ORIGINAL ARTICLE

Ophthalmic Injuries in Orbito-Zygomatic Fractures

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ABSTRACT

Objective: To assess the frequency and severity of ophthalmic injuries in patients with orbito-zygomatic fractures.
Study Design: A case series.
Place and Duration of Study: Oral and Maxillofacial Department, KEMU/Mayo Hospital Lahore, from January 2009 to December 2011.
Methodology: Patients with orbito-zygomatic fractures were divided into three groups. Group-1 patients had fracture of floor/medial wall of the orbit (orbital-blow out fracture). Group-2 had comminuted orbito-zygomatic fractures. Group-3 had simple zygomatic bone fractures. Frequency and types of ocular injuries were determined on each group.
Results: There were 296 (260 male, 36 female) patients with mean age of 31.7 years. Group-1 (n = 20) had 28 ocular findings in 12 (60%) patients including diplopia (n = 10, 36%), enophthalmos (n = 6, 14%), and hyphema, vitreous hemorrhage, retinal hemorrhage, choroidal rupture, traumatic mydriasis, and *commotio retinae* in 2 cases, 7% each. In Group-2 (n = 106), 44 ocular findings were identified in 30 (28%) patients including diplopia (n = 10, 23%), enophthalmos (n = 4, 9%), *commotio retinae* (n = 10, 23%), reduced visual acuity (n = 6, 14%), retinal hemorrhage (n = 4, 9%) and corneal laceration, corneal abrasion, retinal detachment, traumatic mydriasis, and canthal laceration in 2 cases, 4.5%. In Group-3 (n = 170), 22 ocular findings were seen in 16 (9%) patients included diplopia (n = 10, 45%), enophthalmos (n = 4, 18%), and retinal tear, hyphema, angle recession, and traumatic mydriasis in 2 cases, (9%) each.
Conclusion: Ophthalmic injuries are a common complication of orbitozygomatic fractures occurring in about 20% of patients in this study, most frequent in the orbital blow fractures subgroup. Ophthalmology consultation is recommended for patients presenting with midface fractures.

Key Words: *Ophthalmic injuries. Orbito-zygomatic fracture. Orbital blow out fracture.*

INTRODUCTION

Ocular injuries commonly occur in patients with facial fractures.[1] Injuries to the eyes occurs in majority of the patients who sustained midface trauma severe enough to cause a fracture and approximately 15% have decreased visual acuity.[2] Zygomatic fractures are the most common facial fractures second only to nasal fractures and these fractures are also the most commonly occuring fractures of the orbit.[2] These injuries often destroy the integrity of the orbital skeleton and are frequently complicated by injury to the eye, ranging between 2.7% and 90.6%.[3,4] Isolated orbital blowout fractures have associated eye injuries upto one third of the patients.[5] Blindness is an uncommon, yet documented complication of facial trauma, with a reported incidence of fractures around 3%.[2,4] The factors protecting the globe include the prominence of the orbital bones themselves, as well as natural reflexes such as blinking and head aversion.[6,7] Cushioning of the contents of the orbit in the form of orbital fat and the extraocular muscles also protect the ocular structures from injury secondary to blunt external forces.[8,9]

Other than blindness ocular complications like diplopia, enophthalmos, hyphema, vitreous hemorrhage, retinal hemorrhage, choroidal rupture, traumatic mydriasis, *commotio retinae* may also occur in patients with mid face fractures, so the optimum ophthalmic evaluation of the patients who sustained mid face and especially those with orbito-zygomatic fractures is mandatory.[10] In Orbito-zygomatic complex fractures three pattern of injuries are *commonly identified*: orbital blowout fractures, comminuted fractures and simple zygomatic complex fracture.[6]

The frequency of ophthalmic complications in patients with orbito-zygomatic complex have never been assessed in local literature.

The aim of this study was to assess the spectrum and frequency of ophthalmic involvement in patients presenting with orbito-zygomatic complex fracture.

METHODOLOGY

It is an observational study conducted in the Department of Oral and Maxillofacial Surgery, Mayo Hospital/King Edward Medical University, Lahore, Pakistan. The data of patients presenting with orbito-zygomatic fractures from January 2009 to December 2011 were collected. Patients with isolated zygomatic arch fractures or concomitant mid facial fractures were excluded from

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Figure 1: Enophthalmos in patient with fracture of the orbito-zygomatic complex(comminuted).

Figure 2: Loss of vision with canthal laceration in patient with fracture of orbito-zygomatic complex.

Figure 3: *Commotio retinae* and enophthalmos in patient with fracture of orbito-zygomatic complex.

the study. All patients with facial fractures suspected to have ophthalmic injuries were sent for ophthalmic consultation opinion and their injuries were documented in their records. The patient charts were reviewed for the following information: age, gender, method of injury, date of injury, date of presentation to the hospital, side of fracture (right, left, bilateral). On the basis of clinical examination and pre-treatment, radiograph/CT scan result, patients were categorized into three groups; Group-1 with orbital blowout fracture (floor/medial wall), Group-2 with comminuted orbito-zygomatic fractures and Group-3 having simple zygomatic complex fractures.

Injuries included diplopia, enophthalmos, hyphema, vitreous hemorrhage, retinal hemorrhage, traumatic mydriasis, retinal detachment, corneal abrasion, choroidal rupture, decrease visual acuity, retinal tear, angle recession, canthal laceration, corneal laceration and *commotio retinae*. The data collected was analyzed in Microsoft Excel Software 2010. Frequencies and percentages were calculated for categorical variables.

RESULTS

The study population included 296 (260 male, 36 female) patients. The mean age was 31.7 (10-65) years. Fracture etiology was as follows: road traffic accident (n = 202, 68%), accidental falls (n = 50, 17%), fire arm injuries (n = 32, 11%) and occupational injuries (n = 12, 4%).

The ocular findings in the subgroups were as follows: Group-1 (orbital blowout had 20 cases, (7%), out of whom 28 ocular findings in 12 (60%) patients: diplopia (n = 10, 36%), enophthalmos (n = 6, 14%), and hyphema, vitreous hemorrhage, retinal hemorrhage, choroidal rupture, traumatic mydriasis and *commotio retinae* in 2 cases, (7%) each.

Group-2 (comminuted orbito-zygomatic fractures) comprised 106 patients, (36%). Forty four ocular findings were identified in 30 (28%) patients. These included diplopia (n = 10, 23%), enophthalmos (n = 4, 9%), *commotio retinae* (n = 10, 23%), reduced visual acuity (n = 6, 14%), retinal hemorrhage (n = 4, 9%), and corneal laceration, corneal abrasion, retinal detachment, traumatic mydriasis and canthal laceration in 2 cases, (4.5%) each.

Table I: Comparison of the ophthalmic complications of the three groups.

Ocular findings	Group-I (n = 20)	Group-II (n = 106)	Group-III (n = 170)
Diplopia	10 (36%)	10 (23%)	10 (45%)
Enophthalmos	6 (21%)	4 (9%)	4 (18%)
Hyphema	2 (7%)	-	2 (9%)
V. hemorrhage	2 (7%)	-	-
R. hemorrhage	2 (7%)	4 (9%)	-
Choroidal rupture	2 (7%)	-	-
Traumatic mydriasis	2 (7%)	2 (4.5%)	2 (9%)
Commotio retinae	2 (7%)	10 (23%)	-
Reduced visual acuity	-	6 (14%)	-
Corneal abrasion	-	2 (4.5%)	-
Retinal detachment	-	2 (4.5%)	-
Corneal laceration	-	2 (4.5%)	-
Retinal tear	-	-	2 (9%)
Angle recession	-	-	2 (9%)
Canthal laceration	-	2 4.5%	-
	28 ocular findings in 12 patients (60%)	44 ocular findings in 30 patients(28%)	22 ocular findings in 16 patients(9%)

Group-3 (simple zygomatic complex fractures) had 170 cases, (57%). Out of them, 22 ocular findings in 16 (9%) patients including diplopia (n = 10, 45%), enophthalmos (n = 4, 18%), and retinal tear, hyphema, angle recession and traumatic mydriasis in 2 cases, (9%) each.

Overall, ophthalmic complications in orbito-zygomatic fractures occurred in 58 (20%) patients. These injuries were more frequently seen in patients with orbital blow-out fractures (n = 12, 60%), versus comminuted orbito-zygomatic fractures (n = 30, 28%) or simple zygomatic complex fractures (n = 16, 9%).

DISCUSSION

The association between facial fractures and ocular complication due to the mid face fractures has been investigated by many authors.[9,11,12] A high incidence of ocular injury has been noted in these studies.[6,8,12] In

Annexure I: Ophthalmic injuries in patients presenting with orbito-zygomatic fractures.

Name:
Age:
Gender:
Address:
Contact no:
Date of injury:
Date of presentation:
Cause of trauma: RTA:------- Fall:-------- FAI:-------- Violence:-------- Sports:--------
Fracture site:
Mid face:
Maxillary #: Lefort I:------- Lefort II:--------- Lefort III :--------
Zygomatic complex #:
Orbital blowout #:----------
Simple zygomatic complex #:----------
Comminuted #:----------
NOE #:
Markowitz class I:---- II:-------III:---------
Nasal bone #:----------
Ophthalmic complications in mid face #
Diplopia:------- enophthalmos:---------- hyphema:----------
vitreous heamorrhage:---------- Retinal hemorrhage:----------
choroidal rupture:--------- traumatic mydriasis:-------- *Commotio retinae*:--------
reduced visual acuity:--------- corneal laceration:--------- corneal abrasion:--------
retinal detachment:---------- canthal laceration:---------- retinal tear:----------
angle recession:---------

literature, most of the studies which mentioned high incidence of ocular injuries included minor injuries of periorbital region such as eyelid laceration, periorbital ecchymosis and more common complications like subconjunctival edema/hemorrhage and diplopia. In this study, diplopia was considered but other ocular injuries were tabulated as well. The present study showed that blowout fractures were associated with traumatic optic neuropathy in 3% of cases. Traumatic optic neuropathy may be due to many causes, including fracture of the optic canal or direct nerve injury. It is often difficult to positively identify the cause, even if it is associated with other ocular findings.

Results of this study showed that 60% of blowout fractures were associated with ocular complications that can usually be related to a force directly applied to the eye ball. This incidence is similar to the previously reported other studies that examined blowout fractures.[5,13-15] *Commotio retinae,* traumatic mydriasis and iritis usually recover without any permanent deficit.[9,15] Globe rupture, choroidal rupture, retinal detachment and lens dislocation were more severe injuries.

All ocular complications except traumatic optic neuropathy are thought to be associated with direct injury to globe during trauma so negating the concept that the magnitude of forces in the hydraulic and globe-to-wall theories would also be damaging to the ocular globe.[2,5,14,16,17] If the hydraulic or globe-to-wall theory is correct, one would expect a strong association between traumatic hyphema and orbital blowout fracture. Results of this investigation show that this concurrence was not common. Only 2 blowout fractures were associated with traumatic hyphema. Similarly, small percentages were reported by Jayamanne and Gillie (6.7%) and by Brown *et al*. (5.6%) in their series of blowout fractures.[18,19]

Commotio retinae which is the contusion injury of retina is most commonly seen in the posterior pole, but it can occur anywhere in the retina. One would also expect a direct relationship between blowout fracture and *commotio retinae,* but only 2 patients in group-I and 10 patients in group-II were presented with this complication. Brown *et al*. found a slightly higher incidence of *commotio retinae* (14.8%) in their sample of 54 blowout fractures,[19] but Jayamanne and Gillie had an even smaller incidence in their sample of 45 blowout fractures (6.7%).[18]

Choroidal rupture causes considerable distortion of the globe. Stretching of posterior segment tissues around their fixed attachment to the optic nerve head ruptures the choroids and may disrupt the overlying retina. These ruptures are usually concentric with the optic disc and may be multiple. Small ruptures can be present without major hemorrhage. In more extensive ruptures, bleeding from the torn capillaries occurs, resulting in a hematoma underneath the retina (subretinal hemorrhage).[6] Here, only 2 patients were found in the sample who had visible choroidal rupture.

Relatively high percentage of ocular injuries of blowout fractures were found in current study and previously done,[5,11,12,14,15,20] that indicated the possibility of blowout fractures as a result of direct force applied to the globe. Unfortunately, studies are not available that have determined how much force it takes to produce hyphema, *commotio retinae*, choroidal rupture, traumatic mydriasis or iritis, lens dislocation, and so forth. Some experimental evidence is available on the amount of energy necessary to rupture the globe, but it is difficult to relate these forces to the pressure necessary to cause blowout fractures.[21,22] It is likely, however, that a force sufficient to cause a blowout fracture by a hydraulic or globe-to-wall mechanism would be sufficient to cause significant intraocular injury. Green *et al*. found that rupture of the globe occurred in 23% of blowout fractures created by a force delivered to the globe of monkeys.[22] This should not be surprising when one considers that the force was delivered directly to the globe. However, because globe rupture was seen in only 2 of these patients (0.83%), and ocular injuries were present in only 20% of these cases and most of these injuries were minor, one might suspect that another mechanism of blowout fracture occurs more commonly.

CONCLUSION

Ophthalmic injuries are a relatively common complication of orbito-zygomatic fractures occurring in 58 (20%) of patients in this study. These injuries are more

frequently seen in patients with orbital blowout fractures 12 (60%), versus comminuted orbito-zygomatic fractures 30 (28%) or simple zygomatic complex frac-tures 16 (9%). Ophthalmology consultation is recom-mended for all patients presenting with orbitozygomatic fractures, and is essential for all patients with orbital blowout fractures, based on the high incidence of ophthalmic injuries in this sub-group of the patients.

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