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A Study of Ocular Trauma Attending a Tertiarycare Hospital in a Semi Urban Population

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Abstract

Purpose: The aim of this study is to find out the type of ocular trauma attending a tertiary care hospital in a semi-urban population so that the patient can have the best visual outcome after treatment. *Methods:* This is a hospital based prospective study and sample size is of 100 consecutive patients attending emergency services from June 2015 to June 2017. *Result:* Majority of the ocular trauma attending the hospital were of closed globe injuries followed by chemical trauma. Injuries were more common in males. *Conclusion:* The visual outcome of the injured eye depends on the severity of the injury and the time lapse between injury and onset of treatment.

Keywords: Ocular Trauma; Semi Urban Population; Visual Outcome.

Introduction

"VISION" is the most prestigious of all senses and is the most cared for function in humans. Impairment of vision in any form can affect the quality of life of a person significantly.

Binocular vision, one of the most advanced functions present solely in human, imparting the quality of stereopsis in vision. It requires optimal functioning of both the eyes, and hence damage to one eye due to ocular trauma affects the quality of vision significantly.

Naturally, the eyeball is a fairly well protected structure in our body but if injured, the damage is much more than any other organ. There are anatomical as well as physiological factors for its protection. The bony orbit and elastic periorbital fatty tissue are the anatomical factors protecting it. Physiologically it is protected by blink reflex, head turning reflex, tear film, eye turn and copious lacrimation following intrusion by any irritant material.

The effects of such injuries are much more severe because of the delicate nature of the ocular tissue resulting in permanent blindness. Therefore they assume unusual social and economic importance, involving a huge cost in personal unhappiness and economic inefficiency. Injuries to uveal tissue (iris, ciliary body and choroid) induce an inflammatory reaction (uveitis) which excites a similar destructive inflammation (sympathetic ophthalmitis) in the fellow eye. Thus a penetrating injury to one eye can result in total blindness.

Aims and Objectives

This study aims at studying the visual outcome of ocular trauma.

Aims and objectives are as follows

1. To find out the commonest form of ocular trauma presenting to emergency ward or trauma centre of the out- patient department of our hospital
2. To study the various factors influencing visual outcome of trauma

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3. To find out the form of ocular trauma having the best and the worst visual outcome
4. Factors for maximising the visual outcome after ocular trauma.
5. To study the primary treatment given for ocular trauma and assess the delayed complications.

Material and Methods

One hundred consecutive patients with ocular injuries were studied, from June 2015 to June 2017 after the date of approval by Institutional Ethics committee.

1. This is a hospital based prospective study
2. All patients reporting to the casualty or out – patient department with ocular trauma, falling into the inclusion criteria mentioned below, were included in the study.
3. Patients were followed up for a period of three months to study the visual outcome of the injury after treatment, following the treatment protocol mentioned later.

Sample Size

100 consecutive patients suffering from ocular trauma were included in the study.

Sample

From June 2015 to June 2017.

Patients who required admission for specific investigations and management were admitted and the rest were followed up on OPD basis.

Patients were followed up to three months after injury for visual outcome after treatment protocol mentioned below.

Inclusion Criteria

1. Anterior segment trauma
2. Posterior segment trauma
3. Anterior plus posterior segment trauma
4. Chemical Injuries
5. Thermal injuries
6. Radiation injuries
7. Firecracker injuries

Exclusion Criteria

1. Ocular adnexal trauma including lid, lacrimal apparatus injuries.
2. Orbital fractures.
3. Retained Intraocular foreign body.

Methods

A detailed history of each patient was obtained from patient or relatives, and following details were noted which included.

- Date and time of injury
- Object causing injury
- Nature of injury (eg. closed globe/ penetrating / perforating / chemical / thermal etc.)All terminology used is according to the Birmingham Eye Trauma terminology System (BETT) [17].
- Grade of Injury Grading for Mechanical jnjuries is done according to the Ocular Trauma Classification System [17]. Chemical Injuries have been graded according to Roper- Hall Classification of Chemical Injuries.
- Time interval after injury to presentation.
- Visual Acuity at presentation.
- Clinical findings, including Adnexa, anterior segment finding and posterior segment findings.
- Special Investigations to aid in diagnosis and treatment.
- Diagnosis.
- Treatment given. Appropriate surgical or medical management was done.
- Best corrected visual acuity after completion of treatment.
- Best corrected visual acuity after three months after injury.
- The visual outcome according to WHO grading of visual disability.

Specific history of contact lens use or spectacle wear, history of any pre – existing ophthalmic disease or surgery is also important as procedures like Radial Keratotomy or LASIK make the eyes highly vulnerable to trivial trauma. An enquiry regarding pre-injury visual acuity was done.

In blunt trauma, assessment of the force of impact and physical characteristics of the object, including

density and presence of sharp or cutting edges, was done, as these characteristics are the major determinants of the degree of trauma.

If a penetrating injury was suspected, possibility of an intraocular foreign body was considered. Nature of its origin, size, shape, trajectory and risk of microbial infections were assessed as they have long term influence on visual prognosis.

Chemical injuries are true ophthalmic emergencies. Treatment and history taking were started simultaneously. As alkali injuries are potentially devastating, especially due to their rapid penetrance, all chemical injuries are taken as alkali injuries, unless proven otherwise, and treated rigorously. History was directed to the nature (acid/alkali), State (solid/liquid) of chemical, duration of exposure (time elapsed since injury) and whether any primary treatment was instituted.

After detailed history, the injuries were classified as Penetrating injury, Perforating injury, closed globe injury, globe rupture, chemical injury , thermal injury or firecracker injury, and further graded as per the grading systems mentioned above.

A detailed examination of eyes was done using a torch light, slit lamp, direct ophthalmoscope and indirect ophthalmoscope (where required). In every case visual acuity and IOP (where possible) was carefully recorded.

Treatment

- Medical
- Surgical

Follow UP

Visual Acuity and detailed examination was done on every follow up. Best corrected visual acuity at the end of three months was recorded as the final vision, and visual disability graded according to the WHO definition mentioned earlier.

Observations and Results

Three patients had bilateral injuries which are represented as "III – II ", "III – I " " III –IV". In "III-II", "III" represents Grade three injury in right eye and grade two injury in left eye. The other two cases have also been represented similarly.

Table 1: Gender Distribution

Sex	Frequency	Percent
Female	13	13.0
Male	87	87.0
Total	100	100.0

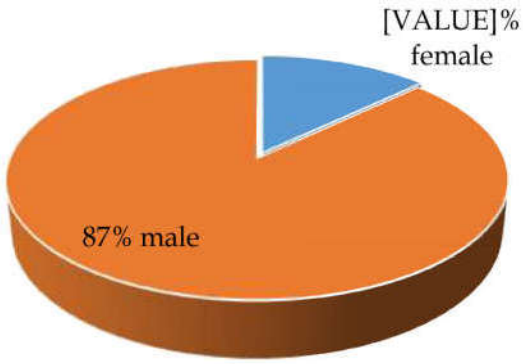

Fig. 1:

Table 2: Age distribution

Age in years	Frequency	Percent
<=2	1	1.0
3 - 23	33	33.0
24 – 44	49	49.0
>=45	17	17.0
Total	100	100.0

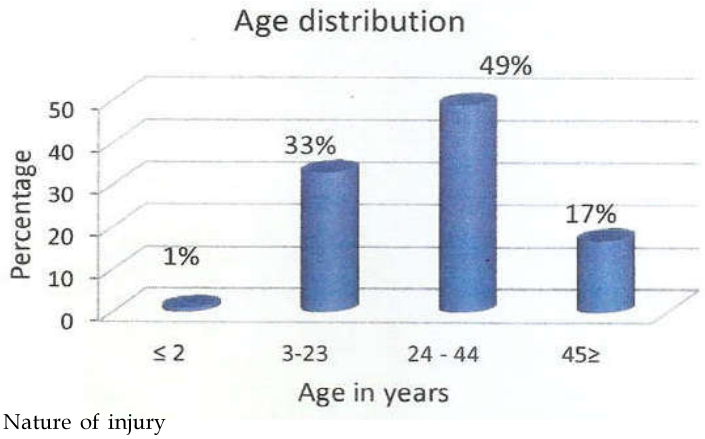

Fig. 2:

Table 3: Nature of injury

Nature of Injury	Frequency	Percent
Chemical injury	16	16.0
Closed globe injury	67	67.0
Fire cracker injury	1	1.0
Globe rupture	1	1.0
Penetrating injury	15	15.0
Total	100	100.0

Table 4: Grade of injury using the WHO grading system

Grade	Frequency	Percent
I	48	48.0
II	14	14.0
III	7	7.0
III –II	1	1.0
III – I	1	1.0
III – IV	1	1.0
IV	26	26.0
V	2	2.0
Total	100	100.0

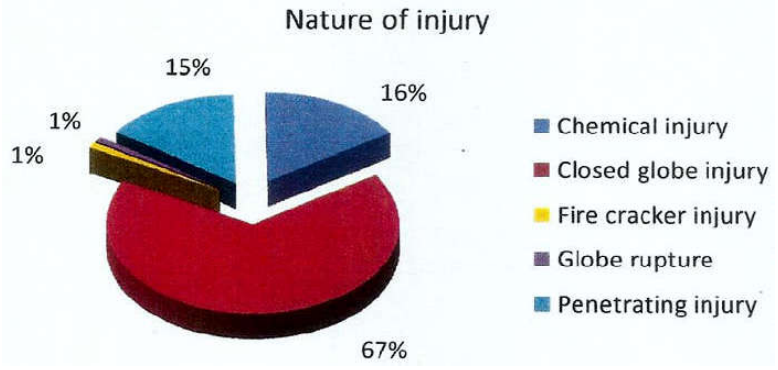

Fig. 3:

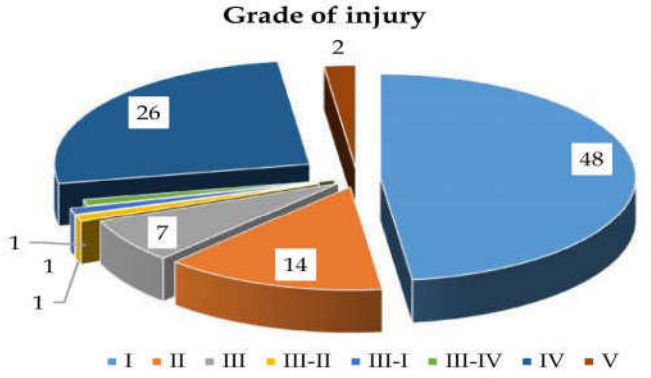

Fig. 4:

Table 5: Time of presentation to the hospital

Time of Presentation	Percent
<2 hr	43
2-6 hr	23
7 -24 hr	14
25 hr-4days	14
Above 4 days	6

Table 6: Object causing injury

Object Causing Injury	Frequency	Percent
Acid burn	4	4.0
Alkali burn	8	8.0
Ball	5	5.0
Fall	3	3.0
Fevi Kwik	3	3.0
Fist blow (Assault)	18	18.0
Glass piece	3	3.0
Hand (Acciental)	9	9.0
Iron Particle	17	17.0
RTA (Road Traffic Accident)	15	15.0
Stone	2	2.0
Others	10	10.0
Wooden stick	3	3.0
Total	100	100

Table 7: Final visual outcome

Visual outcome	Frequency	Percent
Mild Visual impairment	76	76.0
Moderate visual impairment	11	11.0
Severe visual impairment	3	3.0
Blindness (Category 3)	2	2.0
Blindness (Category 4)	5	5.0
Blindness (Category 5)	1	1.0
Normal to mild visual impairment, blindness (Category 4) (Bilateral)	2	2.0
Total	100	100.0

Table 8: Visual outcome in individual nature of injury

Nature of injury	Visual outcome					
	Mild visual impairment	Moderate visual impairment	Severe visual impairment	Blindness (Category 3)	Blindness (Category 4)	Blindness (Category 5)
Closed globe injury	57	6	2	1	1	-
Chemical injury	13	-	-	-	3	-
Fire cracker injury	1	-	-	-	-	-
Penetrating injury	5	4	1	1	3	1
Globe rupture	-	1	-	-	-	-

Table 9: Cross tabulation of anterior segment findings and posterior segment findings with visual outcome

Visual outcome	Anterior segment findings	Posterior segment findings	Anterior and posterior segment findings
Normal to mild visual impairment Category	64	3	9
Moderate Visual impairment	5	1	5
Severe visual impairment	1	-	2
Blindness (category3)	1	1	-
Blindness (category4)	4	-	3
Blindness (category5)	1	-	-

Discussion

The importance of ocular trauma as a major cause of blindness worldwide has been widely documented[2], though reliable population-based data are difficult to obtain., especially in developing countries. As per study by Negrel and Thylefors [3] a review undertaken for planning purposes in the WHO programme for the Prevention of Blindness, suggests that around 55 million eye injuries responsible for restricting activities for more than one day occur annually; they account for 750,000 hospitalized cases each year. These include approximately 200,000 open-globe injuries; with around 1.6 million people blind from such injuries, 2.3 million people with bilateral low vision from this cause, and almost 19 million people with unilateral blindness or low vision [5].

Our study showed male preponderance, with 87% patients being males and 13% being females [Table 1]. Hence the Male: Female ratio was found to be 6.69:1. This correlates with the recent studies by Sana Nadeem et al (Pakistan, 2013) [5], Vats et al (Delhi, 2008) [6], Agarwal et al (2011) [8], Singh et al (2005) [8], Narang et al (2004) [9], in India, Thompson et al (Australia, 2002) [10], Guly et al (UK, 2006) [11], Khatry et al (Nepal, 2004) [12] and Babar et al (Egypt, 2007) [13], where male preponderance was seen as well. This may be attributed to the outdoor and high risk nature of work of males in our country.

In our study majority of the patients were in the age group of 24-44 years (49%), followed by 3-23 years (33%) and finally >45 years (17%) and <2 years (1%) [Table 2]. In the study by Vats et al [6] in Delhi, the mean age at which trauma occurred was 24.2 (±13.5). In China, a study done by He Cao et al (2012), showed majority of patients with ocular trauma, to be in 15-44 year age group (56.2%). The preponderance in 24-44 year age group may be attributed to the fact that this is the main working age group, which is exposed to maximum risk of ocular trauma, especially at work place. The increased frequency among 3-23 year age group may be play and sport – related injuries.

In our study closed globe injuries were found to have the highest frequency, accounting for 67% of our cases. While chemical injuries accounted for 16%, penetrating injuries accounted for 15% of the injuries. Firecracker and globe rupture, each were seen only in 1% of injuries[Table 3]. This was in contrast to the study by Singh et al [8], where closed injuries were present only in 44.2% injuries, and penetrating injuries were present in 55.8% of the eyes. This contrast may be due to the fact that their study was conducted in a tertiary eye trauma centre, where patients were referred from various hospitals from the country.

Majority of the patients in our study presented to the hospital Emergency Department or Out-Patient Department within 2 hours of the injury (43%). 23% patients presented between 2-6 hours, 14% between 7-24 hours and 1-4 days each, while 6% patients presented after 4 days [Table 5]. Out of these majority of the patients with serious injuries presented within 24 hours. Patients with serious injury who presented late included one case of traumatic cataract (8days) and one of Sub hyaloids haemorrhage with Berlin's oedema (8days). All these patients were referred from primary health care centers In villages. This highlights the issue of illiteracy, ignorance on part of the patient who presented late were cases of minor ocular injuries like paracentral or peripheral corneal foreign bodies and subconjunctival haemorrhage. This is probably why on Fisher's exact test, the time of presentation does not show a significant correlation with the final visual outcome in our study (p – value 0.450) [Table 10].

The commonest cause of injury in our study was Fist blow injury due to assault (18%) leading to contusion injury. This was followed by iron particle due to hammering of metal (17%) leading to superficial conjunctival and corneal foreign body. This high incidence in this study may be due to the population of lower socio – economic class, and daily wage workers that the hospital caters to. 15% injuries were due to Road Traffic Accident (RTA), while 9% were due to accidental injuries with hand. Other causes were Alkali burns (8%), Acid burns (4%), Ball (5%), Fevi Kwik glue, glass piece, wooden stick and fall from height, each accounting for 3% injuries. Injury with stone accounted for 2% injuries, while single cases of injury were seen with coconut shell, Drainex powder, firecracker, iron piece, iron rod, nail, needle, horn of bull, tap and wooden piece [Table 6].

The final vision outcome of our study after three months was evaluated. Majority of the patients had only mild visual impairment (6/18 or better) (76%). 11% patients had moderate visual impairment (6/18 P to 6/60), 3% severe visual impairment (6/60 P to 3/60), 2% Blindness (Category 4) (1/60 to Perception of light) and 1% had Blindness (Category 5) (No Perception of light). 2% patients had bilateral injuries, in which one eye had normal vision to mild visual impairment while the other had blindness (Category 4) [Table 7]. As mentioned earlier, there is significant correlation between Grade of injury and Final visual outcome. Hence we can conclude that,

as a vast majority of patients in our study had only Grade I injury, their final visual outcome after successful treatment was normal to mild visual impairment. Out of the total 7 patients with Final visual outcome as Blindness Category 4, three were due to chemical injury, three due to severe penetrating trauma and one due to Traumatic optic neuritis [Table 8].

Out of 67% of Closed globe injuries, a majority 57 patients (85%) attained only mild visual impairment, 6 moderate visual impairment (8.95%) and only 2 attained severe impairment (2.98%), 1 Blindness (Category 4). In Chemical injuries, out of total 16%, 13 patients (81.25%) attained only mild visual impairment, and 3 patients (18.75%) had Blindness (Category 4). Penetrating injuries (total 15%) had slightly worse results. Only 5 patients (33.33%) had mild visual impairment, 4 patients (26.66%) had moderate impairment and 3 patients (20%) had Blindness (Category 4), while 1 patient had severe impairment, blindness (Category 3) and Blindness (Category 5) (6.67%) each [Table 8].

This implies that penetrating injuries had the worst visual outcome, closely followed by Chemical injuries. Closed globe injuries had much better outcome as compared to the other two types. Globe rupture and firecracker injuries were seen in only one patient each, hence their outcome could not be commented upon.

As seen in Table 9, majority of the patients in our study had only Anterior segment findings (76%), 5% had only Posterior segment findings while 19% had anterior and posterior segment findings. Out of the 76% patients, 84.2% patients had normal to mild visual impairment, 6.57% had moderate impairment and 5.2% patients had Blindness (category 4). Among patients who had anterior and posterior involvement 47.36% patients had only mild visual impairment, 26% had moderate impairment, 10.52% had severe impairment and 15.78% had Blindness (Category 4). Among the 5% patients with only posterior segment involvement, 60% patients had mild impairment, 5% moderate impairment and Blindness (Category 3) each. This implies that wherever there is posterior segment involvement, the visual outcome is somewhat worse. Corroborating these findings, are studies by Singh et al [8], Entezari et al [16], Pieramici et al [14] and Rao et al [15].

As we have seen in our study, a large number of young males were affected, most of them at their work place, followed by cases of assault. These patients form the main bulk of earning members of the society, and hence visual impairment leads to a significant loss of economy to the society as a whole. More importantly, this issue needs to be addressed as impairment due to ocular trauma is completely preventable. High risk occupations such as grinders, blacksmiths, carpenters, welders, etc., need to be educated and compelled to use protective gear.

Another group where ocular trauma is seen commonly is the age group of 3 years to 23 years. The trauma in these children is mainly during play and at school. This emphasizes the importance of adult supervision at all times.

The tremendous impact of ocular trauma, on the need of medical care, loss of income and cost of rehabilitation, significantly enhances the need for the strengthening of preventive measures. A clear understanding of the mechanism of ocular injuries ensures prompt detection, treatment and prevention.

Conclusion

According to our study, we may conclude young males were affected the most, either at workplace or at play.

Closed globe injury was the commonest form of injury, but had the best visual outcome amongst all forms of ocular trauma.

Chemical injuries and penetrating injuries followed closed globe injuries in frequency, but had much worse outcome as compared to closed globe injuries.

Grade I injuries were the commonest, followed by grade IV and then grade II injuries.

Nature of injury and grade of injury had significant correlation with visual outcome.

Majority of the patients presented to the hospital within one day of injury, but time of presentation did not have significant correlation with visual outcome.

Assault, road traffic accident and occupational objects were the commonest causes of injury, followed by domestic objects such as needle, toilet cleaner, etc.

Full thickness Corneal tear involving, and not involving visual axis without iris prolapse, Corneo scleral tear involving visual axis, Relative Afferent Pupillary Defect (RAPD), Hyphema Traumatic Cataract, Vitreous haemorrhage and sub hyaloids haemorrhage in mechanical injuries, and Corneal melting and limbal ischemia in chemical injuries had significant correlation with visual outcome.

Corneal tear suturing, cataract extraction with IOL implantation and Amniotic membrane transplantation had significant correlation with visual outcome.

Majority of the patients were left with only mild impairment of vision, followed by moderate impairment.

Even though the overall results in this study pointed towards good visual outcome, a sizable number of patients were left blind as per WHO criteria, which forms a large burden on the society as a whole. This emphasizes on the fact that even with advanced technology and modalities of treatment, the role of prevention is irreplaceable.

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