The Lateral Transorbital Canthopexy for Correction and Prevention of Ectropion
Report of a Procedure, Grading System, and Outcome Study

Kris S. Moe, MD; Thomas Linder, MD

Background: There are numerous approaches to correcting laxity of the lateral canthal tendon, each with advantages and drawbacks. Critical evaluation of these techniques is not possible, however, as there is no grading system currently in use to describe this condition or to report outcomes, and prospective trials are lacking.

Objectives: To report and assess a new procedure for repair of the lateral canthus (lateral transorbital canthopexy) and to describe the Ectropion Grading Scale (EGS), with a prospective outcome analysis of their use.

Design: Prospective outcome study of 15 consecutive patients (16 procedures).

Setting: Tertiary referral center in Zurich, Switzerland.

Patients: Consecutive sample of patients referred for treatment of ectropion of various causes.

Interventions: Preoperative and postoperative EGS grades were recorded, a preoperative and postoperative patient-based questionnaire was administered, and lateral transorbital canthopexy was performed.

Main Outcome Measures: Outcome was determined by improvement in EGS grade and results of the patient-based symptom questionnaire.

Results: There were no surgical failures or complications in the study. An average of 83% reduction in patient-reported discomfort was achieved. Two patients with facial paralysis needed medial canthal repositioning. The EGS allowed clear recording of lower eyelid position before and after lateral transorbital canthopexy, and the procedure was uncomplicated to perform.

Conclusions: Lateral transorbital canthopexy is an effective technique for the correction of lower eyelid laxity and appears to allow refined, durable adjustment of the lateral canthus. Self-reported patient satisfaction confirmed the high rate of success of the procedure in this study. The EGS permits critical evaluation and reporting of results and may assist in predicting which patients will need concomitant correction of the medial canthus.

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The lower eyelid acts in conjunction with the upper eyelid as a shield that protects and maintains a balanced moisturization of the eye. It has 2 primary supports: the medial and the lateral canthal tenoligamentous complexes. While both can stretch, the medial canthal tendon is a rather short and stout structure and is less commonly a cause of eyelid dysfunction. The longer lateral canthal tendon (LCT), however, is the weakest portion of the eyelid, and thus is more susceptible to laxity or increased tension. Dysfunction of the LCT has numerous causes, including facial paralysis, aging, iatrogenic insult, trauma, congenital abnormality, or medical illnesses, such as scleroderma and dermatitis. The resulting ptosis can lead to either entropion or, more commonly, ectropion, with medial, anterior, and inferior displacement of the lateral canthus. The ensuing symptoms are varied, depending on the cause and position of the eyelid; epiphora, photophobia, and erythema are common. Symptoms due to conjunctival irritation and corneal exposure may also occur.

For editorial comment see page 7

Historically, there have been numerous procedures to correct laxity of the LCT dating back at least to Adams’ resection of a full-thickness eyelid triangle in 1812.

Most of these have involved partial eyelid resection, and have shared the complications of unfavorable scarring, phimosis (shortening of the horizontal aperture), trichiasis, and blunting of the lateral canthus. Also, they may further stretch the already lax LCT, leading to recurrence of the problem. A major advance was made in 1977, when Tenzel et al described the lateral sling canthoplasty repair for ectropion, focusing attention on tightening and...
Methods

Preoperative Evaluation

The most critical step in achieving a positive outcome in the treatment of lower eyelid dysfunction is a thorough preoperative evaluation to determine the cause of the problem and to rule out other coincident abnormalities. Assessment begins with observation, comparing the symmetry of the lower eyelid position and the position, width, and angle of the medial and lateral canthi. The vertical traction test is performed, displacing the lower eyelid superiorly over the cornea; this is possible almost to the level of the superior limbus in the normal eyelid and is used to detect cranio-caudal retraction. The degree and location of weakness of the eyelid are then ascertained by the eyelid distraction test, in which the eyelid is retracted inferiorly, while the distance from the globe that it travels and the time that it takes to resume its normal position on release are noted. The results are compared with those of the contralateral side. The ability to distract the eyelid more than 10 mm suggests abnormal laxity. A lateral tension test is then performed, in which the eyelid is pulled laterally. If abnormal laxity is present, the eyelid will move up against the eye. We perform this test both medially, placing tension adjacent to the medial canthus, and laterally at the lateral canthus to aid in ascertaining whether the laxity is primarily medial or lateral. In this maneuver, the lacrimal punctum is carefully observed to ascertain its response to tension: in the absence of eyelid retraction, it should rotate superiority and dorsally to coapt the globe. This response will aid in predicting the surgical outcome. If proper positioning of the punctum is not achieved, or if there is excessive vertical widening of the medial canthal angle, consideration must be given to an ancillary procedure to address the positioning of the medial canthus.

Finally, the position and condition of the eyelashes should be noted, and the conjunctiva should be examined for evidence of exposure changes. Abnormalities of the lacrimal system should be ruled out, and an ophthalmology consultation is obtained as indicated.

The severity of the patient’s ectropion is then graded according to the system depicted in Table 1, and photographic documentation is performed. This includes the following views for every patient (35-mm camera and 105-mm macro lens [Minolta, Osaka, Japan] with ISO 100: 35-mm film): anterior full face at 1:8, anterior eyes and nose at 1:4; anterior and lateral single eye at 1:2; and oblique single eye 1:2 at an angle midway between sagittal and coronal planes, 45° above horizontal. The patient should be in central gaze, sitting position, for all photographs.

Surgical Technique

Figures 1, 2, 3, 4, 5, 6, and 7 demonstrate the steps of the procedure, with preoperative, intraoperative, and postoperative photographs and corresponding illustrations. Figure 1 is a lateral preoperative photograph of a patient with grade III L. ectropion of the right lower eyelid, sitting position. The surgical supine (lateral) perspective with the 1-cm incision marked is shown in Figure 2, A, along with normal anatomy of the lateral canthus and related structures from the same perspective in Figure 2, B, and in the axial plane in Figure 2, C. Local anesthetic with epinephrine and sodium bicarbonate is infiltrated over the lateral orbital rim and medial aspect of the orbital wall in the regions of the zygomatico frontal and zygomaticofacial nerves. Topical anesthetic drops are placed on the conjunctiva. A 1-cm incision is made in a skin fold extending from the lateral orbital rim in a posterior direction and stay sutures are placed through the wound edges (Figure 3, A through C). The orbital segment of the orbicularis muscle is transected, and the underlying periosteum of the orbital rim is exposed. The orbital septum is then transected at its most lateral extent (the arcus marginalis). Dissection is then carried anteriorly under the preseptal orbicularis muscle and orbital septum toward the lateral canthal angle up to the point where the pretarsal orbicularis inserts on the LCT. The LCT is then identified by bluntly displacing the small collection of fat out of the Eissler pocket (Figure 2, C). This is easily seen in younger patients, while in older patients the tendon may be identified more medially by placing a forceps on the elevating the slack lateral tendon. This method was modified by Anderson in 1981 into the tarsal strip procedure, which is often used today. A tarsal strip procedure includes a lateral canthotomy and cantholysis; excision of skin and conjunctiva, leaving a free strip of tarsus; fixation of the tarsal strip to the periosteum of the lateral orbital wall; and reconstruction of the lateral canthus to create the appropriate height and tension of the lower eyelid.

There are several problems with the latter procedure, however. Dysfunction of the lower eyelid is typically attributable to malposition rather than to excess tissue, and resection of one or more layers of the eyelid can cause recurrence or exacerbation of the problem. Furthermore, disruption of the lateral canthal angle can lead to dehiscence, overlapping of the eyelids, failure of proper eyelid positioning, trichiasis, alteration of eyelid contour, obstructive scarring, rounding of the canthus, and loss of cilia. Also, excision of tissue is not reversible should overcorrection occur.

These drawbacks prompted the development of the anterior canthopexy (rather than canthoplasty) for rightening of the LCT. In this procedure, through anterior incisions in the upper or lower eyelids, the LCT is fixed to the lateral orbital wall in a somewhat elevated position without resection of the components of the eyelid or canthus. Anterior canthopexy prevents many of the complications that are associated with resection techniques. But the procedure is still suboptimal. If the LCT is simply sutured to the lateral periosteum, there is a risk of recurrent laxity. This problem may be overcome by fixation of the LCT through drill holes in the lateral wall. However, the anterior approach does not allow a proper angle for drilling and can lead to skin damage. If the access is through the upper eyelid, an additional separate subciliary approach is required for releasing the tethering inferior orbital septum. Also, because the lateral horn of the levator aponeurosis is continuous with the LCT, if an anterior approach through the upper eyelid has been associated with ptosis resulting from entrapment of the aponeurosis with the canthopexy suture. Finally, an anterior approach mandates the creation of operative trauma and distortion directly in the area that must be metricu-
conjunctiva between the eyelid and the globe and displacing the LCT laterally. The tissue is then palpated through the incision with another forceps, and the tendon is located by palpation of its fibrous adhesions with the lateral orbital wall in the region of the Whitnall tubercle. Once identified, the LCT is transected at its lateral insertion. It is important to realize that the lateral insertion of the LCT is approximately 7 mm in vertical extent, and the conjoined attachment of the lateral aspect of the levator aponeurosis at its superior border adds approximately 3 mm, for a total width of 10 mm. To prevent problems of eyelid overlapping or entrapment, we transect the LCT together with the lateral levator aponeurosis from their lateral attachment, maintaining their integrity as a functional unit. When the complex has been freed over its full vertical extent, the lateral canthus and lower eyelid become freely mobile when manipulated with a forceps (Figure 4, A and B). If an element of tethering remains, the lower lateral orbital septum may be further incised in a caudal direction. The tendon is separated from the lateral orbital wall with a craniocaudal vertical incision (ie, cantholysis), but a horizontal canthotomy is not performed. It is maintained fully intact to avoid disruption of attachment of the upper and lower eyelids and to preserve the attachment of the check ligament of the lateral rectus muscle, which can be confirmed by preservation of lateral motion of the lateral canthus on extreme lateral gaze. If the tendon is excessive in its length, a lateral portion may be trimmed so that its bulk does not prevent adequate tightening against the orbital wall.

The lateral orbital periosteum is raised with a septal elevator to expose the bone in the region where the canthus is to be reattached. Two permanent 4-0 sutures are placed through the medial aspect of the LCT at the canthal angle and adjacent to or through the lateral inferior tarsal plate (Figure 4, B, black dots adjacent to the lateral canthus). The ends are left 10 cm long and are clamped with a small hemostat, and the needle is removed. Two 1-mm-diameter holes are bored in the lateral orbital wall 1 to 2 mm posterior and superior to the Whitnall tubercle in the region of the frontozygomatic suture, angled dorsally to 2 mm posterior and superior to the Whitnall tubercle. The tendon is separated from the lateral orbital wall with a craniocaudal vertical incision (ie, cantholysis), but a horizontal canthotomy is not performed. It is maintained fully intact to avoid disruption of attachment of the upper and lower eyelids and to preserve the attachment of the check ligament of the lateral rectus muscle, which can be confirmed by preservation of lateral motion of the lateral canthus on extreme lateral gaze. If the tendon is excessive in its length, a lateral portion may be trimmed so that its bulk does not prevent adequate tightening against the orbital wall.

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To add greater detail if desired, documentation can be added stretching postoperatively, using transosseous suture fixation to prevent dehiscence. Finally, the procedure is rapid; it can be performed under local anesthesia without need for sedation; and, because there is minimal disturbance of the eyelid itself, and there is no incision through the conjunctiva, there is little postoperative discomfort, edema, or chemosis.

A grading system was needed to enable an accurate description of the type and severity of ectropion. On review of the literature, we found no suitable scale, so we developed the Ectropion Grading Scale (EGS) (Table 1). To add greater detail if desired, documentation can be added on the distance between the eyelid margin and the central corneal reflex or on the distance between the ciliary margin and the globe.

Fifteen consecutive patients undergoing 16 procedures (patient 15 underwent simultaneous bilateral repair) were evaluated prospectively with photographic documenta-
tion and preoperative and postoperative questionnaires evaluating and rating their symptoms (Table 2). Their age, underlying diagnosis, and grade of ectropion before and after surgery are shown in Table 3. Five patients were not available for the 6-month postoperative follow-up visit.

The average patient age was 68 years (age range, 55-88 years). The usual time to complete the procedure was 30 minutes, depending on the severity of the underlying process. There were no surgical complications and no instances of infection, problems in wound healing, unfavorable scarring, or instances of eyelid malfunction. The patients experienced minimal postoperative pain, and the mild postoperative edema resolved within 1 week. No patients required reoperation of the lateral canthus. One patient (EGS grade IV LM) underwent placement of a lacrimal stent for persistent epiphora due to stenosis of the lacrimal duct, and another patient (EGS grade, III LM) required a medial blepharorrhaphy to reposition the punctum. No patient who was available for follow-up of 6 months or more had a recurrence of symptoms (although 1 patient developed gustatory lacrimation that was unrelated to the procedure), and there was no evidence on physical examination of dehiscence or weakening of the repair.

Of the 10 patients who were available for at least 6 months of follow-up, the average improvement in the subjective severity of the main symptom was 2.5 out of a possible 3 points (diminution from severity 3 to 0 representing a 3-point improvement), or an 83% reduction in discomfort. It must be noted, however, that many patients had multiple symptoms, and this analysis was based on their most severe symptom only. Furthermore, a patient with facial paralysis should not expect complete resolution of symptoms, as the active function of the lacrimal system does not return.

**COMMENT**

The symptoms caused by dysfunction of the LCT can be extremely annoying to a patient, ranging from continuous epiphora to an exposed, irritated eye with damage of the cornea. The causes of epiphora are numerous, including reflex hypersecretion, punctal stenosis from conjunctival irritation, diminished

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**Table 2**

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age (years)</th>
<th>Underlying Diagnosis</th>
<th>Grade of Ectropion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient 1</td>
<td>65</td>
<td>Congenital</td>
<td>III</td>
</tr>
<tr>
<td>Patient 2</td>
<td>72</td>
<td>Traumatic</td>
<td>IV</td>
</tr>
<tr>
<td>Patient 3</td>
<td>58</td>
<td>Acquired</td>
<td>II</td>
</tr>
<tr>
<td>Patient 4</td>
<td>88</td>
<td>Primary</td>
<td>IV</td>
</tr>
<tr>
<td>Patient 5</td>
<td>60</td>
<td>Congenital</td>
<td>III</td>
</tr>
</tbody>
</table>

**Table 3**

<table>
<thead>
<tr>
<th>Patient</th>
<th>Follow-up (months)</th>
<th>Improvement in Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient 6</td>
<td>12</td>
<td>2.4</td>
</tr>
<tr>
<td>Patient 7</td>
<td>18</td>
<td>2.3</td>
</tr>
<tr>
<td>Patient 8</td>
<td>24</td>
<td>2.2</td>
</tr>
<tr>
<td>Patient 9</td>
<td>36</td>
<td>2.1</td>
</tr>
<tr>
<td>Patient 10</td>
<td>48</td>
<td>2.0</td>
</tr>
</tbody>
</table>

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**Figure 1.** Preoperative lateral photograph of grade III L ectropion, right eye, with patient sitting.

**Figure 2.** A, Patient in supine position, from surgeon’s view, incision marked. B, Normal anatomy from an intraoperative perspective. C, Axial plane viewed from below.

**Figure 3.** A and B, Exposure of orbital rim; stay sutures on wound edges. C, Orbital septum is transected, and lateral canthal tendon is exposed.
medially directed tear conduction due to caudal displacement of the lateral canthus from its normal position approximately 2 mm cranial to the medial canthus \(^{11}\) (normal values vary individually and by ethnic origin), loss of apposition of the eyelid margin to the globe, and vertical shortening of the inferior fornix \(^{1,16}\); or an adynamic lacrimal pump due to laxity and temporal sagging of the eyelid. \(^{11}\) Repositioning of the LCT complex is an effective means of correcting these underlying causes of eyelid malfunction. This abnor-

![Figure 4](image1.png)

**Figure 4.** A and B, Mobilized lateral canthal tendon held with stay suture. C, Placement of permanent 4-0 fixation sutures medially through lateral canthal tendon adjacent to lateral canthus.

![Figure 5](image2.png)

**Figure 5.** A and B, Two fixation holes are drilled adjacent to frontozygomatic suture. B, Black dots indicate points of fixation. C, Fixation suture is placed adjacent to lateral canthus; fixation hole is being drilled. D, Fixation suture is externalized through a hole in the lateral orbital wall by use of a suture “noose.”

![Figure 6](image3.png)

**Figure 6.** A, Fixation sutures are externalized through the lateral orbital wall (note visible traction on lower eyelid). B, Fixation sutures are tied in place (black dots represent points of attachment). C, Lateral canthal tendon is fixed in the desired position.
mality is not rare; indeed, eyelid retraction and ectraption are the most common complications of lower eyelid blepharoplasty,1 and those who treat disorders involving the facial nerve are quite familiar with the manifestations. Earlier attempts to correct lower eyelid malfunction, based on excising a perceived overabundance of tissue, were fraught with difficulties that were partly overcome by the development of canthoplasty and then anterior canthopexy.

We believe that this has now been further improved and simplified by the development of the LTC, which maintains the anatomical and functional integrity of the LCT, including the ability of the lateral check ligament of the lateral rectus muscle to abduct the canthal angle on lateral gaze. By not detaching the lateral horn of the levator aponeurosis from the LCT when it is repositioned, normal functional relationships are maintained and postoperative eyelid malfunction is eliminated.

Subjectively, the patients in this study were satisfied with the procedure postoperatively, obtaining on average an 83% reduction in the severity of their symptom score. Objective analysis of preoperative and postoperative ptosis/ectropion grading demonstrated an improvement in grade in every case. There were no complications, problems with wound healing, or failures to properly reposition the canthus.

Table 1. Ectropion Grading Scale

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
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<tbody>
<tr>
<td>0</td>
<td>Normal eyelid appearance and function</td>
</tr>
<tr>
<td>I</td>
<td>Normal appearance but symptomatic; eyelid laxity present on examination</td>
</tr>
<tr>
<td>II</td>
<td>Scleral show without eversion of lower eyelid</td>
</tr>
<tr>
<td>III</td>
<td>Ectropion without eversion of lacrimal punctum</td>
</tr>
<tr>
<td>IV</td>
<td>Advanced ectropion with eversion of lacrimal punctum from lacrimal lake</td>
</tr>
<tr>
<td>V</td>
<td>Ectropion with complication (eg, conjunctival metaplasia, retraction of anterior lamella, or stenosis of lacrimal system)</td>
</tr>
<tr>
<td>L</td>
<td>Predominantly lateral</td>
</tr>
<tr>
<td>M</td>
<td>Predominantly medial</td>
</tr>
<tr>
<td>LM</td>
<td>Combined medial and lateral</td>
</tr>
<tr>
<td>r</td>
<td>Previous revision</td>
</tr>
</tbody>
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* The number of previous revisions can be indicated by the addition of a number after the r, eg, II LMr2.

We found that the EGS was simple to use and that there was excellent interobserver agreement in patient grading. Furthermore, the system aided in preoperative planning, in that for patients with grade I through III ectropion, no further procedures other than LTC were required; however, in patients with grade III Mr, IV M, or V M ectropion, a procedure directed at the medial canthus, such as medial blepharorrhaphy, should strongly be considered. It should be noted that not all patients attained a postoperative EGS grade of 0. This is because grade 0 means that the patient has had complete resolution of symptoms. In a patient with facial paralysis where the orbicularis muscle is nonfunctional and the lacrimal system functions only passively, the patient cannot be expected to be completely symptom free. In these cases, the goal is EGS grade I.

We believe that the use of a grading system is essential both to enable the surgeon to thoroughly evaluate his or her results and to allow accurate reporting of outcomes and comparisons of various surgical techniques.

Because eyelid retraction and ectropion are frequent complications of lower blepharoplasty, attention should be directed toward preventing this problem. While it has been suggested that lower eyelid tightening be performed routinely with or as a substitute for blepharoplasty,6 it seems reasonable that predisposition to this problem should be sought through the tests discussed above before blepharoplasty is performed; then, LTC may be performed as indicated. We have performed LTC at the same time as blepharoplasty through an extension of either the upper or lower eyelid incision, without difficulty or increased tissue trauma.

Thorough preoperative patient evaluation is necessary to establish the cause of the ptosis and to rule out additional underlying conditions that may require treatment, as well as to plan proper eyelid positioning. Furthermore, patients with long-standing ectropion of advanced grade IV or V may also require adjustment of the medial canthus for full restoration of eyelid contour.

Table 2. Ectropion Symptom Questionnaire

<table>
<thead>
<tr>
<th>Duration of symptoms</th>
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<tbody>
<tr>
<td>Presence of related illness</td>
</tr>
<tr>
<td>Main symptom</td>
</tr>
<tr>
<td>Other symptoms</td>
</tr>
<tr>
<td>Other ophthalmologic problems</td>
</tr>
</tbody>
</table>

Rate the following symptoms according to severity:

- 0, not a problem
- 1, mild
- 2, moderate
- 3, severe

- Excessive tearing
- Poor vision in involved eye
- Burning sensation
- Itching
- Dry eye sensation
- Excessive redness
- Secretions, matting of eyelashes
- Unusually sensitive to bright light
- Unusually sensitive to wind
- Other complaints

* Patients rated these symptoms before surgery and again at each follow-up visit.
We describe a new method for repositioning the lateral canthus and a grading system for evaluating the type and severity of ectropion. The posterolateral surgical approach may allow more surgical precision and refinement than did previous procedures, while preserving the anatomical relationships and function of the LCT and minimizing postoperative discomfort. Also, increased durability of the repair can be expected, as direct fixation of the lateral canthus through bone virtually eliminates dependence on the LCT, the weakest portion of the eyelid. Prospective analysis has confirmed the effectiveness of the procedure through marked subjective relief in the patient-based symptom severity analysis, as well as through objective improvement in the EGS grade.

It is our hope that use of the EGS will aid in personal evaluation and reporting of results and encourage objective comparison and prospective study of future improvements in technique.

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REFERENCES


