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Study Of Clinical Presentation Of Open Globe Injuries Of Eye.

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ABSTRACT

Ocular trauma is one of the major causes of ocular morbidity. Open globe injury (OGI) is an Ophthalmologic emergency that requires early recognition and perfect surgical repair. This study aims to highlight clinical presentation in cases of open-globe eye injuries at a tertiary hospital. A prospective observational study was done on 30 patients with open globe injuries hospitalized in the Department of Ophthalmology at a tertiary hospital in Pune between February 2022 and January 2023. In the present study, we found a majority (30%) of the cases in the age group of 31-40 years followed by 1-10 years (20%). Most of the cases were male (76.66%). The highest number of patients presented with corneal tear (60%) followed by corneoscleral tear (13.33%). The majority of the patients (66.67%) had an injury in Zone 1. Open globe injuries are more common in working-age males. Corneal tear is the most common type of open globe injury. Health education and awareness regarding the mechanism of open globe injuries of eye can prevent the burden of these cases, as majority of the cases are accidental and occur at workplaces. Open-globe injuries are a preventable cause of blindness and warrant good health practices like the use of personal protective equipment (e.g. goggles).

Keywords: Corneal tear, Trauma, Open Globe Injury (OGI)

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INTRODUCTION

Ocular trauma is one of the major causes of ocular morbidity [1]. It is one of the leading indications for enucleation [2, 3]. Ocular trauma has a wide spectrum according to the nature and the location of the injury. Birmingham Eye Trauma Terminology (BETT) system divided ocular trauma into closed wounds and open eye injury; which is defined as full-thickness damage of the cornea, sclera, or both [4]. Open globe injury (OGI) is an Ophthalmologic emergency that requires early recognition and perfect surgical repair. The zone of injury was defined according to the Ocular Trauma Classification Group: zone 1 (the whole cornea, including corneoscleral limbus), zone 2 (corneoscleral limbus to a point 5 mm posterior into the sclera), and zone 3 (posterior to the anterior 5 mm of the sclera). The global incidence rate of ocular trauma was estimated to be 3.5 per 100 000 persons per year. The World Health Organization (WHO) program for the prevention of blindness estimated that annually there were 55 million people suffering from an eye injury requiring limitation in daily activities for more than 24 hours. Ocular trauma leads to unilateral visual loss in approximately 19 million people, whereas bilateral blindness has occurred in 1.6 million cases globally [1, 4].

Knyazer et al [5] reported that 78% of OGI was caused by sharp objects in males, while blunt trauma with a frequency of 63.2% was most common among females. Body parts, sports equipment, and work tools were reported as the most common etiologic factors for OGI-related visual impairment, and metal objects were found as the most frequent cause of OGI in several studies [5, 6]. While advances in ophthalmic surgery techniques, instrumentations, and postoperative visual rehabilitation programs provide decreased blindness risk. OGI still constitutes one of the major causes of visual morbidity and burdens a significant socioeconomic impact on society [7]. Etiology for ocular trauma varies in different parts of the world, even within the same country differing across various regions depending on occupations, traffic, environmental factors, and other factors. So we planned to study the demographics and clinical features in cases of open globe eye injuries in a tertiary hospital in Maharashtra.

MATERIAL AND METHODS

The study was conducted in the Department of Ophthalmology at a tertiary hospital in Pune, Maharashtra. It was a prospective observational study. All patients hospitalized with ocular open globe injury (penetrating/perforating) irrespective of age or sex were included in the study. Patients already having a visual impairment or blindness, previous history of ocular surgery or any major ocular disease, and patients with a history of blunt trauma were excluded from the study.

The sample size was calculated by using the following formula

$$\text{Sample size (N)} = Z \times Z \times P \times (100-P) / d \times d$$

Where, Z= statistic for a level of confidence (here Z=1.96 at 95% confidence interval) P= expected prevalence (Here prevalence of open globe injuries is taken as 2%[8])

d=precision taken as 5

Therefore, sample size would be $N= [(1.96)\ (1.96) \times 2 \times 98] / (5 \times 5) = 30$

After obtaining approval from the Institutional Ethical Committee, the study was conducted in accordance with the protocol, Declaration of Helsinki, ICH, Good Clinical Practice (GCP) guidelines, and the ICMR guidelines for Biomedical Research on Human Subjects.

All the eligible patients were explained in detail the study procedure to the fullest extent possible in the language best understood by them. Subsequently, a written informed consent was taken from each patient prior to enrolment into the study and the participants were free to withdraw without prejudice at any time.

Methodology

This was a prospective observational study done in 30 cases of open globe injury at a tertiary hospital. All the patients hospitalized with ocular open globe injury (penetrating/perforating)

irrespective of age or sex and fulfilling the inclusion criteria were enrolled in the study. This study was done between February 2021 and February 2022. The demographics and clinical findings were recorded in the case report form (CRF).

Apart from general and systemic examinations patients were evaluated for detailed Ophthalmic examination which included examination of visual acuity using Snellen charts and E charts, Slit lamp examination, fundoscopic examination (both Direct and Indirect ophthalmoscopy (IDO)/(70D)/(90D)) for further management. Along with laboratory investigation patients also underwent X-ray orbit or facial skeleton (AP and lateral view), CT scan of Brain + orbit (plain or contrast), B scan ultrasonography, and MRI brain + orbit, if required.

Statistical Analysis

From the CRF, data was entered in MS Excel and appropriate software and a test was applied to find the statistically significant difference. P value <0.05 is considered as statistically significant. For the comparison of qualitative data, Chi-square or Fishers exact test was used and for the comparison of quantitative data Student paired 't' test was used.

RESULTS

Table 1: Distribution of Patients according to Age

Sr. No	Age in years	Number of patients	Percentage
1.	1-10	6	20.0
2.	11-20	2	6.67
3.	21-30	5	16.7
4.	31-40	9	30.0
5.	41-50	5	16.7
6.	51-60	2	6.67
7.	>60	1	3.33
8.	Age (Mean ±SD)	31.26±16.97 years	
9.	**Distribution of patients according to gender**		
10.	Male	23	76.66
11.	Female	07	23.33

Table 2: Distribution of patients according to laterality, zone of injury, cause of injury, place of injury and development of traumatic cataract

Patients' distribution according to laterality			
Sr. No	Laterality	Number	Percentage
1.	Right	12	40
2.	Left	18	60
Patients' distribution depending upon the zone of injury			
	Zone of Injury	Number	Percentage
3.	Zone I	20	66.67
4.	Zone II	1	3.33
5.	Zone III	9	30
Patients' distribution depending upon the cause of injury			
	Cause of injury	Number	Percentage
6.	Accidental	22	73.33
7.	Assault	08	26.67
Patients' distribution depending upon the Place of injury			
	Place of injury	Number	Percentage
8.	Home	12	40
9.	Workplace	16	53.33
10.	Road traffic accidents	02	6.67
Patients' distribution depending upon the development of traumatic cataract			
	Development of traumatic cataract	Number	Percentage
11.	Yes	20	66.67
12.	No	4	13.33
13.	Can't be assessed	6	20

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In our study, we found that the majority (30%) of the cases were in the age group of 31-40 years followed by 1-10 years (20%). 16.7% of patients were in the age group of 21-30 and 41-50 years respectively. 31-40 years age group is working class and they have a high risk of open globe eye injury. Most of the cases were male (76.66%). Males usually do high-risk work as compared to females they have higher chances to get the eye injury. In our study we found left eye (60%) was affected more than the right eye (40The majority of the patients (66.67%) had injury in Zone I followed by Zone III (30%). Traumatic cataract developed after eye injury in the majority of the cases (66.67%). Most of the patients (73.33%) had accidental eye injuries and 26.67% of patients were assault cases. 53.33% of patients had eye injuries at their workplace and 40% got injured at home.

Table 3: Objects causing the injury

Sr. No	Objects causing injury	Number	Percentage
1.	Aluminium burr	01	3.33
2.	Axe	02	6.67
3.	Bangle	01	3.33
4.	Firecracker	01	3.33
5.	Iron nail	05	16.6
6.	Iron rod	01	3.33
7.	Iron wire	01	3.33
8.	Plastic object	01	3.33
9.	Road traffic accidents	02	6.67
10.	Scissors	01	3.33
11.	Stairs	01	3.33
12.	Stone	04	13.3
13.	Sugarcane	01	3.33
14.	Tube light	01	3.33
15.	Unknown object	01	3.33
16.	Vegetative matter	01	3.33
17.	Wooden stick	05	16.6

Iron nail and wooden stick were the most common objects causing open eye injury, each one was responsible for 16.67% of patients. Stones are another common cause of open eye injury (13.33%).

Table 4: Patients distribution depending upon type of injury

Sr. No	Type of injury	Number	Percentage
1.	Corneal tear	18	60
2.	Corneal tear with IOFB	2	6.67
3.	Corneoscleral tear	4	13.3
4.	Limbal to limbal corneal tear	1	3.33
5.	Scleral tear	3	10
6.	Globe rupture	1	3.33
7.	Auto eviscerated eye	1	3.33

The highest number of patients presented with corneal tear (60%) followed by corneoscleral tear (13.33%). In almost all cases, corneal involvement was seen. In 10% of cases, only scleral tear was present. In 6.67% of patients, IOFB was present along with corneal tear.

Table 5: Distribution of patients according to presenting complains

Sr. No	Chief complain	Number of patients	Percentage
1.	Pain and redness of the eye	1	3.33
2.	Pain, redness of the eye and diminution of vision	22	73.33
3.	Pain, redness of the eye and loss of vision	7	23.33

Majority of the patients presented with pain in the eye, redness, and diminution of vision (73.33).23.33% of patients came with loss of vision along with pain in the eye and redness.

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Table 6: Distribution of patients according to associated injuries

Sr. No	Associated injuries	Number of patients	Percentage
1.	No injuries	23	76.66
2.	Burn on the face	1	3.33
3.	Multiple facial fractures	6	20

The majority of the patients had no associated injuries at the time of presentation (76.66%). Multiple facial fractures were present in 20% of patients.

Table 7: Distribution of patients according to extraocular movement after injury

Sr. No	Extraocular movement after injury	Number of patients	Percentage
1.	Normal	25	83.33
2.	Restricted	5	16.66

After the injury, 16.66% patients had restricted extraocular movement and 83.33% patients had normal extraocular movement.

Table 8: Anterior chamber findings in patients

Sr. No	Anterior chamber findings	Number of patients	Percentage
1.	Conjunctival congestion	28	93.33
2.	Circumcorneal congestion	18	60
3.	Subconjunctival haemorrhage	16	53.33
4.	Chemosis	9	30
5.	Hyphema	21	70
6.	Traumatic cataract	21	70
7.	Descemet's membrane fold on cornea	5	16.66
8.	Uveal tissue prolapse	13	43.33
9.	Uveal tissue prolapse with globe rupture	1	3.33
10.	Iris pigmentation on lens	1	3.33
11.	Subluxated lens	1	3.33
12.	Shallow anterior chamber	7	23.33
13.	Collapse anterior chamber	7	23.33
14.	Vitreous in wound	3	10
15.	Sphincter tear	1	3.33

DISCUSSION

Open globe injury (OGI) is a serious ocular condition that occurs when there is full thickness wound of the eyewall. It is a medical emergency that requires immediate attention, as it can cause significant vision loss or even blindness. OGI can occur due to various causes, including penetrating injuries from sharp objects, blunt trauma, or explosive injuries.

In our study, we found a majority of the cases in the working age group of 31-40 years. The mean age of the patients was 31.26±16.97 years. Open globe injury was seen in 16.7% of patients in each age group of 21-30 and 41-50 years. 31-40 years age group is working class and they have a high risk of open globe eye injury. Males were more commonly affected than females by OGI. Males usually do high-risk work as compared to females. Hence, they have a higher chance to get an eye injury. In our study, we found left eye was affected more than the right eye [8].

In a study by Singh et al [9], a total of 220 cases of trauma were evaluated with the mean age being 8.74 ± 3.93 years, males were predominantly affected and open globe injuries outnumbered blunt injuries. Penetrating injuries accounted for 67.79% of cases of open globe injury.

Zhang X et al [10] included a total of 507 eyes from 478 patients. In their study more than 80% of patients were male. The most frequent type of injuries was work-related. The findings of our study are in accordance with these studies.

More than 50 % of the patients presented with a corneal tear. Corneal tear is the most common presenting feature in our study. In almost all cases corneal involvement was seen. In 10% of cases, only scleral tear was present. In 2 patients, IOFB was present along with corneal tear. 20 patients had injuries in Zone I followed by 9 patients in Zone III. Traumatic cataract developed in 66.67% of cases. Accidental eye injuries occurred in 22 patients and 8 patients were assault cases. 16 patients had eye injuries at their workplace and 12 patients got injured at their home. Iron nail and wooden stick were the most common objects causing open globe eye injury, each one was responsible in 5 patients. Stones are another common cause of open globe eye injury.

Majority of the patients presented with pain in the eye, redness, and diminution of vision (73.33). 23.33% of patients came with loss of vision along with pain in the eye and redness. Maximum number of patients had no associated injuries at the time of presentation (76.66%). Multiple facial fractures were present in 20% of patients. Maximum number of patients had normal ocular position after the injury (83.33%). 13.33% of patients had distorted globe and 3.33% had auto-eviscerated eye after injury. After the injury, 16.66% of patients had restricted extraocular movement and 83.33% of patients had normal extraocular movement. Corneal tear was the most prevalent (63.33%) injury in the present study followed by corneoscleral tear (20%) and scleral tear (13.33%).

In the study of Agrawal R et al [11], lid laceration was associated in 22 (12.8%) eyes, and orbital involvement was associated in 7 (4.1%) patients. Hyphema was seen in 73 (42.4%) eyes. Lens was found to be cataractous with or without rupture of anterior capsule in 103 eyes (59.9%). Vitreous loss was noted in 44 (25.6%) eyes. Wound was seen extending to insertion of rectus muscle (intra-operative finding) in 22 eyes (30.55%). Retinal detachment was present in 36 eyes (20.9%). Intra-ocular foreign body was seen in 27 (15.7%) eyes. Similarly, in our study, the common anterior segment finding in the patients were conjunctival congestion (93.33%), hyphema (70%), traumatic cataract (70%), circumcorneal congestion (60%), subconjunctival hemorrhage (53.33%), uveal tissue prolapse (43.33%), chemosis (30%) and Descemet's membrane fold on the cornea (16.66%).

CONCLUSION

Open-globe injuries are more common in working-age males. Corneal tear is the most common type of open globe injury. Health education and awareness regarding the mechanism of open globe injuries of eye can prevent the burden of these cases, as majority of the cases are accidental and occurred at workplaces. Open globe injuries are a preventable cause of blindness and warrant good health practices like the use of personal protective equipment (e.g. goggles).

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