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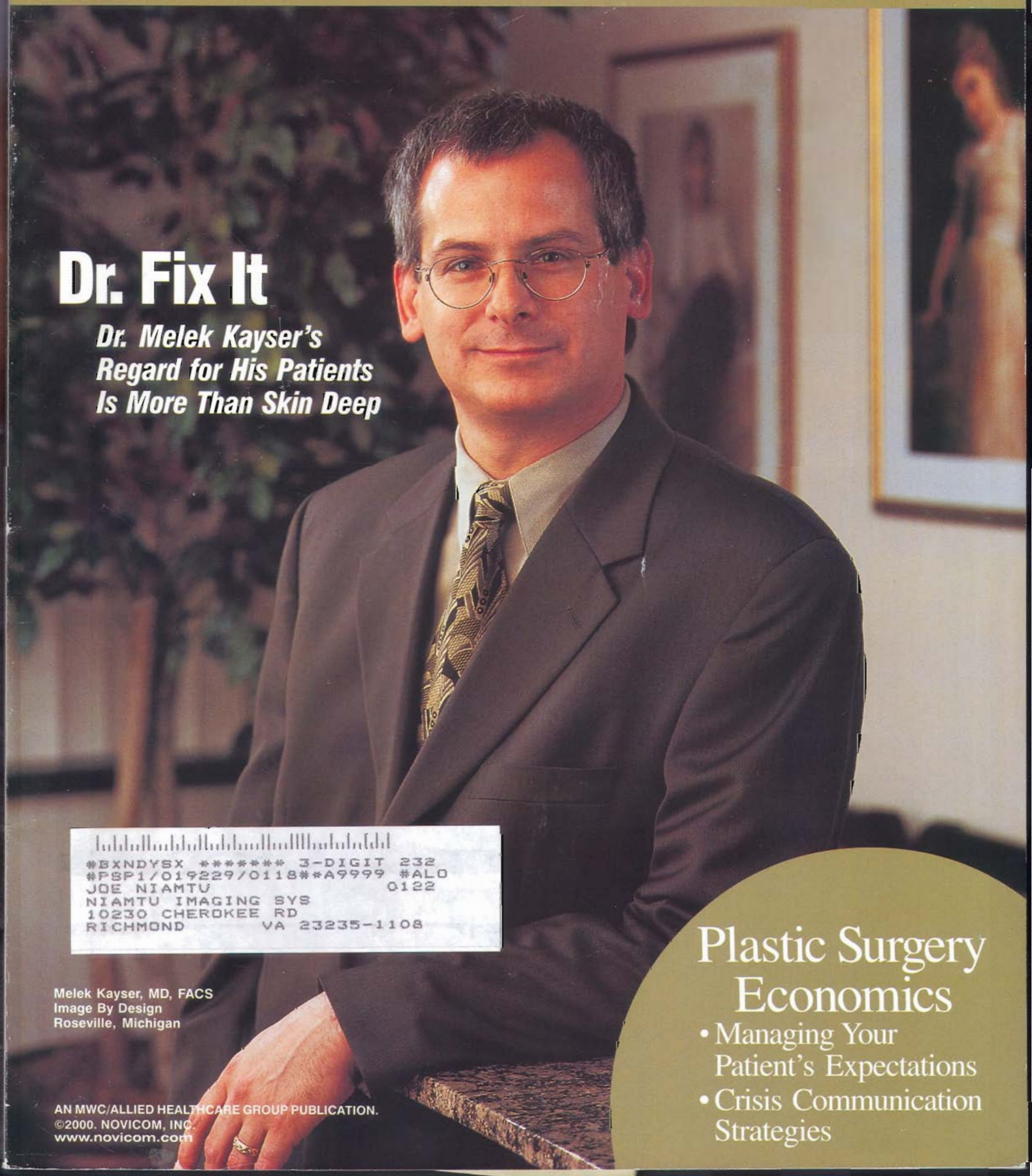

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Endoscopic Brow Techniques: An Evolving Paradigm

by Joseph Niamtu, III, DDS

Endoscopic technology is emerging as the preferred method of brow and forehead lift in multiple specialties.

Endoscopic techniques have changed many surgical procedures forever. They were first performed in the 1800s using tubes and candlelight. As portable light sources and lens systems developed, the endoscope became a functional technique. It was not until the 1960s that the Japanese pioneered endoscopic techniques and created a true paradigm shift in the field of orthopedics. In a short period of time, endoscopic surgery changed the standard of care for multiple orthopedic procedures. These techniques enabled less complicated procedures with decreased recovery. Many other specialties applied endoscopic principles to their respective disciplines. General surgeons, urologists, Ob/Gyn and otolaryngologists quickly applied endoscopic techniques to their surgical repetoire.

Anytime a new procedure evolves, there are promoters and skeptics. The procedure will either prove itself or fade into oblivion. Promoters sometimes develop tunnel vision in an attempt to prove that endoscopy is superior. I have personally witnessed arthroscopists subject a patient to a several-hour endoscopic procedure when a 45-minute open joint procedure would have sufficed. The other side of the coin is the surgeon who is skeptical or fearful of new technology and refuses to pursue endoscopic advances. Who is right and who is wrong? As the adage goes – time will tell. In the past 20 years, we have seen some endoscopic procedures come and go, while others have become the cornerstone of treatment.

There has been an evolving paradigm in cosmetic facial surgery concerning the old concept that excess skin is treated by excision versus the new concept that skin excess can be dealt with by redraping.[1] Endoscopic brow and forehead lift is an example of how surface changes

may be affected by dissecting, redraping and reattachment.

If one reads the multispecialty literature (plastic surgery, facial plastic surgery, dermatology, ophthalmology and oral and maxillofacial surgery) there is no doubt that endoscopic brow and forehead lifts have definite advantages over open approaches. These techniques are driving the literature as well as becoming the preferred method for upper facial rejuvenation.

As with any new procedure, innovative surgeons continually adjust operative technique as the procedure evolves. The past five years have shown many changes and recommendations in endoscopic brow and forehead lift. Controversies exist with most every aspect of the procedure from dissection to suspension.

Figure 1

Diagnosis

In my initial approach to diagnostic implications of endoscopic brow surgery, I ask the patient to bring a picture from their youth to evaluate their brow position. It is a mistake to assume that all adult patients have brow ptosis. I have made this assumption several times only to find out from a photograph that the patient always had a low brow. This patient may be unhappy with an elevated brow, as it will not necessarily be reminiscent of youth.

Another important factor in evaluating the prospective endoscopic brow lift patient is how they will perceive an elevated brow. Although many surgeons feel that an elevated brow conveys an alert or refreshed look, some patients feel that it conveys a "deer in the headlights" appearance. This is one procedure where computer imaging is quite beneficial for an accurate surgical prediction. When evaluating patients for an endoscopic brow procedure, I elevate one eyebrow by either taping it to the forehead or having an assistant elevate the eyebrow. I take a digital photograph and place the image on a computer screen. I then crop out the tape or the assistant's fingers and show the patient the result of an elevated brow, using the other brow as a control (Figure 1).

By showing them a picture of only one eyebrow elevated, they can compare this to the untreated brow and see the significant difference that surgery can produce. I will then repeat the procedure elevating both brows and review the computer image with the patient. In doing this, the patient can "customize" the brow elevation.

I have been surprised several times by having the patient not like my proposed elevation, or wanting elevation where I did not intend. By adjusting the position of the tape strips, the brow elevation may be customized. My personal experience has shown that most females prefer central and lateral brow elevation and disapprove of significant medial elevation. This has caused me to largely abandon central brow suspension sutures, as it seems to create the surprised appearance.

Also germane to the diagnosis driving the surgery is the consideration of simultaneous upper eyelid blepharoplasty. Most patients with ptotic brows also have excess upper lid skin. It is the standard of care to discuss brow position with all cosmetic blepharoplasty patients. Failure to consider brow elevation can cause the surgeon to remove excess upper lid skin and muscle, which can further depress the brow. In addition, I have seen cases where an aggressive blepharoplasty was performed in lieu of a brow lift. Several years later, the patient desires a brow lift, but due to the misdiagnosis and aggressive skin excision, a brow lift may now cause lagopthalmous.

In my initial experience with endoscopic brow lift, I was commonly performing concomitant upper lid blepharoplasty. When performing a simultaneous blepharoplasty, there is controversy as to do the blepharoplasty or the brow lift first or at all. I feel more comfortable performing the brow lift first, as many times experience has shown that merely repositioning the brow will suffice in adequate correction of the dermatochalasis.

Experience has shown that simultaneous laser resurfacing may be safely performed with endoscopic brow lift. This combination of brow elevation and laser skin tightening has essentially eliminated the need for eyelid skin excision in most cases. Figure 2 shows lagophthalmous after brow suspension, removing skin and muscle in this patient may not leave enough tissue to close the eyes. Being conservative is always safe with regard to function.


Figure 2

If simultaneous blepharoplasty is considered, it is important to make all skin markings with the brow elevated and the patient in the upright position before the endoscopic brow procedure is performed. Failure to do this can make the blepharoplasty more difficult as edema, dissection and brow repositioning can distort the normal landmarks.

Surgical Technique

Endoscopic brow techniques have evolved considerably over the past seven years. Many surgeons

use a five-incision technique (a central p median, two lateral and two temporal) and suspend all incisions. I have personally abandoned the para median incisions for several reasons. These incisions tend to elevate the medial brow, which can contribute to the surprised postoperative appearance. In addition, the surgical field can be endoscopically accessed without the need for these incisions.

Many surgeons place the lateral incisions parallel to a line intersecting the lateral limbus. I think that this incision should not be standardized, but customized, to the required point of lateral brow elevation. Since hooding and lateral brow elevation are hallmarks of a successful endoscopic brow procedure, adapting incision position to the patient's specific anatomic condition is paramount. I spend significant time preoperatively with the patient in front of the mirror deciding which areas of elevation are preferred. Oftentimes, simulated brow position that my staff and I thought was aesthetic was not what the patient liked. Due to this, I make my lateral incision in the area that produces the elevation that the patient preferred most.

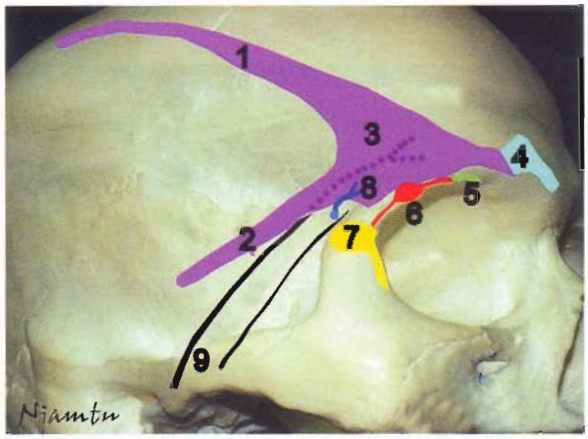

Figure 3

Blind subperisoteal dissection is performed to the vertex and down to the nasofrontal suture. The endoscope is then inserted to visualize the dissection at a point 2.5 cm above the supraorbital rims. The dissection is then continued to the superior arcus marginalis, which is then dissected with a curved instrument.

Temporal incisions are then made perpendicular to the ala-canthal line. Again, paying attention to where the most optimum lateral brow elevation will occur helps determine the incision position. This incision is made to the level of superficial layer of the deep temporal fascia and is taken caudad to the level of the zygomatic arch.

It is important to remember that the dissection plane is between the temporoparietal fascia (superficial fascia) and the superficial layer of the deep temporal fascia. Caution must be used, especially superficially around the zygomatic arch and frontozygomatic suture area, as the frontal branch of the facial nerve is vulnerable. The so-called "sentinel vein" is actually the medial zygomatic temporal vein, which is a direct tributary of the internal maxillary vein. The sentinel vein is predictably encountered about 1 cm lateral to the frontozygomatic suture. A sensory branch of the second division of the 5th cranial nerve known as the medial zygomatic temporal nerve runs in close approximation with the sentinel vessel (Figure 3).

It is important to endoscopically visualize the sentinel vessel to either avoid it or to cauterize the vessel. This vessel can present aggravating bleeding that may be difficult to control with endoscopic technique. Although serious blood loss is not a problem, hematoma with delayed healing with increased ecchymosis and swelling are disconcerting to the patient. What is more important is the intimate relationship of the frontal nerve branches and the sentinel vein. Another landmark, the lateral zygomatic temporal vein is encountered at the level of the zygomatic arch. The temporal branch of the facial nerve emerges through the periosteum just above the zygomatic arch in close proximity to the lateral zygomatic temporal vein. Therefore, the position of these two venous landmarks denotes a danger zone for the proximity of the frontal branch of the seventh nerve.

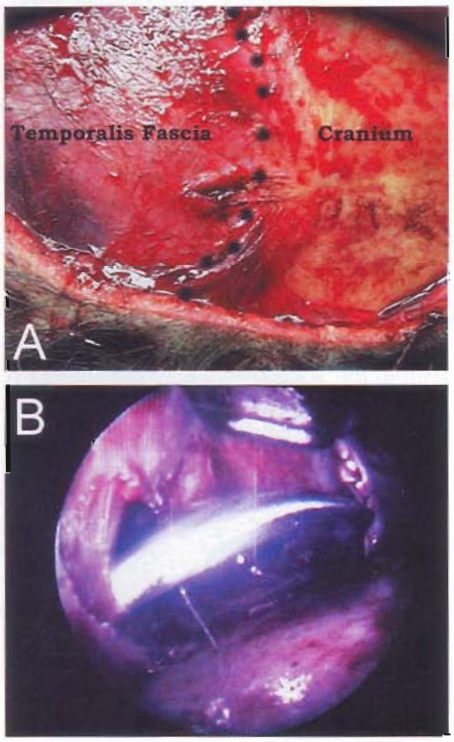

Figure 4A and B

After careful endoscopic dissection of the aforementioned area, the temporal dissection connects with the optical cavity of the subperiosteal dissection by violating the conjoint tendon at the superior temporal crest line (Figure 4A and B). This tissue adherence is the fusion of the superficial temporal fascia (temporoparietal fascia) and the superficial layer of the deep temporal fascia. Although various instrumentation and technique have been described, poking though the conjoint tendon with a finger and sliding forward will bluntly and atraumatically

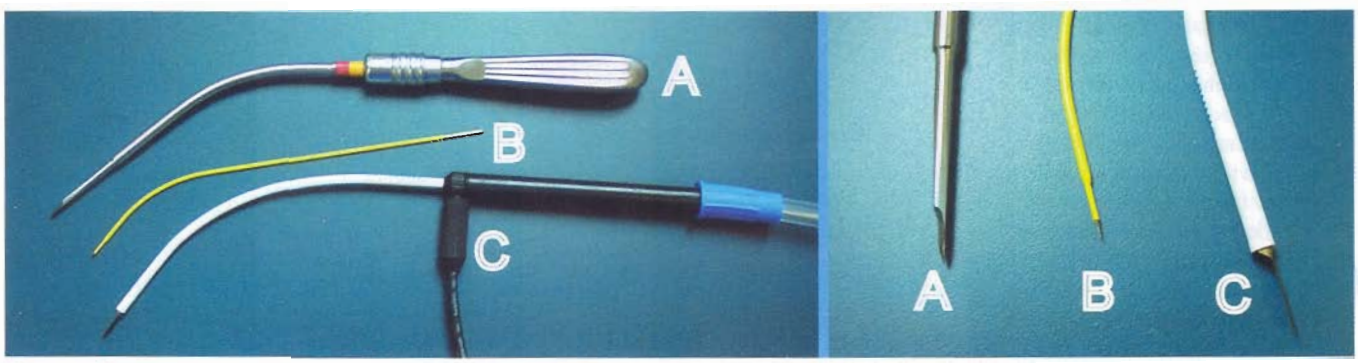

Figure 5

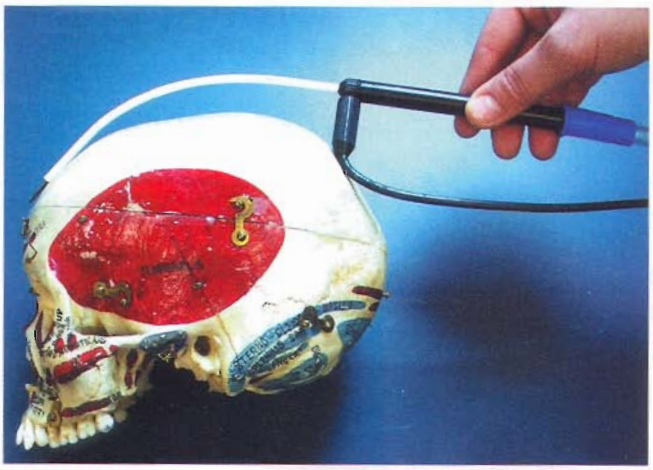

Figure 6

connect the two optical cavities. By this point in the procedure, the brows and forehead should be passively elevated.

The temporal dissection is divided into two compartments – the superior temporal septum and the inferior temporal septum. The upper compartment can be easily dissected without worry of facial nerve disruption. The lower compartment contains a triangle bounded inferiorly by the zygomatic arch, superiorly by the inferior temporal septum and anteriorly by the lateral orbit rim and the frontal process of the zygoma (Figure 3). It is within this inferior triangle that the facial nerve is most vulnerable to damage. Since these nerve branches lie within the superficial temporal fascia, keeping the dissection close to the deep temporal fascia (superficial layer of the deep temporal fascia) will avoid damage.

The last phase of dissection involves a transection of the periosteum just above the orbital rim. This may be performed with laser, radiofrequency or cold steel (Figure 5 and 6). The transection is made from the temporal crest on one side to the temporal crest on the other side. This dissection is intimate to the supraorbital and or supratrochlear vessels and their preservation is paramount, especially as their protection is one of the main advantages of the endoscopic technique (Figure 7A).

At this point, depressor myotomy, myectomy or avulsion is performed by many surgeons. I think this is a controversial point. I have seen cases of glabellar widening or subcutaneous depression from over resection of the depressors. In addition, any surgeon involved with the disruption or resection of facial muscle for trauma or reconstruction is familiar with the ability for these muscles to reattach. Some surgeons claim that the success or failure of endoscopic brow lifting is reliant on depressor disruption, while some surgeons pay little attention to these muscles, relying on Botox to control their action. I do not spend much time with the function of these muscles unless the patient has exceptional tone or muscle hypertrophy in this region. All of my endoscopic brow patients are treated with Botox several weeks before the procedure as I feel that the deactivation of the depressors and elevators will promote faster healing and reattachment. One drawback of preendoscopic Botox is the inability to diagnose motor nerve disruption in the immediate postoperative period.

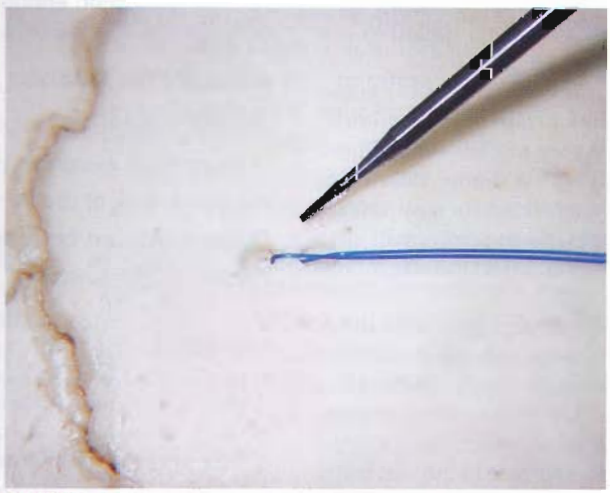

Figure 8

After the supraorbital periosteum is horizontally incised, a back-action dissector is used to stretch the superior periosteal incision (Figure 7B). This maneuver assists in releasing the tissues.

Finally, another important area of release is the area of the superior and lateral orbital rim and frontozygomatic area. A confluence of connective tissue forms the temporal ligamentous attachment and the supraorbital ligamentous attachment and the lateral brow thickening of the periorbital septum in this area, and if not adequately released and dissected, will inhibit the elevation of the lateral brow.[2]

Fixation

The final phase of endoscopic brow lift is fixation. As endoscopic technique has evolved, this has become a debatable technique as some surgeons omit this step, while most continue to suspend the released tissues in some manner.[3]

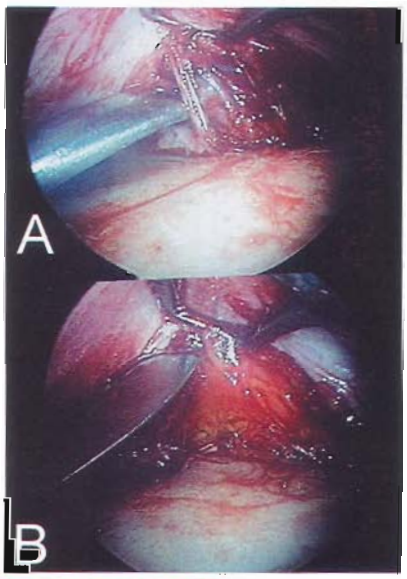

Figure 7A and B

Although many types of sutures have been described, I prefer 2-0 PDS. This suture is strong enough to suspend the tissues and rigid enough to pass through bone tunnels or screw heads. I do not suspend the central incision. The lateral incisions are suspended by passing the suture through all the deeper tissue layers at the inferior portion to the incision with several spirals. The temporal incisions are suspended by passing the suture through the deeper tissues of the inferior portion of the incision and securing the suture to the superficial layer of the deep temporal fascia in the most positive vector for lateral brow elevation. In cases of extreme tissue redundancy, an ellipse of scalp can be removed before suspending.

I have used stainless screws and staples, resorbable screws and suspension sutures and bone tunnels with suspension sutures to suspend the tissue. I have had incisional alopecia with the staple fixation, which is successfully treated with an ellipse of the affected area. This may be from placing too much traction and tension on the incision. Most surgeons have agree that it is the release of tissue and not the traction that makes this procedure

Figure 9

successful. If the dissection and release is adequate, the tissues should present a passive elevation. The suspension merely secures them in that position.

Bone tunnels are quick and safe at a depth of 4-5 mm. A Stryker 1.2-mm cross-cut tapering fissure bur (Ref 2296-101-212) is well suited for these tunnels and when drilled in a V fashion, suture passage is not a problem (Figure 8).

Resorbable screws have also proven successful. Hand instrumentation is available that drills and taps the hole without the need of a rotating drill. The screws are available in multiple lengths, and I use the 5-mm length with a 4-mm drill depth. These screws have holes in the head that allows for easy passing and fixation of the suture. Sometimes, these screws will strip when tightening and if this occurs, I will convert the screw hole into a bone tunnel.

As with any new and evolving procedure, controversy exists concerning drains and dressings. I do not use any drains and do place a large, compressive dressing for the first 24 hours. I place a sanitary napkin across the forehead (unless simultaneous laser resurfacing was performed in which case a Silon membrane is placed first) and the adhesive side of the pad helps keep the pad secure and positioned over the frontals region. This is followed by a full head dressing that is left in place overnight and changed the next day and replaced with a smaller compressive elastic dressing. This is worn 24 hours a day for the next 3-5 days and the patient is then asked to wear a tennis-type headband as much as possible for the next 2 weeks.

Figures 9A and 9B show the results of endoscopic brow and forehead lift with concomitant Ultrapulse CO_2 laser resurfacing.

Complications

Endoscopic brow and forehead lift has proven to be a safe, effective and predictable procedure. Minor complications include hematoma formation, transient or permanent motor and sensory nerve damage, and incision alopecia.

Relapse has occurred, and may be from suspension failure, but probably more commonly from operator error in under-dissection and release.

Conclusion

Endoscopic brow and forehead lifts are undergoing change, but emerging as the preferred methods in multiple specialties. Not only has this technique decreased common complications from previous open techniques, it is also much more palatable in terms of patient acceptance due to the conservative approach. In addition, this procedure has caused surgeons to rethink blepharoplasty techniques as successful endoscopic brow lifting may, in many cases, replace the need for palpebral tissue excision.

There are drawbacks, namely special equipment and training, and mastering the endoscopic triangulation technique. Despite these drawbacks, this technique has become popular with all specialties dealing with this procedure.

As with any new technology or procedure, there will be promoters and skeptics until the success of the operation speaks for itself. Failure to embrace new technology may be a result of cynicism. Some surgeons have tunnel vision and do not want to admit that there is a better procedure. Other surgeons are threatened by new equipment and technology, while others are just not progressive. In any event, endoscopic brow and forehead lifting is a procedure that is stable[4] and easily learned. ■

About The Author

Joseph Niamtu, III, DDS, is a board certified oral and maxillofacial surgeon practicing in Richmond, Virginia. He is a fellow of the American Academy of Cosmetic Surgery. He can be reached via e-mail at niamtu@niamtu.com

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