

An Integrated Approach to Lower Blepharoplasty

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Background: Limitations associated with traditional skin-muscle flaps and later with transconjunctival fat resection combined with carbon dioxide laser resurfacing have led to newer concepts in lower blepharoplasty that emphasize fat preservation, blending of the lid-cheek junction, simplified skin excision, and less morbid resurfacing techniques. Avoiding incision through the orbicularis muscle to preserve its innervation and reduce translamellar scarring is favored, as is a more liberal use of lateral canthal tightening procedures. This study investigates the use of a transconjunctival approach to resect and transpose fat combined with a skin flap technique that permits skin excision and simultaneous resurfacing with 30% trichloroacetic acid. The orbicularis is not violated and lateral canthal support is used as necessary.

Methods: Lower blepharoplasty performed in 248 patients over a 4-year period was studied. The technique consisted of component procedures that varied based on individual anatomy.

Results: Fat excision was performed in 91 percent, fat transposition was performed in 61 percent, skin excision was performed in 63 percent, trichloroacetic acid peels were performed in 62 percent, temporary tarsorrhaphy was performed in 31 percent, and lateral canthopexy was performed in 18 percent of patients. Average follow-up was 5.5 months. There were three complications and six revisions.

Conclusions: Lower blepharoplasty that integrates component techniques tailored to individual anatomical problems and spares the orbicularis muscle is effective and associated with few complications and revisions. Fat transposition achieves effacement of the tear trough deformity. A skin flap approach effectively treats rhytides and is safe for simultaneous resurfacing with a mild peeling agent. Selective use of lateral canthal support improves lower eyelid tone and prevents malposition problems. (*Plast. Reconstr. Surg.* 127: 386, 2011.)

The skin-muscle flap approach to lower blepharoplasty was popularized in the 1970s by Rees after development by McIndoe and others.¹ It remained the most commonly used method through the 1990s because it proved to be fast, effective, and widely applicable.²⁻⁴ Although results were good, untoward aesthetic consequences included hollowing of the orbit, denervation atrophy of the orbicularis, and lower eyelid malposition with rounding of the ocular aperture. Additional problems resulted from adjunctive lateral canthoplasties that included both canthotomy and cantholysis.^{5,6} These shortcomings led to the popularity in the 1990s of using a transconjunctival approach to resect fat combined with aggressive laser resurfacing, procedures that spared

manipulation of the orbicularis muscle and avoided skin resection.⁷ However, this method could still result in a hollow appearance if fat resection was excessive. Moreover, prohibitive short-term morbidity and the potential for late hypopigmentation called the practice of using carbon dioxide laser resurfacing into question.

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The current strategy in lower blepharoplasty takes the lessons of these two previous eras into account. Fat preservation, blending of the lid-cheek junction, simplified skin excision, and less morbid resurfacing techniques are favored presently. The concept of not violating the orbicularis muscle to both preserve its innervation and reduce translamellar scarring is believed important in preventing lower eyelid malposition, as is the liberal use of more conservative lateral canthal tightening methods.

This report examines a lower blepharoplasty technique that observes these principles. The method is individualized by integrating component procedures that each address a specific anatomical problem. These procedures include a transconjunctival approach to either resect fat, transpose it over the infraorbital rim, or both; a skin flap to excise skin with or without simultaneous resurfacing with a mild peeling agent; and either a lateral canthopexy or temporary tarsorrhaphy, as necessary.

PATIENTS AND METHODS

A retrospective review was conducted of all patients undergoing lower blepharoplasty between March 3, 2006, and March 3, 2010, performed by a single surgeon. The start date corresponded to the first patient in whom fat transposition was used to treat a tear trough deformity and blend the lid-cheek junction, a practice that yielded perceptibly improved results. The database included age, sex, concomitant procedures, types of component procedures performed, length of follow-up, complications and their treatment, the total number of revisions, and the procedure(s) used for each revision. The technical aspects of each component procedure are described below.

Transconjunctival Fat Resection and Transposition

A conjunctival incision made midway between the tarsal plate and fornix exposes the orbital fat through a preseptal approach.⁸ Fat is conservatively excised medially, centrally, and laterally. The amount resected often differs on each side and sometimes in each area, consistent with the preoperative examination and photographs. The amount removed is studied by grouping fat particles from each side on a sponge, a method that aids in determining the endpoint of fat resection (Fig. 1).⁷ Fat is more conservatively excised if fat transposition is planned.



Fig. 1. Lining up excised fat into left and right sides helps to visualize the total amount removed and allows comparison between the two sides. Medial and central fat is shown combined below on each side. The lateral compartment fat is grouped separately above.

In patients with a tear trough deformity, the arcus marginalis is released by needle-tip electrocautery. A subperiosteal dissection of the infraorbital rim is then performed that extends approximately 4 mm below it. The dissection is continued laterally by releasing the orbicularis retaining ligament to a variable degree, depending on the planned extent of fat transposition.⁹ It is not usually necessary to continue the release to include the lateral orbital thickening because transposition of the contents of the lateral fat compartment is seldom indicated.^{10,11}

Fat transposition usually requires two sutures to secure enough fat to ablate a typical tear trough deformity. A third suture is placed if blending of the lid-cheek junction centrally is also planned. Unlike Goldberg's description, it is not necessary to develop extensive fat pedicles but instead simply pass the needle through substantive portions of medial and central fat made more visible by slight pressure on the globe.¹¹ It is also not necessary to aggressively suture the fat all the way across the infraorbital rim as described by Hamra.¹² It has proven awkward to suture the fat internally through a transconjunctival approach as originally described by Loeb and more recently modified by Kawamoto and Bradley.¹³⁻¹⁵ It is much easier to pass a suture percutaneously deep to the orbicularis, through the fat and back out through the skin marking, and tie it over a small Xeroform bolster (Tyco Healthcare Group, Mansfield, Mass.) (Figs. 2 and 3). (See **Video, Supplemental Digital Content 1**, which demonstrates the technique of fat transplantation,



Fig. 2. The fat transposition technique. Markings are placed for two external bolsters below the tear trough (*above, left*). A conjunctival incision exposes the fat pads for partial resection (*above, right*). The de la Plaza retractor provides good visibility to release the arcus marginalis and expose the infraorbital rim (*below, left*). A 4-0 plain gut suture on a tapered needle is passed through a skin marking and then under the retractor positioned deep to the orbicularis muscle (*below, right*).

<http://links.lww.com/PRS/A264>.) A blunt tipped 4-0 plain gut suture (RB-1; Ethicon, Inc., Somerville, N.J.) is preferred because it minimizes the potential for bleeding as it traverses the orbicularis. This needle has sufficient length for the tip to be easily seen deep inside the transconjunctival incision. A de la Plaza retractor (Storz, St. Louis, Mo.) provides superior exposure of the infraorbital rim during this process compared with a Desmarres retractor (Fig. 4). All of the sutures are usually passed before they are tied. Gentle traction on the ends allows a preview of the adequacy of effacement of the tear trough by the transposed fat. Adjustments can be made as necessary. The bolsters are left in place for at least 6 days after surgery.

Skin Excision and Resurfacing

An incision is made just below the ciliary margin for skin flap elevation. The pretarsal and pre-

septal orbicularis is exposed as originally described by Castanares, but usually not extending quite as low as the infraorbital rim.³ Transillumination facilitates the process (Fig. 5). Thinning of the pretarsal orbicularis can be performed if significant hypertrophy is present. A conservative skin excision is performed.

Simultaneous resurfacing of the lower eyelid skin is used to treat fine rhytides and hyperpigmentation. A 30% trichloroacetic acid peel is applied in a tapering fashion that is heavier at the base of the flap and thinner as the subciliary incision is approached (Fig. 6).

Eyelid Support Procedures

Patients with early lower eyelid malposition with or without preseptal orbicularis laxity (Fig. 7) and those with more obvious scleral show are treated with a lateral canthopexy like that described by Jelks et al.¹⁶ Both the superficial and the



Fig. 3. The fat transposition technique, *continued*. The needle grasps the fat pad (*above*). The retractor is withdrawn after the needle passes deep to the orbicularis muscle. The needle then exits through the skin marking adjacent to the entry marking (*center*). Sutures are then tied over small gauze bolsters (*below*).

deep portions of the lateral canthal tendon and the lateral orbital thickening are lysed.¹⁷ This is performed through the lateral portion of the upper blepharoplasty incision or through a separate incision if an upper blepharoplasty is not planned.



Video. Supplemental Digital Content 1 demonstrates the technique of fat transplantation, <http://links.lww.com/PRS/A264>.



Fig. 4. A Desmarres retractor (*above*) does not provide adequate exposure for fat transposition. A deep L-shaped de la Plaza retractor (*below*) is essential to facilitate the process of exposing the infraorbital rim and passing the sutures.

The completely mobilized lower eyelid is resuspended by suturing the lateral canthal tendon to the periosteum just inside the lateral orbital rim with permanent suture (4-0 Polydek; Deknatel, Research Triangle Park, N.C.). The level of suture placement is variably positioned between the pupil and superior limbus.

Tarsorrhaphy using 6-0 nylon sutures placed between the upper and lower eyelid margins at 3 to 4 mm from the lateral canthus is used as an alternative in patients requiring minimal and only temporary lower eyelid support. These sutures are typically removed at the first postoperative visit.

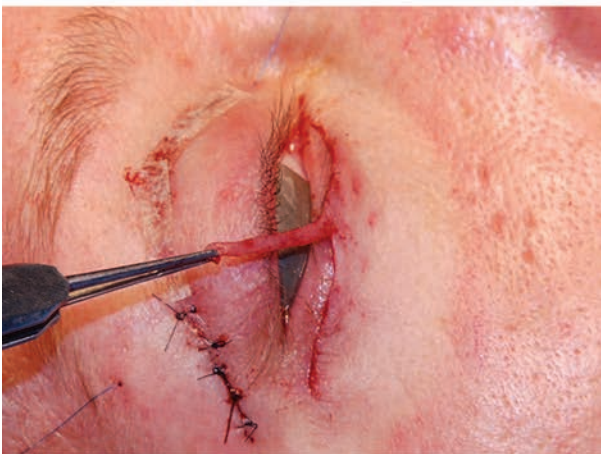
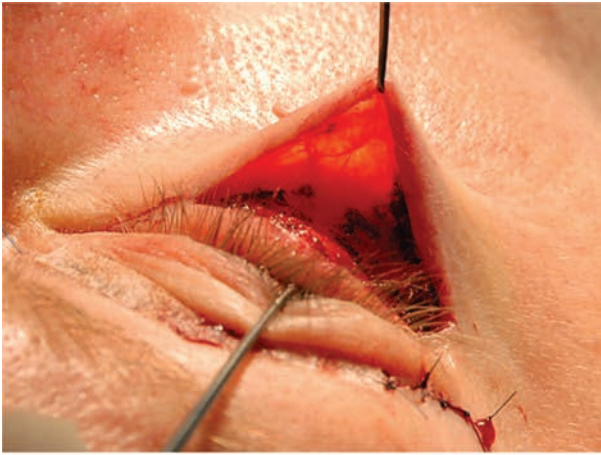


Fig. 5. Skin flap elevation and excision. The skin is elevated with the aid of transillumination (*above*). Most of the preseptal orbicularis is exposed (*center*). Conservative skin excision is performed despite extensive undermining (*below*).

Algorithm for Selection of Component Procedures

The component procedures described above were added progressively to the operative plan as the complexity of the anatomical challenge increased. For example, patients presenting for



Fig. 6. A 30% trichloroacetic acid peel can be safely applied after skin flap elevation. The application is tapered as the subciliary edge of the flap is approached.



Fig. 7. Preoperative view of a patient demonstrating a tear trough deformity, mild excess lower eyelid fat, and lower eyelid laxity (*above*). Postoperative view following fat excision, fat transposition, and a lateral canthopexy (*below*). An upper blepharoplasty was also performed.

lower blepharoplasty who exhibited excess fat and no tear trough and had smooth skin were treated by fat resection alone (rare). Fat transposition was added if a tear trough deformity was present. A trichloroacetic acid peel was added if hyperpigmentation or fine rhytides were present. If there was judged to be excess skin (besides fine rhytides), excision was added. A temporary lateral tarsorrhaphy was added in the case of older patients

undergoing skin excision who exhibited mild lower eyelid laxity without malposition. Patients with lower eyelid laxity who exhibited malposition, had preseptal orbicularis laxity, or both, were treated with a canthopexy.

RESULTS

The series included 248 consecutive patients, of which 224 were women and 24 were men. The mean patient age was 53.5 years (range, 29 to 77 years). The mean follow-up period was 5.5 months (range, 1 week to 44 months). Thirty-six patients did not return for their second postoperative appointment and therefore had less than 6 weeks of follow-up.

Component procedures varied based on individual anatomy. Fat excision was performed in 91 percent, fat transposition was performed in 61 percent, skin excision was performed in 63 percent, trichloroacetic acid peels were performed in 62 percent, lateral canthopexy was performed in 18 percent, and temporary tarsorrhaphy was performed in 31 percent of the patients, although the latter was performed less often as the series progressed. Four patients (1.6 percent) had orbicularis muscle flaps, although this was not an option generally considered during the course of the series.

There were 357 concomitant procedures performed, including 193 upper blepharoplasties, 50 brow lifts, 77 rhytidectomies, and two rhinoplasties. There were 35 procedures noncontiguous with the lower eyelids that included nasal tip-plasty, otoplasty, liposuction, and aesthetic breast procedures.

There were four complications (1.6 percent). There was one unilateral subcutaneous hematoma and three patients who developed symptomatic lower eyelid malposition. One of the latter, a younger patient, required only a temporary tarsorrhaphy on one side. The other two were both older than 70 years and required lateral canthopexies, one bilateral and one unilateral. All four patients had complete resolution of their problem. Interestingly, problematic chemosis was not seen in this series. Patients exhibiting mild chemosis at the conclusion of the procedure were treated with a temporary lateral tarsorrhaphy and a one-time instillation of 0.1% fluorometholone ophthalmic suspension drops (Allergan, Inc., Irvine, Calif.).

The approach to lower blepharoplasty described in this series was generally very effective (Figs. 7 through 9). Patient satisfaction was high, although it was not assessed individually by either

questionnaire or nonbiased observer ratings. One objective measure of patient dissatisfaction is the request for surgical revision. A liberal approach to accommodating requests for revision resulted in secondary procedures in only six patients (2.4 percent). Additional fat resection was performed in two, skin excision and a trichloroacetic acid peel were performed in two, and both fat resection and skin excision were performed in two.

DISCUSSION

The transconjunctival approach to lower blepharoplasty was first described by Bourquet in 1923 according to Tessier.¹⁸ More recently, a technique that combines a transconjunctival approach to resect fat with skin excision using either a skin flap or pinch excision has been described.^{19,20} This inside/outside approach spares the intervening orbicularis and avoids long-term sequelae of denervation atrophy seen with skin-muscle flaps.²¹ This principle was the basis for procedure design in this series.

Orbicularis myotomy with lateral suspension of the muscle to improve lower eyelid tone has been advocated by many authors.²²⁻³⁰ In most reports, a skin-muscle flap is used, although others have approached the muscle by raising a skin flap instead.³¹ Although this was used in four patients (1.6 percent) in this series, there was a perception of higher morbidity, as noted previously by de Castro.²³ Prolonged edema and temporary distraction of the lateral canthus can occur with muscle flaps. Most patients in this series with laxity of the orbicularis also exhibited varying degrees of lower eyelid malposition. A lateral canthopexy was used in these patients as an alternative approach to improve both lower eyelid position and orbicularis tone without having to manipulate the muscle separately.

Treatment of the tear trough with blending of the lid-cheek junction has become an important goal in lower blepharoplasty. This can be accomplished by a variety of means, including the use of injectables,³²⁻³⁵ implants,³⁶ fat grafts,³⁷ fat transposition,¹¹⁻¹⁵ and septal reset procedures.³⁸⁻⁴³ More extreme solutions combine lower blepharoplasty with midface lifts.⁴⁴ Most septal reset procedures require wide exposure using a skin-muscle flap approach. Protruding fat is forced back into the orbit either by advancing attenuated orbital septum to the orbital rim,³⁸ plicating the septum,⁴¹ or suturing the capsulopalpebral fascia to the arcus marginalis.^{42,43} Most authors advocate suturing all the way across the orbital rim with these methods and not just the tear trough area.²⁵ Although good results have been achieved, these



Fig. 8. (Left) Preoperative views of three patients demonstrating tear trough deformities and excess fat of the lower eyelids. (Right) Postoperative views following fat excision, fat transposition, and a trichloroacetic acid peel. No skin excision was performed on any of these patients. An upper blepharoplasty was performed on the two patients shown *above* and *center*.

techniques still entail skin-muscle flaps, with significant orbicularis myotomies required for adequate exposure.

Fat transposition through a transconjunctival approach avoids the disadvantages of skin-muscle flap methods and significantly improves results in patients with tear trough deformities. The technique can be continued lateral to the tear trough to effectively blend the lid-cheek junction at the center of the lower eyelid. Transposition as far as the lateral fat pad was not performed in this series, although it is possible to do so after releasing the lateral orbital thickening. Patients with a class III

deformity³³ that spans the lower eyelid from the medial to lateral canthus would qualify for such an extended approach.

There are several variables associated with fat transposition that impact results. One obvious factor is determining the correct amount of fat to resect. Excessive resection leaves too little to transposition, resulting in minimal tear trough correction. Inadequate fat resection, in contrast, may leave a residual bulge that requires revision. Errors either way may give the impression that the technique is not helpful. Fortunately, resection endpoint judgment improves with experience.



Fig. 9. (Left) Preoperative views of three patients demonstrating tear trough deformities, excess fat of the lower eyelids, and skin laxity with rhytides. (Right) Postoperative views following fat excision, fat transposition, skin excision, and a trichloroacetic acid peel. An upper blepharoplasty was performed on all three patients and temporary lateral tarsorrhaphies (for 1 week) on the two patients shown above and center.

A second variable is the duration of fixation. It is not known how long it takes for transposed fat to become sufficiently adherent in its new location. Six days was used in this study as a reasonable compromise between a desire for adequate length of fixation and the need to remove the external bolsters in a timely fashion. Sutures tied internally as described by Kawamoto and Bradley is more tedious but does make this question moot.

The long-term fate of transposed fat is unclear. Although it appeared durable in the study popu-

lation, some believe that the fat is ultimately pulled back into the orbit.⁴⁵ Fat atrophy could also theoretically develop postoperatively as a result of inadequate blood supply. In any event, patients with significant tear troughs do appear better with fat resection and transposition compared with those with resection alone. Greater longitudinal follow-up should help answer the question of the long-term fate of transposed fat, as might a magnetic resonance imaging study similar to that performed previously in the study of anterior orbital fat volume distribution.⁴⁶

Quantitating the contribution of fat transposition to softening of the tear trough and blending the lid-cheek junction is not possible because some of the improvement no doubt results from fat resection itself. Nevertheless, the contribution to improvement is easily visualized on the operating table when pulling on the fixation sutures before tying them.

Disadvantages of fat transposition include slightly greater postoperative edema and ecchymosis resulting from subperiosteal dissection of the orbital rim, and temporary dents after the bolsters are removed. Neither of these issues proved to be a cause for concern to the patients in this study. A second disadvantage is the increased operating time it takes to perform fat transposition. This technique can easily add 15 minutes per side following fat resection.

Pinch excision is much simpler than the skin flap approach to skin resection used in this series.^{47,48} Although the same amount of skin is typically resected with both techniques, all of the adherent rhytides between skin and muscle are released when a skin flap is raised. Skin flaps also allow thinning of the pretarsal orbicularis when significant hypertrophy exists. Although it takes longer to perform than pinch excision, it appears to be of greater benefit.

It has also proven safe to simultaneously resurface a skin flap with a mild peeling agent (30% trichloroacetic acid). This requires a common sense approach, whereby the skin flap is not raised quite as far as the infraorbital rim and the peel is applied in a tapering concentration with more at the base of the flap and very little in the subciliary area. There were no untoward effects in the 103 patients who had both a skin flap and trichloroacetic acid peel performed.

As mentioned, lateral canthal support was used in this study not just to correct lower eyelid malposition but also as a means of improving pre-septal orbicularis tone in those with early and more subtle eyelid position changes. A cantholytic inferior retinacular canthoplasty as described by Jelks et al.¹⁶ was preferred to the noncantholytic type described by Fagien.⁴⁹ Division of the lateral canthal insertion, the lateral orbital thickening, and a portion of the adjacent orbicularis retaining ligament provides maximum movement of the pre-septal orbicularis as the eyelid position is raised, and does so without denervating the muscle. Although effective and worthwhile, this approach does have the disadvantages of longer operating time, a greater chance of lower eyelid asymmetry, and slightly more patient discomfort.

The overall morbidity was low from this procedure however, and no revisions were necessary because of it. Although used in 18 percent of patients in this series, an argument can be made for even more liberal use given that subtle lower eyelid malposition was still occasionally seen and not prevented by temporary lateral tarsorrhaphy alone (Fig. 9, center).

Temporary lateral tarsorrhaphy was a useful adjunct in older patients undergoing skin resection without frank lower eyelid laxity and in a few who exhibited early postoperative lower eyelid malposition. It was used less as the series progressed but is a simple preventative measure for those with minimal lower eyelid support requirements.

CONCLUSIONS

An integrated approach to lower blepharoplasty assembles component procedures to address a spectrum of patient-specific anatomical problems. A combined transconjunctival (inside) and skin excision (outside) approach avoids orbicularis denervation with its late adverse aesthetic sequelae. The transconjunctival approach provides adequate access for both fat resection and transposition to soften tear trough deformities. A skin flap raised over most of the pre-septal orbicularis more effectively releases skin rhytides compared with pinch excision methods. Concomitant resurfacing with a mild peeling agent to improve hyperpigmentation and fine rhytides is safe for skin flaps. Lateral canthopexy is effective for improving both lower eyelid position and tone, thereby obviating the need for orbicularis muscle flaps in most patients. Patient satisfaction from this approach is high, with few revisions necessary.

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