



Lateral Tarsconjunctival Onlay Flap in Multi-vector Lower Eyelid Retraction

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Aims: To evaluate the safety and efficacy of a lateral tarsconjunctival onlay flap procedure in correcting multi-vector lower eyelid retraction. **Settings and Design:** A retrospective chart review of patients treated with a lateral tarsconjunctival onlay flap procedure for lower eyelid retraction between 2008 and 2013. **Subjects and Methods:** Inclusion criteria were adult patients with multi-vector lower eyelid retraction who underwent a lateral tarsconjunctival onlay flap procedure. Pre- and post-operative symptoms, ophthalmologic biomicroscopic findings, eyelid position, complications, and subsequent treatments were recorded. **Results:** A total of 147 eyelids from 131 patients were included. Exposure symptoms such as irritation, epiphora, photosensitivity, and glare improved in all patients. Signs secondary to abnormal eyelid position such as lagophthalmos, ocular surface exposure, exposure keratopathy, and eyelid retraction (both upper and lower) improved in all cases. Complications were rare but included pyogenic granuloma ($n = 5$), flap dehiscence ($n = 3$), and temporal visual field obstruction ($n = 8$); all were mild and patients either desired no intervention or had subsequent minor surgical management. **Conclusions:** The lateral tarsconjunctival onlay flap was effective in this large series of complex lower eyelid retraction.

Key words: Exposure keratopathy, lateral tarsconjunctival onlay flap, lower lid retraction

INTRODUCTION

Lower eyelid retraction can be due to multiple variables. Facial nerve function, connective tissue tone, tissue shortage, and globe position all contribute to eyelid positioning and closure. If any of these fail, exposure keratitis, corneal ulcer, corneal perforation, and even loss of vision can ensue.

For paralytic vector lower eyelid retraction, prior surgical options include tarsorrhaphy, canthal anchoring, tarsal pillars, or suspension procedures.¹⁻³

The authors previously described the lateral tarsconjunctival onlay flap for use in in paralytic lid malposition.⁴ Briefly, a flap is created to connect the lateral upper eyelid posterior lamella fornix tissue to the lower eyelid margin. The flap is concealed under the upper lid and is rather inconspicuous. Patient satisfaction was high and there was a significant improvement in ocular signs. Moreover, an additional advantage is upward motion of the lower lid margin with eye closure when there exists a strong Bell's reflex, due to communication of the lower eyelid margin to the upper fornix.

Many cases of eyelid retraction can be managed with lateral canthoplasty or the lateral tarsal strip procedure. These treat horizontal laxity when vertical forces exist, recurrence is common. The vertical variables include a prominent globe, cicatrix, and midface ptosis. We evaluate the efficacy of the lateral tarsconjunctival onlay flap procedure in these more complex eyelid retraction scenarios.

SUBJECTS AND METHODS

After obtaining Institutional Review Board approval, a retrospective chart review was performed on consecutive patients presenting with multi-vector lower eyelid retraction treated with lateral tarsconjunctival onlay flap procedure between 2008 and 2013. Inclusion criteria were adult patients with lower eyelid retraction who underwent a lateral tarsconjunctival onlay flap procedure whether alone

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or in conjunction with lateral canthoplasty, midface lift or an eyelid spacer graft. Upper and lower eyelid position, lagophthalmos, ocular surface disease, patient satisfaction, and appearance before and after intervention were recorded. In addition, changes in dynamic eyelid function were analyzed with high definition, slow-motion videography pre- and post-procedure. Postoperative complications and subsequent management were also recorded for analysis. All procedures were performed by the same surgeon (JT) at a single facility (Gavin Herbert Eye Institute, University of California in Irvine, USA).

Surgical techniques were as those previously reported⁴ and are as follows. The upper eyelid, lower eyelid, and lateral canthus were infiltrated with local anesthesia, and a 5-0 polyglactin suture was then passed through the upper eyelid margin to aid upper eyelid eversion with a cotton-tipped applicator. The tarsoconjunctival flap was marked on the lateral, posterior eyelid lamella 3–4 mm superior to the eyelid margin. A horizontal incision extended from the lateral fornix medially for 4–8 mm, depending on the desired amount of palpebral fissure closure. A tarsoconjunctival flap was developed using number 15 blade and scissors [Figure 1a]. The lateral lower eyelid was incised at the gray line using a number 15 blade for a length that corresponded to the fashioned upper eyelid flap and the epithelium from the posterior lamella was denuded using the blade or Westcott scissors [Figure 1b]. The flap from the upper eyelid was secured to the superior border of the lower eyelid posterior lamella using interrupted, mattress 5-0 polyglactin sutures [Figure 1c and d].

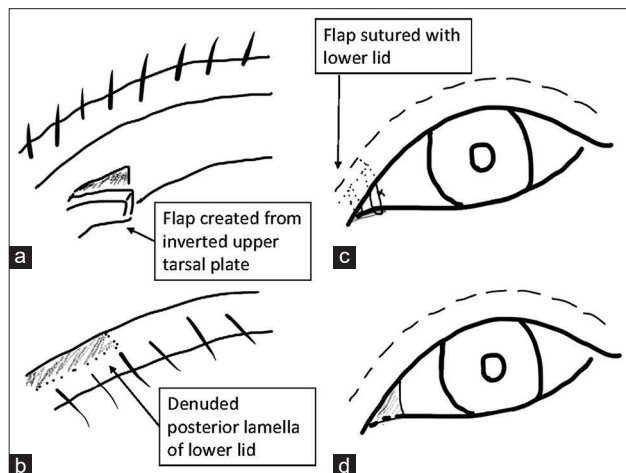


Figure 1: The steps of lateral tarsoconjunctival onlay flap. Upper lid was inverted and one horizontal incision was made with number 15 blade to create a flap 4 mm superior to the lid margin and 4–8 mm medial to the lateral canthus (a). The lateral lower eyelid was incised at the grey line with a length matching with the upper eyelid flap and then the epithelium from the posterior lamella was then denuded (b). The flap from the upper eyelid was then secured to the superior border of the lower eyelid posterior lamella using interrupted, mattress 5-0 polyglactin sutures (c and d)

If significant horizontal laxity was present (identified with an eyelid distraction test, snap back test, or both preoperatively), a lateral canthotomy and inferior cantholysis were performed before securing the tarsoconjunctival flap to the posterior lamella. Several millimeter of excess length of the lower eyelid was resected to achieve tightening. The tarsoconjunctival flap was sutured to the posterior lamella as described above, and the free lateral tarsus of the lower eyelid was secured to the inner rim periosteum using a 4-0 polyethylene or 4-0 polyglactin suture.

If significant vertical vectors were present, a midface lift with a posterior lamella collagen spacer was performed in the following technique. A #15 blade lateral canthal incision was fashioned, and sharp dissection was continued to the lateral orbital rim. A subciliary incision was fashioned across the extent of the eyelid. A dissection was carried out in the septal plane, down to the orbital rim where a subperiosteal dissection was performed across the midface, releasing the arcus marginalis, and orbitomalar ligament. Care was taken to avoid injury to the infraorbital nerve. The conjunctiva and retractor band were incised horizontally below the tarsus, and a porcine collagen matrix graft (Enduragen TM, Stryker, Kalamazoo, MI) was cut into an ovoid configuration and sewn into the posterior lamella defect with interrupted 6-0 chromic sutures. Hemostasis was achieved using electrocautery. The orbicularis muscle was sharply dissected away from the skin laterally. The orbicularis was advanced superotemporally and secured to the outer rim periosteum and temporalis fascia with interrupted buried 4-0 polyglactin sutures. The excess superolateral skin was resected. The remaining skin/muscle complex was secured to the outer rim periosteum using a 4-0 polyglactin suture. Minimal (if any) vertical skin was removed from the subciliary area. The subciliary incision was closed using running fine 7-0 prolene suture. The skin laterally was closed with 5-0 vicryl deeply and 6-0 nylon sutures to the skin.

The efficacy of this procedure was assessed from comparisons of perioperative symptoms, ophthalmologic biomicroscopic findings, and eyelid position. Operation complications and subsequent treatments (if any) were recorded.

RESULTS

A total of 147 eyelids from 131 patients were enrolled in this study. Follow-up periods ranged from 3 months to 5 years. There were 32 eyelids (22%) from patients who had undergone prior attempts at eyelid retraction repair elsewhere. Among the subjects, 96 eyelids were treated only with the tarsoconjunctival flap alone, while 21 eyelids had concomitant lateral canthoplasty. Thirty patients had all of the above plus a midface lift and posterior lamella spacer graft.

The lower lid vectors resulting in lower lid retraction included paralytic ectropion, cicatricial ectropion, involutional ectropion, and congenital ectropion. Figure 2 demonstrates representative pre- and post-operative result of treatment with the tarsoconjunctival onlay flap.

There were few complications. Signs secondary to lid position such as lagophthalmos, ocular surface exposure, exposure keratopathy, and eyelid retraction (both upper and lower) improved in all cases shortly after the procedure. Symptoms such as irritation, epiphora, photosensitivity, and glare all improved. There was no recurrence of same lid malposition after the surgery.

The dynamic upward motion of lower lid margin during blinking after the proposed procedure was noted in most patients. Slow-motion videography of our prior study⁴ demonstrated the subtle upward motion of the lower eyelid driven by the tarsoconjunctival flap connected to the upper fornix [Figure 3].

Complications were all mild and correctable with minimum surgery. Flap dehiscence occurred in 3 (2%) eyelids, all within 2 weeks postoperatively, and were all successfully treated with another surgery involving dissection through prior granulation tissue and repeat flap suturing. Eight (5%) patients complained about restriction of temporal peripheral vision after the surgery. Sharp division at the medial aspect of the flap and lower eyelid under local anesthesia was performed and patients returned without eyelid position change or lagophthalmos. Five (3%) patients had pyogenic granulomas that were excised without recurrence. Another 5 (3%) patients still had some medial lagophthalmos after the surgery and received another supplemental medial partial intermarginal adhesion tarsorrhaphy with care to preserve the canaliculus. One patient had unexpected recovery of facial nerve function and underwent successful complete flap takedown using the same technique mentioned above.

DISCUSSION

Lower eyelid retraction is one of the most difficult problems in eye and facial surgery. If it cannot be managed correctly or promptly, exposure keratopathy may develop and serious



Figure 2: Preoperative (a) and postoperative (b) one of our patients who underwent the lateral tarsoconjunctival onlay flap procedure. The flap was hidden under the upper lid margin and barely noticeable

complications such as corneal scarring, ulcer, and perforation may occur.

The tarsal strip procedure is a surgical technique that strengthened horizontal forces secondary to lax tendons.⁵ However, the tarsal strip procedure is limited in its efficacy in more advanced cases, especially those with vertical vectors pulling the eyelid into malposition.

The lateral tarsoconjunctival onlay flap, previously described to be effective in correcting paralytic lower eyelid malposition,⁴ may be a useful adjunct in multi-vector lower eyelid retraction. Our data demonstrate excellent functional results. In addition, the small flap is well hidden in the lateral canthus and associated with a natural appearance.

Compared with the traditional tarsal strip procedure for strengthening the eyelid horizontally, the current technique provides not only horizontal support but also an additional force to elevate lower lid during eyelid closure.⁴ A physiologic sign helps explain this mechanism. Bell's reflex, named after Scottish physiologist Charles Bell, is a normal physiologic defense reflex where elevation of the globe occurs during when blinking.⁶ The flap created by the proposed procedure connects the upper fornix and the lower lid margin and transmits the supraduction force from the upper fornix into an upward force to raise the lower lid. Moreover, the upward lower lid helps protect the lower half of cornea and tear status when blinking.

Similar concepts have been mentioned. The tarsal pillar technique proposed by Tanenbaum *et al.* connects borders of upper and lower lids but leaves no noticeable "pillars."⁷ Other implant of spacers or grafts in the lower lid to provide support.⁷⁻¹⁰ Hardware exposure, another surgical wound, and local inflammations to bioengineered materials are all trade-offs for these procedures. Although spacer grafts were also utilized in some of the patients in this study. The proposed lateral tarsoconjunctival onlay flap procedure can be a simultaneous technique. It creates a flap hidden beneath the upper lid and gives patients good cosmesis without implants or another surgical wound.



Figure 3: Preoperative (a and b) and postoperative (c and d) comparison of lower lid positions. (a and b) Severe retraction of lower lid with conjunctival congestion of both eyes. (c and d) Lid retraction was successfully corrected with the lateral tarsoconjunctival inlay flap with barely noticeable feature.

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The lateral flap naturally shortens the palpebral aperture vertically and horizontally. Temporal visual field loss is a rare concern (5% of the studied patient). Nevertheless, it may be managed with a subsequent flap takedown procedure.

An additional advantage of the flap is that it is titratable. In addition to partial takedown, as above, augmentation can be easily performed. Either additional posterior lamella upper eyelid tissue is recruited or the existing flap may be medialized along the lower eyelid margin.

This study has several limitations. First, there is no control or comparative group in this retrospective noncontrolled study. In addition, the included subjects were somewhat heterogeneous in preoperative conditions and the treatments often included other adjunctive eyelid elevating procedures such as spacer grafts and midface lifting. Some of the outcomes measures were highly subjective with patient reports.

CONCLUSIONS

This report introduces another indication for a novel procedure, the lateral tarsoconjunctival onlay flap. Multi-vector lower lid retraction, including those that failed prior standard procedures, may benefit from this technique. This procedure provides good cosmesis, eyelid margin preservation, is titratable and reversible. Notably, significant preservation of lower cornea by the upward motion of lower lid on eye closure was an accompanying advantage of this procedure.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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