

Transconjunctival Preseptal Approach for Management of Orbital Fractures: A Hidden Tool

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ABSTRACT

Background: Orbital fractures remain one of the most difficult fractures to manage, as it has great functionality and aesthetic implication. It remains one of the most controversial issues in maxillofacial trauma as regards its classification. Diagnosis, surgical approaches and the material used in the treatment of orbital blowout fractures. The transconjunctival preseptal approach is an effective approach for the infraorbital rim, orbital floor and even to ZMC (zygomatico maxillary complex) by adding canthotomy to the conjunctival incision. It is aesthetically superior than other approaches with minimal complications if performed meticulously with sound knowledge of periorbital regional anatomy.

Aim of the Work: Evaluation of the transconjunctival approach in repairing orbital fractures.

Patients and Methods: This study included 13 patients presented to Kasr Al-Ainy Hospital Casualty Department from July 2015 to July 2016 with orbital blowout fractures who were repaired by transconjunctival approach.

Conclusion: Transconjunctival approach is an effective approach in repairing blow out fracture regarding the vulnerability, accessibility and aesthetic effect.

Key Words: Orbital fractures – Orbital blow out – Transconjunctival – Subciliary approaches - Ectropion – Enophthalmus.

INTRODUCTION

Maxillofacial fractures are more prevalent in large cities as it is related to heavy traffic and high incidence of violence [1]. Isolated orbital fractures constitute 4-16% of facial fractures [2]. Orbital fractures occurred by different types of trauma, however blunt trauma is the commonest one that damage both bones and soft tissues [3]. Orbital blow out fractures was first described by Smith and Regan in 1957 [4]. Since this many studies were done to reach the best surgical methods for orbital blowout fractures repair [5]. Management of periorbital trauma is a great challenge confronting the plastic surgeon as the repair must restore both function and aesthetic outcome [5]. The repair

could be done through different approaches as infraorbital, endoscopic, sub ciliary and transconjunctival approach [6]. Despite that subciliary approach is the commonest approach as it seldom leaves a noticeable scar, but it is linked with complications as cicatricial ectropion [7] which evolves the appearance of other approaches as transconjunctival approach.

Bourget in 1924 was the first who described in transconjunctival approach in lower eyelid Blepharoplasty [8].

However the repair of orbital fractures has different goals than transconjunctival Blepharoplasty despite of the direct exposure of the orbital fat in lower eyelid blepharoplasty being as an advantage but it is considered as a disadvantage in orbital fractures [9].

For this cause, the preseptal transconjunctival approach was used in orbital fracture to the contrary of retroseptal approach that was used in Blepharoplasty [10].

Hadeed et al., [11] described that the presence of adequate knowledge about orbital anatomy with precise surgical technique makes transconjunctival approach and lateral canthotomy provides the proper exposure for orbital floor, lower two third of zygomatic orbital complex fractures and elevation of simple depressed zygomatic arch fractures and it can be considered as an excellent alternative to subciliary approach [11].

PATIENTS AND METHODS

This study was conducted on 13 patients presented to Kasr Al-Ainy Hospital Casualty Department with orbital fractures in the period between July 2015 to July 2016 the patients who fulfilled the inclusion criteria were enrolled in the study.

Inclusion criteria:

- Patients with unilateral orbital fractures.
- Patients with intact globe.

Exclusion criteria:

- Bilateral cases.
- Extreme of age.
- Cases associated with major morbidities.
- The presence of external facial wounds that can be applied to repair the fractures through.

The protocol used in this study was as follows:

All patients underwent a proper history taking regarding their age, occupation, associated symptoms as vomiting, bleeding from nose, or ear, disturbed consciousness level, amnesia with special concern to the mode and timing of the trauma to be followed by proper examination. General examination was done as part of a trauma survey (ATLS) and detailed local examination was done to detect facial edema ecchymosis, subconjunctival hemorrhage limitation of ocular motility, enophthalmos or exophthalmos, increased in intercanthal distance and soft tissue injuries. Palpation was done gently to be done simultaneously bilaterally starting from the supraorbital ridges, lateral orbital rim, medial orbital rim, the bridge of the nose, lateral nasal wall, paranasal regions, zygomatic bone and then the arch contour for any deformities, abnormal mobility of any segments and tenderness.

All patients were photographed pre and post-operative. Full laboratory studies were done for all patients before any surgical intervention in addition to CT face axial and coronal cuts both pre and post-operative, antiseptic mouth wash was used in cases associated with mandibular fracture.

Surgical technique:

A single dose of prophylactic antibiotic 3rd generation cephalosporons was administered 15 minutes before conjunctival incision.

The operation was done on the 5th to 7th day to give a chance for the oedema to subside.

At the operating room the patient lay in a supine position with the neck slightly extended, armed tube was employed and was nasally applied in cases associated with mandibular fracture. The corneal eye shield was used with topical eye ointment to protect the cornea during the operation. Three traction sutures were taken in the lower eyelid and on the conjunctiva below the preseptal incision by Polypropylene Suture 5/0. One in the center, one medially lateral to the lacrimal drainage punctum and the last one laterally.

An incision was placed in the conjunctiva 3-4mm below and parallel to the tarsal plate using Colorado needle at cutting mode 7 degree, after infiltration of 1:100 000 epinephrine solution using insulin syringe. Photo Opening the conjunctiva medially toward the punctum along the inferior margin of the tarsal plate, then the resulting conjunctival flap is stretched superiorly after which the lower eyelid can be distracted away from the globe without excessive tension by lid retractor and the globe was retracted by spatula. The inferior orbital rim and floor are accessed by dissecting through the sub muscular plane after identifying the septum.

The infra orbital rim was reached by blunt dissection, opening of the periosteum by scalpel 15 then complete dissection of the periosteal flap by sharp dissector till complete exposure was done to the fracture site and orbital floor.

In cases of blow out fracture freeing of the muscle entrapment and closing the bony defect by either by titanium mesh or conchal cartilage.

One layer was closed to cover the inserted ware then the conjunctiva is either closed by continues prolene 6 zero sutures which can be stripped away latter or left it to heal spontaneously without sutures.

In cases of zygomaticomaxillary complex fractures where more exposure was required lateral canthotomy was done. It was done using the tip of pointed scissors that was placed inside the palpebral fissure, extending laterally to the depth of the underlying lateral orbital rim (approximately 7-10mm). The scissor was used to cut structures horizontally through the lateral palpebral fissure. The structures cut in the horizontal plane were skin, orbicularis oculi muscle, orbital septum, lateral canthal tendon, and conjunctiva.

Postoperative:

All patients were hospitalized for 48 hours, antibiotics were given for 7 days' (3rd generation cephalosporons) in addition to anti-inflammatory, antioedematous drugs and topical eye drops were used for 7 days.

Patients were discharged and scheduled for fixed postoperative visits every week in the first month then monthly for 3 months.

The results were evaluated regarding:

- Aesthetic outcome.
- Patient satisfaction.
- Presence of complication.
- The feasibility, efficacy and degree of exposure.



Fig. (1): Shows stay sutures and infiltration with adrenaline.

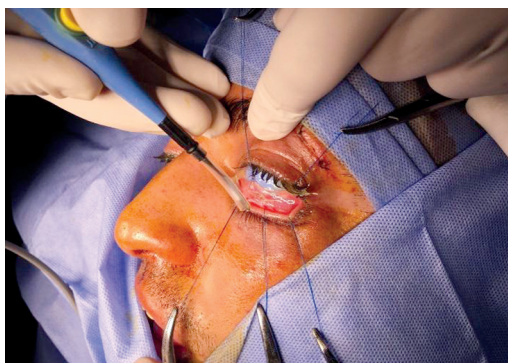


Fig. (2): Shows incision opened by Colorado needle.

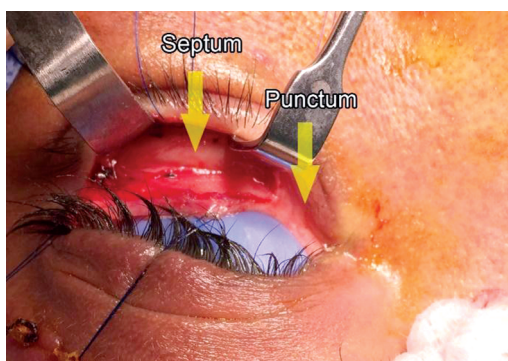


Fig. (3): Shows septum and punctum.



Fig. (4): Shows the mesh used in blow out fracture.



Fig. (5): Shows the canthotomy added to transconjunctival preseptal approach.

RESULTS

Out of 13 patients involved in this study 4 were females and 9 were males. Ages ranged from 16 to 41 years old.

Out of 13 cases 12 cases were done through transconjunctival preseptal approach and in one case lateral canthotomy was added.

Table (1): Demographic distribution of the patients.

Case serial	transconjunctival	Age	Sex
1		32	Female
2		16	Male
3		18	Female
4		36	Male
5		41	Male
6		18	Male
7		25	Male
8		19	Female
9		27	Male
10		21	Female
11		34	Male
12		28	Male
13		40	Male

Operative results:

Some difficulties were found during the repair of orbital fracture through transconjunctival approach. Reaching the orbital floor or the orbital rim after reduction of the bone and its fixation by micro plate, closure of the periosteum over the mesh or plate is a difficult procedure which is facilitated a lot by doing lateral canthotomy. There is also Difficulty for the assistant to vitalize the field during TPA only, making fixation take much time despite that the exposure takes less time. The time of the surgical procedure was varied according to the type of fracture as fixation of orbital floor with ZMC fracture takes much time than orbital

floor alone, as the time of exposure of the orbital floor or rim takes from 15 to 20 minutes.

There is a risk of corneal injury during dissection, but application of corneal shield makes it nil.

Clinical results:

Regarding the clinical improvement as preoperative diplopia, which was found in 3 patients 2 cases were totally improved while one of them still has mild diplopia to far vision and enophthalmos which was found in 3 patients, 3 cases showed improvement but one of them still has mild enophthalmos detected by measurement not clinically. One case developed entropion that required surgical correction that was done by the ophthalmologist, Infection was reported in one case with abscess formation in the 4th week postoperative and was drained through trans buccal incision with salvage of the mesh.

There are 4 cases presented with facial wounds at the time of their arrival, 3 with an upper eyelid wound which complain from ptosis improved after repair of the upper eyelid muscle, and one of them with upper eyelid margin injury.



Fig. (6): Shows a case complicated by abscess formation.

Table (2): Complications in the technique.

Serial	Fracture type	Pre-operative complain	Post-operative complications		
			Transient treatment	Permanent	Requiring
1	ZMC	Diplopia	Edema	Entropion and diplopia	Entropion
2	Blow out fracture	None	Edema	None	None
3	ZMC	None	Edema	None	None
4		Diplopia	Diplopia	None	None
5	ZMC	Diplopia	None	None	None
6	ZMC	None	Edema	None	None
7	ZMC	None	Diplopia for far vision	None	None
8	ZMC	Enophthalmos	Edema	None	None
9	ZMC	None	None	None	None
10	Blow out fracture	Enophthalmos	None	Enophthalmus	None
11	ZMC	None	None	None	None
12	Removal of orbital mesh	None	None	None	None
13	ZMC	None	Edema	Infection with abscess collection	Drainage and lavage

Case (1)



Cases series



Fig. (7): Shows pre and post-operative for a case complicated by entropion.

Case (2)



Fig. (8): Shows pre and post-operative.

Case (3)

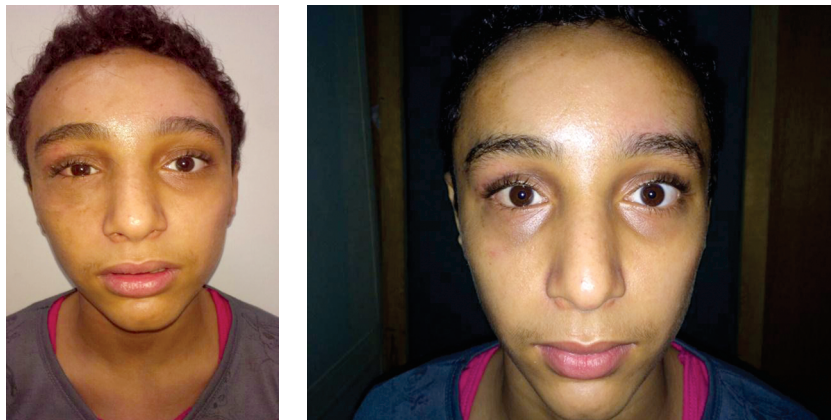


Fig. (9): Shows pre and post-operative.

Case (4)



Fig. (10): Shows pre and post-operative.

DISCUSSION

Management of periorbital fracture is a great challenge that faces the reconstructive surgeon as the repair requires restoration of both function and aesthetic appearance.

Smith and Regan were the first described the orbital blow out fractures in 1957 and since this

many studies were done to study the optimal surgical methods for repairing the orbital fractures [4]. Many approaches were used to fix orbital fracture as subciliary, subtaral infraorbital endoscopic and transconjunctival approaches [12]. Subtaral approach despite being the easiest and the least technically demanding but it leaves visible scars [12].

However, a comprehensive review was done to study different approaches used in orbital fracture repair and it did not find a high level of evidence to prefer one approach over the other, but it showed lower incidence of complication with transconjunctival approach and the highest rate in subciliary approach [7].

Another retrospective study described by Appling et al., 1993 [13] comparing transconjunctival with subciliary approaches and it showed 12% rate of ectropion and 28% scleral show in subciliary approach with no ectropion in transconjunctival approach and 3% scleral show using the same approach.

In 2001 Arnulf Baumann and Rolf Ewers [14] reported no complications in any patients repaired using preseptal transconjunctival approach, but it did with subciliary approach in the form of tarsal plate laceration with over all complication rate 2%.

This study matched other studies finding as it showed 0% rate (no case) of transient ectropion, 6.6% rate (1 case) of permanent ectropion which require surgical repair, no laceration of the tarsal plate (0% rate), no permanent ectropion, and one case of infection of the surgical site.

A comparative study was done by Wray et al., 1977 [15]. The study included 90 patients. It showed 4 patients out of 45 in the subciliary approach group required subsequent surgery to correct ectropion in contrary, only one case showed ectropion due to tarsal lacerations in other group this made the authors to perform lateral canthotomy in 25 patients.

Tessier [16] was first to advocate a transconjunctival approach in the treatment of congenital disease and using lateral canthotomy to reach frontozygomatic suture.

In this study lateral canthotomy was done in one case to facilitate the fracture fixation.

Plastic corneal shield was used in this study to protect the globe. No cases had Intraoperative complications such as corneal abrasion, tearing (button holing) of eyelid or damage to the lacrimal system. This was correlated to earlier studies done by many authors [17].

Holtman et al., [18] compared different approaches used in orbital fractures and rated them for the speed of access, complications and scar appearance. The study declared that subtarsal and infraorbital as the fastest with skin to fracture

exposure 5-8min while subciliary takes 15min and transconjunctival 21min.

In this study, the mean average time required for exposure was 21min. This approach takes longer time to perform than other approaches. Exposure was considered adequate for fixation in all cases, which can be correlated to the above study. However, surgical technique is comparatively difficult to all operators at least initially.

Ilanovan et al. [19] mentioned that simultaneously visualization of both infraorbital rim and lateral orbital rim is one of the advantage of this technique that makes it different from others technique. In this study exposure obtained in all cases was adequate for visualization and management of infraorbital rim and orbital floor. In one case transconjunctival preseptal approach was supplemented with the lateral canthotomy to get adequate exposure of the frontozygomatic suture.

Conclusion:

The transconjunctival preseptal approach is an effective surgical access to infraorbital rim and orbital floor and even to the medial orbital wall. This approach is surgically similar in providing exposure and access, also aesthetically superior to other approaches and has minimal complications. Potential advantages of this approach negate the longer time taken for this approach. There are no disadvantages to transconjunctival preseptal approach, if performed meticulously with sound knowledge of anatomy of periorbital tissues.

REFERENCES

- 1- Kamulegeya A., Lakor F. and Kabenge K.: Oral maxillo-facial fractures seen at a ugandan tertiary hospital: A six-month prospective study, *Clinics.*, 64 (9): 843-8, 2009.
- 2- Nakamura T. and Gross C.: Facial fractures: Analysis of five years of experience, *Arch. Otolaryngol.*, 97: 288-290, 1973.
- 3- Joseph J.M. and Glavas I.P.: Orbital fractures, *Clinical Ophthalmology* Joseph and Glavas a review, 5: 95-100, 2011.
- 4- Smith B. and Regan W.F.: Blow-out fracture of the orbit: Mechanism and correction of internal orbital fracture, *Am. J. Ophthalmol.*, 44 (6): 733-739, 1957.
- 5- Chen Chien-Tzung, Chen Ruei-Feng and Wei Fu Chan: *Craniofacial Trauma and Reconstruction, Plastic and Reconstructive Surgery*, pp 275-296, 2010.
- 6- Eppley B.L., Custer P.L. and Sadove A.M.: Cutaneous approaches to the orbital skeleton and periorbital structures. *J. Oral Maxillofac. Surg.*, 48: 842-854, 1990.
- 7- Han D.H. and Chi M.: Comparison of the outcomes of blowout fracture repair according to the orbital implant. *J. Craniofac. Surg.*, 22: 1422-1425, 2011.

- 8- Lorenz H.P., Longaker M.T. and Kawamoto H.K.: Primary and secondary orbit surgery: The transconjunctival approach. *Plast. Reconstr. Surg.*, 103: 1124-1128, 1999.
- 9- Zarem H.A. and Resnick J.I.: Expanded applications for transconjunctival lower lid blepharoplasty. *Plast. Reconstr. Surg.*, 88: 215-220, 1991
- 10- Baumann A. and Ewers R.: Use of the preseptal transconjunctival approach in orbit reconstruction surgery. *J. Oral Maxillofac. Surg.*, 59: 287-291, 2001.
- 11- Hadeed H., Ziccardi V.B., Sotereanos G.C. and Patterson G.T.: Lateral canthotomy transconjunctival approach to the orbit. *Oral Surg. Oral Med. Oral Pathol.*, 73: 526-530, 1992.
- 12- Jin H.R., Yeon J.Y., Shin S.O., Choi Y.S. and Lee D.W.: Endoscopic vs external repair of orbital blowout fractures. *Otolaryngol. Head Neck Surg.*, 136 (1): 38-44, 2007.
- 13- Appling W.D., Patrinely J.R. and Salzer T.A.: Arch Otolaryngol. *Head Neck Surg. Sep.*, 119 (9): 1000-7, 1993.
- 14- Baumann A. and Ewers R.: Use of the preseptal transconjunctival approach in orbit reconstruction surgery. *J. Oral Maxillofac. Surg.*, 59: 287-291, 2001.
- 15- Wray R.C., Holtmann B., Ribaud J.M. and Keiter J.: Weeks PM Br. *J. Plast. Surg. Apr.*, 30 (2): 142-5, 1977.
- 16- Tessier P., Rougier J. and Herrouat F. (1981): Plastic surgery of the orbit and eyelids: Report of the French Society of Ophthalmology. Wolfe S.A., translator. New York: Masson Publishing; Original Work Published, 1977.
- 17- Waite P.D. and Carr D.D.: The transconjunctival approach for treating orbital trauma. *J. Oral Maxillofac. Surg.*, 49: 499-503, 1991.
- 18- Holtmann B., Wray R.C. and Little A.G.: A randomized comparison of four incisions for orbital fractures. *Plast. Reconstr. Surg.*, 67: 731-735, 1981.
- 19- Ilankovan V. (1991): Transconjunctival approach to the infraorbital region: A cadaveric and clinical study. *Br. J. Oral Maxillofac. Surg.*, 29: 169-173, 1991.