Orbicularis Muscle Position During Lower Blepharoplasty With Fat Repositioning

Objective: To evaluate intraoperative changes in the position of the orbicularis muscle edge, which defines the tear trough during lower eyelid blepharoplasty with subperiosteal fat repositioning.

Methods: Thirty consecutive patients undergoing transconjunctival lower eyelid blepharoplasty with a subperiosteal fat repositioning technique underwent intraoperative measurement of the elevation of the released orbicularis muscle edge. Using a “dipstick” method, the distance between the midinferior orbital rim and the inferior orbicularis muscle edge, which was previously located below the orbital rim, was measured after fixation of the repositioned orbital fat. Age, associated procedures, length of follow-up, and complications were noted.

Results: The released orbicularis muscle edge was elevated between 6 and 12 mm above the orbital rim (average elevation, 8.8 mm). All measurements were within 2 mm between the 2 sides for a given patient, with 24 of the cases being within 1 mm. No apparent difference was seen between the muscle elevation achieved with externalized suture fixation of repositioned fat (22 patients) and that achieved with internal suture fixation (8 patients).

Conclusions: The orbicularis oculi muscle fusion to the maxilla below the arcus marginalis defines the junction between the eyelid and the cheek, and it provides an anchor for the tear trough. The eyelid-cheek interface is significantly elevated with our surgical technique of fat repositioning in the supraperiosteal plane. Elevation of the orbicularis muscle edge may contribute to improved blepharoplasty results in treating the aging midface.


A harmonious topographical continuum between the lower eyelid and the cheek helps to define a youthful appearance. Aging in the midface is defined by the prominence of tear trough deformity (nasojugal fold), pseudohermision of fat in the lower eyelids, and lower facial deflation and descent. Orbital fat protrusion into the lower eyelid occurs because of weakened fibrous septae within the orbital septum and the orbital suspensory system. The lower eyelid crease generally defines the perceived eyelid-cheek junction in youth, with a smooth S-shaped transition between the eyelid and the cheek.

The tear trough is anatomically defined by the location of the orbitomalar or orbicularis-retaining ligament, which corresponds to the approximation of the orbicularis oculi muscle and the tissues immediately inferior to the arcus marginalis. The lateral tear trough is defined by pseudoligamentous attachments traversing the suborbicularis oculi fat between the orbicularis muscle and the peristeum. The anatomy of the tear trough induces the observed biconvex contour of the aging midface because of the apparent lower eyelid fat protrusion and the deflated, descending midface. Many times, the tear trough is perceived as a dark circle, which corresponds to the lower eyelid causing shadows within the groove of the tear trough. Many different surgical techniques have been used for the cosmetic treatment of the aging lower eyelid and the midface. Traditionally, subtractive lower eyelid blepharoplasty was performed either through a transcutaneous or a transconjunctival approach. The lower eyelid fat compartments were sculpted flush with the lower orbital rim. Complications of subtractive lower blepharoplasty include eyelid skeletonization, retraction, ectropion, rounding of the lateral canthus, and eyelid phimosis. Not only do subtractive blepharoplasty techniques inadequately address the anatomical basis for the tear trough deformity, but they also commonly accentuate it.

Novel techniques have been described using fat preservation to surgically fill the tear trough by fat repositioning or grafting. In 1981, Loeb described an orbital fat
sliding technique through a subciliary approach. Later, Hamra repositioned the orbital fat over the orbital rim by suturing it to the malar preperiosteal fat. Goldberg et al. described fat repositioning through a transconjunctival approach. In their technique, dissection is carried out through the arcus marginalis, and a subperiosteal pocket is created inferomedially. The medial and central fat pads are mobilized and repositioned into the subperiosteal pocket. External or internal sutures are used to stabilize the repositioned fat. Our surgical technique of lower eyelid blepharoplasty involves fat repositioning in a supraperiosteal plane, with release and elevation of the inferior orbicularis muscle edge. Because the aesthetic goal of lower eyelid blepharoplasty is to create a smooth transition between the lower eyelid and the cheek, rehabilitation is achieved not only by filling the tear trough groove but also by elevating the eyelid-cheek interface. The goal of this study was to evaluate the intraoperative vertical displacement of the orbicularis muscle during lower blepharoplasty with supraperiosteal fat repositioning.

**METHODS**

We reviewed the medical records of 30 consecutive patients who underwent lower eyelid blepharoplasty via a transconjunctival, supraperiosteal (intrasuborbicularis oculi fat) repositioning technique between November 19, 2008, and June 10, 2009. No institutional review board approval was required. All patients underwent surgery using the technique described by Mohadjer and Hold in 2006. In all cases, a pedicle of medial and central lower eyelid fat was developed, and a broad release of the orbicularis muscle was performed in a plane superficial to the periosteum medially and laterally within the suborbicularis oculi fat plane (Figure 1). The orbicularis muscle and cheek tissues were undermined to a level 10 to 12 mm inferior to the orbital rim. The inferior oblique muscle was identified and avoided. The central and medial fat pads were released and advanced into the depth of the suborbicularis muscle pocket. The amount of eyelid laxity determined the fixation technique for the advanced orbital fat. Younger patients with less laxity were treated with a single externalized mattress suture of 5-0 polypropylene woven through the central and medial fat pads (22 patients, Figure 1), while cases involving older patients with lax eyelids were fixated with direct suturing of the fat pedicles into the depth of the submuscular flap with two to three 5-0 polyglactin 910 sutures (8 patients). Using a “dipstick” technique, the distance from the bony orbital rim to the orbicularis muscle edge previously attached to the suborbicularis oculi fat just inferior to the orbital rim was measured intraoperatively at the center of the inferior orbital rim on each side after fixation of the repositioned orbital fat (Figure 1). Patient age, length of follow-up, simultaneous procedures, and surgical complications were recorded.

**RESULTS**

Thirty consecutive patients, 28 women and 2 men, underwent the above-described technique of lower blepharoplasty between November 18, 2008, and June 10, 2009. The patients ranged in age from 41 to 72 years (average age, 60 years). Twenty-two patients underwent fat repositioning with externalized sutures and a bolster, while 8 patients underwent internal suture fixation. Eight patients underwent a pinch skin excision via a subciliary incision. Six patients underwent a lateral canthoplasty to improve lower eyelid tone and prophylaxis against ectropion. Skin resurfacing was performed on 24 patients, with 15 patients undergoing dual-mode erbium-YAG laser skin resurfacing and 9 patients undergoing medium-depth trichloroacetic acid peel, 30%, resurfacing. Simultaneous surgical procedures included upper eyelid blepharoplasty (25 patients), brow-
lifting (9 patients), facial fat transfer (6 patients), and upper eyelid ptosis repair (5 patients).

Intraoperative measurements of vertical displacement of the orbicularis muscle cut edge from the superior aspect of the inferior orbital rim were performed on each side in all cases. Overall, the measurements ranged from 6 to 12 mm of elevation. On the right, elevation ranged from 6 to 11 mm, while on the left, it ranged from 6 to 12 mm. The overall average distance of elevation was 8.8 mm, with an average of 8.7 mm on the right and 8.8 mm on the left. The average muscle elevation was 8.6 mm for patients who underwent fat repositioning with externalized sutures and 8.8 mm for those with internal sutures, with no statistical difference ($P = .22$). No other differences related to the method of suturing the fat pedicle were apparent in the surgical results. Measurements between both sides were equal in 3 cases, and there was 1 mm of disparity in 21 cases and 2 mm of difference in 6 cases.

Follow-up ranged from 1 to 6 months (average follow-up, 2.8 months). A mild degree of orbicularis muscle paralysis is commonly seen in the first month after surgery, and its prominence is largely dependent on how far inferiorly the surgeon dissects in the plane superficial to perosteum. By limiting the dissection to 10 to 12 mm, orbicularis muscle paralysis and associated ectropion are seldom an issue. No complications were observed in any of our patients during the follow-up period.

However, we found that the transposed fat becomes palpable and sometimes visible as a nodule below the tear trough in almost all patients 2 to 3 weeks after surgery. This condition spontaneously resolves over 2 to 3 weeks. When we first performed this surgical technique in 2000, we sometimes injected corticosteroid into the swollen transposed fat. This step was found not to be necessary, and steroid injection sometimes caused temporary fat atrophy, which confused results in recovery. Prolonged chemosis lasting up to 30 days is seen to a mild degree in approximately 5% of patients with this technique. Malar edema is present after surgery in susceptible patients but only to a modestly increased degree when compared with patients undergoing simple subtractive blepharoplasty. Persistent ectropion is uncommon and is most frequently seen in older patients (>70 years) and in those with existing insipient ectropion.

**COMMENT**

A cornerstone of cosmetic rehabilitation of the lower eyelid is effacement of the tear trough. Surgical techniques aimed at fat preservation and the repositioning of lower eyelid fat to fill the tear trough have grown in popularity. However, the small amount of fat in the eyelid that is repositioned to fill the tear trough may not fully explain the impressive results of the surgery (Figure 2).
Another explanation for the significant smoothing of the facial contour is the release and vertical displacement of the structures that tether the tissues externally defined as the tear trough. While the tear trough is often thought of as a static anatomical consequence of development and aging, we believe that the external topographic location of the tear trough is determined by the orbicularis muscle’s attachment to the orbital periosteum medially and the suborbicularis oculi fat laterally, inferior to the arcus marginalis.

Numerous authors’ techniques for lower eyelid blepharoplasty with fat repositioning to fill the nasojugal fold have been described in the literature. Demartelaere et al.10 described a technique that uses a subciliary incision with excision of the orbital septum. The released “hanging curtain” of lower eyelid fat is then repositioned into the tear trough to soften the contour.11 Goldberg et al.7,8 describe a transconjunctival blepharoplasty with orbital fat repositioning. In their technique, dissection is carried out through the arcus marginalis, with creation of subperiosteal pockets to house the repositioned orbital fat. Similar to our technique, temporary sutures are generally used to tether the fat into position during healing.

We believe that our surgical technique, similar to that described by Goldberg and colleagues, not only transfers fat to fill the tear trough and lessens the herniated fat within the eyelid, but it also addresses the anatomical cause for the tear trough. The attachment of the orbicularis muscle to the preperiosteal tissues just inferior to the arcus marginalis creates a posterior tethering, which is externally recognized as the tear trough. Repositioned fat not only acts as a filler but also provides a shelf for the vertically displaced orbicularis muscle to rest on and scar at an elevated position. This superior vertical repositioning of the muscle edge elevates the apparent eyelid-cheek junction and fills this space with fat, which aids in aesthetic correction. Because dissection in our surgical technique is carried out in a supraperiosteal plane, the orbicularis muscle attachments and overlying cheek tissues are released, allowing improved elevation of the eyelid-cheek junction (Figure 3). A dissection plane superficial to the periosteum may be superior to a subperiosteal plane, as the tissues are not restrained by the periosteum and may elevate better.

A smooth, elevated eyelid-cheek junction defines a youthful-appearing eyelid. Surgical correction of the tear trough during lower eyelid blepharoplasty is necessary for aesthetically pleasing results. Surgical release of the inferior orbicularis muscle edge by an average of nearly 9 mm allows elevation of the eyelid-cheek junction after surgery. Repositioned fat is used not only to fill the tear trough groove but also to elevate and stabilize the released orbicularis muscle. We have seen intraoperative evidence of eyelid-cheek junction elevation. Our technique may be criticized because we are measuring the position of a mobile datum point (the muscle edge inferior to the arcus marginalis) intraoperatively on a supine patient. Nonetheless, this muscle elevation appears to persist after surgery. We believe that the elevation of the orbicularis muscle edge plays a role in the improved aesthetic results with the technique of transconjunctival lower eyelid blepharoplasty with fat repositioning.

Figure 3. Sagittal diagram of a lower eyelid after lower eyelid blepharoplasty with supraperiosteal fat repositioning and an externalized bolster. The suture passes through the bolster, skin, and facial tissues; through the depth of the dissected pocket and the transposed orbital fat; and then back to the bolster. Note the elevated orbicularis muscle edge (arrow) that was previously below the orbital rim, after release from the orbital rim. The distance is measured from this edge to the orbital rim.

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