

ORIGINAL ARTICLE

Penetrating Ocular Injuries in Pediatric Age Group in a Rural Area of Western Maharashtra, India

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ABSTRACT

Background: Ocular injuries comprise a group of disorders with a wide variation in clinical presentation, causes, and visual outcome. Penetrating injury is defined as a single full thickness laceration of the eyeball usually caused by a sharp object. **Aims:** The purpose of this study was to know the causes, clinical features, and visual outcome of various penetrating ocular injuries in the pediatric age group. **Settings and Design:** It was a hospital based longitudinal study. **Subjects and Methods:** In this hospital based longitudinal study, 50 consecutive patients in the pediatric age group (up to 14 years) presenting to the ophthalmic OPD or casualty with penetrating ocular injuries were studied during a period of 2 years (August 1998–July 2000). **Results:** The present study showed the highest incidence (48%) of penetrating ocular injury in the age group of 6–10 years. Incidence of penetrating eye injury was found to be more in males (74%) as compared to females (26%). Wooden stick (34%) injuries are the most commonly observed penetrating eye injuries. Final visual outcome of more than 6/36 was seen in 79.31% of those patients in which only anterior segment was involved as against it was seen in only 23.08% of those in which posterior segment was involved. **Conclusions:** Penetrating ocular injuries are the most common cause of mono-ocular preventable blindness in pediatric age group. The three most important factors determining the final visual outcome were size and site of injury, as well as the time interval, between the injury and the presentation.

Keywords: Blindness, pediatric age group, penetrating injury, visual outcome

INTRODUCTION

The eyeball is a fairly well protected structure in our body with many anatomical as well as physiological factors protecting it. The bony orbit, its elastic fatty tissue, and the eyelids are the anatomical factors whereas the blink reflex, head turning reflex, and the copious lacrimation which follows intrusion of any irritant material are the physiological factors. Despite

these protective mechanisms, injuries to the eye are common.

Ocular injuries comprise a group of disorders with a wide variation in clinical presentation, causes, and visual outcome. Penetrating injury is defined as a single full thickness laceration of the eyeball usually caused by a sharp object.^[1] Most penetrating injuries encountered are occupational, therefore, seen in adults. However, there is a disproportionate increase in incidence in childhood, with ocular injuries in the pediatric age group being the commonest among causes of mono-ocular blindness.^[2] In terms of loss to the society of productive human beings due to visual impairment, childhood blindness contributes significantly since the total number of blind years suffered by a blind child

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is more than those suffered by an adult. Thus human, social, and economic consequences of eye injury are enormous.

The purpose of this study was to know the causes, clinical features, and visual outcome of various penetrating ocular injuries in the pediatric age group.

SUBJECTS AND METHODS

In this hospital based longitudinal study, 50 consecutive patients in the pediatric age group (up to 14 years) presenting to the ophthalmic OPD or casualty with penetrating ocular injuries were studied during a period of 2 years (August 1998–July 2000). These patients were thoroughly evaluated regarding the causes, clinical features, and the visual outcome after appropriate management. After discharge from the hospital, patients were followed up on OPD basis up to a period of 6 months (weekly for 2 months and then monthly for 6 months). A detailed history was obtained from either patients or their relatives. The injuries were categorized as those occurring during work (occupational), at home (domestic), during farm work (agricultural), during play (sports), during traffic accidents, and others (assault). Each patient was evaluated according to a structured proforma. A detailed examination of the eye was done using the torch light, slit lamp, direct, and indirect ophthalmoscope. Appropriate statistical test was used for statistical analysis. Uncooperative patients were examined under sedation or general anesthesia. Visual acuity of both eyes was carefully recorded. All patients were given tetanus toxoid 0.5 mL intramuscularly on presentation. Intravenous antibiotics in the form of cephalosporin and Aminoglycosides according to the kg body weight were given for 7 days. All patients underwent primary repair for penetrating injury of the eye under general anesthesia. Some required additional surgical procedures later on such as vitrectomy, cryopexy, and intraocular lens implantation. During follow-up their visual acuity was recorded carefully with full workup of anterior and posterior segment. If required, patients were readmitted for secondary surgical procedures.

RESULTS

The present study showed the highest incidence (48%) of penetrating ocular injury in the age group of 6–10 years [Table 1].

Incidence of penetrating eye injury was found to be more in males (74%) as compared to females (26%) [Graph 1].

In this study, 76% of the patients presented to the hospital within 24 h of injury while 20% presented to the

hospital between 24 and 72 h. Four percent of the patients presented to the hospital after 72 h of injury [Table 2].

In the present study, injuries sustained at play or sports were maximal (40%). Domestic injuries constituted 32% while agricultural injuries were seen in 24% of cases [Graph 2].

Common objects causing penetrating eye injuries were found to be wooden stick (34%), wooden arrow (30%), thorn (18%), and metal wire (10%) [Table 3].

In the present study, injuries restricted to cornea constituted 60% while corneoscleral injuries were seen

Table 1: Age incidence

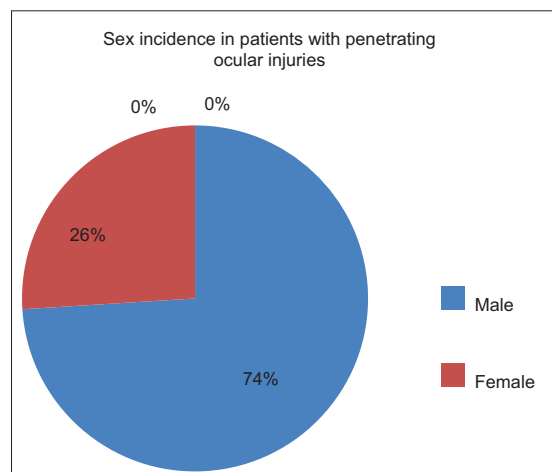
Age group (years)	Number of patients	Percentage
0-5	09	18
6-10	24	48
11-14	17	34
Total	50	100

Table 2: Time interval between injury and presentation at hospital

Time	Number of patients	Percentage
Within 24 h	38	76
24-72 h	10	20
>72 h	02	04
Total	50	100

Table 3: Objects causing ocular injuries

Nature of objects	Number of patients	Percentage
Stick	17	34
Wooden arrow	15	30
Thorn	9	18
Metal wire	5	10
Scissors	2	4
Stone	2	4
Total	50	100



Graph 1: Sex incidence

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in 16%. Prolapse of uveal tissue was found in 62% of the total number of patients. Lens was affected in 52% with traumatic cataract seen in 42% of patients. (In four patients cataractous lens was subluxated) and posterior dislocation or extrusion from the eye seen in 10% of patients [Table 4].

Among the posterior segment injuries, macular edema occurred in maximum number of patients (40%) while vitreous prolapse through the wound was observed in 34% patients. Other findings were vitreous hemorrhage (10%), endophthalmitis (4%), retinal detachment (4%), and retinal break (4%) [Table 5].

In the present study, corneal tear involving center was seen in 23 patients while peripheral corneal tear was seen in 15 patients. Final visual outcome was 6/12

or better in 87.5% of the patients with corneal tear measuring 0–2 mm. The same visual outcome was observed in 54.54% of the patients with corneal tear of size 2–4 mm [Table 6].

Of 38 patients, who presented within 24 h of injury, two had extensive anterior and posterior segment injuries such as retinal detachment and large corneoscleral tear with vitreous in the wound. Visual outcome was good in these two patients as compared to six patients who presented after 72 h of injury with similar affection. These six patients ended up with either phthisical eye or one needing enucleation.

In the present study in patients with injury limited to cornea with or without uvea 64.28% patients had final visual outcome of 6/12 or better. When injury was limited to cornea plus lens, 30.76% patients had visual acuity of 6/12 or better. In patients having posterior segment injury with or without vitreous loss 54.5% patients had final visual outcome of 6/60 or less [Table 7].

Table 4: Anterior segment injury

Structure involved	Number of patients	Percentage
Cornea only	30	60
Sclera only	12	24
Cornea and sclera	08	16
Prolapsed uveal tissue	31	62
Lens	26	52

Table 5: Posterior segment injury

Structure involved	Number of patients	Percentage
Vitreous prolapse through wound	17	34
Vitreous hemorrhage	05	10
Endophthalmitis	02	04
Macular edema	20	40
Retinal detachment	02	04
Retinal break	02	04

DISCUSSION

In this study, 50 patients in the pediatric age group (up to 14 years) with penetrating ocular injuries were studied during the period from August 1998 to July 2000.

The highest incidence of penetrating ocular injuries was found in the age group of 6–10 years (48%) which correlates with the following studies: Dasgupta *et al.*^[2] found the incidence of penetrating ocular injuries to be 45.45% in the age group of 6–10 years. Rapoport *et al.*^[3] found almost half of the penetrating

Table 6: Visual outcome in relation to corneal or corneoscleral tear

Size in mm	Visual acuity						Number of patients
	6/12 or better	6/18-6/36	6/60 or less	Phthisis	Enucleation	Undetermined	
0-2	7	1	-	-	-	2	10
2-4	6	4	1	-	-	-	11
4-6	-	8	6	-	-	2	16
6-8	-	-	3	2	-	-	5
>8	-	-	2	4	2	-	8
Total	13	13	12	6	2	4	50

Table 7: Visual outcome in relation to structures involved

Structures involved	Visual acuity						Number of patients
	6/12 or better	6/18-6/36	6/60 or less	Phthisis	Enucleation	Undetermined	
Cornea and/or sclera with or without uvea	9	4	1	-	-	2	16
Cornea plus lens damage	4	6	3	-	-	-	13
Posterior segment injury with or without vitreous loss	-	3	6	2	-	2	13
Extensive anterior and posterior segment injury	-	-	2	4	2	-	8
Total	13	13	12	6	2	4	50

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ocular injuries sustained by children of 6–12 years. This could be explained by the fact that play at this age is usually not restricted to home and therefore is unsupervised. Moreover, children of this age are generally more adventurous.

In this study, penetrating ocular injuries were found to be more in males (74%) as compared to females (26%). This difference was significant. This is probably due to more active involvement of male children in outdoor sports.

In our study, while 76% of patients presented to the hospital within 1-day of injury, a good 20% of patients presented between 1 and 3 days and remaining 4% patients presented after more than 3 days of injury. This draws attention to the fact that in spite of the injuries being serious and vision threatening, many patients fail to report to the hospital early. Many factors could be responsible for this, such as illiteracy and lack of awareness on the part of parents, and lack of health services within reachable distance.

Thus health education in rural area is a necessity and the dangers and consequences of ocular trauma need to be highlighted to parents.

In this study, the common causes of penetrating eye injuries were wooden stick (34%), wooden arrow (30%), metal wire (10%), and thorn (18%). In rural area, the first three are the common objects of play, cheap, and readily available. Thorn injury becomes important in this age group since many children help out their parents in agricultural activities and in grazing the cattle. Both these occupations make them vulnerable to injury with branches of thorny trees which grow abundantly in this area.

Corneal injuries (76%) constituted the greatest bulk of this study [Figure 1]. Injuries restricted to cornea alone were 60% while corneoscleral injuries were 16%. This is due to the fact that cornea, being the most anteriorly situated structure of the eye, is most vulnerable to injury. Arnold Sorsby^[4] stated that approximately 66% of penetrating wounds of eye are through cornea and 24% are corneoscleral. Bigar^[5] reported that in 53% patients injury was limited to cornea and 18% were corneoscleral. Ag el Mouchtahide^[6] reported that most frequent eye injuries in children were corneal injuries. Sclera was injured in 24% of the patients included in present study. All scleral injuries were in the form of sclera tear. Uveal tissue prolapsed was seen in 66.6% of these patients indicating more severe grade of injury with high chances of infection [Figure 2].



Figure 1: Corneal tear with iris prolapse

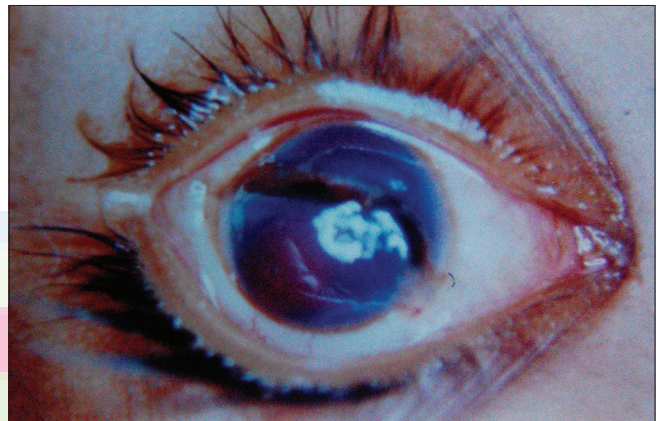
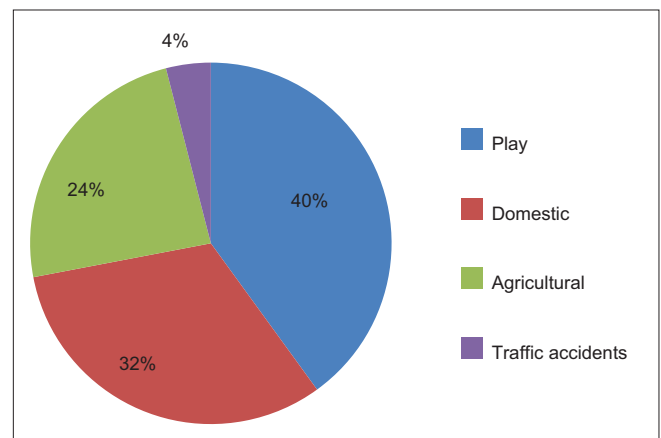


Figure 2: Corneoscleral tear with iris, vitreous prolapse with anterior chamber hyphema



Graph 2: Type of injury

In the present study, lens was affected in 52% of the total patients with the commonest affection being traumatic cataract (42%). In the remaining 10% of patients the lens was either posteriorly dislocated or extruded from the eye.

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Vitreous hemorrhage was found in 10% of the total patients, most of whom were managed conservatively.

Visual outcome depends on the size of injury, type of injury, and most importantly the time of presentation.^[7] Considering only the size of corneal tear, 87.5% of the patients measuring 0–2 mm size corneal tear as against 54.54% of those with 2–4 mm size corneal tear could attain a final visual acuity of 6/6–6/12. In patients with corneal tear sized 6–8 mm, 60% of patients had final visual outcome of 6/60 or less, while the remaining 40% patients developed phthisis with no light perception.

Visual outcome was better in patients in which only anterior segment was involved as against extensive trauma involving both anterior as well as posterior segment. Final visual outcome of more than 6/36 was seen in 79.31% of those patients in which only anterior segment was involved as against it was seen in only 23.08% of those in which posterior segment was involved.

As already mentioned above, time interval between the injury and presentation to the hospital is a crucial factor in determining the final visual outcome. Two patients who presented after 72 h of injury required enucleation, whereas 52% of those patients who presented within 24 h of injury attained useful visual acuity.

CONCLUSION

Penetrating ocular injuries are the most common cause of mono-ocular preventable blindness in pediatric age group. The three most important factors determining the final visual outcome were size and site of injury, as well as the time interval, between the injury and the presentation. Blindness due to penetrating trauma in the pediatric age group can be reduced by providing health

education to the parents so as to bring out the dangers of common objects of play in the Indian scenario such as bow and arrow, sticks, metal wire, scissors, and knives. Importance of supervised play by parents should be stressed upon. Proper and repeated education of children and their parents regarding the hazards due to ocular injury will be helpful in preventing such injuries. It is a matter of grave concern that in spite of significant advances in the industrial and scientific fronts, India still fails to provide essential, and accessible health services. This has amply been brought out by this study which showed that time interval between the injury and the presentation to the hospital was a crucial factor in determining the final visual outcome.

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Conflicts of interest

There are no conflicts of interest.

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