+Original Article

# Visual Outcome of Ocular Trauma

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**Purpose:** To evaluate the causes and visual outcome of ocular trauma threatening vision.

**Material and Methods:** This study was conducted at the Department of Ophthalmology, Holy Family Hospital, Rawalpindi, from 1st November, 2011 to 30th September, 2012. Visually significant ocular trauma included all cases with any decrease in vision at presentation. A detailed history with complete ocular examination was undertaken and relevant investigations were done as necessary. Patients were treated medically or surgically as the case may be. Follow up ranged from 1 month to 10 months.

**Results:** Our study found a male preponderance in ocular trauma patients, with a male to female ratio of 4.92:1.The commonest agents responsible being stones and wooden sticks, both constituting 10 (12%) cases each. Unilateral involvement occurred in 82 (98.8%) cases. Blunt trauma cases were the most frequent, pertaining to 47 (56.6%) cases. The anterior segment was predominantly involved with 55 (66.3%) cases. Complex patterns of trauma were observed. The post-operative best corrected visual outcome was statistically significant to the pre-operative visual acuity with 24 (28.9%) eyes attaining a visual acuity of 6/6 (p = 0.000). The greatest number of cases were managed conservatively with medical treatment i.e. 36 (43.4%), and the rest required surgeries.

**Conclusion:** Ocular trauma is a great threat to vision. Early recognition of the severity, adequate evaluation, and appropriate management lead to a better visual outcome.

Ocular trauma is a significant cause of preventable visual impairment and unilateral visual loss worldwide. Epidemiology of ocular trauma and visual outcome in developing countries is little known. Nearly half a million people are blind monocularly as a result of ocular trauma worldwide according to a survey.[1] Approximately, 75% of the populations suffering ocular trauma are monocularly blind.[2] One out of twenty patients presenting to the ophthalmologist has an ocular injury.[3]

Ocular injuries vary greatly in type and complexity. The etiology of ocular trauma is diverse and varies in different geographical locations. Despite causing structural and functional visual loss, ocular trauma has profound social, economical, occupational and medico-legal consequences. Early detection and management hold the key to trauma management and prevention of further complications.

Prevention is always better than cure: measures to create awareness about ocular trauma and preventive measures would result in a great decrease in ocular morbidity and mortality due to trauma. We conducted this study to determine the etiology, pattern and extent of ocular trauma presenting to us, and manage it appropriately and abruptly, and evaluate the subsequent visual outcome. We also sought to find out the factors that affect the final visual outcome, and how to manage trauma patients more effectively in future.

## MATERIAL AND METHODS

This prospective, interventional case series was carried out at the Department of Ophthalmology, Holy Family

Hospital from 1st November, 2011 to 30th September, 2012. All cases of ocular trauma causing decreased vision at presentation were included in the study. Exclusion criteria included sole lid lacerations, minor trauma like conjunctival tears and superficial metallic corneal or conjunctival foreign bodies, superficial corneal abrasions not causing decreased vision, sub-conjunctival hemorrhage and periorbital ecchymosis. Orbital fractures causing no visual loss were also excluded, along with very old cases of trauma.

A detailed history with ocular examination was performed. Snellen visual acuity was performed in each case. With children less than 2 years, fixation and follow test patterns were used and in older children picture Snellen chart was used. All patients were examined under the slit-lamp, direct ophthalmoscope or indirect ophthalmoscope. Tonometry was done as per requirement. EUA (Examination under anesthesia) was done for small, non-cooperative children or retarded / handicapped patients.

Traumatic iritis was treated with topical steroids and cycloplegics and intraocular pressure (IOP) lowering agents. Hyphema was managed along similar lines with best rest and head elevation. Corneal tears and scleral tears were sutured with 10/0 nylon and 6/0 vicryl respectively. Sutures were removed later after adequate wound healing, and the time period varied with each case. Severely disfigured globes with no vision were eviscerated primarily after appropriate consent. A ruptured lens associated with a corneal / corneoscleral tear was treated via irrigation and aspiration primarily, with secondary intraocular lens (IOL) implantation with posterior capsulotomy or anterior vitrectomy if needed, 6 – 8 weeks later. Rigid 6.5 mm PMMA (Polymethyl–methacrylate) intraocular lenses (IOLs) or foldable hydrophilic acrylic lenses were used. Vitreoretinal cases were referred to a vitreoretina facility elsewhere, due to lack of such a facility at our hospital. Final visual acuity was measured according to the case managed.

Data analysis was done using SPSS version 16. Frequencies and percentages were calculated for age, gender, laterality, causative agent, type, extent, pattern, and management. Chi square test was employed to compare pre- and post-operative visual acuity, with a p value of less than 0.05 being considered significant.

## RESULTS

A total of 83 patients were included in the study. The mean age was 23.3 ± 17.3 years with a range from 8 months to 80 years. There was a male preponderance with 69 (83.1%) male and 14 (16.9%) female patients with a male to female ratio of 4.92:1.

Right eye involvement occurred in 53 (63.9%) cases, left in 29 (34.9%) cases, and bilateral

**Table 1:** Agent of trauma

| Agent | Frequency n (%) |
|---|---|
| Stone | 10 (12.0) |
| Wood (Stick) | 10 (12.0) |
| Vegetative | 7 (8.4) |
| Metal rod | 6 (7.2) |
| Ball (any kind) | 5 (6.0) |
| Glass piece | 5 (6.0) |
| Wire | 4 (4.8) |
| Fall | 4 (4.8) |
| Iron nail | 3 (3.6) |
| Iron piece | 3 (3.6) |
| Needle / pin | 3 (3.6) |
| Knife | 3 (3.6) |
| Grinder blade | 3 (3.6) |
| Plastic Toys | 3 (3.6) |
| Chemical | 2 (2.4) |
| Bullet | 1 (1.2) |
| Pen | 1 (1.2) |
| Bottle cap | 1 (1.2) |
| Firecracker | 1 (1.2) |
| Finger nail | 1 (1.2) |
| Pistol | 1 (1.2) |
| Axe | 1 (1.2) |
| Metallic fist | 1 (1.2) |
| Torch | 1 (1.2) |
| Pellet | 1 (1.2) |
| Unknown | 2 (2.4) |

involvement occurred in 1 (1.2%) case only.

The causative agents involved are shown in the table (Table 1). The most common agent being stones and wooden sticks, both constituting 10 (12%) cases each, followed by vegetative agents 7 (8.4%), then metal rods 6 (7.2%), and balls and glass pieces accounting for 5 (6%) cases each.

We classified trauma into five types, with blunt trauma cases being the most frequent; 47 (56.6%), penetrating; 27 (32.5%), perforating; 2 (2.4%), penetrating/perforating with intraocular foreign body (IOFB) Fig. 1-3; 5 (6%), and chemical injury accounting for only 2 (2.4%) cases (Table 2).

**Table 2:** Type of trauma

| Type | Frequency n (%) |
|---|---|
| Blunt | 47 (56.6) |
| Penetrating | 27 (32.5) |
| Perforating | 2 (2.4) |
| Penetrating/Perforating with IOFB | 5 (6.0) |
| Chemical injury | 2 (2.4) |

We also analyzed the extent of ocular trauma Fig. 4 with the greatest number of cases pertaining to the anterior segment i.e. 55 (66.3%), the posterior segment involved in 5 (6%) cases, both anterior and posterior segment involvement in 23 (27.7%), and orbital fracture in only 2 (2.4) cases.

Complex patterns of trauma were observed and documented in a tabulated form (Table 3).

The Pre-operative visual acuity (Table 4) and post-operative visual acuity (Table 5) were compared and analyzed with the Chi square test, and the visual outcome of our management was found to be statistically significant (p=0.000).

Management of these diverse cases varied profoundly (Table 6). The greatest number of cases were managed conservatively with medical treatment i.e. 36 (43.4%), simple corneal repair was required in 9 (10.8%) cases, with another 9 (10.8%) cases requiring a corneoscleral repair with iris repositioning, 8 (9.6%) patients treated by a corneal repair with iris repositioning, with 3 (3.6%) cases requiring a phacoemulsification with posterior capsulotomy / anterior vitrectomy and an

**Table 3:** Pattern of trauma

| Trauma Pattern & Structural Damage | Frequency n (%) |
|---|---|
| Corneal tear (partial thickness)/abrasion/ulcer | 6 (7.2) |
| Corneal tear (partial thickness) | 25 (30.1) |
| Corneo-scleral tear | 11 (13.3) |
| Corneal edema/ischemia | 29 (34.9) |
| Iris prolapse | 24 (28.9) |
| Scleral tear/perforation | 2 (2.4) |
| Hyphema | 38 (45.8) |
| Iridodialysis/other iris damage | 17 (20.5) |
| Traumatic uveitis/hypopyon | 41 (49.4) |
| Lens rupture/subluxation/dislocation | 15 (18.1) |
| Traumatic cataract | 30 (36.1) |
| Angle recession | 5 (6.0) |
| Glaucoma (any mechanism) | 10 (12.0) |
| Vitreous hemorrhage | 9 (10.8) |
| Retinal/Subretinal hemorrhage | 3 (3.6) |
| Retinal/Macular edema/Commotio | 7 (8.4) |
| Retinal detachment | 8 (9.6) |
| Macular hole | 1 (1.2) |
| IOFB | 4 (4.8) |
| Siderosis bulbi | 1 (1.2) |
| Traumatic optic neuropathy | 4 (4.8) |
| Expulsive hemorrhage with phthisis bulbi | 4 (4.8) |
| Endophthalmitis | 5 (6.0) |
| IOL dislocaiton | 1 (1.2) |
| Orbital hemorrhage | 10 (12.0) |
| Orbital fracture | 3 (3.6) |
| Orbital cellulitis | 1 (1.2) |
| Associated lid laceration | 13 (15.7) |

**Table 4:** Presenting visual acuity

| Visual Acuity (Snellen) | Frequency n (%) |
|---|---|
| Less than 6/60 | 56 (67.5) |
| 6/24-6/60 | 8 (9.6) |
| 6/6-6/18 | 17 (20.5) |
| Unrecordable | 2 (2.4) |

**Table 5:** Post-operative/Best corrected Visual Acuity

| Visual Acuity (Snellen) | Frequency n (%) |
|---|---|
| Less than 6/60 | 25 (30.1) |
| 6/24-6/60 | 14 (16.9) |
| 6/6-6/18 | 37 (44.6) |
| Unrecordable | 2 (2.4) |
| Missing (Lost of follow up) | 5 (6.0) |

**Table 6:** Management of ocular trauma

| Management of Ocular Trauma | Frequency n (%) |
|---|---|
| Medical | 36 (43.4) |
| FB removal | 2 (2.4) |
| Corneal repair | 9 (10.8) |
| Corneal repair with iris repositioning | 8 (9.6) |
| Corneoscleral repair with iris repositioning | 9 (10.8) |
| Corneal repair with LMA | 2 (2.4) |
| Corneal repair with LMA wit IOL | 1 (1.2) |
| Scleral repair | 2 (2.4) |
| Phaco with IOL | 1 (1.2) |
| Phaco with IOL with IOFB removal | 2 (2.4) |

IOL implant, primary evisceration done also in 3 (3.6%) cases with unsalvageable globes, and 3 (3.6%) were referred to a vitreo-retina facility elsewhere, with a loss of follow up. 2 (2.4%) cases each required a corneal repair with primary lens matter aspiration (LMA) due to a ruptured lens, scleral repair, phacoemulsification with IOFB removal with IOL implant for traumatic cataracts, intracapsular cataract extraction (ICCE) with anterior chamber IOL (ACIOL), and corneal foreign body removal. Corneal repair with LMA with primary IOL implant was done in 1 (1.2%) case, and so was phacoemulsification with IOL. Secondary surgeries were required in 16 (19.2%) cases.

## DISCUSSION

Ocular trauma is a leading cause of ocular morbidity in children and young adults with a male preponderance; the former accounting for 20% to 50% of all ocular injuries[1, 3-9]. 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[10].

In our study, males were found to be at a greater risk of ocular injury, with a male to female ratio of 4.92:1. This is consistent with local studies carried out in Lahore[7,8] and Karachi[6], and internationally as well in India[2,4,11]. Australia[5], Nepal[12], UK[3, 13] and Egypt[14].

The major objects causing ocular trauma were stones, wooden sticks, vegetative foreign bodies, metal rods, balls and glass pieces. This is consistent with local studies with vegetative material being the commonest in a study carried out at Al-Ibrahim Hospital[6], and sticks and pencils at Sir Ganga Ram Hospital[8], and hammer on metal injuries at Jinnah Hospital, Lahore[7].

Unilateral involvement occurred in 82 (98.8%) cases. Bilateral ocular injury is rare[6,7,14]. Blunt trauma cases were the most frequent type, pertaining to 56.6% of the cases, as observed by Bukhari[6] et al and Guly[3] et al in their trauma studies. On the contrary, lacerating injury was found to be predominant in other studies carried out in Lahore[7,8], Peshawar[14], Egypt[15] and Nepal[12]. Penetrating trauma constituted 32.5% and true perforating injuries accounted for 2.4% only. Six (6)% of the patients were found to have an intraocular foreign body and chemical injury accounted for only 2.4% cases.

The anterior segment was predominantly involved in 66.3% of the cases. Complex patterns of trauma

were observed with multiple structures involved.

The post-operative best corrected visual outcome was statistically significant as compared to the pre-operative vision with 28.9% eyes attaining a visual acuity of 6/6. In other studies carried out in Karachi[6], a good visual outcome was obtained; however, the opposite is true for a study in Lahore[8].

The greatest numbers of cases were managed conservatively with medical treatment (43.4%), and the rest required surgeries.

**Fig. 1:** Antero-posterior radiograph of a 60 year old female hit with a grinder blade accidentally, which was protruding from her left eye and embedded in the orbital floor. The eye was primarily eviscerated.

**Fig. 2:** Lateral radiograph of the same patient.

Factors predicting final visual outcome after open globe trauma include mechanism or type of injury, preoperative visual acuity, time lag between trauma and surgery, relative afferent pupillary defect, size and location of the wound, hyphema, lens rupture, vitreous loss, vitreous hemorrhage, retinal detachment, intraocular foreign body[4,6,11,12]. The "Golden Hour" in trauma is broadly defined as the first sixty minutes and is vital that the patient should be transferred to a trauma facility, antibiotics started and appropriate investigations undertaken to treat it adequately, either medically or surgically.

**Fig. 3:** An intra-lenticular metallic foreign body in the left eye of a patient with occupational trauma. Best corrected vision was 6/36.

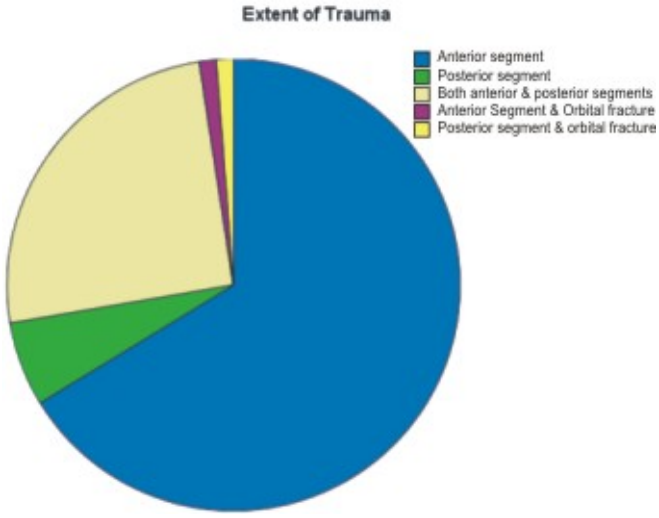


**Fig. 4:** Pie chart illustrating extent of trauma

Limitations of study are many. This study is a small scale study and does not reflect the epidemiological aspects of ocular trauma. Some of the patients were lost to follow up and this could affect

the overall visual outcome. Our hospital lacked a vitreo-retina facility and thus patients referred were eventually lost. In a developing country, compliance to treatment, counseling and follow up are difficult due to ignorance, carelessness and illiteracy of the patients and their relatives; most patients would not comply to a follow up, once useful vision is attained. Hence, long term results of such patients are hard to obtain.

The tremendous impact of ocular trauma, on needs 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. Parents and teachers should be counseled regarding availability and use of potentially traumatic objects by children, along with close supervision. Sportsmen and employers and workers in hazardous industries need education regarding use of protective and safe eye gear at all times.

## CONCLUSION

Ocular injury is a very grave cause of ocular morbidity and mortality. Prevention is always better than cure, so appropriate preventive measures should be employed at potentially hazardous places. Prompt transfer to a good eye facility, early investigations and management are key features to prevent permanent visual loss.

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## REFERENCES

1. **Thylefors B.** Epidemiological patterns of ocular trauma. Aust N Z J Ophthalmol http://www.ncbi.nlm.nih.gov/pubmed/ 1389141. 1992; 20: 95-8.
2. **Vats S, Murthy GVS, Chandra M, Gupta SK, Vashist P, Gogoi M.** Epidemiological study of ocular trauma in an urban slum population in Delhi, India. Indian J Ophthalmol. 2008; 56: 313-6.
3. **Guly CM, Guly HR, Bouamra O, Gray RH, Lecky FE.** Ocular injuries in patients with major trauma. Emerg Med J. 2006; 23: 915–7.
4. **Agarwal R, Rao G, Naigaonkar R, Ou X, Desai S.** Prognostic factors for vision outcome after surgical repair of open globe injuries. Indian J Ophthalmol. 2011; 59: 465-70.
5. **Thompson CG, Kumar N, Bilson FA, Martin F.** The aetiology of perforating ocular injuries in children. Br J Ophthalmol. 2002; 86: 920-2.
6. **Bukhari S, Mahar PS, Qidwai U, Bhutto IA, Memon AS.** Ocular trauma in children. Pak J Ophthalmol. 2011; 27: 208-13.
7. **Jahangir T, Butt NH, Hamza U, Tayyab H, Jahangir S.** Pattern of presentation and factors leading to ocular trauma. Pak J Ophthalmol. 2011; 27: 96-102.
8. **Arfat MY, Butt HM.** Visual outcome after anterior segment trauma of the eye. Pak J Ophthalmol. 2010; 26: 74-8.
9. **Vafaee I, Nobar MB, Goldust M.** Etiology of ocular trauma: A two years cross-sectional study in Tabriz, Iran. [Letter to the editor] J Coll Physicians Surg Pak. 2012; 22: 344.
10. **Négrel AD, Thylefors B.** The global impact of eye injuries. Ophthalmic Epidemiol. 1998; 5: 143-69.
11. **Narang S, Gupta V, Simalandhi P, Gupta A, Raj S, Dogra MR.** Paediatric open globe injuries. Visual outcome and risk factors for endophthalmitis. Indian J Ophthalmol. 2004; 52: 29-34.
12. **Khatry SK, Lewis AE, Schein OD, Thapa MD, Pradhan EK, Katz J.** the epidemiology of ocular trauma in rural Nepal. Br J Ophthalmol. 2004; 88: 456-60.
13. **Eagling EM.** Ocular damage after blunt trauma to the eye. Its relationship to the nature of the injury. Br J Ophthalmol. 1974; 58: 126-40.
14. **Babar TF, Khan MT, Marwat MZ, Shah SA, Murad Y, Khan MD.** Patterns of ocular trauma. J Coll Physicians Surg Pak. 2007; 17: 148–53.
15. **El-Mekawey HE, Abu El Einen KG, Abdelmaboud M, Khafagy A, Eltahawy EM.** Epidemiology of ocular emergencies in the Egyptian population: a five-year retrospective study. Clin Ophthalmol. 2011; 5: 955-60.