also be difficult and awkward to pass the needle of a suspension suture through the tunnel. Finally, some struggling and needle-bending will be encountered.

In a 7-year period beginning September 1999, 350 patients underwent EBLs using our approach for correction of brow ptosis (Figs. 8–13). All operations were performed with the patient under general anesthesia. The mean follow-up period was 4 years. Postoperative visits were arranged at 1 week, 2 weeks, 1 month, 3 months, 6 months, and yearly. Satisfactory forehead rejuvenation was obtained in all patients with correct eyebrow movement. Correction of brow asymmetry was obtained in the vast majority of the patients. Even for patients in whom a very limited asymmetry existed, the overall aesthetic result satisfied them. Blinking and vision were adequately preserved. There were no reports of excessive elevation of the eyebrows or shifting of the hairline. In our patients, we have not seen severe alopecia cases associated with the bolster or V-Y suture techniques. No infection and no hematomas were observed in the patients. Short-term postoperative headache or severe neuralgic pain was not seen. We had no recurrences of brow ptosis or failure of the procedure. With this procedure, complications

Figure 9 Preoperative appearance (left) and 3-year postoperative appearance (right) after EBL using our fixation technique.

Figure 10 Preoperative appearance (left) and 1-year postoperative appearance (right) after EBL using our fixation technique. The patient also underwent face lift and upper and lower blepharoplasty in both eyes.

Figure 11 Preoperative appearance (above) and 6-month postoperative appearance (below). Combination of EBL with our fixation technique, face lift, and unilateral upper and lower blepharoplasty.

Figure 12 Preoperative appearance (above) and 2-year postoperative appearance (below) after EBL using our fixation approach and lower blepharoplasty in both eyes.

are few and include swelling, periorbital ecchymosis, and dulled sensitivity to the forehead and scalp that last 1 to 3 weeks. Frontal paresthesia is resolved in 3 months. Apraxia of the frontal branch of the fascial nerve was seen in only four patients who experienced spontaneous recovery after 3 to 4 months. This apraxia is due to the stretching of the nerve because of the skin elevator. That is why the procedure time must be quick. In eight patients, very small incision site alopecia was seen (~ 0.5 to 1 cm). It was treated very easily with resection of the alopecia area under local anesthesia. No complications were recorded that were directly related to this fixation technique. The position and shape of the eyebrows were aesthetically superior to those with previously attempted methods. In addition, patients are not burdened by bulky dressings, tapes, or external screws. With this approach, we can avoid the associated concerns and expense of implanted hardware. We rely on the adequate soft-tissue undermining and release, the upward and lateral re-draping of the undermined tissues, and the stable fixation of the elevated tissue flaps.⁸ We have observed satisfactory and long-lasting results. There is no lim-

itation to the degree or direction of the pull on the brow; however, according to our experience, we have found an overcorrection at the time of surgery of 1 to 1.5 cm to be optimal. We did not have under- or overcorrection cases. The brow is always pulled superiorly and laterally in the most aesthetic position, depending on the case. We always check the new position intraoperatively. EBL is a predictable procedure for rejuvenation of the upper third of the face with minimal complications.¹⁸ We describe our approach to suspend the brow fixation.²⁷ This approach allows specific suspension of the periosteum with positive positioning until the third phase of wound healing is complete. It provides a straightforward, inexpensive, effective, and secure system of fixation with the proper vector force without any risk of long-term postoperative complications from permanent indwelling devices. No special tools are needed. We consider this approach to be a simple, rapid, secure, and reliable forehead fixation method for EBL that allows satisfactory and long-lasting cosmetic results. It might be a useful tool in a plastic surgeon's repertoire.

Figure 13 Preoperative appearance (above) and 2-year postoperative appearance (below) after EBL using our alternative fixation approach, face lift, and upper and lower blepharoplasty in both eyes.

REFERENCES

- Core GB, Vasconez LO, Askren C, et al. Coronal face lift with endoscopic techniques. *Plas Surg Forum* 1992;15:227
- Isse NG. Endoscopic facial rejuvenation: endoforehead, the functional lift. Case reports. *Aesthetic Plast Surg* 1994;18:21-29
- Ramirez OM. Endoscopic techniques in facial rejuvenation: an overview. Part 1. *Aesthetic Plast Surg* 1994;18:141-147
- Ramirez OM. Endoscopic subperiosteal browlift and facelift. *Clin Plast Surg* 1995;22:639-660
- Rohrich RJ, Beran SJ. Evolving fixation methods in endoscopically assisted forehead rejuvenation: controversies and rationale. *Plast Reconstr Surg* 1997;100:1575-1582
- Ramirez OM. Endoscopic full facelift. *Aesthetic Plast Surg* 1994;18:363-371
- Pozner JN. Simplified fixation for endoscopic brow lifts: self-tapping, drill-free posts. *Plast Reconstr Surg* 1999;103:1326
- Eppley BL, Coleman J, Sood R, et al. Resorbable screw fixation technique for endoscopic brow and midfacial lifts. *Plast Reconstr Surg* 1998;102:241-243
- Niazi ZBM, Salzberg CA. Endoscopic forehead lifts: the postoperatively adjustable technique. *Plast Reconstr Surg* 1998;101:2006
- Taylor CO, Green JG, Wise DP. Endoscopic forehead lift: technique and case presentations. *J Oral Maxillofac Surg* 1996;54:569-577
- Pakkanen M, Salisbury A, Ersek R. Biodegradable positive fixation for the endoscopic brow lift. *Plast Reconstr Surg* 1996;98:1087-1091
- Landecker A, Buck J, Grooting J. A new resorbable tack fixation technique for endoscopic brow lifts. *Plast Reconstr Surg* 2003;111:880-886
- Chasan PE, Kupfer DM. Direct K-wire fixation technique during endoscopic brow lifts. *Aesthetic Plast Surg* 1998;22:338-340
- Loomis MG. Endoscopic brow fixation without bolsters or miniscrews. *Plast Reconstr Surg* 1996;98:373-374
- Mixter RC. Endoscopic forehead fixation with histoacryl. *Plast Reconstr Surg* 1998;101:2006-2007
- Kobienia BJ, Van Beek A. Calvarial fixation during endoscopic brow lift. *Plast Reconstr Surg* 1998;102:238-240
- Muller G-H. Endoscopic forehead lift: the subperiosteal pulling stitch. *Aesthetic Plast Surg* 1996;20:297-301
- Jones B, Grover R. Endoscopic brow lift: a personal review of 538 patients and comparison of fixation techniques. *Plast Reconstr Surg* 2004;113:1242-1250
- Hoenig JF. Rigid anchoring of the forehead to the frontal bone in endoscopic facelifting: a new technique. *Aesthetic Plast Surg* 1996;20:213-215
- Mckinney P, Sweis I. An accurate technique for fixation in endoscopic brow lift: a 5-year follow up. *Plast Reconstr Surg* 2001;108:1808-1810
- Putterman AM. Intraoperatively controlled small-incision forehead and brow lift. *Plast Reconstr Surg* 1997;100:262-266
- Daniel RK, Tirkanits B. Endoscopic forehead lift: an operative technique. *Plast Reconstr Surg* 1996;98:1148-1157
- Schur PL, Don SA. Forehead and brow lift. In: J. Weinzwieg, ed. *Plastic surgery secrets*. Philadelphia, PA: Hanley and Belfus; 1999
- Romo T, Sclafani AP, Yung RT, et al. Endoscopic foreheadplasty: a histological comparison periosteal refixation after endoscopic versus bicoronal lift. *Plast Reconstr Surg* 2000;105:1111-1117
- Mckinney P, Celetti S, Sweis I. An accurate technique for fixation in endoscopic brow lift. *Plast Reconstr Surg* 1996;97:824-827
- Guyuron B, Michelow BJ. Refinements in endoscopic forehead rejuvenation. *Plast Reconstr Surg* 1997;100:154-160
- Foustanos A, Zavrides H. An alternative fixation technique for the endoscopic brow lift. *Ann Plast Surg* 2006;56:599-604