Research Article

Profile of ocular trauma and its visual outcome at tertiary care hospital in North-West Rajasthan

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ABSTRACT

Background: Trauma to the eye and its surrounding structures remains a leading cause of visual morbidity and blindness. Ocular injuries can cause loss of career, major lifestyle changes, and cosmetic disfigurement; they have a significant socioeconomic and psychological impact. **Objective:** To study the demographics, profile, and prognostic factors among ocular trauma patients. **Materials and Methods:** A cross-sectional study of ocular trauma cases presenting to the outdoor or emergency department in a tertiary care center who undergone surgical and conservative management. The demographics, type of intervention, and final visual outcome were compared with the ocular trauma score categories and with the time interval between the injury and surgery. **Results:** A total of 217 eyes of 212 patients were evaluated, and out of them 158 (74.50%) were males and 54 (25.50%) were females. The age of the patients ranged from 6 months to 68 years with mean age 28.53 years. 137 (64.6%) patients had open-globe injury and 75 (35.4%) had closed-globe injury. Among the causes of trauma, road traffic accidents (RTA) (50.5%, n = 107) were the most common followed by wooden stick and occupation-related injury (21.7%, n = 36), trauma due to assault 9.9%, n = 21), and miscellaneous injuries. **Conclusion:** In all cases of ocular trauma, it is important to assess the patient, accurately. Prophylactic and protective measures are of utmost importance in preventing visually disabling complications of ocular trauma. Wearing helmets for two-wheeler, seat belts for four-wheeler passengers, and strict compliance to traffic rules will minimize RTA-related injuries.

KEY WORDS: Ocular Trauma; Open- and Closed-Globe Injury; Road Traffic Accident; Ocular Trauma Score

INTRODUCTION

The eye is protected anatomically from direct injuries by the lids, eyelashes, and projecting margins of the orbit. However, it can be injured in several ways, by chemicals, heat, radiation, and mechanical trauma. Traumatic mechanical damage causes severe morphological and functional damage to the eye which is usually unilateral and sometimes may be bilateral.[1,2] Mechanical injury to the globe may occur in a variety of ways such as the direct impact of the object to the orbit, appendages, or eyeball. Variety of ocular trauma could be produced depending on nature of object such as sharp or blunt, size of object, energy and speed of the object, and produce myriad clinical sequelae.[3,4]

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Injury to the eyelids can cause lid laceration which may or may not involve lid margin and may be associated with tissue loss. Lower eyelid trauma on medial side may result into watering from eyes due to damage to the lacrimal drainage system. Traumatic manifestations to the anterior segment vary in severity and prognosis and range from corneal abrasion, hyphema, corneal tear, and angle damage leading to secondary glaucoma. Lens subluxation, traumatic cataract, lens dislocation, vitreous hemorrhage, choroidal tear, retinal detachment, and traumatic optic neuropathy are the other manifestation of ocular trauma. A foreign body can cause damage to the eye through its mechanical effect, introducing

infection, and sequelae of toxic reactions in case of the metallic foreign body.

Trauma to the eye and its surrounding structures remains a leading cause of visual morbidity and blindness. Many ocular traumas are an avoidable cause of blindness and visual impairment.[5] Worldwide, there is approximately 6 million people blind from eye injuries, 2.3 million bilaterally visually impaired, and 19 million with unilateral visual loss; these facts make ocular trauma the significant cause of unilateral blindness.[6]

However, since ocular injuries can cause loss of career, major lifestyle changes, and cosmetic disfigurement, they have a significant socioeconomic and psychological impact. They are a significant cause of monocular visual impairment.[7,8]

Operational definitions of ocular trauma given by the World Health Organization and Birmingham Eye Trauma Terminology System[9] followed Flowchart 1.

- Blindness: Visual acuity <3/60.
- Eyewall: Cornea and sclera.

Closed-globe Injury

No full-thickness wound of the eyewall.

- Contusions: No full-thickness wound, direct energy delivery (e.g., choroidal rupture) or due to change in shape of the globe (e.g., angle recession).
- Lamellar laceration: Partial-thickness wound of the eyewall.

Open-globe Injury

Full-thickness wound of the eyewall.

- Laceration: Full-thickness wound at the impact site of a sharp object by outside - in the mechanism.
- Penetrating: Entrance wound only.
- Perforating: Entrance plus exit wound.
- Intra-ocular foreign body: Technically, a penetrating injury but grouped separately because of different clinical implications.
- Rupture: Full-thickness wound by the blunt object by inside-out mechanism due to increased intraocular pressure.
- Adnexal injuries: Eyelid and/or conjunctiva injuries.
    - Wound location was defined by the ocular trauma classification group. Open-globe injuries
        - Zone I injuries were confined to the cornea,
        - Zone II injuries confined to the anterior 5 mm of the sclera, and
        - Zone III injuries which involved more posterior than 5 mm from the limbus.
    - In closed-group injuries.
        - Zone I the injury was limited to bulbar conjunctiva, sclera, or cornea.
        - Zone II the injury involved structures in the anterior segment to the posterior lens capsule including the pars plicata.
        - Zone III the injury involved one or more of the remaining posterior segment structures.

MATERIALS AND METHODS

After obtaining permission from the institutional review board, a prospective cross-sectional study of ocular trauma cases presenting to the outdoor or Emergency Department in a tertiary care center in the Department of Ophthalmology, Sardar Patel Medical College, Bikaner (Rajasthan), from January 2015 to December 2015.

The ocular injury was defined as any injury affecting eye or adnexa. The patients' demographic data were noted. A complete ophthalmic examination including best-corrected visual acuity (with Snellen chart), anterior segment examination with torchlight and slit lamp, and posterior segment examination with direct and indirect ophthalmoscopy. Relevant investigations such as ultrasonography, B-scan, computed tomography (CT) scan, and magnetic resonance imaging (MRI) were done where indicated.

The patients were divided into those that required surgical intervention and those that were managed conservatively. The time between the injury and presentation to the hospital and surgery was noted. The final visual outcome was compared with the ocular trauma score (OTS) categories and with the time interval between the injury and surgery. In open- and closed-globe injuries, the zone of injury was compared with the final visual outcome.

A surgical procedure as per protocol was done under local or general anesthesia after obtaining written consent from patients and parents in case of minor. The post-operative outcome was noted at day 2, 1 week, 2 weeks, 1 month, 3 months, and 6 months duration.

Data were compiled using a structured data collection format and analyzed using SPSS for Windows version 16.0. Associations between variables were analyzed by Chi-square test and significance was considered when $P < 0.05$. Records of all patients were kept confidential.

The OTS developed by Kuhn et al. was used to assess the severity of injury.[10] It is based on the initial visual acuity and five anatomical characteristics (rupture, endophthalmitis, perforating injury, retinal detachment, and afferent pupillary defect).

The patients were divided into those that required surgical intervention and those that were managed conservatively. The final visual outcome was compared with the OTS categories

and with the time interval between the injury and surgery. In open- and closed-globe injuries, the zone of injury was compared with the final visual outcome.

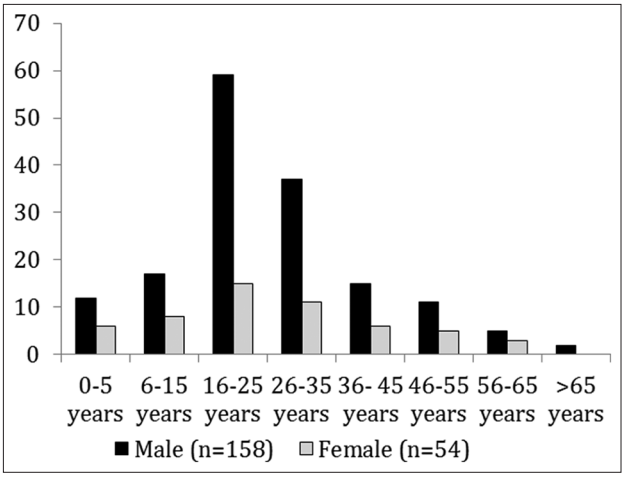
RESULTS

A total of 217 eyes of 212 patients were evaluated, and out of them 158 (74.50%) were males and 54 (25.50%) were females (P = 0.005). The age of the patients ranged from 6 months to 68 years with mean age 28.53 ± 23.67 years (Graph 1 and Table 3). The most common age group was 16-25 years and consisted of 35% (n = 74) patients. Out of the total, 44.3% (94) patients had the right eye, 53.3% (113) patients had the left eye involvement, and 2.3% (5) patients had bilateral ocular trauma. There was no significant difference with respect to laterality.

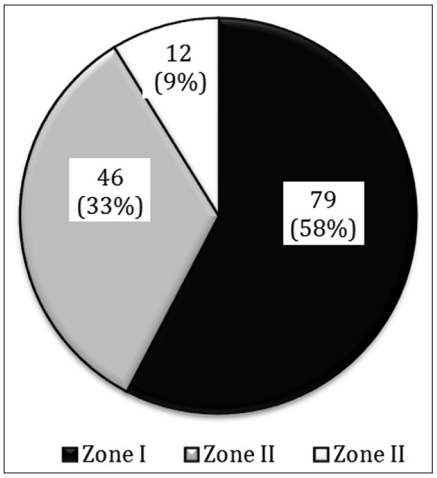
Of the total 217 eyes of 212 patients, 67% (142) required surgery. 137 (64.6%) patients had open-globe injury (Graph 2) and 75 (35.4%) had closed-globe injury (Graph 3). Among the causes of trauma, road traffic accidents (RTA) (50.5%, n = 107) were the most common followed by wooden stick and occupation-related injury (21.7%, n = 36), trauma due to assault (9.9%, n = 21) (Graph 4), and miscellaneous injuries. Childs hand/nail among young mothers, trauma due to cattle horn or tail, vegetative matter injury at fields in farmers and fall in the bathroom among elderly patients were common causes of domestic injuries. Work-related trauma commonly occurred during occupation related to iron and furniture workshop, soda water factory blasts, chisel, and hammer injuries. Sports injuries were commonly caused by shuttlecocks, tennis, and golf balls.

About 69.8% (148) cases reported within 24 h of injury, 18.3% (39) cases between 24 and 48 h, and 12 (5.7%) cases between 2 and 5 days. About 6.1% (13) cases could not recall when they had the injury. Among patients, 80.2% (171) had multiple injuries. Sub-conjunctival hemorrhage was the most common injury in 17.9% (38 cases), followed by lid ecchymosis and lid laceration in 13.2% (28), hyphema 11.8% (25), corneal abrasion 11.3% (24), corneal and intraocular foreign body 10.9% (22), traumatic mydriasis 9.6% (20), cataract 9.1% (19), and lens subluxation in 7.5% (16) cases. A numerical value (raw points) is allocated to each of these variables, and a total OTS is calculated. The obtained numerical values related to the OTS variables were converted into OTS categories (Tables 1, 2 and Graph 5).

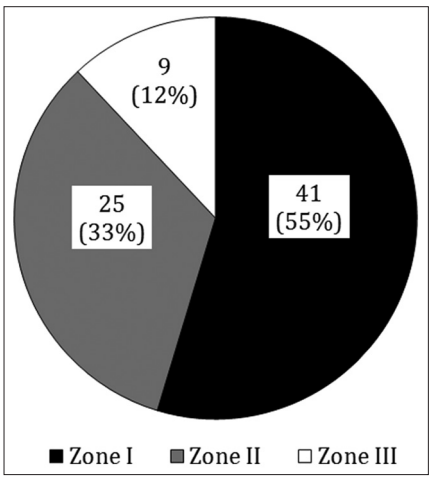
Radiological investigations such as skiagram of orbit, ultrasonography B-scan, CT scan, MRI head, and orbit were obtained wherever indicated. Out of 142 patients who required surgery, 24 (16.9%) required the second stage surgical intervention including 14 (9.9%) patients of traumatic cataract undergone cataract extraction with IOL implant Figures 2 and 3. Five patients who had traumatic cataract also had vitreous hemorrhage and/or retinal detachment and referred to a vitreoretinal surgeon.



Graph 1: Age distribution of study patients

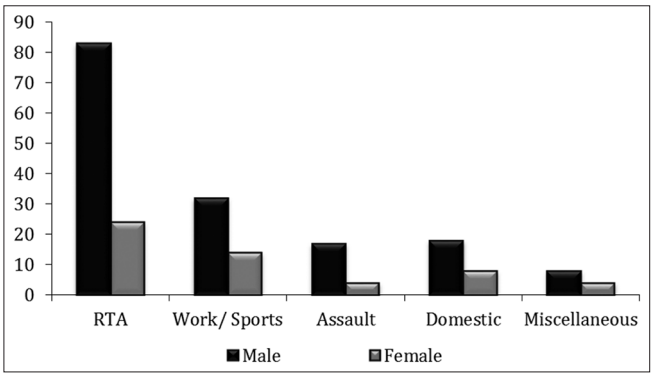


Graph 2: Open-globe injuries: Zone distribution

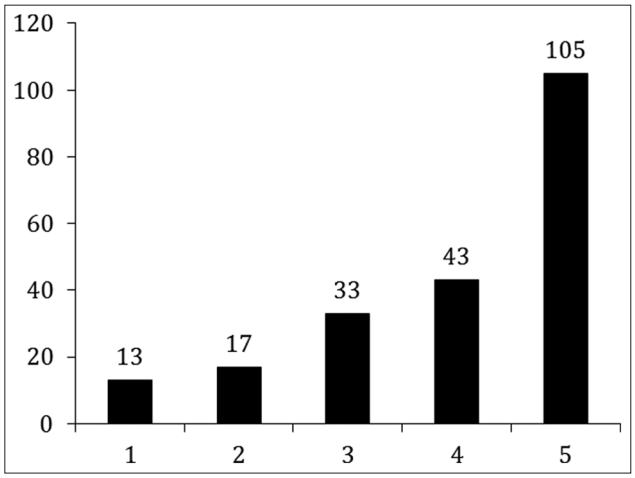


Graph 3: Closed-globe injuries: Zone distribution

Retained intraocular foreign bodies were present in 10 (7.1%) cases, out of them four were iron and removed using a magnet, and three were wooden foreign body removed using forceps under direct visualization. Three cases with the intravitreal



Graph 4: Causes of trauma



Graph 5: Ocular trauma score category

foreign body were referred. Three patients of penetrating injury with uveal tissue prolapse and severe corneal laceration were eviscerated and one patient who had eyeball protrusion due to cow horn injury underwent enucleation Figure 4.

DISCUSSION

There were 74.50% males compared to studies by Desai et al.,[11] Cillino et al.,[12] and Emem and Uwemedimbuk[13] who had 83%, 84.6%, 74%, and 61.4%, respectively. This higher prevalence among male patients could be attributed to their involvement in outdoor activities, vehicle driving, and occupation related (Graph 1). The most common age group was 16-25 years with 35% patients (mean age 28.53 ± 23.67 years) compared to 21-50 years (63.1%) by Emem and Uwemedimbuk[13] 33 years mean age by Cillino et al.[12]

In our study, 69.8% (148) cases reported within 24 h of injury, 18.3% (39) cases between 24 and 48 h, and 12 (5.7%) cases between 2 and 5 days. About 6.1% (13) cases did not recall when they had the injury. In a study by Emem and Uwemedimbuk,[13] 18.6% of the trauma cases reported within 24 h of injury, 39.1% within 1 week, 22.2% reported between 1 week and 1 month, 13.2% after 1 month, and 4% did not recall when they had the injury. In a study by Qi et al.,[14]

Table 1: Calculation of the OTS

Initial visual factor raw points		Raw points
A	Initial visual acuity category	
	NLP	60
	LP to HM	70
	1/200-19/200	80
	20/200-20/50	90
	≥20/40	100
B	Globe rupture	–23
C	Endophthalmitis	–17
D	Perforating injury	–14
E	Retinal detachment	–11
F	Afferent pupillary defect	–10

OTS: Ocular trauma score, NLP: No light perception, LP: Light perception, HM: Hand movement

Table 2: Calculation of the OTS category

OTS score	Category
0-44	1
45-65	2
66-80	3
81-91	4
92-100	5

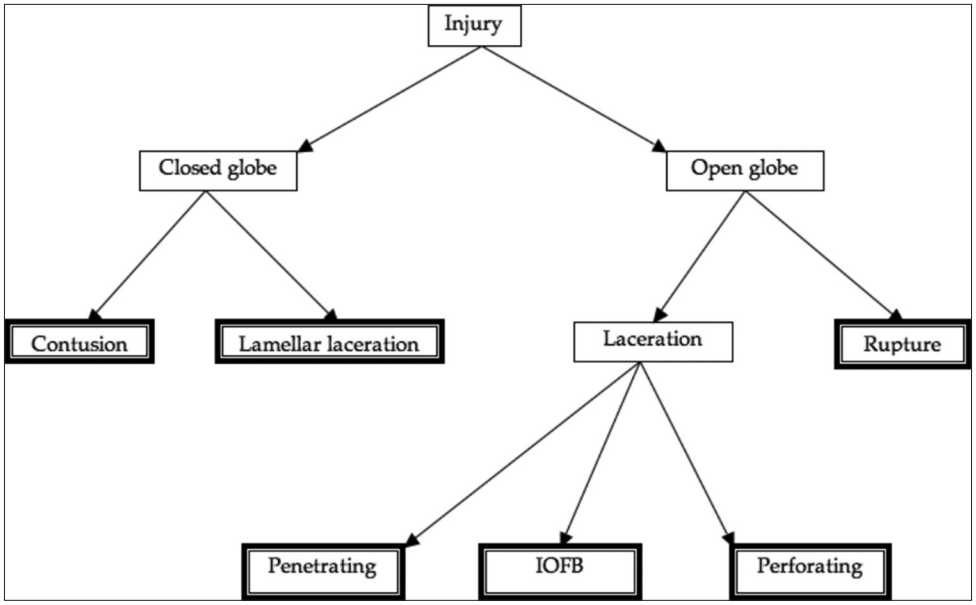
OTS: Ocular trauma score

Table 3: Age distribution of study patients

Age group (years)	Male (*n*=158)	Female (*n*=54)	Total
0-5	12 (7.6)	6 (11.1)	18
6-15	17 (10.8)	8 (14.8)	25
16-25	59 (37.3)	15 (27.8)	74
26-35	37 (23.4)	11 (20.4)	48
36-45	15 (9.5)	6 (11.1)	21
46-55	11 (7.0)	5 (9.3)	16
56-65	5 (3.2)	3 (5.6)	8
>65	2 (1.2)	-	2
Total	158 (100)	54 (100)	212

83.6% cases reported within 24 h of injury. The wide variation between different studies may be because of difference in accessibility of medical facilities and patient literacy in various areas where the studies were carried out. In our study, the patients from rural areas and illiterate guardians in case of very young age group patients living in far flung areas reported late.

About 35.4% patients had closed-globe injury and 64.6% had open-globe injury. In a study by Qi et al.,[14] on hospitalized cases of ocular trauma 15.7% had closed-globe injuries and 76.9% open-globe injuries. Soliman and Macky[15] reported 19.6% closed-globe injuries and 80.4% open-globe injuries. This variation is because our study included both outdoor



Flowchart 1: Types of ocular trauma

Figure 1: Globe protrusion due to cow horn trauma

Figure 2: Traumatic cataract -pre-operative

and inpatient department patients. Pandita and Merriman[16] reported 69.1% closed-globe injuries and 30.9% open-globe injuries. In this study, 32% required surgery compared to 77% by May et al.[17] In our study, RTA-related trauma was the most common followed by sports and work-related trauma. Desai et al.[11] reported the home as the most common place for a serious injury to occur (30.2%), followed by the workplace (19.6%), and a sports or leisure facility (15.8%). In

Figure 3: Traumatic cataract- post-operative

a study by Emem et al.,[13] the most common causes of injury were assault (62.2%) followed by RTA. Qi et al.[14] reported firework related (24.5%), RTA (24.2%) related as the most common causes. The wide variation in the causes of injury may be due to the patient profile selected in various studies. In our study, the most of the patients were from rural areas. The limitations of this study were the small sample size.

CONCLUSION

In all cases of ocular trauma, it is important to assess the patient, accurately record visual acuity as it is used in calculating the OTS. Several prognostic factors are involved in the final outcome of ocular trauma patients which include timing of presentation, site of injury, size of injury, nature of trauma, i.e., by organic or inorganic substance and timely appropriate management. Patients presenting earlier to the hospital, patients having Zone I injury with smaller in size and away from pupil have better prognosis. Prophylactic and

protective measures are of utmost importance in preventing visually disabling complications of ocular trauma. Several measures can be taken for this. Wearing helmets for two-wheelers, seatbelts for four-wheeler passengers, and strict compliance to traffic rules will minimize RTA-related injuries. It is imperative that individuals who are involved in handling machine tools, chemicals, bottles, and allied activities must wear protective eyewear. Professionals who are handling people in such activities need to pay heed to this very important aspect.

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