

Upper Lid Transconjunctival Versus Transcutaneous Approach for Fracture Repair of the Lateral Orbital Rim

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Abstract: The use of the lower eyelid transconjunctival approach in the setting of orbital trauma has become increasingly popular in recent years. However, experience has found that access to the lateral orbital rim can be somewhat limited with this type of incision. Many authors supplement the approach with a lateral canthotomy in order to gain adequate access laterally. Although usually well tolerated, there can be side effects associated with this incision. We examine the upper lid transconjunctival approach to the lateral orbital rim. Furthermore, we compare this technique to the more traditional transcutaneous approaches used for orbital trauma. We have found this technique to be safe, effective, and to cause no more complications than the more traditional approaches.

Key Words: transconjunctival, orbital trauma, upper eyelid, tripod fractures, trimalar fractures, zygomaticomaxillary complex, zygomaticofrontal buttress, levator aponeurosis, lateral canthotomy

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First described by the French surgeon Bourguet¹ in 1924, the transconjunctival incision has become an increasing popular technique in both cosmetic and reconstructive surgery of the peri-orbital region. Tessier^{2–4} further developed this technique when he described its use in bony surgery of the orbit secondary to congenital defects and trauma. The transconjunctival approach offers several advantages over the traditional transcutaneous approaches to the orbits. It leaves no visible scars and also leads to less dissection through the supporting structures of the eyelid. Multiple comparative studies have shown that the lower-lid transconjunctival approach is associated with fewer eyelid complications than with the traditional subciliary approach.^{5–7}

One of the difficulties previously encountered when using the transconjunctival approach for orbital surgery is that access to the lateral orbital rim is somewhat limited. Many authors have supplemented the lower transconjunctival incision with a lateral canthotomy and/or inferior cantholysis to provide access to the zygomaticofrontal buttress.^{5–9} Although usually resulting in only a minimal scar, this lateral canthotomy may be associated with canthal malpositioning or distortion of the palpebral fissure.

In 2005, the senior author (P.R.L.) first described the upper lid transconjunctival approach to the lateral orbital wall.¹⁰ This approach, which takes advantage of the anatomy of the upper lid, allows excellent access to the lateral orbital rim while obviating the

need for a lateral canthotomy incision. Fractures of the zygomaticofrontal buttress are readily repaired while the patient is left with no visible external scars. The current study compared our combined upper and lower transconjunctival approach to the more traditional transcutaneous approaches used in orbital trauma. More specifically, we examined patients who underwent either approach for fractures of the zygomaticomaxillary complex, the so called “tripod fracture,” to determine if there was any difference in the rates of complications between the transconjunctival and transcutaneous approaches.

SURGICAL TECHNIQUE

The transcutaneous approaches to the zygomaticomaxillary complex were accomplished via traditional sub tarsal and lateral brow incisions. The lateral brow incision was placed directly over the zygomaticofrontal suture in a similar position to the lateral portion of an upper blepharoplasty incision. The lower lid transconjunctival approach to the orbital rim was performed using a preseptal technique which has been described extensively elsewhere.^{8,10,11}

In preparation for the upper conjunctival incision, 1% lidocaine with 1:100,000 units of epinephrine is infiltrated into the planned incision site, and adequate time is allowed to elapse for full vasoconstriction to occur. A Crile (Miltex, York, PA) retractor is used to gently retract the upper eyelid in a superior-lateral direction until the conjunctiva directly overlies the fracture of the zygomaticofrontal buttress (Fig. 1). Great care is taken preoperatively to ensure the patient does not have a ptotic lacrimal gland to avoid the possibility of any damage or distortion during retraction. After being treated with bipolar cautery, a sharp incision is made directly through the conjunctiva as it is retracted over the zygomaticofrontal fracture site (Fig. 2). This incision is made in a location superior to Whitnall’s tubercle and lateral to the muscular fibers of the levator palpebrae superioris.

The plane of dissection remains deep to the orbicularis oculi muscle until the bony orbital rim is identified. At this point the periosteum over the fracture is incised sharply and elevated from the fracture site. This subperiosteal dissection may usually proceed roughly a centimeter superiorly above the zygomaticofrontal suture line and inferiorly to the level of the lateral canthal tendon (Fig. 3). If further inferior dissection is required it may be easily accomplished through the lower lid transconjunctival incision.

The fracture is then reduced through the existing incisions. If additional leveraging forces are needed to obtain proper fracture reduction, intraoral manipulation via a gingivobuccal sulcus incision may be used. Once satisfactory reduction has been obtained, the fracture is fixated with low-profile titanium miniplates (Fig. 4). The incision is not closed with suture. The edges of the conjunctival incision are easily aligned as the eyelid is moved inferiorly into its natural position.

METHODS

This study was approved by the University of Tennessee—Health Science Center’s institutional review board. All patients who underwent open reduction and internal fixation of a zygomaticomax-

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FIGURE 1. Retraction of the upper lid conjunctiva over the fracture site.



FIGURE 2. Treatment with bipolar cautery prior to incision.



FIGURE 3. The lateral orbital rim fracture is exposed after subperiosteal elevation.



FIGURE 4. Fracture fixation with low-profile titanium miniplate.

illary complex (aka “trimalar”) fracture between 2004 and 2006 were included in this retrospective chart review. All procedures were performed by the same surgeon (P.R.L.) at the University of Tennessee—Health Science Center, Memphis, TN.

Patients were assigned to 1 of 2 groups. Those in the “transcutaneous” group included those patients whose surgeries were performed via a lower lid sub tarsal incision combined with a traditional lateral brow incision. The “transconjunctival” group was defined as those who underwent a lower lid preseptal transconjunctival approach to the orbital rim combined with the upper lid approach described above. Transcutaneous approaches were generally used if the patient had pre-existing lacerations from the trauma or if the fractures were markedly displaced. The transconjunctival approach was otherwise considered, especially if the patient expressed concern over the cosmetic impact of the procedure and its associated incisions. Demographics and mechanisms of injury were obtained for both groups. Finally, complications as well as surgical outcomes from both groups were recorded. Both an unpaired *t* test and Fisher exact test of independence were used for statistical analysis.

RESULTS

During the designated study period, 45 patients were identified. There were 20 patients who underwent a transconjunctival approach, compared with 25 in the transcutaneous group. Demographics and mechanisms of injury are shown in Table 1. There were no statistically significant differences among any of the variables listed.

The average patient was 37 years old, and there was a male preponderance. Assaults accounted for the greatest number of injuries, followed by motor vehicle accidents. Roughly two-thirds of patients suffered multiple facial fractures, while the remainder had isolated fractures of the zygomaticomaxillary complex.

In the transcutaneous group, 2 of 25 patients (8%) suffered a complication. One patient showed an early lower-lid ectropion formation in follow-up, which resolved over time without surgical intervention. Another patient developed a postoperative infection requiring a return trip to the operating room for hardware removal. Of note, this patient was on chronic steroid therapy for her rheumatoid arthritis.

TABLE 1. Patient Demographics

	Transconjunctival	Transcutaneous
Mean age (range)	37 yr (15–72)	37 yr (17–67)
Sex	16 male, 4 female	21 male, 4 female
Interval between injury and repair	5.7 d	5.5 d
Average follow-up	33 d	90 d
Mechanism of injury	9 assaults 4 motor vehicle accidents 5 falls 1 gunshot wound	12 assaults 10 motor vehicle accidents 2 falls 1 gunshot wound
Other facial fractures	13 associated with other facial fractures 7 isolated ZMC fractures	17 associated with other facial fractures 8 isolated ZMC fractures

In the transconjunctival group, 1 of 20 patients (5%) had a complication. This patient developed a lower-lid entropion in the postoperative period. It later resolved with conservative measures. No patients showed any signs of upper lid ptosis, lacrimal abnormalities, dry eye syndrome, symblepharon, or significant edema. There was no significant difference between the complication rates of the 2 groups ($P = 1.0$).

DISCUSSION

The transconjunctival approach was first described by Bourguet¹ in 1924, who used the technique to remove orbital fat from those patients who did not require excision of lid skin. In 1973, Tessier^{2–4} first described use of the technique in bony surgery of the orbit, primarily for congenital orbital malformations but also for orbital trauma. Later that same year, Converse⁸ described both the preseptal and retroseptal variations of the transconjunctival approach.

Over the next couple decades, the role of the lower-lid transconjunctival approach became established in both cosmetic and reconstructive surgery. Then, in 1999, Januszkiewicz and Nahai¹² published their series of patients who had undergone transconjunctival upper blepharoplasty. They described the technique as a method to remove medial upper eyelid fat in patients who did not have excess skin. Guerra et al^{13,14} further described the anatomy of the upper lid that made this procedure safe and effective. They describe a “bare area” of the medial upper lid, where extensions of the levator aponeurosis covering the conjunctiva are very thin and delicate. This allows dissection of this area without disrupting the integrity of the levator aponeurosis.

The lateral upper lid has similar anatomic features to this medial “bare area,” which allows our technique to be safe and effective. The lateral extensions of the levator aponeurosis are also thin, delicate, and easy to dissect. None of our patients experienced postoperative ptosis, supporting the concept that the function of the levator aponeurosis remains undisturbed by the procedure. Furthermore, as the dissection proceeds on the external surface of the lateral orbital rim, the lacrimal gland remains protected by this structure. Again, none of the patients in the study experienced any postoperative lacrimal gland abnormalities.

There have been several studies that have compared eyelid complications between the subciliary approach to the orbital rim and the lower-lid transconjunctival approach. The studies done by Wray et al,⁷ Appling et al,⁵ and Patel et al⁶ have all found significantly higher rates of eyelid-related complications with the subciliary

incision when compared with the lower-lid transconjunctival incision. The differences were sometimes quite striking, with one review detailing a 40% rate of eyelid retraction or ectropion among the subciliary incisions compared with only 3% for transconjunctival.⁵ We had a much lower rate of eyelid complications among our transcutaneous group. This may be a reflection of using a subtarsal rather than subciliary incision, which usually results in less scar contraction of the eyelid margin and preserves a significant sling of supporting pretarsal orbicularis muscle.

To our knowledge, this is the first study that compares the upper lid transconjunctival approach for the lateral orbital rim with the traditional transcutaneous approach. The transcutaneous group had a slightly higher incidence of postoperative complications, although not statistically significant. Moreover, there were no complications relating to the upper lids in either group. One patient in the transconjunctival group did develop a postoperative lower-lid entropion, which resolved without surgical intervention. Of note, this patient had a significant smoking history and inconsistent follow-up.

Once the initial learning curve of the transconjunctival technique is mastered, it does not appear to be any more time-consuming than the transcutaneous approach. In fact, the efficiency of the transconjunctival approach is improved by the fact that very little time is required to be spent on closure. The postoperative edema in the lower lid was similar to that seen in a transconjunctival blepharoplasty. In patients undergoing the upper lid transconjunctival approach, there was some mild persistent edema over the upper lateral orbital rim, which generally resolved within a month.

As previously reported, access to the lateral orbital rim can be somewhat limited with lower transconjunctival incisions. Excessive traction on the lower lid while trying to work laterally can result in eyelid lacerations. Most authors have advocated combining a lateral canthotomy incision with the lower transconjunctival incision to access the lateral orbital rim and the zygomaticofrontal buttress.^{5–9} Although this approach is generally well tolerated, complications associated with lateral canthotomy have been reported, including canthal malpositioning, blunting of the lateral canthus, and a visible scar.¹⁵ Our upper lid technique affords good access to the lateral orbital rim without any of the risks associated with lateral canthotomy. Importantly, this approach does limit the level of tension that can be applied to the eyelids during retraction. Excess tension on either the upper or lower lid could result in a tear of the lid margin or a disruption of the collecting ducts. Accordingly, patients with markedly displaced or comminuted fractures in which a very wide exposure is needed may not be the best candidates for the transconjunctival approach.

In properly selected patients, the upper-lid transconjunctival approach is a safe technique that affords excellent access to the lateral orbital rim without a significant incidence of complications. When combined with a lower-lid transconjunctival incision, it allows reduction of zygomaticomaxillary complex fractures without any external evidence of repair. When compared with the traditional transcutaneous approaches, it leads to no more and perhaps fewer postoperative complications. Increased patient numbers and long-term follow-up may further help to validate the findings contained in this study.

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Informed patient consent has been obtained for publication of the figures in this article.

REFERENCES

- Bourguet J. Les hernies graisseuses de l'orbite. Notre traitement chirurgical. *Bull Acad Med Paris*. 1924;92:1270–1272.

2. Tessier P. The conjunctival approach to the orbital floor & maxilla in congenital malformation & trauma. *J Maxillofac Surg*. 1973;1:3–8.
3. Woillez M, Tessier P, Lekieffre M, et al. Fractures of the orbit [in French]. *Bull Mem Soc Fr Ophtalmol*. 1963;76:393–398.
4. Tessier P. Surgical Treatment of rare orbito-facial malformations. *J Genet Hum*. 1966;15(suppl):322–355.
5. Appling WD, Patrinely JR, Salzer TA. Transconjunctival approach vs. subciliary skin-muscle flap approach for orbital fracture repair. *Arch Otolaryngol Head Neck Surg*. 1993;119:1000–1007.
6. Patel PC, Sobota BT, Patel NM, et al. Comparison of transconjunctival vs subciliary approaches for orbital fractures: a review of 60 cases. *J Craniomaxillofac Trauma*. 1998;4:17–21.
7. Wray RC, Holtmann B, Ribaldo JM, et al. A comparison of conjunctival & subciliary incisions for orbital fractures. *Br J Plast Surg*. 1977;30:142–145.
8. Converse J, Firman F, Wood-Smith D. The conjunctival approach in orbital fractures. *Plast Reconstr Surg*. 1973;52:656–657.
9. Manganello-Souza LC, Freitas RR. Transconjunctival approach to zygomatic and orbital floor fractures. *Int J Oral Maxillofac Surg*. 1997;26:31–34.
10. Langsdon PR, Knipe TA, Whatley WS, et al. Transconjunctival approach to the zygomatico-frontal limb of orbitozygomatic complex fractures. *Facial Plastic Surg*. 2005;21:171–175.
11. Jacano AA, Moskowitz B. Transconjunctival versus transcutaneous approach in upper and lower blepharoplasty. *Facial Plastic Surg*. 2001;17:21–27.
12. Januszkiewicz J, Nahai F. Transconjunctival upper blepharoplasty. *Plast Reconstr Surg*. 1999;102:1015–1018.
13. Guerra AB, Metzinger SE, Black EB. Transconjunctival upper blepharoplasty: a safe and effective addition to facial rejuvenation techniques. *Ann Plast Surg*. 2002;48:528–533.
14. Guerra AB, Berger A III, Black EB III, et al. The bare area of the conjunctiva: a closer look at the anatomy of transconjunctival upper blepharoplasty. *Plast Reconstr Surg*. 2003;111:1717–1722.
15. Converse J, et al. Orbital blowout fractures: a ten-year survey. *Plast Reconstr Surg*. 1967;39:20–36.