The Modified Lateral Brow Lift

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In the aging face, the lateral third of the brow ages first and ages most. Aesthetically, eyebrow shape is more significant than height and eyebrow shape is highly dependent on the level of the lateral brow complex. Surgical attempts to elevate the brow complex are usually successful medially, but often fail laterally. The “modified lateral brow lift” is a hybrid technique, incorporating features of an endoscopic brow lift (small hidden incisions, deep tissue fixation) and features of an open coronal brow lift (full thickness scalp excision). Sensory innervation of the scalp is preserved and secure fixation of the elevated lateral brow is achieved. Side effects and complications are minimal. (Aesthetic Surg J 2009;29:158–166.)

Over the last century, many methods to elevate the eyebrow complex have been described. With the introduction of endoscopic brow surgery, a predictable elevation of the brow complex with minimal incisions and few side effects seemed possible. Despite its widespread adoption, many surgeons have been frustrated with the unpredictable results of endoscopic brow lifting (Figure 1).

Depending on the portion of the eyebrow being addressed, different mechanisms are involved in surgically elevating the brow complex. Medially, eyebrow elevation depends on weakening of the depressor muscles plus soft tissue release; frontalis, the only brow elevator, is then allowed to do its job unperturbed. Laterally, frontalis action is weak or nonexistent, so that lateral brow elevation depends completely on mechanical fixation after appropriate soft tissue release. When a surgical brow elevation initially succeeds but later fails (as seen in Figure 1), the failure is one of fixation and it typically occurs in the lateral brow region. Conversely, elevation of the medial brow rarely fails. In an attempt to solve this problem, a multitude of different fixation techniques have been described for the lateral half of the brow. Unfortunately, none of these techniques has been foolproof.

**AESTHETICS**

The prevailing aesthetic regarding eyebrow shape and position has fluctuated throughout history as fashion changed and women have taken artistic license with makeup and eyebrow hair removal. Gunter and Antrobus discussed this issue, acknowledging that aesthetics in the periorbital region are influenced by ethnicity, gender, orbital shape, eye prominence, and overall facial proportions. Nevertheless, they describe certain universal principles that contribute to the aesthetically appealing orbital region (Figures 2 through 4).

Traditional teaching on this subject has simply been that the eyebrow should be at or above the orbital rim. While this is generally true, a great many other variables come into play. Over time, the most stable anatomic factor is the bone of the orbital rim, although this has also been shown to change. With advancing age, there is an enlarging aperture of the orbit in the area of the superomedial orbital rim, contributing to the “hollow eyes” of age. The greatest changes, however, are in the overlying soft tissue. The eyebrow complex becomes ptotic, upper lid skin becomes redundant, there may be loss of fat from the upper eyelid sulcus, or fat may protrude above the palpebral fold. Senile ptosis may develop in the eyelid, which typically leads to a retracted palpebral fold and reflex lifting of the eyebrow. Such changes result in dramatic alterations in the ratio of distance between the upper eyelid lash line, the visible upper eyelid fold, and the eyebrow.

In addressing these issues, surgeons have a wide variety of procedures from which to choose. Eyebrows can be lifted (brow lift) or lowered, the eyelid level can be raised (ptosis repair), excess eyelid skin or fat can be removed (blepharoplasty), and fat can be added to the hollow palpebral fold (fat grafting). Botulinum toxin is available as an adjunct. Therefore, the actual level of the eyebrow is only one of several variables and the shape of the eyebrow is more important than its height (Figure 4).
AGING

In contrast to the aesthetic ideal, over time the lateral brow ages first and ages most.\textsuperscript{9,10} Figure 5 illustrates this phenomenon. Consequently, in facial rejuvenation surgery, it is usually the lateral half of the brow that must be elevated to achieve an optimal aesthetic outcome. Unfortunately, this is also the portion of the brow in which surgical elevation is most subject to relapse.

PERTINENT ANATOMY

The temporal crest is a palpable line that separates the temporal fossa from the forehead portion of the frontal bone. This line represents an area of transition in which the deep temporal fascia continues medially as frontal bone peristeum and the superficial temporal fascia continues medially as the galea. These layers are all attached to bone along the temporal crest line in an area called the zone of adhesion\textsuperscript{10} or the superior temporal septum.\textsuperscript{11} Closer to the orbital rim, the zone of adhesion widens to become the orbital ligament,\textsuperscript{10} also known as the temporal ligamentous adhesion.\textsuperscript{11} Medially, across the supraorbital rim, there is further attachment of galea to bone (supraorbital ligamentous adhesion). Around the orbital rim, the orbicularis is attached to bone by the orbicularis retaining ligament. This attachment is thickest laterally (Figure 6).

Laterally, where the frontalis dissipates, the galeal fat pad may be continuous with the preseptal retroorbicularis fat. Alternatively, these fat components may be separated by galeal attachment along the orbital rim. It has been speculated that a continuity of galeal and preseptal fat may predispose some people to lateral brow ptosis (Figure 7).\textsuperscript{9,10}

The supraorbital nerve leaves the orbit through either a notch in the rim or a foramen above the rim. There is considerable anatomic variation, so that blind dissection can easily damage a nerve that exits through a supraorbital foramen. The supraorbital nerve divides into two branches. The superficial por-
tion travels on the superficial surface of the frontalis, innervating the central forehead. The rest of the scalp and top of the head is innervated by the deep branch that travels laterally and deeply between the perios-teum and the galea. The deep branch normally consists of one, two, or three branches. In all instances, these deep branches run in a band, 1 cm wide, that lies between 5 mm and 15 mm medial to the palpable temporal crest line (Figure 8).

THE MODIFIED LATERAL BROW LIFT

The modified lateral brow lift was developed to address problems associated with other available techniques. It is a hybrid operation using small incisions, soft tissue release, and deep tissue fixation (like an endoscopic brow lift), but also using scalp tightening (like a coronal brow lift). The logic in removing the scalp is based on the observation that coronal brow lifting is effective and long-lasting. Variations on this theme are numerous. In an attempt to minimize incision length, the “temple lift” uses only the lateral portion of the coronal incision lateral to the temporal crest line. Other techniques depend on a limited excision of skin or full thickness scalp at the anterior hairline. Some methods employ nonendoscopic deep plane procedures with no skin excision at all. Combining these concepts, the modified lateral brow lift uses traditional endoscopic techniques along with full thickness scalp excision in the hair-bearing scalp. The galea is closed under tension but, unlike a coronal lift, innervation of the scalp is completely preserved by saving the deep branch of the supraorbital nerve.

Figure 5. A, C, A 17-year-old woman. B, D, The same woman at 34 years of age. Note that the medial brow is fairly stable, acting like a fulcrum around which the central and lateral portions of the eyebrow descend. (Photos courtesy of National Geographic.)
The modified lateral brow lift has proven to be a durable method of fixation for the lateral half of the brow.

**INDICATIONS**

Although the modified lateral brow lift has become the author’s preferred technique in almost all brow elevation procedures, there are some situations in which it is uniquely advantageous. In 2 distinct patient groups designated as having “unfavorable brow,” sustained elevation of the lateral brow is unlikely to be achieved with standard limited incision techniques. The first group includes patients with a life-long appearance of downturned lateral eyebrows. Such patients have a clear predilection to lateral brow ptosis and fit the anatomic category of patients with no galeal attachment in the supralateral orbit. In such cases, the galeal fat pad is contiguous with preseptal fat and the galea is not attached to bone. The second group includes patients with a brow problem caused by skin. This problem may be found in elderly patients with excess loose skin or in men with thick, heavily corrugated skin. Such patients present an impossible challenge for standard endoscopic techniques that rely on deep dissection planes and deep fixation without skin tightening (Figure 9).

**SURGICAL TECHNIQUE**

The required surgical procedures are determined in the course of preoperative planning. Photographs depicting the patient at a younger age are especially helpful in discussing the goal of possibly recapturing that younger appearance.

Patients with ptotic brows may also have excess upper eyelid skin, a deficiency of upper sulcus fat,
Frown muscle action may also be an issue. Therefore, to achieve aesthetic harmony, brow lift candidates often require other procedures such as blepharoplasty, eyelid ptosis repair, fat removal, fat grafting, or frown muscle modification.

When considering the brow complex, the shape of the eyebrow should be addressed. If the medial brow is stable and the lateral brow is ptotic, a lateral brow procedure alone is indicated. When frown muscles are to be addressed, options include an endoscopic approach from above, an upper eyelid approach from below, or simply an injection of botulinum toxin. When the medial brow is also ptotic, frown muscles are excised and the periosteum and galea are released from the medial orbital rim to allow for frontalis lifting.

Preoperative marking is accomplished with the patient in the upright position (Figure 10). With the patient’s teeth clenched, the temporalis becomes pal-visible, which is useful for identifying the deep branches of the supraorbital nerve.
pable, delineating the temporal ridge. If visible, the sentinel vein (medial zygomatico temporal vein) is marked; the vein is more visible if the patient is recumbent. The expected course of the temporal branch of the facial nerve is marked, crossing the middle third of the zygomatic arch and coursing just superior and lateral to the sentinel vein. The expected course of the supraorbital nerve (ie., the deep and superficial branches) is marked. The desired vectors of pull are marked. Although guidelines for these vectors have been described, a customized approach is more accurate and will result in a more vertical trajectory than traditional descriptions. The incision is then marked, centered on the primary vector 6 cm in length and 1 cm behind the hairline. A widow’s peak will require a curved modification of the incision line. Lastly, if frown muscle modification is planned (either transpalpebral or through an endoscope), the patient is asked to frown and the action of the muscle is marked.

The procedure is performed under general or local anesthesia with sedation. Local anesthetic containing epinephrine is injected into the planned incision and around the orbital rim. Hair is shaved in a 1 cm strip immediately superior to the planned incision. The incision is made parallel to the hair follicles; the skin is peeled back from the underlying frontalis muscle medially and from the superficial temporal fascia laterally. This skin can be excised now or later, when the degree of scalp mobility has been determined (Figure 11).

The lateral portion of the incision is entered, using scissors to spread through the superficial temporal fascia down to the deep temporal fascia (Figure 12). This dissection is lateral to the expected course of the deep branch of the supraorbital nerve. The temporal pocket can then be opened under direct vision using a headlight or lighted retractor.

The medial portion of the incision is then accomplished, dissecting through the frontalis, galea, and periosteum to reach the subperiosteal plane (Figure 13). The medial subperiosteal pocket can be developed blindly to within 2 cm of the supraorbital rim. Once the two dissection pockets have been created, a vertical wall of tissue will remain along the temporal crest line. This zone of adhesion separates the lateral (temporal) and medial pockets. These pockets are then connected from lateral to medial, using a periosteal elevator in a blind motion, sweeping superiorly (Figure 14). The result of this action is a change of anatomic planes; the superficial lateral pocket (superficial to the deep temporal fascia) is now contiguous with the deep medial pocket (subperiosteal plane). The remaining zone of adhesion is then divided down to the orbital rim, where it thickens to become the orbital ligament. This stout attachment must be completely released.

Throughout the dissection process, the neurovascular bundle containing the deep branches of the supraorbital nerve is preserved (Figure 15). All soft tissue attachments to the lateral and superior orbital rims are then addressed. This can be done under direct vision using a headlight or lighted retractor or, as is the author’s preference, by endoscopic assist. In approaching the lateral orbital rim, dissection is kept deep.
against the deep temporal fascia to avoid the overlying facial nerve temporal branches that travel in the superficial temporal fascia and are therefore in the roof of the dissection pocket when the sentinel vein is identified (Figure 16). Soft tissue attachments to the lateral orbital rim are extensively released down to the level of the zygomatic arch. This can be done in the subperiosteal plane or, as is the author’s preference, in the supraperiosteal plane. Moving to the supraorbital rim, release of the periosteum and galea should extend at least 1 cm medial to the supraorbital nerve trunk to ensure adequate mobility. Some means of visualization is necessary in this area so as to protect the trunk of the supraorbital nerve. Blind dissection could avulse the nerve in those patients in whom it exits from a foramen above the orbital rim. Lastly, satisfactory mobility of the elevated flap is confirmed by inserting a finger to palpate and release any remaining soft tissue attachments around the perimeter of the orbit.

The scalp flap is then drawn superiorly and fixed into place. This is accomplished through the lateral portion of the incision with two sutures placed from the superficial to the deep temporal fascia. If a peak in the lateral third of the brow is aesthetically desirable, working through
the medial portion of the incision, the flap can be fixated to bone using any of the available techniques. Bone tunnels, titanium screws, or absorbable devices are all effective (Figures 17 and 18).

Lastly, the flap is drawn along the planned vector of pull, an action that tends to rotate the lateral portion of the flap superiorly. Overlapping tissue is marked and the galea is sutured under tension (Figure 19). The redundant scalp skin is conservatively excised to allow a tension-free closure. The preserved neurovascular bundle will telescope up under the scalp closure. A bupivacaine block is injected into the supraorbital nerve. A drain is not normally used. A soft dressing with circumferential head wrap is then applied.

**POSTOPERATIVE CARE**

The head is kept elevated and cold packs are applied to the eyes. The patient is seen in 24 to 48 hours for dressing removal and wound inspection. Scalp stitches and staples are removed at 7 days postsurgery. The primary early postoperative problem is headache, which can be problematic when the nerve block wears off. Mild analgesics are normally effective. Two weeks postoperatively, 10 units of botulinum toxin are injected into the lateral orbicularis oculi on each side to help prevent relapse. This is repeated several months later and is considered part of the original surgery.

**COMPLICATIONS**

Problems with this procedure are analogous to the endoscopic approach. Specifically, there is the potential for early hematoma and sensory or motor nerve injury. Because the incision is longer than with a purely endoscopic approach, there is also the potential for minor alopecia (Figure 20). Should alopecia develop, it can be watched for 6 months and, if persistent, cor-
rected with simple excision. The results of this procedure can be seen in Figures 21 and 22.

DISCLOSURES
The author has no financial interest in and receives no compensation from manufacturers of products mentioned in this article.

REFERENCES

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Figure 21. A, Preoperative view of a 45-year-old woman. B, Postoperative view 8 months following a modified lateral brow lift and upper lid skin trim.

Figure 22. A, Preoperative view of a 48-year-old woman. B, Postoperative view 6 months following a modified lateral brow lift and upper lid skin trim.