Original Article

Ocular Trauma in Children

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Purpose: To evaluate the causes of ocular trauma, management and visual outcome in children.

Materials and Methods: This prospective observational case series was conducted at the Department of Pediatric Ophthalmology, Isra Postgraduate Institute of Ophthalmology / Al-Ibrahim Eye Hospital, Karachi from November 2009 to October 2010. All patients of Ocular trauma aging less than 15 years were included in the study.

Results: A total number of 173 children (174 eyes) presented with ocular trauma from November 2009 to October 2010. Minimum age of presentation was 2 months, while the maximum age was 180 months with mean of 97.172 months (SD = 41.82). Out of total number of children, 125 (72.25%) were male and 48 (27.75%) were female. Blunt mode of trauma was the most frequently observed mode of injury among children and was, seen in 88 (50.6%) patients. The causes included Vegetative material in 25 (14.4%) and wooden stick in 23 (13.2%) patients. Fifty four (31%) patients were treated surgically while rest of the patients was treated medically. Most common cause of decreased vision was disorganized globe seen in 21 (12.1%) patients followed by corneal opacity in 18 (10.3%) patients.

Conclusion: Pediatric ocular trauma is a common cause of ophthalmic consultation. These injuries are mainly result of the blunt trauma. Majority of patients are young boys. There is a need for increasing awareness among parents.

Ocular trauma in children is a leading cause of visual morbidity. Ocular injuries accounts for approximately 8-14% of total injuries suffered by children[1,2]. Besides, direct damage to the ocular structures resulting in loss of vision, poor visual outcome may also due to dense amblyopia caused by prolonged period of light and formed vision deprivation[2,3]. Children are more prone to injuries because of their inability to avoid hazards[4]. In general, male are more frequently reported to have eye injuries as compared to female due to their adventurous and aggressive nature[5-8]. Etiologically such injuries are largely accidental. The Infants and children, less than 3 years of age sustain fewer injuries due to close parental supervision[9]. Older children injure themselves by spikes of toys, pencils, arrows, needles, thorns and stones. Sports related injuries are common in children from 5-15 years of age[10]. Injuries by animal tail and bird beak are common in rural areas. Fire crackers and toy pistols on religious events such as Eid and Shab-e-barat lead to loss of many eyes every year. We conducted this study to help us in documenting the prevalence of this preventable cause of visual deterioration.

MATERIALS AND METHODS

This prospective observational case series was conducted at Department of Paediatric Ophthalmology, Isra Postgraduate Institute of Ophthalmology/Al-Ibrahim Eye Hospital, Karachi, from November 2009 to October 2010. All children up to 15 years with ocular trauma were included in the study. The long standing trauma patients with prior management were excluded.

All patients were examined in detail including complete history and ocular examination. Visual acuity was measured at the time of presentation.

Children less than 2 years were examined using fixation and follow test patterns, while children between 2-5 years were examined on Cardiff visual acuity charts, Kay pictures and Sheridan-Gardner charts. The children above 5 years were examined with Snellen's chart and illiterate E chart. The ocular examination was carried out with the help of direct ophthalmoscope, slit lamp and hand held slit lamp. The fundus examination was carried out with the help of indirect ophthalmoscope in cases of clear ocular media with +20 Diopter lens. The B- Scan mode ultrasonography was performed in patients with opaque ocular media for posterior segment examination. The non-cooperative and very young children were examined under general anesthesia. The patients with any insignificant ocular structural damage or simple subconjunctival hemorrhage were reassured and discharged. The superficial foreign bodies were removed using topical anesthesia (Alcain –Alcon, Belgium). The corneal abrasions and superficial corneal lacerations with formed anterior chamber were treated by antibiotic drops (Vigamox – Alcon, Belgium) and ointment (Tobrex - Alcon, Belgium) with patching of the eye. The corneal abscess were treated with topical fortified antibiotic drops (Vancomycin 50mg/ml, Amikacin 33mg/ml), topical antifungal (Amphoteracin 0.05%) and cycloplegics (Mydriacyl - Alcon, Belgium). Any child with uveitis was treated with topical (Predforte - Allergan, Pakistan), subtenon (Triamcinolone Acetonide, Dexamethasone) or systemic corticosteroids (Deltacortil) and cycloplegics (Mydriacyl - Alcon, Belgium). Hyphaema was treated with conservative methods like complete bed rest, topical corticosteroids (Predforte - Allergan, Pakistan), and topical antiglaucoma medication (Betalol - Sante, Pakistan) whenever needed. Any form of surgical intervention like anterior chamber paracentesis or trabeculectomy using Mitomycin C was done in required cases. The surgical intervention was carried out under general anesthesia using operative microscope. All corneal lacerations were repaired with 10-0 nylon and scleral lacerations were sutured with 6-0 Vicryl. In cases of multiple ocular structure damage, primary globe repair was done as early as possible and further management was carried out according to the severity and residual sequel. Cataract surgery was performed usually after 6-8 weeks of primary repair using irrigation and aspiration of lens matter. For posterior capsular opacity (PCO), posterior capsulotomy and anterior vitrectomy were performed. In cooperative patients with PCO, YAG-laser capsulotomy was substituted. The intraocular lenses (IOL) were implanted in all cases using polymethyl-methacrylate (PMMA) 6.5mm optical diameter or scleral fixation lenses in case of absent posterior capsule. The grossly subluxated lenses were removed through pars plana approach and scleral fixated IOLs were implanted as a secondary procedure. The cases of posterior segment trauma, including posteriorly dislocated lens, vitreous hemorrhage, retinal detachment and intraocular foreign body were referred to vitreo-retinal services in hour hospital. Cases, which required surgical intervention were managed by 3-port pars plana approach. Final visual acuity was measured after 6 months.

Data analysis was performed using SPSS version 18.0. Frequency of age, gender and eye involved were calculated with mean ± standard deviation. Paired t-test was used to compare the visual acuity before and after the management of the trauma.

RESULTS

One hundred and seventy three children attended our hospital with ocular trauma from November 2009 to October 2010. Minimum age of patients was 2 month while the maximum age was 180 months with mean of 97.172 months (standard deviation=41.82). Out of these 173 children, 125 (72.25%) were male and 48 (27.75%) were female Table 1. The right eye was in Eighty one (46.6%) patients and the left eye in 92 (52.9%). Only 1 (0.6%) child had his both eyes involved. One hundred and seventy four eyes were evaluated. Blunt mode of trauma was the most frequently observed mode of injury among children. It was seen in 88 (50.6%) patients. Other modes are seen in (Fig. 2). Vegetative material and wooden stick were the most frequent causative agents. 25 (14.4%) patients had injury by vegetative trauma while 23 (13.2%) had it with wooden stick. Other causative agents are shown in table 2. Most common finding seen in patients after trauma was sub-conjunctival hemorrhage, which was seen in 20 (11.5%) patients followed by cataract in 14 (8%) patients. Damage to multiple ocular structures was seen in 17 (9.8%) patients. Other findings and their frequencies are shown in table-3. Only 37.9 % patients were 6/18 or better at the time of presentation while after management it improved to 57.9% ($p<0.05$). Fifty four (31%) patients were treated surgically while 119 (68.78%) were treated medically. (Fig. 3) shows the frequencies of management options used. Change in visual acuity after the management is shown in (Fig.4). Most common cause of decreased vision was disorganized globe which was seen in 21

(12.1%) of the patients, followed by corneal opacity in 18 (10.3%) of patients. Other causes of decrease vision are shown in (Fig. 5).

Table 1: Gender and age frequencies

Gender	No. of Patients n (%)	Minimum Age	Maximum Age
Male	125 (72.25)	2 months	180 months
Female	48 (27.75)	24 months	176 months

Table 2: Causative agents

Causative Agent	Frequency n (%)
Vegetative material	25 (14.4)
Stores	13 (7.5)
Ball	8 (4.6)
Plastic pallet	7 (4.0)
Toys	4 (2.3)
Wooden stick	23 (13.2)
Fire cracker	5 (2.9)
Needle	9 (5.2)
Finger	1 (0.6)
Fist or hand	5 (2.9)
Kinfe	4 (2.3)
Iron rod	6 (3.4)
Animal horn / bird beak	7 (4.0)
Others	27 (15.5)
Missing	30 (17.2)
Total	174 (100)

DISCUSSION

Ocular trauma is the leading cause of acquired monocular blindness in young patients. This prospective study focuses on the causes of eye injuries in children who presented to the Department of Pediatric Ophthalmology in a tertiary eye center. We also evaluated the severity, primary management, initial and final visual acuity in these patients. Children are more susceptible to the ocular trauma because of their immature motor skills and curious nature. A marked preponderance of injuries is seen in 6-10 years of age group[11]. Adult supervision has been found to be an important factor in the prevention of injuries to children. Infants and children of less than 3 years of age sustain fewer injuries because of close supervision by parents. In our study the mean age of child was high i.e. 97.172 months (8.09 years). The male children are affected more than female, because boys generally are granted more liberty than girls in our society and they tend to spend more time outside. In our study we also found higher number of male children affected i.e. 71.8% as compared to female i.e. 27.6%.

The type of injury, its severity and initial visual

Table 3: Frequency of ophthalmic findings

Ophthalmic Findings	Frequency n (%)
Lid tear	5 (2.9)
Ecchymosis	6 (3.4)
Sub conj hg	20 (11.5)
Conj tear	3 (1.7)
Sclera tear	1 (0.6)
Corneal abscess	13 (7.5)
Corneal opacity / adherent leucoma	4 (2.3)
Corneal abrasion / laceration	7 (4.0)
Corneal tear	6 (3.4)
Corneal foreign body	12 (6.9)
Uveal prolapsed	9 (5.2)
Uveitis	5 (2.9)
Hyphema	12 (6.9)
Cataract	14 (8.0)
Subluxated lens	7 (4.0)
Dislocated lens	3 (1.7)
Endophthalmitis	7 (4.0)
Vitreous hemorrhage	1 (0.6)
Retinal detachment	7 (4.0)
Optic atrophy	2 (1.1)
Multiple ocular structure damage	17 (9.8)
Phthisis	3 (1.7)
Other	4 (2.3)
Painful blind eye	4 (2.3)
Macular / retinal edema	2 (1.1)
Total	174 (100

Table 4: Comparison of mechanism of ocular injuries

Mechanism of Injury	Present Study % of Cases	Krishnan M and Sreenivasan R % of Cases	Mac. Ewal et al % of Cases
Blunt	51	30.80	65
Penetrating	29	69.20	24
Chemical	1	–	1

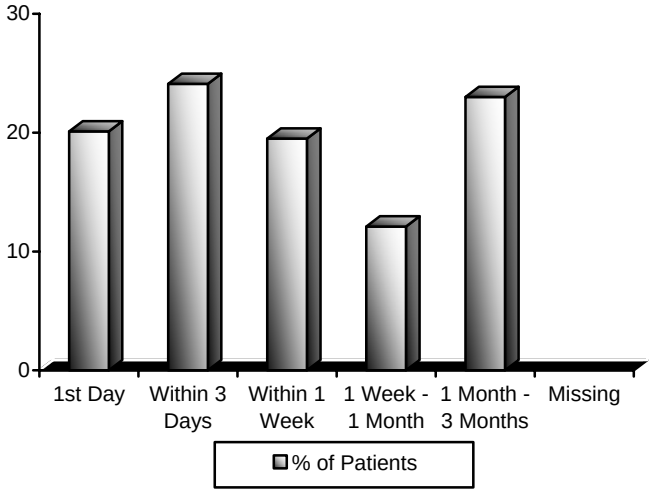

Fig. 1: Duration of patient presentation after trauma

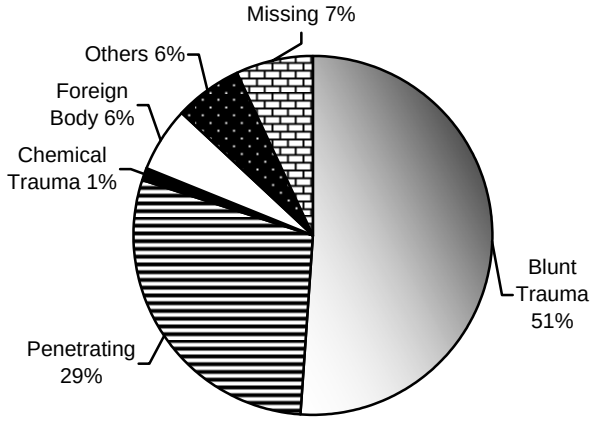

Fig. 2: Modes of trauma

acuity are known prognostic factors for the final outcome. In our cohort of patients, most cases were not severe and did not cause any initial visual impairment. Our study also showed that closed globe injuries were more common (50.6%) than open globe injuries (28%). Chemical burns accounted for only 0.6% cases. Our results are comparable to the results published by Mc Ewen and coworkers[10]. The percentage of patients sustaining close globe injuries in their series was 65% comparing to 24% receiving open globe injuries. In contrast Krishnan[12] found open globe injuries in more number in India at 69.20%. Serrano and colleagues[13] published epidemiology of ocular injuries involving children less than 15 years of age. In their series of 393 children, 64.9% patients were boys. The highest proportion of injuries (44.4%) occurred at home. Closed-globe injuries were far more frequent than open-globe injuries for boys (82.4% vs 17.6%) and girls (83.8% vs 16.2%). Most closed-globe injuries (223 [92.1%]) did not cause any final visual impairment in the affected eye whereas 26 open-globe injuries (55.3%) caused severe visual impairment. Ocular trauma among 126 children in Nepal and their visual outcome was reported by Adhikari et al. [14] Fifty seven percent of their reported children were male with open-globe injury registered in 5% of cases. The common agents of trauma were wood sticks and grass leaves. Nine percent of the children had final vision of less than 6/60 and 5% with no perception of light after treatment. On the home front Malik and coworkers [15] reported 200 cases of ocular trauma in children less than 15 years of age attending a local hospital in Peshawar. In this study male children constituted 47% of the total cases. The injury caused by blunt object was seen in 64.05% (129) of children and mostly it was due to stone in 21.5% (71) cases. The visual acuity on arrival was perception of light only In 35.5% patients with open-globe injury. At the end of 2 months 13.5% eyes were physical. Babar et al[16] in a retrospective study looked at the medical records of 481 children of

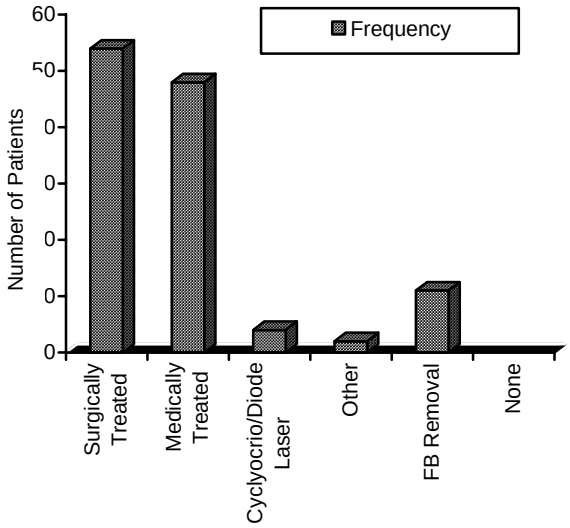

Fig. 3: Management options used

up to 16 years who had sustained ocular trauma. About 51% injuries were of open-globe type and 37.6% were closed-globe injuries. At the time of admission, 14.6% eyes were infected with 2.3% requiring evisceration or enucleation.

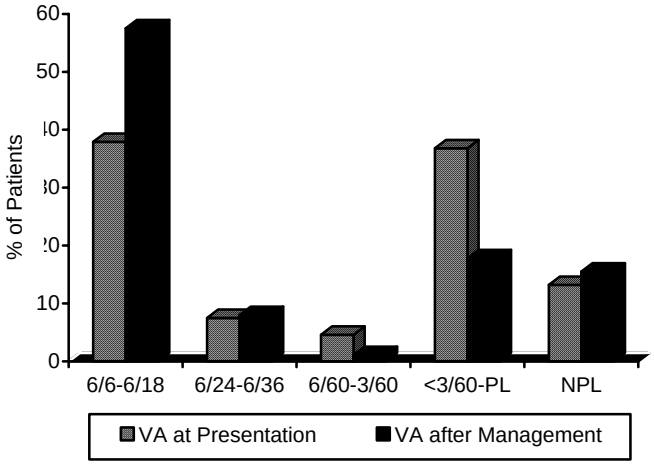

Fig. 4: Change in Visual acuity.

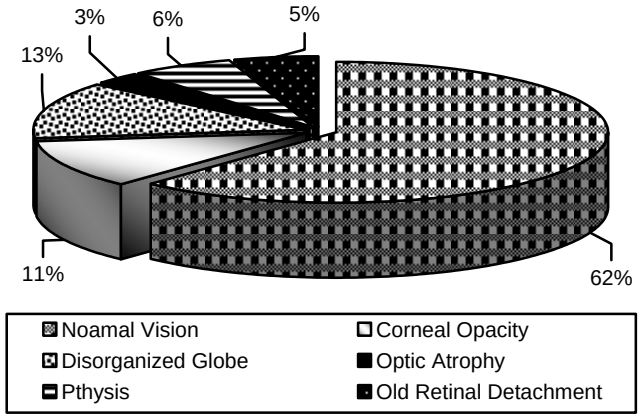

Fig. 5: Normal vision / cause of decreased vision

Our study showed that vegetative material (branches of trees, thorns) and wooden sticks were the common causative agents. Stones, sharp needles and cricket balls also cause grave ocular injuries. The Injuries from plastic pallets (toy pistols) and fire crackers on religious events of Eid and Shab-e-barat accounted for significant number of ocular injuries and can lead to ocular damage either because of trauma but also due to late presentation because of government holidays on these events (Table 2).

The visual prognosis of eye injuries improves when prompt examination, diagnosis and treatment is provided. However socioeconomic, cultural and awareness factors may also play a role in receiving timely attention. Twenty percent (20%) of children in this study received medical attention during 24 hours after injury, while 24.1% children presented after 72 hours. The open-globe injuries generally results in poorer visual outcome compared to close-globe trauma[17]. Blunt trauma involving anterior segment has better visual outcome than when posterior segment is involved. The non-perforating vegetative trauma can cause corneal erosions and ulcers which can be complicated by polymicrobial infections leading to severe visual deterioration. Therefore proper antimicrobial treatment is required at an early stage. The traumatic hyphaema is usually managed conservatively. The glaucoma resulting from trauma may have early, intermediate and delayed presentation. The lens injuries can lead to cataract formation or subluxation of crystalline lens. The perforating anterior segment trauma may cause corneal or scleral injury with varying degree of uveal tissue, lens and vitreous involvement. Unrepaired cases may carry a potential risk of endophthalmitis and panophthalmitis. The reported incidence of post-traumatic endophthalmitis is high compared to intraocular surgery[18]. The Posterior segment involvement adversely affects visual outcome. [17] It manifests as commotio retinae, choroidal rupture, macular hole, retinal breaks, retinal dialysis and retinal detachment. Patients with traumatic retinal detachments need to be operated as early as possible.

CONCLUSION

Ocular trauma leads to diminution of vision, cosmetic blemishes and resultant personality defects. The most important aspect of pediatric trauma is prevention. The parents, caretakers and teachers have an important role to play in prevention of these injuries. Playing with hazardous objects, toy pistols and fire crackers should be discouraged. The appropriate management by primary health care physician and general ophthalmologist, before ophthalmic consultation at tertiary eye care center, is a key factor in improving visual prognosis.

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