Al-Azhar International Medical Journal

Volume 5 | Issue 5 Article 20

7-1-2024
Section: Plastic surgery

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How to Cite This Article

Amin, Mahmoud Ahmed; Youssif, Sherif Hamdeno; Omran, Ahmed Moustafa; and Mekawy, Ahmed Mohammed (2024) "Evaluation of Transconjunctival Approach Mixed with Lower Lateral Tarsal Incision for Zygomatico-Maxillary Complex Fracture," *Al-Azhar International Medical Journal*: Vol. 5: Iss. 5, Article 20.
DOI: https://doi.org/10.58675/2682-339X.2422

ORIGINAL ARTICLE

Evaluation of Transconjunctival Approach Mixed with Lower Lateral Tarsal Incision for Zygomatico-Maxillary Complex Fracture

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Abstract

Background: ***Orbital fractures are typical in modern society due to various accidents affecting the craniofacial region. Transconjunctival incisions have the main benefit of causing minimum scar formation compared to other orbital access procedures.***

Aim: ***To assess the value of the Transconjunctival Approach with Lower Lateral Tarsal Incision for accessing ZMC fractures.***

Subject and Method: ***In this prospective clinical study, we recruited 20 patients with unilateral Orbito-Zygomatic-Maxillary complex fracture operated at the Plastic and Reconstruction Department, Al-Azhar University Hospital, Damietta.***

Results: ***All participants were male, with a mean age of 35.4±11.3 years. We found the mean time needed for the incision to be 17.8± 3.5 min. All subjects exhibited a typical incision site with uninterrupted access to the surgical area and the lower eyelid properly positioned about the eyeball.***

Conclusion: ***Combining a transconjunctival approach with a lower lateral tarsal incision offers extensive access to the inferior orbital rim and orbital floor, resulting in a minimal risk of complications and improved aesthetic results.***

Keywords: Transconjunctival; Lower Lateral Tarsal Incision; ZMC Fractures

1. Introduction

Orbital fractures are a common occurrence in modern society, sometimes resulting from trauma to the craniofacial region. [1]

Possible complications of Orbito-Zygomatic-Maxillary complex fractures may involve malar area depression, enophthalmos, injury to the globe and optic nerve resulting in blindness, sensory disruption of the infraorbital nerve, trismus and potentially death if associated with brain trauma. Therefore, it is essential to provide proper care for these fractures. [2]

Zygomatic-orbital fractures are managed according to severity and can entail closed or open reduction techniques. Multiple incisions are utilized to access the underlying bones in an open reduction approach for healing a zygomatic fracture. [3]

Transconjunctival incisions have the main benefit of causing minimum scar formation compared to other orbital access procedures. They also provide less exposure compared to transcutaneous methods like subsidiary and subtarsal access, often resulting in insufficient visibility. [4]

To overcome the constraint of this exposure, a lateral canthotomy, commonly known as a "swinging lower eyelid flap," was performed. The disruption of the lateral canthal architecture undermines the purpose of reducing complications related to orbital access, which is, hence, the primary objective of the transconjunctival incision design. [5]

This work evaluates the transconjunctival approach with a lower lateral tarsal incision for accessing ZMC fractures.

Accepted 21 May 2024.
Available online 31 May 2024

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2. Patients and methods

In this prospective clinical study, we recruited 20 patients with unilateral Orbito-Zygomatic-Maxillary complex fracture operated at the Plastic and Reconstruction Department, Al-Azhar University Hospital, Damietta.

2.1.Eligible criteria were adults with acute unilateral Orbito-Zygomatic-Maxillary complex fracture. We excluded patients with bilateral Orbito-Zygomatic-Maxillary complex fracture or trauma onset for more than two weeks and preoperative pathological conditions affecting the orbit, e.g., Enophthalmos, Dystopia, Diplopia, or Ectropion.

All recruited participants underwent complete history taking, local orbital examinations, and radiological examinations (panoramic x-ray, pan facial x-ray, and skull CT -3D-).

2.2.Ethical declaration:

The study received approval from the Ethics Board at Al-Azhar University. This research was conducted in compliance with the Declaration of Helsinki 6. The World Medical Association's Code of Ethics for human research projects. Informed and written consent were obtained from participants.

Patient consent was obtained for the operation and the publication of photographs.

We would like to acknowledge all the staff members of the plastic surgery department at the Faculty of Medicine at Al-Azhar University, Egypt.

2.3.Surgical procedures:

The surgical procedure was performed under general anesthesia, and corneal protection was performed with Tobramycin ointment.

Traction of the lower eyelid

The lower eyelid was turned outward using fine forceps, and two and sometimes three traction sutures were inserted through the eyelid. Make sure to insert the sutures directly through the eyelid, starting at the palpebral conjunctiva and extending to the skin around 4 to 5 mm below the lid margin to include the tarsal plate in the suture. Figure 1

Figure 1. Intraoperative photograph that shows the eversion of lower eyelid with the traction sutures.

Protection of the globe

To preserve the cornea, we attached the tarsal plate of the upper eyelid to the front edge of the lower conjunctival flap using a 3/0 silk suture. Figure. 2

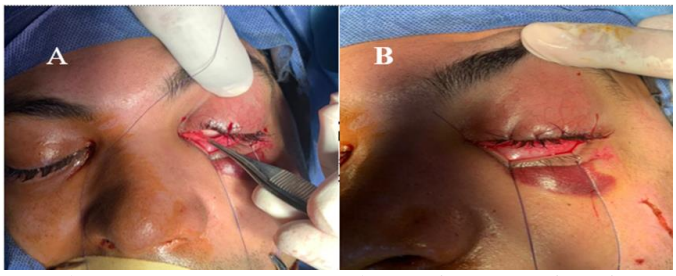

Figure 2. Intraoperative photograph that shows (A) the elevation of the conjunctival flap (B) the conjunctival flap is sutured to upper eyelid margin for the protection of the cornea.

Local vasoconstriction

We injected a local anesthetic solution containing 2% mepivacaine hydrochloride and 1:20000 levonordefrin as a vasoconstrictor (mepacine) into the site of incisions.

Transconjunctival incision

A transconjunctival incision was performed below the lower border of the tarsus using scalpel no. 15. The incision started 3-4 mm away from the lateral canthus on the outer side and 3 mm away from the punctum on the inner side. Figure. 3

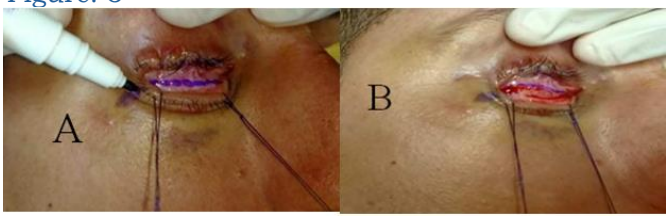

Figure 3. This intraoperative photograph that shows (A) the transconjunctival ink marking (B) the transconjunctival incision.

Lower Lateral Tarsal Incision

Determine the starting site of the lateral paracanthal incision at the gray line, about 3 mm inward from the outer corner of the eye. We draw a line perpendicular to the tangent of the gray line, extending beyond the eyelashes by about 3 mm. The design extends diagonally by roughly 5 to 8 mm in the lower and side directions, resulting in the appearance of a slight skin fold. Sharp scissors can cut through the entire thickness of the lower eyelid, including the tarsal plate. The lower eyelid can easily be moved away from the eyeball without requiring too much force . Figure. 4

Figure 4. This intraoperative photograph that shows the lateral para-canthal incision.

Preseptal dissection

Using a straight surgical dissection scissor, we carried out blunt dissection until we reached the inferior orbital rim . Figure. 5

Figure 5. Intraoperative photograph that shows preseptal dissection with extended dissection till reaching to the inferior orbital rim.

Periosteal incision

Using a broad, flexible retractor to expose the contents of the orbit and lower eyelid. We used a no. 15 scalpel to precisely cut the periosteum, avoiding the crest of the infra-orbital border and concentrating on the anterior portion of the maxilla. Figure. 6

Figure 6. Intraoperative photograph that shows the periosteal incision with using scalpel no. 15.

Subperiosteal orbital dissection

We utilized normal elevators to extract the periosteum from the orbital rim, as well as the front surface of the maxilla, zygoma, and orbital floor. Once the herniated soft tissue was fully reduced, the entire bone defect was exposed. We examine orbital floor defects at 2.5-centimeter intervals to avoid harming the optic canal and inferior orbital fissure contents. We positioned a wide, flexible retractor to shield the eye socket and contain any protruding periorbital fat. Figure. 7

Figure 7. Intraoperative photograph that shows the subperiosteal orbital dissection, with the good bony exposure of the orbital floor fracture.

Reduction and fixation

We initially used a lateral eyebrow incision to secure front zygomatic fractures, either with 0.5 interosseous wire for misplaced fractures or microplates for non-displaced fractures. An infraorbital fracture was repaired with 2.0mm miniplates, and the orbital floor was restored with 0.5mm orbital mesh. Figure.8, 9,10

Figure 8. Intraoperative photograph that shows fixation fronto zygomatic fracture by 0.5 interosseous wire.

Figure 9. Intraoperative photograph that shows fixation the fronto zygomatic fracture by miniplate.

Figure 10. Intraoperative photograph that shows fixation of the infraorbital rim with miniplate and reconstruction of the orbital floor using titanium mesh.

Closure:

We removed the stitch that was attaching the conjunctival flap to the upper tarsal plate. We repositioned the conjunctiva and sutured it with a polyglactin suture on a curved needle, employing inverted sutures. We used a curved needle and a 6-0 polyglactin suture to sew the tarsal plate. We used a simple interrupted suture method to stitch the skin on the side incision with a 6/0 proline suture, Subsequently, the traction sutures were removed from the lower eyelid .Figure.11

Figure 11. Intraoperative photograph that shows the closure of the lateral paracanthal incision.

Postoperative care

We utilized eye patches to protect the functioning eye for a duration of 5-7 days. All patients were directed to apply ice bags to the operative site for 5 minutes every 30 minutes for 8 hours following the procedure. Hot compresses were used at the surgical site for 8 hours per day, beginning on the second day after the operation, until the swelling had subsided.

Patients were scheduled for regular follow-up appointments. The skin sutures were removed seven days later.

Postoperative Assessment

Clinical assessment:

Colored images were taken from the front with the eyes open at intervals of 2 weeks, 1, 2, 3, and 6 months post-operative.

The following data were collected:

The globe's location in its orbit and the lower eyelid's position in relation to the globe when looking straight ahead. The dimensions and angle of the eyelid opening, as well as the cosmetic quality of the scar from the outer corner incision, Complications and Patient Satisfaction: using standard Likert scale which is:

Score I for strongly unsatisfied.
Score 2 for Unsatisfied.
Score 3 for Neither satisfied nor unsatisfied.
Score 4 for Satisfied.
Score 5 for Strongly satisfied.

Radiological Assessment:

An immediate postoperative CT scan was done to check the accuracy of the bony procedure.

Statistical analysis:

Data collection, processing, and summarization using Microsoft Excel.

3. Results

All participants were male with an average age of 35.4 years and a standard deviation of 11.3 years. The average duration from admission to surgery was 12.2± 2.8 days. We found the mean time needed for the incision was 17.8± 3.5 min. We summarize the preoperative data in Table 1.

80% of the patients underwent open reduction and internal fixation for a zygomatic complex fracture, 20% had the same procedure along with simultaneous orbital floor reconstruction, and 20% received titanium mesh reconstruction of the orbital floor.

The incision in all individuals displayed normal accessibility to the operation field and the lower eyelid was in a normal position relative to the globe. Table 2 showed postoperative data.

Table 1. preoperative data:

OPERATIVE DATA	STUDY	SOUND
POSITION OF THE GLOBE INSIDE THE ORBIT (CM), MEAN± SD	1.7± 0.1	1.7± 0.1
HEIGHT OF PALPEBRAL FISSURE (CM), MEDIAN (IQR)	1(1,1)	1(1,1)
WIDTH OF PALPEBRAL FISSURE (MM), MEAN± SD	3.3± 0.2	3.3± 0.2
INCLINATION OF PALPEBRAL FISSURE (CM), MEDIAN (IQR)	0.5(0.5,0.5)	0.5(0.5,0.5)

Table 2. Postoperative data:

AESTHETIC SCAR SCORE	N (%)
INVISIBLE SCAR	20(100%)
BARELY SCAR	0
VISIBLE SCAR	0
THE LEVEL OF PATIENT SATISFACTION	N (%)
UNSATISFIED	0
NEITHER SATISFIED NOR UNSATISFIED	0
SATISFIED	8(40%)
STRONGLY SATISFIED	12(60%)
COMPLICATION	N (%)
NO	16(80%)
SCLERAL SHOW	0
ENOPHTHALMOS	0
TRICHIASIS	4(20%)
ECTROPION	0

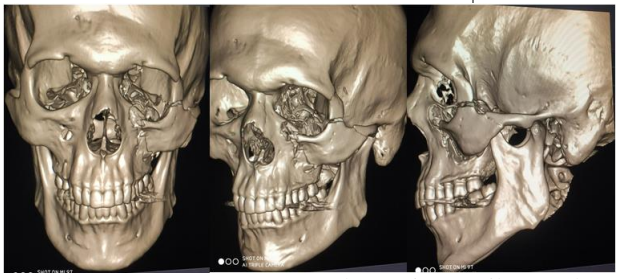

Figure 12. preoperative three-dimensional CT scan photo radiograph of case number 2 illustrates left zygomatic complex fracture with multiple fracture lines.

Figure 13. postoperative three-dimensional photo CT scan radiograph of case number 2 illustrates good reduction and fixation.

Figure 14. photograph A-P, oblique and lateral view of case number 2 one month postoperative. Transconjunctival combined with lateral Para canthal approach group show normal lower lid position.

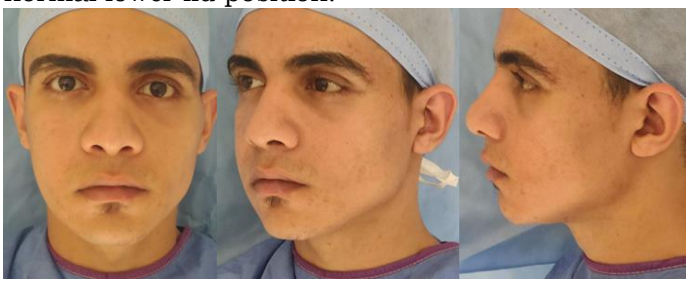

Figure 15. photograph A-P, oblique and lateral view of case number 2 six months postoperative. Transconjunctival combined with lateral Para canthal approach group show normal lower lid position with excellent aesthetic outcome.

4. Discussion

Zygomatic fractures are common in modern life, often resulting from injuries to the craniofacial region, either as blowout fractures or as part of more complex zygomatic fractures. [7]

These patients usually seek treatment for cosmetic reasons. Proper surgical repair of zygomatic fractures requires sufficient surgical exposure of the inferior orbital rim and orbital floor. [8]

Once the wound has healed, transcutaneous methods often result in a visible skin scar. While skin scars may fade with time, many people consider them cosmetically undesirable. [1]

The transconjunctival method offers a hidden scar in the conjunctiva with a low likelihood of apparent complications. However, access to the inferior orbital rim and floor is restricted. Hence, there is a genuine requirement for a new method or adjustment to address this issue. [1]

Authors have suggested employing a modified lateral extension through the lateral peri-canthal incision to improve the treatment of ocular blowout fractures that involve cantholysis. [5]

The study aimed to investigate the outcomes of using the modified transconjunctival technique with lateral paracanthal incisions to treat various orbito-zygomatic fractures.

Before the first observation, all patients underwent an immediate postoperative CT scan to prevent aberrant soft tissue appearance from improper bone procedures. This aligns with Gosau et al.,[9] retrospective investigations of

complications and outcomes in orbital floor fractures.

The study revealed that, on average, the incision and exposure of the inferior orbital rim and floor required 18.4 minutes. When paired with a lateral canthal approach, the transconjunctival incision has a lengthier duration than traditional transcutaneous approaches, but it closely resembles the transconjunctival procedure with lateral canthotomy.

The typical times recorded were 8 minutes for infraorbital, 10 minutes for subtarsal, 14 minutes for single eyelid incision, and 22 minutes for transconjunctival with lateral canthotomy approach. [10]

Kilinc and Sayar[11] stated that a key aspect of attractive eyes is the alignment of the lower eyelid with the globe in both eyes of a person.

Throughout the follow-up period, no permanent changes were observed in the lower eyelid position relative to the globe.

Salgarelli et al.,[12] found that lower eyelid malposition was absent in instances treated with the transconjunctival technique without canthotomy.

Kumar and Shubhalaksmi's[13] investigation on the transconjunctival technique found that it rarely led to lower eyelid malposition.

Salgarelli et al.,[12] stated a 40% occurrence of lower eyelid malposition in instances treated with a transconjunctival technique with lateral canthotomy. Our study found that the modified transconjunctival method with lateral pericentral incision is better than other procedures at keeping the lower eyelid in the correct position relative to the eye.

The study concluded that there is no statistically significant variation in the dimensions of the PF (HPF and WPF) between the affected and healthy eyes. The modified transconjunctival method with lateral para-canthal incision did not affect the size of the PF at one, three, and six months after surgery. This study may demonstrate good cosmetic results as the lateral paracanthal incision was imperceptible.

This agrees with Song et al.,[14], who reported an unnoticed scar in the lateral para canthal incision. The thin structure of the eyelid skin may result in unnoticeable scarring.

In this study, patient satisfaction was surveyed, and we found that 16 patients (80%) were satisfied and (20%) were strongly satisfied.

4. Conclusion

A transconjunctival technique and a lower lateral tarsal incision provide enhanced vision of the inferior orbital rim and orbital floor while minimizing complications and enhancing aesthetic outcomes.

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Authorship

All authors have a substantial contribution to the article

Funding

No Funds : Yes

Conflicts of interest

There are no conflicts of interest.

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