Extended Abstract

Medical Implants & Surgery

2018
Vol. 3, Iss. 2

Euro Surgery 2020: Pattern and Significance of Ocular Injuries Associated with Orbito- Zygomatic Fractures

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Introduction: The face, orbit, and eyes have a relatively prominent position in the human body making this area more susceptible to trauma. A variety of ophthalmic injuries associated with mid-facial fractures has been reported in the literature [1]. Motor-vehicle accidents, as sault, falling down injuries, occupational, and sport accidents are generally considered as common etiologies of maxillofacial fractures [2].

Zygomatic fractures are the most common facial fractures second only to nasal fractures and these fractures are also the most commonly occurring fractures of the orbit [3]. There is a recognized association between orbitozygomatic fractures and ocular injuries. The reported incidence of ocular injuries in patients with orbital fractures varies widely, ranging from 2.7% to 90% [1,4]. Al-Qurainy et al. developed criteria for appropriate referral to an ophthalmologist. The authors proposed the acronym "BAD ACT," to represent Blowout, Acuity, Diplopia, Amnesia, and Comminuted Trauma, as a method for easy recall. However, the system is not commonly used in clinical practice [5]. The severity of an injury is related to the site of the fracture and direction of the incoming force. The outcome may range from mild injury such as sub-conjunctival hemorrhage (SCH) to severe damage like globe rupture or permanent visual loss [1,4].

Early diagnosis of potentially serious ophthalmic injuries is paramount not only in minimizing long-term complications of midfacial fractures but also from a medico-legal standpoint. The management of the ophthalmic injuries must be considered as the first priority. Repairing the fractures before treatment of ophthalmic injuries may further compromise visual outcomes, leading to visual loss [5].

Patients and Methods: This is a retrospective study of patients presenting with orbitozygomatic bone fractures admitted to Maxillofacial Surgery Department at King Fahad Hospital in Almadinah Almunawara, Saudi Arabia from 2012 to 2017. Patients with isolated zygomatic arch fractures or concomitant midfacial fractures were excluded from the study.

Fractures were diagnosed clinically. The extent of the bony injury was confirmed with computerized tomographic scans (CT). Patient demographics, date of injury, date of presentation to the hospital, fracture etiology, brain injuries status and clinical ocular signs were recorded.

All patients were examined by the ophthalmologist preoperatively, and if needed were also followed up postoperatively. On the basis of clinical examination and pre-treatment, radiograph/CT scan result, the study population was divided into 3 subgroups based on the extent of the bony injury.

Results: The study population included 156 patients (142 male and 14 female). There was a peak in incidence for adult compared to female accounting for 91% of the fractures as shown in Table 1.

Road traffic accident was the most commonly documented mechanism of injury, accounting for 79.5% (n=124) of the fractures, followed by fall down injuries (18%, n=11.5), explosion (0.6%, n=1), assault (4.5%, n=7), and gunshot (0.6%, n=1). This is summarized in Table 2.

Variables	Frequency	Percentage (%)

Note: This work is partly presented at 15th International Conference on Surgery and Anesthesia on August 10-11, 2020 held at London, UK

Road traffic accident	129	82.7
Explosion	1	0.6
Assault	7	4.5
Fall down	18	11.5
Gun shot	1	0.6
Total	156	100

Table 2: Details about road traffic accidents.

Group-1 ("simple" fractures) accounted for 67.3% (n=105) of the patients, Group-2 ("comminuted" fractures) accounted for 23.7% (n=37), and Group-3 ("orbital blowout") for 9% (n=14). All orbitozygomatic fractures were unilateral.

There were 2 ocular findings in Group-1 (1.9%). Complete visual loss occurred in one patient. The other patient had mild diplopia. There were 15 ocular findings (n=37, 40.5%) in Group-2.

Resolution occurred in 10 patients. Three patients had permanent visual loss. One has mild exophthalmos and one patient presented with oculomotor nerve neuropathy. There were 7 ocular findings (n=14, 46.6%) in Group-3.

Resolution occurred in 6 patients. One had persistent non disabling diplopia at the extremes of visual field. The data is represented in both Table 3 and 4.

Variables	Sample size (n)	Percentage (%)
Zygomatico-maxillary complex fracture	37	23.7
Isolated orbital floor fracture	14	9
Simple non comunuted zygomatico-maxillary fracture	105	67.3
Total	156	100

Table 3: Subgroups of zygomatic fractures frequency.

Category of ocular injury	Type of zygomatic fracture			Total
	Zygomatico-maxillary complex fracture	Isolated orbital floor fracture	Simple noncomunuted zygomatico-maxillary fracture	
Blindness	3	0	1	4
Free	22	8	103	133
Occulomotor injury	5	0	0	5
Rupture globe	1	0	0	1
Enophthalmos	5	0	0	5
Diplopia	0	6	1	7
Exfliated globe	1	0	0	1
Total	37	14	105	156

Table 4: Frequency of ocular injury associated with zygomatic fracture.

Discussion

Analysis of the data from this retrospective study allows examination of demographic patterns, etiology of injuries, and highlights the ocular morbidity associated with orbitozygomatic trauma. There were no patients in the study population presenting with bilateral orbitozygomatic fractures.

Pan facial and midfacial/nasoethmoid fractures were excluded in order to examine ocular morbidity specifically related to orbitozygomatic fractures. Similar to other studies addressing maxillofacial trauma, there was a peak in incidence for orbitozygomatic fractures in adult males compared to children as shown in Table 1 [7]. Road traffic accident was the most commonly documented mechanism of injury in this study, accounting for 82.7% of patients, followed by fall down (11.5%), and assault (4.5%). This corresponds with other urban trauma studies [8].

The etiology of injury varies geographically: in Western countries with large urban populations, alcohol related assault remains the primary etiologic factor in maxillofacial trauma. However, motor vehicle accidents predominate in many developing countries, in the absence of seat belt legislation and where alcohol-related assault is uncommon [9].

The reported incidence of ocular injuries in patients

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with orbital fractures varies widely, ranging from 2.7%1 to 90% [2]. The incidence in this study was 14.7%, which is consistent with many other studies. Lower levels reported where ophthalmologic input is absent or only sporadic may indicate that some ocular findings were undetected [3]. On the other hand, variation in reported incidence between studies may represent differences in inclusion criteria.

For example, the 90.6% incidence reported by Al-Qurainy et al. includes subconjunctival hemorrhage as ocular pathology. This is not counted as a significant ocular finding in many other studies, including this study. Furthermore, Al-Qurainy's study includes all midfacial/ nasoethmoid fractures that were excluded in this study [3].

BAD ACT, scoring system proposed by Al-Qurainy et al. to predict ocular injury risk and therefore allow appropriate referral, is not widely used in clinical practice [6,7]. An estimation of the ocular injury risk associated with specific orbitozygomatic fractures may be useful for assessment of risk. Based on data from this study, "simple fractures" have 2% risk of concomitant ocular finding or injury. However this complication arises from severe brain injuries associated with simple orbito-zygomatic bone fracture.

Comminuted fractures have 40.5% risk (over one third); and blowout fractures a 42.8% risk (over one thirds of patients). We postulate that the varying incidence of ocular finding or injury in the fracture groups ("simple" "comminuted'', "blow out'') is related to the mechanism of injury. The higher velocity of impact required to generate a comminuted orbitozygomatic fracture leads to an increased number of ocular findings and injuries in this group when compared with the "simple" fracture group.

The mechanism of injury in orbital blowout fractures has been a source of discussion, but may explain the increased incidence of ocular findings and injuries in the "Blow Out" group. There are 2 main theories, as follows:

Table 5: Illustration of the level of significance of Group-1, 2 and 3.

We propose that orbitozygomatic fractures be divided into "simple"/ "noncomminuted" fractures, "comminuted" fractures, and "blowout" fractures, based on clinical and conventional radiographic findings. CT scan should be used to confirm the extent of bony injury, allowing estimation of ocular injury risk.

Ophthalmology consultation is recommended for Group-2 and 3 presenting with orbitozygomatic fractures. Where constraints in available ophthalmology resources exist, preferential referral for comminuted and blowout fractures is recommended based on the high incidence of ocular findings and injuries in these patient subgroups.

Statistical analysis: This study revealed statistically significant made by Group-2 and 3 as predictor for ocular injury as summarized in Table 5.

Analysis of predictors (head injuries and gender) as a contribution factors to ocular injuries are summarized in Tables 6 and 7 using linear regression test. The independent variable as a set accounts for 7% of variance in ocular injuries. The overall regression model was significant. F (1.5.11)=6.4, P value less than 0.05, R square is 0.077. This is illustrated in Table 7.

Table 6: Model Summary.

The role of Pharmacological treatment for orbito-zygomatic bone fracture

Ice packs and head elevation are recommended for the Patient with orbital floor fracture for 48 hours to reduce the swelling [10,11]. Moreover, Patient should be informed not to blow the nose to prevent the emphysema for 4 to 6 weeks after the injury.

Patient with limited ocular movements may benefit from short term use of steroids (0.75-1 mg/kg per day of prednisone) if not contraindicated. Steroids treatment helps for peri orbital and extra ocular

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muscle edema to subside quickly and helps to decide whether this limited ocular movement is transient or if surgery is needed. Nasal decongestant and antibiotics are advised for one week.

Conclusion: Ocular injuries are a relatively common complication of orbitozygomatic fractures occurring in 23 of patients (14.7%) in this study. These injuries are more frequently seen in patients with comminuted orbito-zygomatic fractures 15 (44%) followed by orbital blowout fractures 6 (42.9%). Although simple zygomatic complex fractures has low incidence (n=2, 1.9%), it associated with major ocular complication if brain injuries present. Ophthalmology consultation and ocular examination of at least three components; visual acuity, ocular movement, and pupil reaction to light are strongly recommended for Group-2 and 3 presenting with orbito-zygomatic fractures.

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