Lower Eyelid Malposition Following Orbital Fracture Surgery: A Retrospective Analysis Based on 198 Surgeries

Alexandra G. Kesselring, DDS¹ Paul Promes, DDS¹ Elske M. Strabbing, MD, DDS¹
Karel G. H. van der Wal, DDS, MD, PhD¹ Maarten J. Koudstaal, MD, DDS, PhD¹

¹ Department of Oral and Maxillofacial Surgery, Erasmus University Medical Center, Rotterdam, The Netherlands

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Address for correspondence Alexandra G. Kesselring, DDS, Department of Oral and Maxillofacial Surgery, Erasmus University Medical Center Rotterdam, 's-Gravendijkwal 230 3015 CE Rotterdam, The Netherlands (e-mail: agkesselring@gmail.com).

Abstract

The aim of this study is to analyze the development of lower eyelid malposition following reconstruction of orbital fractures, in relation to the incisions used for access. A total of 198 surgical orbital floor reconstructions were performed in 175 patients between 2001 and 2011. Preoperative and postoperative presence of lower eyelid malposition of patients was reported. The types of incision used for access were as follows: approach via laceration (4.5%), via preexisting scar (16.2%), infraorbital (40.9%), subciliary (23.7%), transconjunctival (13.1%), and transconjunctival with lateral canthotomy (1.5%). The incidence of ectropion development following surgery was 3.0% and the incidence of entropion development following surgery was 1.0%. The highest rate of ectropion (11.1%) was seen using an approach via a laceration, followed by approach via a scar (6.3%). Our conclusion is that the transconjunctival incision without a lateral canthotomy has a low complication rate, provides adequate exposure, and leaves no visible scar.

Keywords

- orbital trauma
- ectropion
- entropion
- lower eyelid malposition
- incision

Good access and visibility of the orbital floor are crucial in orbital fracture surgery, and the most common incisions used are the subciliary, infraorbital, and transconjunctival approach with or without lateral canthotomy. The lower eyelid is subdivided into the anterior lamella (the skin and orbicularis oculi muscle), the middle lamella (the orbital septum and orbital fat), and the posterior lamella (the capsulopalpebral fascia and conjunctiva). The lateral and medial canthal tendons, the capsulopalpebral fascia, the tarsus, and the orbicularis oculi muscle support and suspend the lower eyelid.¹ With the *subciliary approach*, an incision is placed ~2 mm caudal to the ciliary line. Dissection is possible in three ways: the skin flap, which divides the orbicularis muscle at the level of the infraorbital rim; the non-stepped skin-muscle flap, which divides the orbicularis muscle at the same level of the skin incision; and the stepped skin-muscle flap, which divides the orbicularis muscle 2 to 3 mm below the level of the skin incision, keeping the pretarsal fibers of

the orbicularis muscle attached to the tarsal plate.² The *infraorbital* incision is placed in a skin crease at the junction of the thin eyelid skin and the thicker cheek skin, overlying the inferior orbital rim. The orbicularis muscle is divided at this same level.³ In the *transconjunctival* approach, the lower eyelid is reversed and an incision is placed either preseptal or retroseptal. In the preseptal approach, a conjunctival incision at 2 to 3 mm from the caudal tarsal plane is made and the dissection proceeded between the orbital septum and the orbicularis muscle. In the retroseptal approach, the conjunctiva is incised more caudally near the inferior conjunctival fornix. The periosteum is incised, and the infraorbital rim, the floor, and the orbital walls are exposed.⁴ The transconjunctival incision can be extended with a lateral canthal incision in a natural skin crease which is extended laterally for at least 5 mm with the goal of transecting the lower limb of the lateral canthal tendon.⁵ The choice of incision is based on the surgeon's preference, the amount of exposure needed, and

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scar visibility. Regardless of the approach used to access the orbital floor, lower eyelid malposition is the most common long-term complication following the trauma and surgical repair of orbital fractures and includes ectropion and entropion. After orbital trauma surgery, *ectropion* may occur because of scar contracture, cicatricial shortening of the anterior lamella (skin and orbicularis muscle) of the eyelid, as well as loss of muscle tonus. Ectropion is a common complication after a transcutaneous incision, especially in the subciliary approach.^{2,3,6–8} Entropion may occur because of scarring or reduction of the conjunctiva, subconjunctiva, or internal tarsus (posterior lamella). The scarring leads to contracture at the tarsus as well as at the conjunctiva and results in an inward bowing of the eyelid.⁹ In the literature, the reported incidence of lower eyelid complications following a transcutaneous or transconjunctival approach ranges from 0 to 42%.^{3,5,7–14} Management of these complications varies from a conservative approach to surgical repair. Lower eyelid malposition can occur with any lower eyelid trauma or incision for facial fracture repair, but several studies show that the subciliary approach has the highest risk of developing ectropion.^{2,3,6–8,15,16} and the transconjunctival approach is associated with the lowest risk of ectropion.^{3,8,13,15} As a result of the relatively high risk of lower eyelid retraction with the subciliary approach, over the past 10 years, there has been increased interest in use of the transconjunctival approach. The transconjunctival incision provides good access to the entire orbital floor as well as acceptable access to the medial orbital wall and it does not interfere with the lacrimal drainage system.^{4,9,11} It lowers the risk of retraction and avoids a visible scar.¹⁷ Some authors, however, prefer the extended incision for additional exposure.^{12,17} The transconjunctival incision can be extended either laterally or medially.¹⁸ The downside of the extended incision is the higher risk of lower eyelid malposition.¹³ Complications of the transconjunctival approach are uncommon, and the incidence of entropion development following a transconjunctival approach ranges from 0 to 4.4%.^{8–10,14,17} The aim of this study is to analyze the incidence of lower eyelid malposition in relation to the incisions used for orbital floor reconstruction.

Patients and Methods

In this retrospective clinical study, analysis of all orbital floor fractures requiring surgical treatment between 2001 and 2011 was performed. Data were analyzed for gender, age, type of incision, and preoperative as well as postoperative presence of lower eyelid malposition. Diagnosis and treatment of the patients were based on physical examinations and computed tomography (CT) scans of the orbit. Cases were then subdivided in the type of incision used for treatment of the orbital fracture: laceration, preexisting scar, infraorbital, subciliary, and transconjunctival with or without lateral canthotomy. A chart review was performed, identifying all complications, including ectropion and entropion. Ectropion is defined as any eversion of the eyelid margin. Entropion is defined as any inversion of the eyelid margin. For the statis-

tical analysis, IBM SPSS Statistics 20 (Armonk, NY) was used. The significance of the association between incidence of lower eyelid malposition and surgical approach was examined using the Fisher exact test.

Results

A total of 198 surgeries were performed on 175 patients during the study period. Fifteen out of 175 patients underwent two surgeries and 4 patients underwent three surgeries. Women constituted 34.3% ($n = 60$) of the cases and men constituted 65.7% ($n = 115$). Patient's age ranged from 4 to 83 years (mean: 37.5 years). In this study, bilateral orbital fractures were seen in 4 patients (2.3%) and 171 patients (97.7%) showed unilateral fractures. ▶Table 1 shows the frequency of every incision used in this study.

Ectropion development: In six patients (3.0%), ectropion developed following surgery. ▶Table 2 shows the frequency of ectropion development for each incision. The highest rate of ectropion was seen using an approach via a laceration (11.1%), followed by an approach via a scar (6.3%). There was no statistically significant difference between incisions for development of ectropion ($p = 0.371$). In five cases (2.5%), preexisting ectropion was present as a result of the trauma itself or after surgery elsewhere. One of these ectropion cases was corrected during surgery.

Table 1 Incisions used in 198 surgeries

	Frequency, n	Percentage
Laceration	9	4.5
Preexisting scar	32	16.2
Infraorbital	81	40.9
Subciliary	47	23.7
Transconjunctival	26	13.1
Transconjunctival with canthotomy	3	1.5
Total	198	100

Table 2 Ectropion and entropion development in 198 surgeries

	Developed ectropion	Developed entropion
Laceration ($n = 9$)	1 (11.1%)	0
Preexisting scar ($n = 32$)	2 (6.3%)	0
Infraorbital ($n = 81$)	2 (2.5%)	1 (1.2%)
Subciliary ($n = 47$)	1 (2.1%)	0
Transconjunctival ($n = 26$)	0	0
Transconjunctival with canthotomy ($n = 3$)	0	1 (33.3%)
Total incisions ($n = 198$)	6 (3.0%)	2 (1.0%)

Entropion incidence: Two cases (1.0%) developed entropion following surgery. ▶ **Table 2** shows the frequency of entropion development for each incision. For entropion development, a statistically significant difference between incisions was found ($p = 0.044$). The highest percentage of entropion was seen in the transconjunctival incision with a lateral canthotomy (33.3%). One case (0.5%) had a preexisting entropion and the entropion remained following surgery.

Discussion

This retrospective analysis was conducted on 175 patients who underwent a total of 198 orbital reconstructions. Patients with unsatisfactory postsurgical outcome received a second surgery. In this study, 15 patients underwent a second operation and 4 patients underwent three operations. The primary goal of this study was to analyze the incidence of ectropion and entropion development following orbital floor reconstruction, in relation to the incisions used for access. The overall complication rate was low. The incidence of ectropion development was 3.0%, and the incidence of entropion development was 1.0%. These complication rates are low compared with the rates available in the literature regarding lower eyelid malpositions: 0 to 42%^{3,5,7-14} for ectropion and 0 to 4.4% for entropion.^{8-10,14,17} The lower eyelid malpositions we found clinically relevant were an aesthetic dissatisfaction, significant corneal exposure, overflow of tears in ectropion, and irritation of the cornea in entropion, as the eyelashes are continuously touching the cornea. At our medical center, the approach via a laceration was associated with the highest risk of ectropion, followed by approach via a scar, but this was not statistically significant ($p = 0.371$). This is presumably a result of a lack of soft-tissue control and due to the trauma itself causing tissue damage and scar tissue formation, leading to the malposition. Ectropion occurred only with transcutaneous incisions. Access via a preexisting scar was used in 16.2% of cases. This number is relatively high and is probably due to the fact that often patients who were primarily operated on elsewhere and did not have a desirable outcome were sent to our medical center for secondary repair. The infraorbital incision covers a large part of the used incisions in this study; this is because our database is fairly old and we have long been in favor of the infraorbital incision. However, today we use almost only the transconjunctival incision. In our study, no entropion development occurred after the use of the transconjunctival incision without lateral canthotomy and we believe this is a safe approach that provides good access to the orbital floor. The transconjunctival approach with a lateral canthotomy was associated with the highest risk of entropion, but although statistically significant ($p = 0.044$), this should be interpreted with care because it is based only on three cases making this association rather weak. The literature also suggests that the lateral extension increases the risk of lower lid complications, and that this is the result of disturbance of an anatomic structure and the difficulty to reattach the lateral canthal ligament in the correct position.^{13,14} The lower eyelid is supported and suspended by the lateral and medial canthal

tendons, the capsulopalpebral fascia, the tarsus, and the orbicularis oculi muscle.¹ Disturbance of these anatomical structures increases the risk of lower eyelid malpositions. If the transconjunctival incision is placed too far anterior, close to the eyelid edge, there might be traction postoperatively and shortening of the tarsal plate by fibrosis and scarring. If the incision is placed too far posterior, close to the globe, the risk of an injury of the inferior oblique muscle is increased.¹⁶ Although our complication rates are low, most eyelid malpositions that were present preoperatively did not resolve after surgery. Especially when the transcutaneous laceration of the trauma itself was used to access the orbital floor in the first surgery and ectropion arose postoperatively, we found that soft-tissue management in a second surgery was harder and the outcome was unpredictable. One case of ectropion did resolve after a "release" surgery via an already existing infraorbital scar. In our study, entropion developed in two cases and only after the use of a transconjunctival approach with lateral canthotomy. These cases did not receive secondary surgery yet. There was one case where entropion was present preoperatively after having received two prior surgeries via a transconjunctival approach. The patient underwent another procedure, again via a transconjunctival approach, and although the lower lid seemed to improve a bit, the entropion remained. After surgical approaches through the lower eyelid, we advise all patients to massage the lower lid for 5 minutes every hour during the first month postoperatively. When mild-to-moderate lower lid retraction persists after this month, we advise to continue the massage for a period of 6 months before surgical intervention should be considered.¹⁹ Early operative intervention should be avoided unless significant corneal exposure and irritation are encountered. This is rarely seen with ectropion but is common in entropion, as the eyelashes are a source of constant irritation. After 6 months of conservative therapy, unresponsive retractions may be better managed operatively.²⁰ In persistent or severe *ectropion*, if conservative treatment fails, the etiology of the ectropion should be addressed. Where there is vertical shortening from excessive skin resection or scarring of the orbital septum, there should be release and, when needed, grafting of the deficiency.¹⁹ In patients with postoperative *entropion*, conservative measures such as massage, lubricating ointment, and taping are indicated for mild cases and may provide symptomatic relief. In mild entropion, the Weis technique may be used: a transverse lid split with a block resection of the posterior lamella, creating a fibrous scar with upward migration of the preseptal orbicularis oculi over the tarsal plate. In severe entropion, successful reconstruction requires scar excision and replacement of tissue deficiency. These procedures lengthen the posterior lamella and are indicated in cases of significant scar and contraction of the posterior lamella. When entropion persists, electrolysis of the offending eyelashes is possible.⁹ Limitation of this study is the fact that it is a retrospective study and that different surgeons performed the surgical interventions. Although, in this study, all incisions are associated with a low complication rate, the transconjunctival approach showed the best result without occurrence of ectropion or entropion.

Conclusion

In this study, the overall incidence of lower eyelid malposition is low. Although lower eyelid malposition can occur with any lower eyelid incision for orbital wall fracture repair, the highest rate of ectropion was seen using an approach via a laceration (11.1%), followed by approach via a scar (6.3%). We advocate the transconjunctival incision without a lateral canthotomy: it has a low complication rate, provides adequate exposure in most cases, and leaves no visible scar.

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