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Original Article

A Clinical Study on Severity of Ocular Injuries in Orbital Trauma – At a Tertiary Trauma Centre

T R Anuradha[1], R Beena[1], Tinu Stefi[2], Heber Anandan[3]

[1]Associate Professor, Department of Ophthalmology, Kanyakumari Medical College Hospital, Nagercoil, Tamil Nadu, India, [2]Senior Resident, Department of Ophthalmology, Kanyakumari Medical College Hospital, Nagercoil, Tamil Nadu, India, [3]Senior Clinical Scientist, Department of Clinical Research, Dr. Agarwal's Healthcare Limited, Chennai, Tamil Nadu, India

Abstract

Background: Orbital fractures are common in facial trauma, with the orbital floor and medial wall commonly affected. The goal of this study is to summarize the evaluation of commonly encountered orbital fractures and their consequent damage to ocular structures.

Materials and Methods: This is an observational hospital-based study for 1 year done in a tertiary trauma referral center. All patients with facial injuries with suspicion of orbital fractures were included in the study. A complete ocular examination was done along with radiological investigation. Orbital fractures classified according to their location and ocular injuries evaluated and recorded.

Results: The study enrolled 82 patients. Orbital trauma was most commonly recorded in males in their 3rd and 4th decades. The most common etiology was road traffic accidents. Severe vision-threatening complications were traumatic optic neuropathy (28%), globe perforation (8%), and retinal detachment (3%). Larger the orbital fracture, the lesser the intraocular injuries and vice versa.

Conclusion: This study was conducted to analyze the severity of ocular injuries due to orbital trauma. It is clear from this study that there is a high probability of associated ocular injuries in patients with orbital fractures. From this study, we conclude that the smaller the orbital fracture, the greater the ocular injuries. The general population can be educated regarding the importance of obeying traffic rules and following safety guidelines.

Key words: Globe perforation, Ocular injury, Orbital fracture, Traumatic optic neuropathy

INTRODUCTION

Trauma to the orbit can cause fractures of the orbital walls and damage to ocular structures. Orbital fractures are a common traumatic condition, more commonly occurring in young men and it has a wide range of clinical outcomes.[1] Complications may vary from mild bruising and temporary diplopia to traumatic optic neuropathy (TON), globe rupture, etc.[1] Hence, our important concern is to diagnose vision-threatening ocular injuries and timely intervention. Most fractures involving orbital walls require only close observation, whereas some require emergency orbital surgery.[1] Majority of facial fracture cases are managed by a trauma team composed of neurosurgeons, ear, nose, and throat surgeon, plastic surgeon, etc. This study emphasizes the importance of an ophthalmologist in the team. The association between facial trauma and ocular damage seems logical unassailable.[2] Recent studies of facial anatomy suggest that the primary function of hard anterior orbital rims and thin orbital walls is to protect the eye from blunt trauma.[3] This may be why the rare incidence of direct injury to the globe than that of orbital fractures.[4]

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Routine ophthalmic examination is not feasible in all trauma cases. Severe ocular injuries are easily detected by an emergency physician or facial trauma surgeon, whereas other subtle injuries are often missed.[5] Therefore, the emergency physician's major responsibility is to identify patients requiring specialist ophthalmological assessment. The available evidence of indications for an ophthalmological

Corresponding Author: R Beena, Department of Ophthalmology, Kanyakumari Medical College Hospital, Nagercoil, Tamil Nadu, India.

referral is extensive but also contradictory.[6] The incidence of ocular injuries of any severity in patients with orbital fracture has been reported to range from 2.7% to 90%.[7,8] Various protocols for specialist ophthalmology screening have recommended referral of all orbital fractures or using formal risk scores, or relying on the assessing physician's clinical judgment.[8-10]

Ophthalmic examination for severe ocular injuries may be delayed due to head injury, intoxication, intubation, patient unconsciousness, etc.[11] In view of life-saving procedures, given more importance to such patients with a head injury and facial fractures, the need for ophthalmic examination and management is often neglected.[12] The goal of this study is to summarize the evaluation of commonly encountered orbital fractures and their consequent damage to ocular structures.

Aim and Objectives

The study aims to assess the severity of ocular injuries in relation to orbital trauma in a tertiary trauma referral center.

1. To assess the severity of ocular injuries in relation to orbital fractures
2. To study the spectrum of ocular injuries in orbital fractures.

MATERIALS AND METHODS

This study is an observational hospital-based case series for a period of 1 year conducted in a tertiary trauma care center. All patients presenting in the emergency department with facial injuries of any etiology with suspicion of orbital fractures were included in the study.

Inclusion Criteria

Patients with facial injuries of any etiology with suspicion of orbital fractures were included in the study.

Exclusion Criteria

Patients with a history of defective vision, patients with a history of trauma or surgery in the eye were excluded from the study.

All patients underwent detailed ocular examination involving best corrected visual acuity, color vision using Ishihara's chart, slit lamp examination for anterior segment, pupillary light reflexes, fundus examination, field charting, etc. B scan ultrasonography was done for those with opaque media obscuring the posterior segment visualization. Computed tomography scan and magnetic resonance imaging of the orbit were done depending on the severity of the injury.

RESULTS

A total of 82 patients with facial injuries were enrolled in the study, of which 66 were male and 16 were female [Figure 1].

The mean age of the patients was found to be 29.1 ± 13.9 years (range 17–89 years). Most frequent involved age group was 3rd and 4th decades.

Two wall fractures, category 2 with floor involvement (21), were more commonly observed in the study. Road traffic accident (RTA) was the most common cause of injury observed in the study [Table 1 and Figure 2].

Analyzing the intraocular injuries in orbital trauma patients, it was observed that eight out of 82 had TON (28%), and one patient had retinal detachment (3%). Analyzing the severity of ocular injuries related to the severity of orbital fractures, 23 patients in small fracture group (categories 0, 1, and 2) had ocular injuries compared to only five of the large fracture (categories 3 and 4) group [Figures 3 and 4].

In this study, severe vision-threatening complications observed were TON (28%), globe perforation (8%), and retinal detachment (3%). Hematoma or periocular

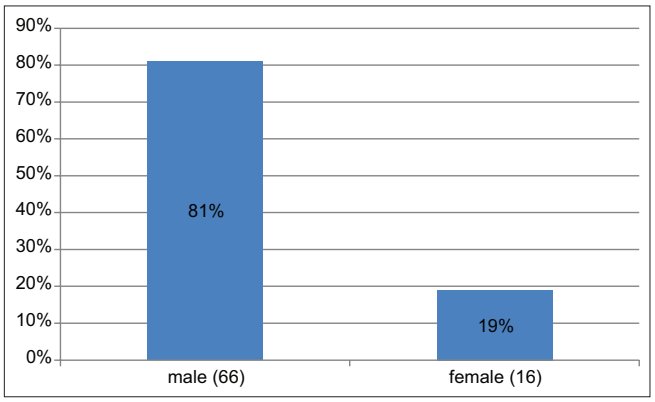

Figure 1: Distribution of gender

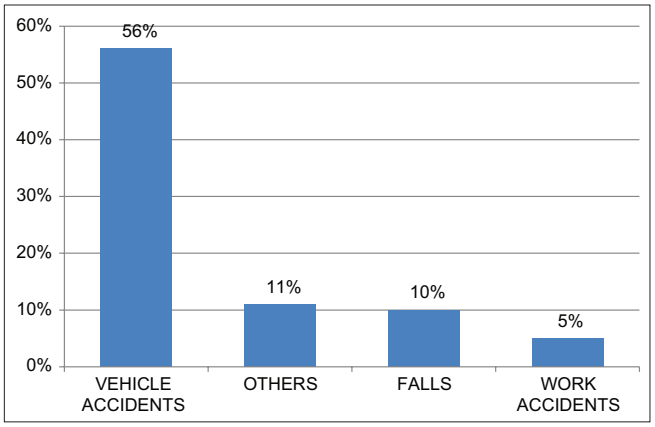

Figure 2: Distribution of etiology

Table 1: Distribution of Fractures

Category	*n* (%)	Most common wall involved	Most common mode of injury
Category 0	3 (3)	-	Assault (2)
Category 1	20 (24)	Floor (9)	RTA (7)
Category 2	36 (46)	Floor (21)	RTA (27)
Category 3	17 (20)	Lateral (10)	RTA (9)
Category 4	6 (7)	–	RTA (6)

RTA: Road traffic accidents

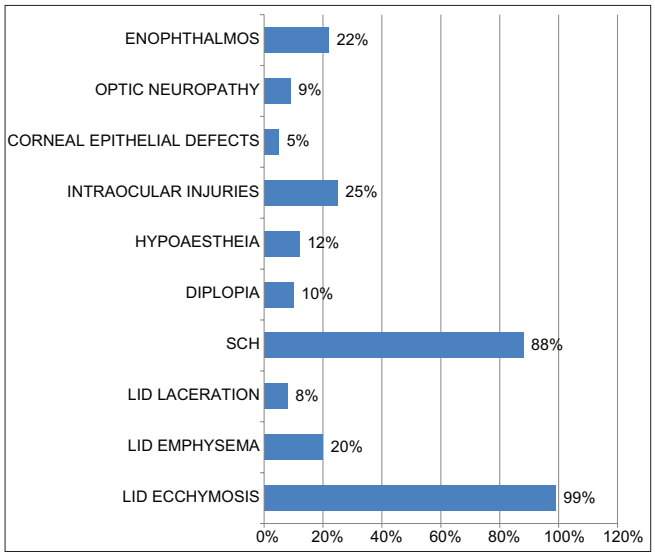

Figure 3: Spectrum of occular injuries

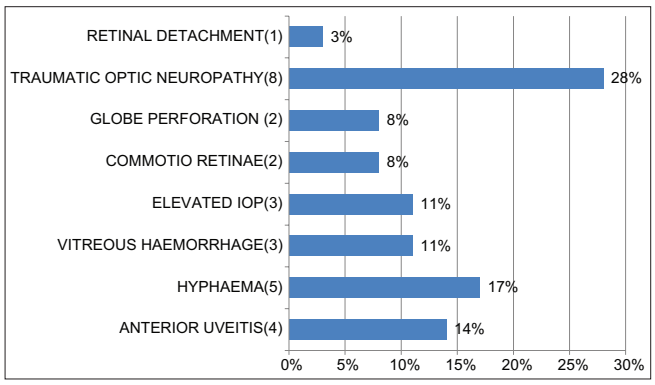

Figure 4: Prevalence of intraocular injuries

ecchymosis and edema is the most common manifestation of blunt injury to the eyelid. Retinal detachment occurred due to combined floor, roof, and lateral wall fractures Globe perforation was observed in 2 cases one in category 0 and the other in category 1, revealing that ocular injury is more severe in small fractures.

DISCUSSION

Orbital trauma associated with intraocular and periocular pathologies causes significant visual loss and debility. A hematoma or periocular ecchymosis and edema is the most common manifestation of blunt injury to the eyelid. It is easier to examine the globe before lids become edematous. Orbital roof fracture is suspected if periorbital ecchymosis is associated with subconjunctival hemorrhage without a visible posterior limit.[13] Basal skull fracture may give rise to characteristic bilateral ring hematomas (panda eyes). The effects of blunt trauma include stretching of limbal tissues, equatorial scleral expansion, posterior displacement of the lens iris diaphragm, consequent tearing of tissues in anterior chamber angle, and intraocular bleeding.

It results in lid laceration, corneal abrasion, tears in Descemet membrane, hyphema, transient miosis, traumatic mydriasis, vossius ring on the anterior lens capsule, iridodialysis, hypotony due to occult open injury (or) ciliary body shutdown (or) glaucoma associated with angle recession, cataract formation (rosette-shaped), subluxation, dislocation of the lens due to rupture of zonular fibers, globe rupture, vitreous hemorrage, commotion retinae, choroidal rupture, retinal breaks, retinal dialysis, retinal detachment secondary to giant tear, macular hole. TON, optic nerve avulsion, etc.[13]

The proposed mechanisms for blowout fractures in orbit are hydraulic theory, which states that any blunt trauma to orbit with an object larger than the aperture of orbit causes raised intraorbital pressure, which is transmitted to the globe, causing retropulsion of globe, it is then transmitted to orbital walls and decompressing fracture occurs in the weakest part of orbital floor, medial to the infraorbital canal which gives way leading to herniation of orbital soft tissues into the maxillary sinus. Buckling theory states that direct trauma to the rigid inferior orbital rim transmits force posteriorly, creating a compression fracture of the orbital floor.[14] TON occurs with sudden vision loss. It can be direct, due to damage from displaced bone fragments, a projectile or indirect in which forces transmitted secondarily to the nerve by shearing force (acceleration of nerve at the optic canal where it is tethered to dural sheath through rupture of microvascular supply).[14] Penetrating injuries are 3 times more common in males than females.[13] They typically occur in the younger age group (15–34 years). The most frequent causes are assault, RTA, and sports. The appropriate use of protective eyewear can prevent serious eye trauma.

In this study, the most common etiology for orbital trauma is RTA. The most common orbital wall fractured is the floor of the orbit, comparable with He *et al.* report. However, some studies reported that medial wall fractures are more common than floor fracture. This study revealed that most common intraocular pathologies are optic neuropathies, anterior uveitis and hyphema following orbital trauma.[15] Intraocular injuries

were found to be more prevalent in small sized fractures than in large sized fractures. Kreidl *et al.* reported that intraocular injuries were more frequent in patients with severe orbital trauma without orbital fractures (58.9%).[16]

Interestingly, in our study, we found less ocular injuries accompanying larger orbital fractures, attributed to the protective role of orbital fractures. It shows the importance of buckling mechanism in large fracture. This is comparable with Stephanie *et al.* study.[15]

CONCLUSION

This study concludes that the risk of ocular injury in orbital trauma is stratified by the degree of orbital wall involvement. Various intraocular injuries occur due to orbital fractures.

Major ocular injuries are uncommon in severe fractures. It is mandatory to perform a detailed ophthalmic examination in all patients with a head injury and facial injury, suspicious orbital fractures for timely management of vision-threatening ocular injuries. This study emphasizes the important role of ophthalmologist in the trauma team.

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