Glabella Rejuvenation via Corrugator Excision and Volume Replacement

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According to the authors, satisfactory glabella deanimation can only be achieved by nearly complete corrugator excision, from the supraorbital neurovascular bundle on one side to the other. This amount of muscle excision leaves minimal residual muscle activity but also creates a concave defect, which the authors recommend filling with autologous tissue. (*Aesthetic Surg J* 2007;27:563–567)

The glabella is the smooth, hairless region of the forehead above the nose and between the eyebrows. Its central facial location gives it prominence, making it an integral part of overall facial aesthetics. The muscles of facial expression that function primarily in the glabella area are the corrugator supercili and the procerus, although the depressor supercili and medial head of the orbital portion of the orbicularis oculi also play a role.1,2 The dynamic action of these muscles can produce furrows3 within the glabella, contributing to an overall appearance of aging. Furthermore, people frequently feel that these creases make them look worried or angry.

Nonsurgical treatment of the glabella, including Botox (Allergan Inc., Irvine, CA) and injectable fillers, has yielded considerable success. Botox effectively blocks the dynamic muscle action,4 and injectables are used to fill creases in this region. Yet, there are many patients who display hyperdynamic corrugator muscles and exhibit deep glabellar furrowing despite repeated injections of Botox and fillers. Moreover, the effects of these techniques are time limited, and many people want a more permanent result.

The plastic surgery literature describes multiple surgical approaches to the glabella. Initially, direct excision of the glabella musculature was performed through incisions in the vertical creases or eyebrows.1 Then, a coronal incision was used to raise the brow position and provide access to the upper orbits and glabella through an incision hidden within the hairline. The coronal approach provides excellent exposure to the muscles of glabellar expression. More recently, endoscopic brow lift procedures5 have gained popularity because they are less likely to distort the hairline or cause scalp numbness. However, exposure of the corrugators via an endoscopic approach is more limited, making complete muscle excision and filling of defects (created by excision) more difficult. An aggressive approach to muscle belly excision between the supraorbital nerves is necessary to ensure that excess glabellar activity does not return. In our opinion an endoscopic brow lift approach does not provide adequate exposure for complete excision and defect correction.

An even more recent approach to gain popularity is accessing the glabella through an upper eyelid incision.6-8 This is frequently performed in conjunction with blepharoplasty, and occasionally in conjunction with brow lift,9 providing direct access to the corrugator supercili, medial orbicularis oculi, and procerus muscle bellies.

Once the glabellar musculature has been exposed, there are various surgical treatments to deanimate the region. Attempts at muscular denervation have been largely unsuccessful10 because of extensive cross-innervation between both temporal and zygomatic branches of the facial nerve.11 Additionally, attempts at myotomy or partial corrugator muscle belly excision12 have also failed because these muscles demonstrate a tenacious ability to heal and resume their activity. It has been the senior author’s experience that only near-complete excision of the corrugators from the supraorbital neurovascular bundle on one side to the other will provide adequate deanimation of the glabella. This much muscle excision yields minimal residual muscle activity but also creates a concave defect between the eyebrows, which requires autologous tissue filling to avoid possible permanent deformity13 and to ensure a smoother glabella.

Method

The muscles responsible for glabellar furrowing may be approached through a coronal brow lift or an upper...
eyelid blepharoplasty incision. In our surgical center, these techniques are typically performed with the patient under general anesthesia and usually together with other procedures.

In the open brow lift approach, a coronal incision is made within the hairline, and the forehead flap is dissected in the subgaleal plane. The supraorbital nerves are visualized as they exit the supraorbital foramen; these neurovascular bundles are landmarks for the lateral extent of the muscle excision. Then, electrocautery is used to excise all muscular tissue medial to the nerves, inferiorly to the nasofrontal suture; laterally to the neurovascular bundles; and superiorly, near to the top of the vertical lines (Figure 1).

Muscle excision leaves an obvious glabella concavity that should be filled. The area is measured, and an appropriately sized temporalis fascia and muscle graft is taken and sutured into the defect. If superficial musculoaponeurotic system (SMAS) tissue is available from a concurrent face lift, then a SMAS graft is used (Figure 2).

In the upper lid blepharoplasty approach, the location of the supraorbital neurovascular bundles and area of

![Figure 1](https://example.com/fig1.png)

**Figure 1.** Through a coronal approach, the supraorbital neurovascular bundles are identified and gently retracted laterally. The corrugator muscle bellies are grasped medial to the neurovascular bundle, retracted medially, and excised with cautery.

![Figure 2](https://example.com/fig2.png)

**Figure 2.** After measuring the extent of the concavity left by the departed musculature in the glabella, an appropriately-sized graft of temporalis muscle and fascia is used to fill the void and smooth the glabella.
intended glabella muscle excision are marked. Sharp dissection begins bilaterally at the medial aspect of the upper lid incisions and is carried superficially in the subdermal plane of the planned muscle resection (Figure 3). This dissection, freeing the muscles from dermal attachments, is carried superiorly to (near) the top of the glabellar frown lines, inferiorly to the nasofrontal angle, and laterally to the neurovascular bundles. Thus a rectangular excision of tissue is performed. The scissors are then placed onto the periosteum, and the muscles are sharply dissected from their periosteal origins until they are completely freed across the radix from one eyelid incision to the other. The muscle bellies are then grasped with forceps and gently retracted while a Bovie cautery (Aaron & Co., Piscataway, NJ) is used to completely excise them.

A concave depression, seen within the glabella where the corrugators were removed, will need filling. If a concurrent face lift is performed, a SMAS graft may be used; if not, a dermal fat graft may be harvested. Monofilament sutures are placed through the corners of the graft, then passed percutaneously through the superolateral aspects of the defect in a horizontal mattress fashion (Figure 4). The free ends of these sutures are then

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**Figure 3.** Through an upper lid blepharoplasty approach, all musculature medial to the supraorbital neurovascular bundles is sharply excised from its dermal attachments. Using cautery, the muscle is then grasped and excised of its periosteal attachments.

**Figure 4.** The resulting concavity is filled with an appropriately-sized graft of SMAS or dermis. The upper corners of the graft are sewn into the upper corners of the defect with monofilament suture.
tied over bolster dressings that are left in place for 5 days to allow for healing (Figure 5). The inferior aspect of the graft is then tailored to size, and the upper eyelid incisions are closed as usual.

Results

The senior author (LW) did a retrospective review of his experience over a 30-year period, including 245 patients who underwent near total excision of the corrugator muscles between the years of 1975 and 2005. Patients had a variety of facial aging complaints, but all displayed deep glabellar furrows and active corrugator muscles. Patients were separated into groups on the basis of the technique used to approach the corrugator muscle bellies. Two hundred patients underwent coronal brow lift, and 45 underwent upper eyelid blepharoplasty. Patients were examined after surgery at about 1 week, 3 months, and 6 months by the senior author. Patient photographs and surgeon’s notes regarding residual corrugator activity, brow widening, glabellar concavity, forehead numbness, and postsurgical complications were reviewed. Average follow-up, ranging from 3 months to several years, was 6 months.

A few patients displayed residual corrugator activity medial to the supraorbital neurovascular bundles, probably related to inadequate excision of the muscles. This was, however, substantially reduced from preoperative corrugator activity. Residual activity at or lateral to the neurovascular bundles, although detected in some patients, did not create significant glabellar furrowing and therefore was not bothersome to the patients. No difference could be detected between the various autologous fillers used.

Four patients had glabella depressions requiring office treatment. All four patients were satisfactorily treated with fat injections in the office. One patient had a postoperative infection of her dermal fat graft requiring antibiotics and drainage. Three others had minor depressions. Comparing postoperative photographs with preoperative appearance, no significant brow widening was observed. Moreover, when questioned after surgery about forehead region numbness, mildly decreased sensitivity was reported by a few patients, but only within the rectangle of muscle excision.

Conclusion

The combination of near-complete corrugator excision with volume replacement with autologous tissue has been performed by the senior author in 245 patients over the past 30 years for the treatment of glabellar furrowing. It has provided safe, reliable, predictable results and has been an excellent surgical option for patients who desire a more permanent alternative to Botox therapy for treatment of glabellar furrows (Figures 6 and 7).
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References

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