Primary Transcutaneous Lower Blepharoplasty with Routine Lateral Canthal Support: A Comprehensive 10-Year Review

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VIDEO+

Background: Rejuvenation of the lower eyelid often requires tightening of excess skin and muscle and removal or transposition of orbital fat. Although transcutaneous lower blepharoplasty can accomplish these aesthetic demands, it has been associated with an increased risk of lower lid malposition. Routine lateral canthal support during lower blepharoplasty has recently been advocated to minimize this risk. This study reviewed the outcome of a surgeon's 10-year experience with primary lower transcutaneous blepharoplasty and lateral canthal support consisting of canthopexy, canthoplasty, and orbicularis suspension.
Methods: A retrospective chart review of a primary lower transcutaneous blepharoplasty series over a 10-year period was performed. Patients with a history of prior eyelid surgery for blepharoplasty or midface lift were excluded. Preoperative demographic and morphological data from patient charts and standardized photographs obtained before and after surgery were evaluated by an independent observer. Surgical technique and management of complications were determined from operative reports and clinical notes.
Results: There were 264 patients with a median follow-up of 264 days (range, 60 to 2410 days). Lid malposition requiring operative correction occurred in nine patients (3.5 percent). Additional complications included orbital hematoma in one patient (0.4 percent), chemosis in 32 patients (12.1 percent), and blepharitis in 10 patients (3.8 percent). Minor surgical revisions unrelated to lid malposition were performed on 31 patients (11.7 percent) for correction of subciliary incision cysts or granulomas, canthal suture inflammation, and canthal webbing.
Conclusions: Lateral canthal support should be considered a routine component of lower transcutaneous blepharoplasty to obtain the desired aesthetic result and maintain the natural appearance of the eyelid shape. The associated complication rate is acceptable. (*Plast. Reconstr. Surg.* 121: 241, 2008.)

While lower blepharoplasty has been referred to as one of the more challenging procedures in plastic surgery, it is also one of the most commonly requested and performed aesthetic procedures. With the increase in the number of blepharoplasties performed each year, there is also an increase in the incidence of postblepharoplasty complications. Today, there are two evolving trends in blepharoplasty, one toward more aggressive techniques to maximize the aesthetic outcome and the other toward more conservative techniques to minimize the risk of complications. Transconjunctival lower blepharoplasty,

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although more conservative, does not eliminate the risk of lid malposition, as some original publications have suggested. Although excellent aesthetic results can be achieved with transcutaneous lower blepharoplasty, lid retraction and ectropion are the most common complications after lower blepharoplasty as well as the most common causes for reoperative surgery.[1] Some authors advocate routine lateral canthal support to minimize the risk of lid malposition.[2,3] A limited number of studies have analyzed the complication rates of lower blepharoplasty after routine canthal support.[4,5] Since 1994, the senior author (M.A.C.) has performed lower blepharoplasty using a skin muscle flap and routine canthal support with lateral canthopexy, canthoplasty, and orbicularis suspension. The purpose of this study was to review the 10-year experience of a single technique of primary lower blepharoplasty with routine canthal support to evaluate the outcome with respect to complication rates and aesthetic results. Furthermore, a subset of patients with prominent eyes and tear trough deformity were identified and required additional surgical management.

PATIENTS AND METHODS

Sample Population

A retrospective review was conducted of all lower blepharoplasty procedures performed by the senior author between 1994 and 2005. Patients with previous surgery for transcutaneous or transconjunctival lower blepharoplasty, midface lift, lower lid tumors, Graves' ophthalmopathy, or facial fractures were excluded.

Measurement

Canthal tilt, scleral show, tear trough deformity, and excess skin, orbicularis muscle, and orbital fat were determined by having an independent observer examine preoperative standardized photographs. Canthal tilt was considered positive when the lateral canthus was superior to the level of medial canthus, neutral when it was located at the same level, and negative when it was inferior (Fig. 1). Scleral show was present when the lower eyelid was inferior to the lower limbus during forward gaze. The tear trough deformity was defined as the soft-tissue groove overlying the inferomedial orbit (Fig. 2). Excess skin and muscle were defined by the presence of redundant lower eyelid anterior lamella. Excess orbital fat was determined by review of the anterior and lateral photographs and the preoperative clinical notes. Operative reports were evaluated to determine the surgical technique specifically used to address management of the septum, orbital fat, skin, muscle, and lateral canthus.

Outcomes

Clinical charts were reviewed by the authors to identify postoperative complications, including orbital hematoma, blepharitis, chemosis, lid malposition, and surgical revisions. The study inclusion criteria required a minimum follow-up period

Fig. 1. Canthal tilt is defined by the line from the medial to lateral canthus: (*left*) negative, lateral canthus inferior to medial canthus; (*right*) positive, lateral canthus superior to medial canthus.

Fig. 2. Tear trough deformity is the groove below the medial canthus and the nasolacrimal crest.

of 60 days. All patients' postoperative photographs were evaluated by an independent observer for aesthetic results. Analysis of postoperative photographs, patient and surgeon satisfaction, and the requirement for reoperation for aesthetic enhancement were the primary methods of aesthetic result evaluation.

Surgical Technique

To view the surgical technique, **see Video, Supplemental Digital Content 1,** which demonstrates the transcutaneous approach to lower blepharoplasty, ***http://links.lww.com/A346***. The main steps include elevation of a skin muscle flap, release of the orbitomalar ligament, removal of lower lid fat, lateral canthopexy, and resuspension of the orbicularis muscle.

All procedures were performed using general anesthesia with local injection of lidocaine with epinephrine to provide vasoconstriction. The lateral aspect of the incision was made 4 to 5 mm from the lateral canthal angle within an existing crow's foot. Straight iris scissors beveling away from the pretarsal orbicularis completed the subciliary skin incision. The scissors were used to develop a plane between the septum and the preseptal orbicularis. The skin muscle flap was elevated, preserving at least 5 mm of pretarsal orbicularis. This flap was dissected to the level of the orbital rim using cutting electrocautery. Along the entire infraorbital rim, the orbitomalar ligament was divided (Fig. 3). When a tear trough deformity was present, an additional medial dissection was performed to release the origins of the orbicualris muscle, the levator labii superioris alaeque nasi, and the levator labii superioris (Fig. 4). Release of the muscle along the orbital rim was required to create a space for fat transposition to correct the tear trough deformity.

Fig. 3. Orbitomalar ligament cross-sectional anatomy demonstrates the osteocutaneous ligament between the inferior orbital rim and the orbicularis and dermis (*SOOF*, sub–orbicularis orbital fat).

After release of the anterior lamella, orbital fat was conservatively removed, preserved, or repositioned. Preoperative determination of fat excess was an indication for fat removal. Intraoperatively,

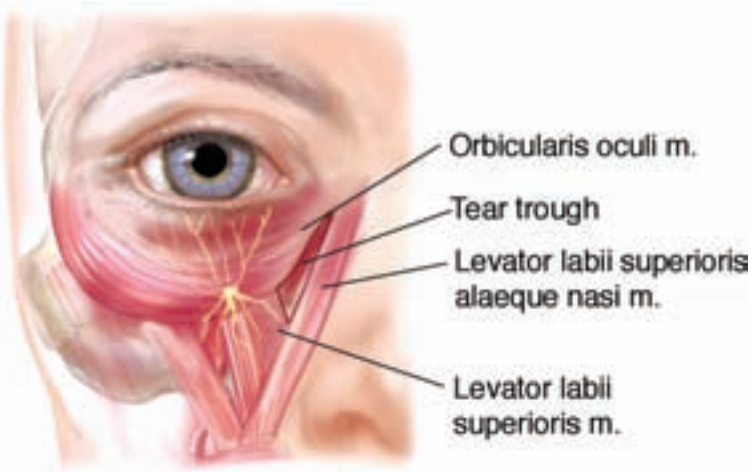

Fig. 4. The anatomy of the tear trough deformity demonstrates the muscular triangle formed by the orbicularis oculi, levator labii superioris, and levator labii superioris alaeque nasi.

the volume of fat from each of the three lower eyelid compartments was assessed. Fat removal was performed using electrocautery with partial excision of the septum. Partial septectomy was performed to minimize the risk of postoperative septal scarring. Inferior orbital rim hollowing and tear trough deformities were indications for fat transposition. Once the orbicularis was released, orbital fat from the medial and central compartments was transposed and sutured to the periosteum with 6-0 Vicryl. The tear trough was corrected by release of the muscular origin contributing to the deformity, addition of volume by fat transposition, and tightening of the skin muscle flap. Conservative dissection was performed to minimize the risk of injury to the buccal branch of the facial nerve.

Lower lid laxity was evaluated by intraoperative lid distraction. The degree of laxity was used to determine the type of lateral canthal support. A lateral canthopexy was performed for moderate lid laxity, which was considered less than 6 mm of lid distraction away from the globe (Fig. 5). A double-armed 4-0 Prolene or Mersilene was used to suture the tarsal plate and lateral retinaculum to the lateral orbital rim periosteum (Fig. 6). The mattress suture was placed through the periosteum within the lateral orbital rim to maintain the posterior position of the lid margin against the globe. The vertical position of the lateral canthal suture was dependent on eye prominence and

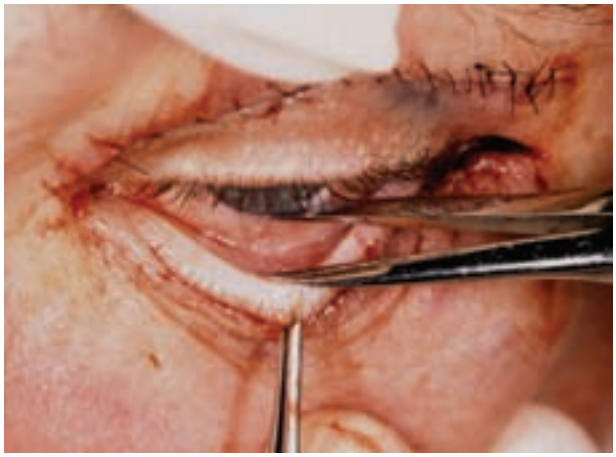

Fig. 5. Lid distraction. Intraoperative lower lid distraction with caliper measuring of anterior displacement of the lid.

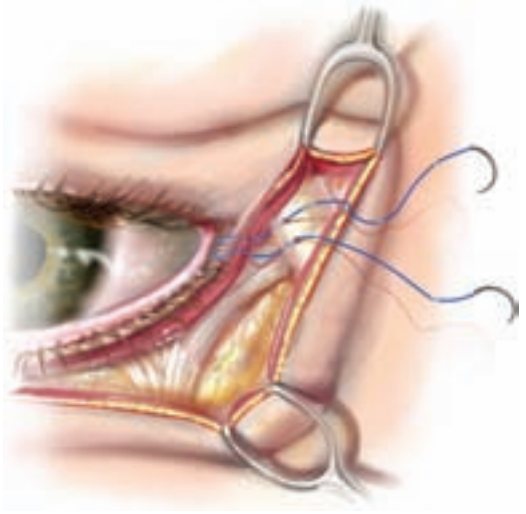

Fig. 6. Canthopexy. The tarsoligamentous sling is tightened by suturing the lateral canthal tarsal plate to the lateral orbital rim.

preexisting canthal tilt. Patients with prominent eyes and negative vector morphology were found to be at higher risk for lid malposition and required additional vertical support of the lateral canthus. While the standard position of the lateral canthopexy suture was most commonly at the lower level of the pupil, patients with prominent eyes or negative vectors required supraplacement or additional vertical positioning of the lateral canthal support suture at the superior aspect of the pupil.

Lateral canthoplasty, which included surgical division of the lateral canthus, was required for more significant lower lid laxity, defined by lid distraction greater than 6 mm away from the globe. Lateral canthotomy and cantholysis of the inferior limb of the lateral canthal tendon were performed, followed by a 2- to 3-mm full-thickness lid margin resection depending on the degree of tarsoligamentous laxity (Fig. 7). Fixation to the lateral orbital periosteum with a permanent suture followed the aforementioned principles for suture placement. To avoid webbing of the lateral canthus, the lateral commissure was carefully reconstructed by aligning the anatomical grey line with a 6-0 plain.

Elevation of the skin muscle flap was an integral part of achieving the desired aesthetic result once the desired changes of the posterior lamella were performed. The anterior lamella was redraped in a superior lateral vector rather than a pure vertical vector. Excision of excess skin and muscle was performed by removing a triangle of tissue lateral to the canthus, thereby minimizing the amount of tissue removed along the actual lid margin. The orbicularis muscle was resuspended to the lateral orbital rim with three-point quilting sutures using 4-0 Vicryl (Fig. 8). Resuspension of the orbicularis was performed with direct periosteal fixation to the lateral orbital rim at the same level as the canthal suture. After resuspension of the skin and muscle flap, the amount of skin excision parallel to the lid margin was very minimal. A tension-free closure was thereby achieved with a 6-0 plain catgut suture. Combined periosteal fixation of the posterior lamella using lateral canthopexy along with separate fixation of the anterior lamella with orbicularis suspension was routinely performed to maximize the degree of lower lid support.

Fig. 7. Canthoplasty. Lateral canthotomy and cantholysis of the lower lid are performed with excision of 2 to 3 mm of lateral lid margin followed by suturing the tarsal plate to the periosteum of the lateral orbital rim.

Fig. 8. The orbicularis is suspended to the lateral orbital rim for additional anterior lamellar support.

Statistical Analysis

Frequencies were used to describe categorical data. For continuous data, the mean and standard deviation were used to summarize the data. For continuous data with extreme outliers, median and range were used. The chi-square test for independence was used to determine whether two categorical variables were related. When the lowest expected cell frequency was less than 5, Fisher's exact probability test was used instead. All statistical analyses were performed using SPSS 13.0 for Windows software (SPSS, Inc., Chicago, Ill).

RESULTS

Patient Population

Between February of 1994 and June of 2005, 485 patients underwent transcutaneous lower lid blepharoplasty performed by the senior author.

Table 1. Baseline Demographic and Preoperative Morphologic Characteristics

Characteristic	Patients
Age, years	
Mean	52
Range	24 to 75
Sex	
Male	9.5% (25/264)
Female	90.5% (239/264)
Excess	
Skin	98.1%
Muscle	96.9%
Fat	91.2%
Scleral show	7%
Tear trough deformity	39.5%
Canthal tilt	
Positive	41.5%
Neutral	51.9%
Negative	6.6%

Although 304 patients met the inclusion criteria, 264 patients satisfied the required follow-up period of 60 days. Table 1 lists the baseline demographic and preoperative morphologic characteristics. The mean age of the study population was 52 years (range, 29 to 75 years), and 90.5 percent were female. Analysis of the preoperative photographs showed 98.1 percent of patients presented with excess skin and 96.9 percent with excess muscle. Additional distribution of anatomical findings showed 91.2 percent of patients with excess fat, 39.5 percent with a tear trough deformity, and 7 percent with scleral show. Canthal tilt was neutral in 51.9 percent of patients, positive in 41.5 percent, and negative in 6.6 percent. Patients with a negative canthal tilt had a higher incidence of preoperative scleral show and negative vector morphology.

Operative Management

Table 2 lists the variations in operative management. A total of 96.6 percent of patients had partial excision of the septum. Orbital fat was left intact in 4.2 percent of patients, removed in 83.3 percent, transposed in 6.8 percent, and both partially removed and transposed in 5.7 percent. Canthal support was performed with canthopexy in 72.6 percent of patients, and canthoplasty in 27.4 percent. As of September of 2003, Mersilene replaced Prolene as the canthal support suture in an attempt to decrease knot palpability. Since this retrospective review began in 1994, the majority of sutures used were Prolene.

Table 2. Operative Management

Management	Patients
Septum	
Intact	3.4% (9/264)
Partially excised	96.6% (255/264)
Fat	
Intact	4.2% (11/264)
Excision	83.3% (220/264)
Transposition	6.8% (18/264)
Excision and transposition	5.7% (15/264)
Canthal support	
Canthopexy	83.4% (191/263)
Canthoplasty	27.6% (72/263)
Support suture	
Prolene	84% (221/263)
Mersilene	16% (42/263)

Table 3. Postoperative Complications and Revisions

Complications	Patients
Orbital hematoma	0.4% (1/264)
Blepharitis	3.8% (10/264)
Chemosis	12.1% (32/264)
Granuloma(s)/cyst(s) excision	4.9% (13/264)
Scar requiring revision	1.5% (4/264)
Lid support suture requiring removal	3.0% (8/264)
Canthal web revision	2.3% (6/264)
Lid retraction	
Mild (resolved with massage)	6.1% (16/264)
Requiring revision	2.7% (7/264)
Ectropion	0.8% (2/264)

Postoperative Complications

The median follow-up period was 264 days (range, 60 to 2410 days). Table 3 lists the rates of postoperative complications and revisions. Complications included orbital hematoma, blepharitis, chemosis, lid malposition, and minor revisions. One patient (0.4 percent) developed an orbital hematoma requiring operative evacuation. Ten patients (3.8 percent) developed blepharitis; all were successfully treated with a combination of steroids and antimicrobial eye ointment. Chemosis was the most common complication and occurred in 32 patients (12.1 percent). Postoperative treatment of chemosis consisted of steroid ophthalmic ointment and occasional short-term eye patching. Patients with significant intraoperative chemosis underwent placement of a lateral tarsorrhaphy suture to minimize the risk of postoperative corneal exposure. Two patients (0.8 percent) developed prolonged chemosis (>3 weeks) requiring conjunctival incision and drainage followed by antibiotic ophthalmic ointment and patching, with complete resolution within 3 months.

Table 4 describes the management of postoperative lid malposition. Sixteen patients (6.1 percent) developed temporary lid malposition. All cases were considered mild (≤1 mm lower lid retraction) and resolved completely with conservative lid massage. Lower eyelid retraction requir-

Table 4. Management of Lid Malposition

Malposition Management	Cases
Lid retraction	
Massage only	6.1% (16/264)
Canthoplasty	1.5% (4/264)
Spacer	0.4% (1/264)
Canthoplasty plus spacer	0.8% (2/264)
Ectropion	
Canthoplasty	0.8% (2/264)

ing operative correction occurred in seven patients (2.7 percent) with 2 to 3 mm of scleral show. Corrective procedures included lateral canthoplasty in four patients, a posterior lamellar spacer in one patient, and combined canthoplasty and spacer placement in two patients. Ectropion was defined as outward rotation of the lid margin with symptoms of corneal exposure. Bilateral ectropion developed in two patients (0.8 percent) and required revision of the lateral canthoplasty.

Other minor complications requiring revision included excision of cysts or granulomas from the incision line in 13 patients (4.9 percent), scar revision in four (1.5 percent), removal of the canthal suture due to palpability or inflammation in eight (3.0 percent), and revision of a canthal webbing in six (2.3 percent).

Predictors of Complications

There was no statistically significant relationship between the development of postoperative lid retraction and preoperative scleral show or negative canthal tilt ($X^2 = 1.43$, $p = 0.23$, and $X^2 = 0.545$, $p = 0.76$, respectively). The operative management of the septum (partial excision versus leaving the septum intact) also did not significantly influence lid retraction ($p = 0.89$). There was no statistically significant relationship between the technique of canthal support (cathopexy versus canthoplasty) and the rate of postoperative chemosis ($X^2 = 0.1$, $p = 0.75$). The canthoplasty group, however, had a statistically significant increase in the frequency of postoperative webbing compared with the canthopexy group ($X^2 = 4.8$, $p = 0.05$).

Fig. 9. Revision case. A 60-year-old woman underwent lower blepharoplasty with fat transfer and lateral canthoplasty. (*Above*) Preoperative right lateral oblique view. (*Center*) Eight-month postoperative view demonstrating right lateral lid retraction and rounding of the scleral triangle. (*Below*) Six months after revision, right canthoplasty with correction of lateral retraction and scleral rounding.

DISCUSSION

Traditional transcutaneous blepharoplasty corrects multidimensional aspects of periorbital aging through tightening the lower eyelid skin and muscle and manipulation of orbital fat. Historically, the most common complication following lower blepharoplasty was lower lid malposition, with a published complication rates ranging from 5 percent to 30 percent.[4,6,7] There are limited data in the literature defining the actual risk of lower blepharoplasty. Lid malposition includes lid retraction, scleral show, and ectropion. These complications not only detract from the aesthetic result, they can also lead to debilitating functional problems. The most common etiological factor in postblepharoplasty lid malposi-

Fig. 10. Aesthetic result. (*Above*) Preoperative view of a 36-year-old woman who underwent lower blepharoplasty with orbital fat excision and canthopexy. (*Below*) Fifteen-month postoperative view.

Fig. 11. Tear trough result. (*Left*) Preoperative view of a 29-year-old woman who underwent lower blepharoplasty with tear trough correction, with orbital fat transposition and canthopexy. (*Right*) Twelve-month postoperative view.

Fig. 12. Prominent eye result. (*Left*) Preoperative view of a 42-year-old female negative-vector patient who underwent lower blepharoplasty overcorrection of lateral canthoplasty. (*Right*) Fifteen-month postoperative view demonstrating lid position correction.

tion is vertical deficiency of the anterior or posterior lamella in the setting of tarsoligamentous laxity.[1] Lower lid retraction most commonly occurs after scar contraction of the septum and posterior lamella to the orbital rim.[8] To avoid this complication, several surgeons have recommended less invasive lower blepharoplasty techniques.[9,10] The limitations of the more conservative procedures relate to limited ability to tighten the anterior lamella. In this study, excess skin and muscle were present in approximately 98 percent of patients. To maximize the aesthetic results, tightening the anterior lamella was found to be an important aspect of lower blepharoplasty. The addition of routine canthal support provided an anatomical solution to the problem of avoiding lid malposition.

Many different methods of canthal support have been documented in the literature.[3,11,12] In general, all methods correct tarsoligamentous laxity, thereby counteracting the downward forces of healing. The two most important aspects of the blepharoplasty technique in this study were tightening of the posterior lamella with canthal support and resuspension of the anterior lamella. Lid retraction was corrected by posterior lamellar release of the capsulopalpebral fascia (Fig. 9). Paralytic ectropion from denervation of the pretarsal orbicularis was not observed. A recent electromyogram study of the pretarsal orbicularis oculi after transcutaneous skin muscle flap blepharoplasty did not demonstrate any evidence of denervation.[13] The two cases of ectropion were both limited to the lateral lower lid and were secondary to technical failure of the lateral canthal support suture. Since conservative skin resection had been performed, no skin grafting was required in any case (Fig. 10).

Morphological features associated with increased risk of postoperative lid retraction include scleral show, negative canthal tilt, and negative vector patients. Adding canthal support to the lower blepharoplasty may reduce the incidence of lid retraction in high-risk patients. The required surgical techniques for patients with prominent or morphologically prone eyes include routine lateral canthopexy, which overcorrects the lateral canthus superior to the medial canthus to create additional vertical support to the lower lid.[14] The skin muscle flap should also be sutured more superiorly to the lateral orbital rim to provide additional support.

A commonly considered cause of lid malposition is scar contracture of the septum.[15] Analysis of patients who had excision of the septum versus no manipulation of the septum showed no statistically significant difference in lid retraction. Partial removal of the septum may theoretically decrease the risk of scar contracture and, therefore, lid retraction in patients undergoing this procedure.

The primary advantages of this technique are the ability to more aggressively tighten the anterior lamella and the ability to preserve the preoperative eye shape. The management of orbital fat was individualized, and redistribution of orbital fat was used to correct the tear trough deformity. The tear trough deformity was the second most common preoperative physical finding, occurring in nearly 40 percent of patients. This anatomical deformity is caused by a deficiency of tissue overlying the anterior nasolacrimal crest. Ligamentous release and fat transposition were performed to add volume to camouflage the rim. The orbital fat and sub–orbicularis oculi fat were used to blend the lid/cheek junction (Figs. 11 and 12).

Despite consistent aesthetic results and acceptable rates of lid malposition, additional complications warrant further discussion. Chemosis was the most common complication in this series, occurring in 12 percent of patients. Although the mechanism of chemosis is poorly understood, surgical dissection causes conjunctival edema from increased vascular permeability and disruption of lymphatic venous channels.[16] In this study, there was no statistically significant difference in the rate of chemosis between the canthopexy and canthoplasty groups. The canthoplasty procedure was associated with a higher incidence of lateral canthal webbing, underscoring the importance of lateral commissure reconstruction following canthotomy. Limitations of this study include the retrospective nature and the lack of observer impartiality. Despite these limitations, this study describes a comprehensive series of lower transcutaneous blepharoplasty.

CONCLUSIONS

Lower blepharoplasty has been referred to as one of the more difficult procedures in the practice of aesthetic surgery. The complications that can occur after blepharoplasty range from a subtle change in eye shape to frank ectropion with corneal ulceration. Primary blepharoplasty goals should be aimed at preventing these complications. Due to consistent and reproducible results, the senior author has continued to use routine canthal support for more than 10 years. Transcutaneous lower blepharoplasty with canthal support and orbicularis resuspension provides safe and effective rejuvenation of the lower eyelid.

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