

Outcomes of Transconjunctival Approach and Its Modifications for the Treatment of Orbito-Zygomatic Complex Fractures: A Pilot Study

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Abstract

Background and Objectives: Transconjunctival incision is used to access the floor of orbit and infraorbital rim; however, when continued with lateral canthotomy, it becomes a versatile approach to treat various types of zygomaticomaxillary fractures. The aim of this study was to evaluate the outcomes of transconjunctival approach and its modifications in terms of accessibility, esthetic outcome, and postoperative complications for the treatment of patients of orbito-zygomaticomaxillary complex fractures. **Methods:** In the hospital, a total of five cases of zygomatic complex fractures were operated from October 2019 to December 2019. The transconjunctival approach was assessed on the following criteria: adequacy and ease of exposure, time required for exposure of fracture site, accuracy of reduction of fracture, esthetic outcome, and postoperative complications (e.g., ectropion, entropion, chemosis, infection, and scarring). The patients were kept on follow-up for 6 weeks. **Results:** The average age of the patients was 26 years. The average time required for exposure of fracture site was 25.2 min. Exposure obtained in all the cases was adequate according to the operating surgeon. During postoperative follow-up, all the patients were evaluated for ectropion, entropion, chemosis, and infection. None of the patients reported with any complications, and the postoperative esthetic results were satisfactory (according to the patient). **Conclusion:** The transconjunctival approach is an efficient approach to gain surgical access to infraorbital rim and zygomatic complex fractures. With good exposure and nonvisible scar, transconjunctival approach is superior to other techniques. The numerous advantages of this approach nullify the longer time taken for the procedure.

Keywords: Lateral canthotomy, retroseptal, transconjunctival approach, zygomatic complex fractures

INTRODUCTION

Zygomatic bone fractures are one of the most common fractures of the face, due to the prominent anatomical position of zygoma.^[1,2] Since zygoma forms the floor of orbit and is functionally related to surrounding bones, trauma to zygomatic bone also affects ocular and mandibular functions. Therefore, proper diagnosis and adequate treatment of zygomatic bone injuries are important to regain its form and function.^[3] The increasing trend of treatment of the facial bone fractures by open reduction has made surgeons to come up with versatile

approaches, which provide exposure of fracture sites with a single incision. Recently, there has also been an emphasis on utilization of incisions, which provide better esthetic results.^[4,5]

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In the early 1971, Tenzel and Miller^[6,7] described transconjunctival approach for the management of orbital floor fractures, but Tessier^[6,8] and Converse *et al.*^[6,9] later popularized this technique for the management of congenital malformations and orbital trauma.^[6] The advantage of using transconjunctival incision is that it produces a scar hidden in conjunctiva and according to the literature has a low frequency of postoperative complications, such as ectropion.^[4,10] Another advantage of this approach is that when used in combination with lateral canthotomy, it further provides access to the infraorbital and the lateral orbital rim; in addition, the anterior portion of the zygomatic arch can be visualized through modifications of the transconjunctival incision.^[4,11]

The purpose of this study was to evaluate the outcomes of transconjunctival approach and its modifications for the treatment in patients of orbito-zygomaticomaxillary complex fractures.

SUBJECTS AND METHODS

A prospective study was conducted in the department of oral and maxillofacial surgery to evaluate the outcomes of transconjunctival approach in orbito-zygomaticomaxillary complex fracture.

From October 2019 to December 2019, five cases of orbito-zygomaticomaxillary complex fractures were operated employing the transconjunctival incision. All cases had zygomatic complex fracture with etiology of road traffic accident (RTA), which required surgical intervention for the management of fracture.

A thorough history, clinical examination, and radiographic examination with the help of computed tomography (CT) scan were done for final diagnosis, and those which fulfilled the inclusion criteria were included in the study. The patient was explained about the surgical procedure, and informed consent was taken in their native language in all cases. Consent for academic use of CT films and clinical images was also taken.

Inclusion criteria

1. Patients with orbito-zygomaticomaxillary complex fractures (Class III to VIII - according to Rowe and Killey's Classification) which require surgical reduction of the fracture by transconjunctival approach and its modifications
2. Patients without existing lacerations in the inferior and lateral periorbital regions
3. Patients with associated facial bone fractures.

Exclusion criteria

1. Patients medically contraindicated for surgery
2. Patients with infected fracture of the orbito-zygomaticomaxillary complex region
3. Patients with undisplaced fracture which can be managed conservatively without surgical intervention
4. Patients with comminuted fracture of orbito-

zygomaticomaxillary region

5. Patients with eye injury or history of ophthalmic diseases.

The criteria for the evaluation of transconjunctival approach were intraoperative – adequacy and ease of exposure and time required for exposure of fracture site; postoperative – accuracy of reduction of fracture, esthetic outcome; and postoperative complications (e.g., ectropion, entropion, chemosis, infection, and scarring).

Time required for exposure of fracture site was measured from starting of incision till the exposure of fracture site in minutes, by stopwatch. Adequacy and ease of exposure were evaluated by the operating surgeon (1 – easy, 2 – moderate, and 3 – difficult). Accuracy of reduction of the fracture was assessed postoperatively by clinical and radiographic examination (X-ray PNS view) as either adequate or inadequate. Esthetic outcome was scored by the patient on Likert's scale^[12] (1 – very dissatisfied, 2 – dissatisfied, 3 – neither satisfied nor dissatisfied, 4 – satisfied, 5 – very satisfied).

Postoperative complications (ectropion, entropion, chemosis, infection, and scarring) were evaluated on the 1st, 7th, and 10th day, 3rd week, and 6th week.

Surgical procedure

The surgical procedure was done under general anesthesia with all aseptic conditions. After preparation and draping, local anesthetic solution was injected under the conjunctiva and additional solution infiltrated for lateral canthotomy. The lower eyelid was everted, and retraction was achieved by passing traction sutures in the medial, middle, and lateral aspect of the lower eyelid through the tarsus [Figure 1]. An incision was made through mucous membrane of the conjunctiva and subcutaneous tissue of the lower eyelid, up to the orbicularis oculi muscle. Next, incision through the orbicularis oculi muscle was taken and blunt dissection was performed under the muscle with a curved mosquito forceps, following the infraorbital rim. Then, sectioning of the conjunctiva was performed 5 mm inferior to the lower tarsal plate. Blunt dissection was then performed to reach the infraorbital rim.

When canthotomy was indicated, canthotomy of the superficial limb of the lateral canthal ligament was performed and subperiosteal dissection was carried out to expose the fracture [Figure 2]. A small maxillary vestibular incision was taken to expose the fracture at the zygomatic buttress. Reduction and fixation of fractures in a regular fashion were accomplished [Figure 3]. The superficial portion of the lateral canthal ligament was sutured back, and the conjunctiva was closed with 4-0 vicryl suture material. Next, the skin over the lateral canthus was sutured with 4-0 prolene suture material. Eye was cleaned by copious rinses with saline solution. Ophthalmic antibiotic ointment and eye pad were placed for 72 h postoperatively. Patients were evaluated as per the intraoperative and postoperative protocols Figure 4.



Figure 1: Traction sutures placed for lower lid retraction

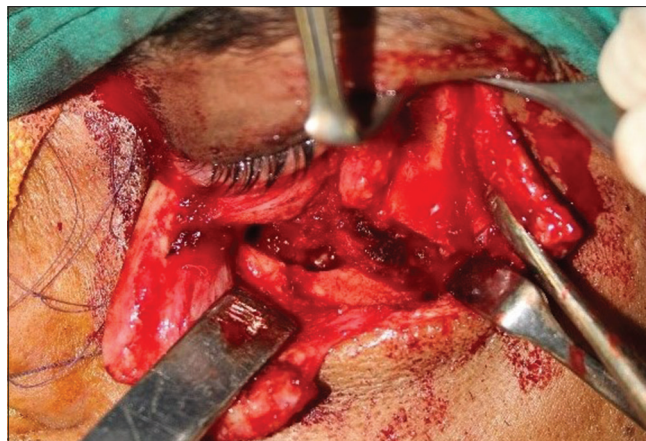


Figure 2: Exposure of fracture site



Figure 3: Fixation of fracture segments



Figure 4: Pre- and post-operative view to show esthetic result of transconjunctival approach

RESULTS

The five cases of zygomaticomaxillary complex fractures were surgically reduced by transconjunctival retroseptal approach with lateral canthotomy. The average time for exposure from the placement of incision till the exposure of the fracture site in this study was 25.2 min. Four patients were males and one female aged 18–29 years. There was not much difference in the side involved.

The average score for adequacy and ease of exposure was 1.5. The transconjunctival approach provided satisfactory access to the orbital floor and infraorbital rim of the zygomatic bone. The accuracy of reduction of fracture was evaluated postoperatively by clinical and radiographic examination, which was found to be adequate in all cases.

Preoperatively, periorbital edema, ecchymosis, and subconjunctival hemorrhage were noticed in all cases, which resolved completely after surgery. Decrease in the palpebral distance was noticed in two patients, which was normal after 1 month of the postoperative period.

Table 1 shows the tabulated data of all the cases according to the criteria mentioned before.

In all the cases, postoperative ocular movements and vision were normal. During postoperative follow-up, all the patients were evaluated for ectropion, entropion, chemosis, scarring, and infection. None of the patients presented with the above-mentioned complications. In all cases, postoperative esthetic results (according to patient's satisfaction on Likert's scale) were good and satisfactory. There was no injury/insult to infraorbital nerve in any of the operated cases.

DISCUSSION

Zygomatic bone is a paired irregular bone of the face which articulates with the frontal, sphenoid, temporal, and maxillary bones. It contributes to strength and stability of the mid-face and also forms the prominence of the cheek. This prominence makes the zygoma most vulnerable to traumatic injuries on the face.^[13-15]

According to Ellis,^[1] there is a male predilection of zygomatic bone fractures, with a ratio of 4:1 (approximately) over females. In a study, Yamsani *et al.*^[16] stated that the common cause of facial trauma is due to RTA, assaults, fall, interpersonal violence, and sports-related injuries.

Table 1: Tabulated data collected of five operated cases (criteria defined in Materials and Methods)

Age of patient (years)	Time required for exposure (min)	Adequacy of exposure	Intraoperative complications	Postoperative complications	Aesthetic result
18/male	15	1	Nil	Nil	5
41/male	22	1	Nil	Nil	5
29/female	24	1	Nil	Nil	4
24/male	20	1	Nil	Nil	5
18/male	45	2	Nil	Nil	5

The clinical features of zygomatic complex fractures are periorbital ecchymosis and edema, diplopia, subconjunctival ecchymosis, flattening of the malar prominence, ecchymosis of maxillary buccal sulcus, extraocular muscle entrapment, enophthalmos, and injury to the infraorbital nerve. Since zygoma shares an intimate relationship with surrounding bones, proper reduction of zygomatic fractures is of supreme importance to achieve its original function.^[6]

Different approaches have been mentioned for open reduction of the orbito-zygomaxillary complex fractures: lateral eyebrow, upper blepharoplasty, coronal, subciliary, subtarsal, infraorbital, transconjunctival, and transoral.^[6,17]

The infraorbital incision is a quick and straightforward approach, which can heal well with thorough wound closure, but the approach can at times be associated with lower eyelid pretarsal edema. The major disadvantage of this incision is that it leaves an unesthetic visible scar on the face. The subciliary incision leaves an imperceptible scar but has reported with significant instance of ectropion.^[18,19] Another limitation of the above-mentioned approaches is inaccessibility to the frontozygomatic region.

According to Wray *et al.*, the transconjunctival technique gives easy and fast access without the need for skin or muscle dissection.^[4,10] The transconjunctival approach when combined with lateral canthotomy provides excellent exposure to the inferior orbital rim, orbital floor, and the lateral orbital wall. Depending upon the path of dissection in relation to orbital septum, there are two routes for transconjunctival approach: retroseptal and preseptal.^[20] In our study, we preferred retroseptal approach over preseptal as it gives rapid and direct access to the infraorbital rim. In the retroseptal approach, incision is given in the conjunctiva to reach the retroseptal space, where fat pads are present. Proper retraction of the fat pads is necessary to avoid it from obscuring the surgical field. In preseptal approach, the incision is directed toward preseptal plane. Novelli *et al.*^[21] evaluated transconjunctival preseptal approach in 56 cases of orbital fracture. In their study, they used preseptal approach because it provided a definite anatomical plane of dissection and prevented the exposure of periorbital fat.^[21] However, Barcic *et al.* preferred retroseptal transconjunctival incision because of the lower risk of injury to the tarsal plate and considerable distance between the incision and the connective tissue of the lower eyelid, which reduces the risk of soft tissue complications. They stated that the retroseptal approach is straightforward, safe, rapid, and simple.^[22,23]

Lateral canthotomy enhances exposure to the frontozygomatic region and is frequently employed along with transconjunctival incision.^[24] According to a study by Wray *et al.*,^[10] the transconjunctival approach was used for access to orbital floor and rim fractures and lateral canthotomy was necessary for improving access in 56% of cases. Another modification of the transconjunctival approach is the “Y” modification, which gives access to the frontozygomatic suture without the need for a second incision. To accomplish this, canthotomy of the lateral canthal ligament has to be performed where the Y opens into a box. The scar produced hides in a natural skin crease in the lateral canthal region, giving a good aesthetic result, especially in older patients.^[25] Other than these modifications, one of the most recent evolutions was the use of monopolar microneedle instead of scalpel for incision. Gander *et al.*^[26] experienced that incisions made with the monopolar microneedle device resulted in better depth control and improved healing and was found to be a good alternative to conventional scalpel.

The age group of 21–30 years showed increased evidence of maxillofacial injuries, followed by the age group of 31–40 years; the demand for better esthetic results is expected by younger patients. Transconjunctival incision in these situations is the ideal approach for access to the fracture site.^[27]

In cases of orbital floor trauma, repair of the orbital floor defect is mandatory if the defect measures at least 50% of the size of the orbital floor bone,^[28,29] and in this type of reconstructions, the transconjunctival approach can be a good option providing better esthetic results.

In the present study, we found that the transconjunctival approach is a technique-sensitive approach which can give excellent results, provided when performed by an experienced surgeon. It was observed that the transconjunctival incision in conjunction with lateral canthotomy provided adequate exposure of the fracture site for reduction and fixation. There were no complications intraoperatively in any of the five cases. The transconjunctival incision was sutured with 6-0 vicryl in continuous suture pattern and the lateral canthotomy incision closed with 4-0 prolene sutures. Special care should be taken while closure of transconjunctival incision so that the eyelid adapts properly to the globe. The canthal reattachment should be done carefully so that the level of ligaments on either side is same. All the cases were followed for 3 months’ postoperatively and evaluated for scleral show, entropion, ectropion, chemosis, diplopia, infection, and conjunctival

scarring. The transconjunctival incision has its benefits; however, in few instances, it can be difficult to perform this incision specially, in cases of persistent chemosis, orbital proptosis, intense lower eyelid oedema, or traumatic lower eyelid avulsion or injury. In these situations, the surgeon should opt for other transcutaneous approaches.^[30]

CONCLUSION

The transconjunctival approach was found to be successful to achieve surgical access to infraorbital rim, orbital floor, and zygomatic complex fractures. The advantages of this approach are good exposure to fracture site, nonvisible scar, rapid technique, lesser incidence of ectropion, and less chances of infraorbital nerve injury as the incision is placed in the conjunctiva. Major drawbacks to this approach according to our study were longer operating time and risk of injury to cornea. The risk of damage to cornea can easily be avoided by the use of corneal shields, and there is always a learning curve for mastering a new technique, which develops gradually with time and practice.

The results of this study are on the basis of limited cases performed; this study will be continued in the hospital to further evaluate the transconjunctival approach and its modifications in orbito-zygomaticomaxillary fractures.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Ellis E 3rd. Fractures of the zygomatic complex and arch. In: Fonseca RJ, Walker RF, editors. *Oral and Maxillofacial Trauma*. Philadelphia, U. S: WB Saunders; 1991. p. 583-94.
2. Dawson RL, Fordyce GL. Complex fractures of the middle third of the face and their early treatment. *Br J Surg* 1953;41:255-68.
3. Middleton DS. Management of injuries of the nose and upper jaw. *Proc R Soc Med* 1953;46:476-9.
4. Kumar S, Shubhalaksmi S. Clinical outcome following use of transconjunctival approach in reducing orbit zygomaticomaxillary complex fractures. *Contemp Clin Dent* 2016;7:163.
5. Hazrati E, Waite P, Carr DD. The transconjunctival approach for treating orbital trauma. *Plast Reconstr Surg* 1992;90:151.
6. Rajkumar K, Mukhopadhyay P, Sinha R, Bandyopadhyay TK. 'Y' modification of the transconjunctival approach for management of zygomatic complex fractures: A prospective analysis. *J Maxillofac Oral Surg* 2016;15:45-51.
7. Tenzel RR, Miller GR. Orbital blow-out fracture repair, conjunctival approach. *Am J Ophthalmol* 1971;71:1141-2.
8. Tessier P. The conjunctival approach to the orbital floor and maxilla in congenital malformation and trauma. *J Maxillofac Surg* 1973;1:3-8.
9. Converse JM, Firmin F, Wood-Smith D, Friedland JA. The conjunctival approach in orbital fractures. *Plast Reconstr Surg* 1973;52:656-7.
10. Wray RC, Holtmann B, Ribaldo JM, Keiter J, Weeks PM. A comparison of conjunctival and subciliary incisions for orbital fractures. *Br J Plast Surg* 1977;30:142-5.
11. Manganello-Souza LC, Rodrigues de Freitas R. Transconjunctival approach to zygomatic and orbital floor fractures. *Int J Oral Maxillofac Surg* 1997;26:31-4.
12. Sullivan GM, Artino AR Jr. Analyzing and interpreting data from likert-type scales. *J Grad Med Educ* 2013;5:541-2.
13. Miloro M, Ghali GE, Larsen P, Waite PD. *Peterson's Principles of Oral and Maxillofacial Surgery*. 3rd ed. USA: People's Medical Publishing House; 2011. p. 465-69.
14. Leech TR, Martin BC, Trabue JC. An analysis of the etiology, treatment and complications of fractures of the malar compound and zygomatic arch. *Am J Surg* 1956;92:920-4.
15. Chang EL, Hatton MP, Bernardino CR, Rubin PA. Simplified repair of zygomatic fractures through a transconjunctival approach. *Ophthalmology* 2005;112:1302-9.
16. Yamsani B, Gaddipati R, Vura N, Ramiseti S, Yamsani R. Zygomaticomaxillary complex fractures: A review of 101 Cases. *J Maxillofac Oral Surg* 2016;15:417-24.
17. Starch-Jensen T, Linnebjerg LB, Jensen JD. Treatment of zygomatic complex fractures with surgical or nonsurgical intervention: A retrospective study. *Open Dent J* 2018;12:377-87.
18. Santosh BS, Giraddi G. Transconjunctival preseptal approach for orbital floor and infraorbital rim fracture. *J Maxillofac Oral Surg* 2011;10:301-5.
19. Wesley RE. Transconjunctival approaches to the lower lid and orbit. *J Oral Maxillofac Surg* 1998;56:66-9.
20. Baumann A, Ewers R. Use of the preseptal transconjunctival approach in orbit reconstruction surgery. *J Oral Maxillofac Surg* 2001;59:287-91.
21. Novelli G, Ferrari L, Sozzi D, Mazzoleni F, Bozzetti A. Transconjunctival approach in orbital traumatology: A review of 56 cases. *J Craniomaxillofac Surg* 2011;39:266-70.
22. Barcic S, Blumer M, Essig H, Schumann P, Wiedemeier DB, Rucker M, *et al.* Comparison of preseptal and retroseptal transconjunctival approaches in patients with isolated fractures of the orbital floor. *J Craniomaxillofac Surg* 2018;46:388-90.
23. Bruneau S, Scolozzi P. Preseptal transconjunctival approach to the orbital floor fractures. Surgical technique. *Rev Stomatol Chir Maxillofac Chir Orale* 2015;116:362-7.
24. Ellis E 2nd, Zide M. Transconjunctival Approaches. In: *Surgical Approaches to Facial Skeleton*, Ellis E III, Zide M, editors. Philadelphia, U. S; Lipincott Williams and Wilkins; 2006. p. 41-64.
25. Martinez AY, Bradrick JP. Y modification of the transconjunctival approach for management of zygomaticomaxillary complex fractures: A technical note. *J Oral Maxillofac Surg* 2012;70:97-101.
26. Gander T, Rostetter C, Blumer M, Wagner M, Schumann P, Wiedemeier DB, *et al.* Use of a monopolar microneedle device in a transconjunctival, retroseptal approach. *J Craniomaxillofac Surg* 2017;45:1934-7.
27. Saluja H, Sachdeva S, Shah S, Dadhich A, Singh M, Mishra S. Ten-year review of facial bone fractures in rural population at a teaching institute in central India (Maharashtra). *J Head Neck Physicians Surg* 2020;8:23.
28. Saluja H, Sachdeva S, Shah S, Dadhich A, Tandon P. Autogenous grafts for orbital floor reconstruction: A review. *Int J Oral Craniofac Sci* 2017;3:046-52.
29. Rudagi BM, Halli R, Mahindra U, Kharkar V, Saluja H. Autogenous mandibular symphysis graft for orbital floor reconstruction: A preliminary study. *J Maxillofac Oral Surg* 2009;8:141-4.
30. Pausch NC, Sirintawat N, Wagner R, Halama D, Dhanuthai K. Lower eyelid complications associated with transconjunctival versus subciliary approaches to orbital floor fractures. *Oral Maxillofac Surg* 2016;20:51-5.