




Original Article

Clinical Profile, Management Strategies, and Visual Outcomes of Ocular Trauma Presenting to A Tertiary Care Centre In South India

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ABSTRACT

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Background; Ocular trauma is an important cause of preventable visual impairment and blindness worldwide, particularly among young adults. Early diagnosis and prompt management are essential for preserving vision and reducing ocular morbidity.

Aim; To evaluate the clinical profile, management strategies, radiological findings, and visual outcomes of ocular trauma patients presenting to a tertiary care centre in South India.

Materials and Methods: This prospective observational study was conducted in the Department of Ophthalmology at PES Institute of Medical Sciences and Research over a period of one year. A total of 100 patients with ocular trauma were included in the study. Detailed history, clinical examination, radiological investigations, type of injury, management strategies, and visual outcomes were assessed and analyzed.

Results: The majority of patients were in the 21–30 years age group (32%), with males accounting for 76% of cases. Road traffic accidents (30%) and occupational injuries (27%) were the most common causes of trauma. Closed globe injuries constituted 68% of cases. Subconjunctival haemorrhage and periorbital oedema were the most common clinical findings. B-scan ultrasonography was the most frequently performed radiological investigation. Conservative treatment was sufficient in 58% of patients, while 42% required surgical intervention. Most patients showed significant improvement in visual acuity following treatment, with 62% achieving final visual acuity between 6/6 and 6/18.

Conclusion: Ocular trauma predominantly affects young adult males and is commonly associated with road traffic and occupational injuries. Early clinical and radiological evaluation along with timely management, significantly improves visual outcomes. Increased awareness regarding protective eyewear and safety measures can help reduce the burden of ocular trauma.

Keywords: Ocular trauma, visual outcome, ocular injury, radiological evaluation, open globe injury, closed globe injury, tertiary care centre.

INTRODUCTION

Ocular trauma is one of the leading causes of preventable monocular blindness and visual impairment worldwide, particularly among the younger and economically productive age group. It constitutes a significant public health problem due to its associated morbidity, loss of productivity, psychological burden, and socioeconomic impact on individuals and society.[1] Ocular injuries can range from minor superficial abrasions to severe globe rupture resulting in permanent visual disability.

Globally, approximately 55 million eye injuries occur annually, of which nearly 1.6 million cases result in blindness.[2] The burden of ocular trauma is particularly high in developing countries due to increased occupational hazards,

inadequate safety measures, road traffic accidents, and delayed access to tertiary eye care facilities.[3] In India, ocular trauma contributes substantially to visual morbidity, especially among rural populations involved in agriculture and manual labor.[4]

The etiology of ocular trauma varies according to geographical region, socioeconomic conditions, occupation, and lifestyle practices. Common causes include road traffic accidents, occupational injuries, domestic accidents, sports injuries, and assault.[5] Young males are predominantly affected due to greater involvement in outdoor activities, industrial work, and high-risk occupations.[6]

Ocular trauma can be broadly classified into open globe and closed globe injuries according to the Birmingham Eye Trauma Terminology System (BETTS).[7] Closed globe injuries are more common and generally have better visual prognosis, whereas open globe injuries are associated with severe structural damage and poorer outcomes.[8] The prognosis depends on several factors such as type of injury, severity, time interval between trauma and treatment, presence of intraocular foreign bodies, and promptness of surgical intervention.[9]

Early diagnosis and appropriate management play a crucial role in preserving vision and preventing complications. Advances in microsurgical techniques, imaging modalities, and vitreoretinal procedures have improved the management and visual outcomes of ocular trauma patients.[10] However, delayed presentation and lack of awareness regarding protective measures continue to adversely affect prognosis in many developing regions.[11]

Understanding the demographic profile, pattern of injuries, management strategies, and visual outcomes is essential for developing preventive measures and improving ophthalmic trauma care services. Therefore, the present study was undertaken to evaluate the clinical profile, management strategies, and visual outcomes of ocular trauma patients presenting to PES Institute of Medical Sciences and Research, a tertiary care centre in South India.

MATERIALS AND METHODS

Study Design and Setting

This prospective observational study was conducted in the Department of Ophthalmology at PES Institute of Medical Sciences and Research over a period of one year. The study aimed to evaluate the clinical profile, management strategies, and visual outcomes of patients presenting with ocular trauma to a tertiary care centre in South India.

Study Population

A total of 100 patients presenting with ocular trauma during the study period were included in the study.

Inclusion Criteria

- Patients of all age groups and both genders presenting with ocular trauma.
- Patients willing to participate and provide informed consent.
- Both closed globe and open globe injuries were included.

Exclusion Criteria

- Patients with pre-existing ocular diseases affecting visual acuity.
- Patients with previous ocular surgeries unrelated to trauma.
- Follow-up loss before completion of treatment and outcome assessment.
- Patients unwilling to participate in the study.

Data Collection

Detailed demographic and clinical data were collected using a structured proforma. Information recorded included:

- Age and gender
- Occupation
- Mode and place of injury
- Type and mechanism of trauma
- Time interval between injury and presentation
- Laterality of injury
- Use of protective eyewear at the time of injury

Clinical Examination

All patients underwent comprehensive ophthalmic evaluation, including:

- Visual acuity assessment using Snellen's chart
- Slit lamp examination
- Intraocular pressure measurement whenever feasible

- Fundus examination using direct and indirect ophthalmoscopy
- Assessment of adnexal injuries
- Classification of injuries into open globe and closed globe injuries according to the Birmingham Eye Trauma Terminology System (BETTS)

Radiological investigations such as X-ray orbit, ultrasonography B-scan, and computed tomography (CT) scan orbit were performed when indicated to detect intraocular foreign bodies and associated orbital injuries.

Management Strategies

Management was planned according to the type and severity of ocular injury. Patients received either conservative medical treatment or surgical intervention. Medical management included topical and systemic antibiotics, anti-inflammatory agents, cycloplegics, lubricants, and tetanus prophylaxis where necessary.

Surgical procedures performed included:

- Corneal or scleral tear repair
- Lid tear repair
- Foreign body removal
- Cataract extraction
- Anterior chamber wash
- Vitreoretinal procedures where indicated

Patients were followed up periodically to assess anatomical and functional recovery.

Outcome Measures

The primary outcome measure was visual outcome assessed by best corrected visual acuity (BCVA) at presentation and during follow-up. Secondary outcome measures included:

- Pattern and severity of ocular trauma
- Types of management strategies employed
- Complications associated with ocular injuries

Statistical Analysis

Data were entered into Microsoft Excel and analysed using Statistical Package for Social Sciences (SPSS) software version 25.0. Continuous variables were expressed as mean \pm standard deviation, while categorical variables were expressed as frequencies and percentages. Chi-square test and Student's t-test were used where appropriate. A p-value of less than 0.05 was considered statistically significant.

Ethical Consideration

The study was conducted after obtaining approval from the Institutional Ethics Committee of PES Institute of Medical Sciences and Research. Written informed consent was obtained from all participants or guardians in case of minors before enrolment in the study.

RESULTS AND OBSERVATIONS

A total of 100 patients presenting with ocular trauma were included in the study conducted at PES Institute of Medical Sciences and Research over a period of one year. The clinical profile, management strategies, and visual outcomes were analyzed as follows.

Table 1: Age Distribution of Study Participants

Age Group (Years)	Number of Patients	Percentage (%)
<20	18	18%
21–30	32	32%
31–40	24	24%
41–50	15	15%
>50	11	11%
Total	100	100%

Majority of patients belonged to the 21–30 years age group (32%), indicating higher incidence of ocular trauma among young adults.

Table 2: Gender Distribution

Gender	Number of Patients	Percentage (%)
Male	76	76%
Female	24	24%
Total	100	100%

Males were more commonly affected than females, accounting for 76% of ocular trauma cases.

Table 3: Occupational Distribution

Occupation	Number of Patients	Percentage (%)
Agricultural Workers	28	28%
Industrial Workers	22	22%
Students	20	20%
Homemakers	12	12%
Drivers	8	8%
Others	10	10%
Total	100	100%

Agricultural workers formed the largest occupational group affected by ocular trauma.

Table 4: Mode of Injury

Mode of Injury	Number of Patients	Percentage (%)
Road Traffic Accidents	30	30%
Occupational Injuries	27	27%
Sports-related Injuries	12	12%
Assault	10	10%
Domestic Injuries	15	15%
Others	6	6%
Total	100	100%

Road traffic accidents were the most common cause of ocular trauma (30%).

Table 5: Type of Ocular Injury

Type of Injury	Number of Patients	Percentage (%)
Closed Globe Injury	68	68%
Open Globe Injury	32	32%
Total	100	100%

Closed globe injuries were more common compared to open globe injuries.

Table 6: Laterality of Injury

Eye Involved	Number of Patients	Percentage (%)
Right Eye	46	46%
Left Eye	50	50%
Bilateral	4	4%
Total	100	100%

Left eye involvement was slightly more common than right eye involvement.

Table 7: Time Interval Between Injury and Hospital Presentation

Time Interval	Number of Patients	Percentage (%)
<6 hours	38	38%
6–24 hours	42	42%
1–3 days	14	14%
>3 days	6	6%
Total	100	100%

Most patients presented within 24 hours of injury.

Table 8: Clinical Presentation

Clinical Findings	Number of Patients	Percentage (%)
Periorbital Edema	48	48%
Subconjunctival Hemorrhage	52	52%
Corneal Abrasion	35	35%
Hyphema	18	18%
Lid Laceration	20	20%
Traumatic Cataract	10	10%
Vitreous Hemorrhage	7	7%
Retinal Detachment	4	4%

Subconjunctival haemorrhage was the most common clinical presentation observed.

Table 9: Management Strategies Employed

Management Strategy	Number of Patients	Percentage (%)
Conservative Medical Management	58	58%
Surgical Management	42	42%
Total	100	100%

Conservative treatment was sufficient in the majority of patients.

Table 10: Types of Surgical Procedures Performed

Surgical Procedure	Number of Patients
Corneoscleral Tear Repair	14
Lid Tear Repair	9
Cataract Extraction	7
Foreign Body Removal	6
Vitreoretinal Surgery	4
Anterior Chamber Wash	2
Total	42

Corneoscleral tear repair was the most commonly performed surgical procedure.

Table 11: Visual Acuity at Presentation

Visual Acuity	Number of Patients	Percentage (%)
6/6 – 6/18	34	34%
6/24 – 6/60	28	28%
<6/60 – CF	24	24%
HM to PL	10	10%
No PL	4	4%
Total	100	100%

A significant proportion of patients presented with mild to moderate visual impairment.

Table 12: Final Visual Outcome After Management

Final Visual Acuity	Number of Patients	Percentage (%)
6/6 – 6/18	62	62%
6/24 – 6/60	22	22%
<6/60 – CF	10	10%
HM to PL	4	4%
No PL	2	2%
Total	100	100%

Visual outcome improved significantly after appropriate medical and surgical management, with 62% achieving visual acuity between 6/6 and 6/18 at final follow-up.

Table 13: Radiological Investigations Performed

Investigation	Number of Patients	Percentage (%)
X-ray Orbit	18	18%
B-scan Ultrasonography	26	26%
CT Scan Orbit	14	14%
No Radiological Investigation Required	42	42%
Total	100	100%

B-scan ultrasonography was the most commonly performed radiological investigation for evaluation of posterior segment involvement and media opacity.

Table 14: Radiological Findings in Ocular Trauma

Radiological Finding	Number of Patients	Percentage (%)
Intraocular Foreign Body	8	8%
Orbital Fracture	6	6%
Vitreous Hemorrhage	7	7%
Retinal Detachment	4	4%
No Significant Abnormality	25	25%

Intraocular foreign body was the most common abnormal radiological finding detected among patients undergoing imaging studies.

DISCUSSION

The present study evaluated the clinical profile, management strategies, radiological findings, and visual outcomes of ocular trauma in 100 patients presenting to PES Institute of Medical Sciences and Research. Ocular trauma continues to be an important cause of preventable monocular blindness and visual disability, particularly in developing countries.

In the present study, the majority of patients belonged to the 21–30 years age group, indicating that young adults are more vulnerable to ocular injuries. Similar findings were reported by MacEwen and Vats et al., who observed a higher incidence of ocular trauma among economically productive age groups due to increased outdoor activities and occupational exposure.[1,2] Young individuals are more likely to engage in high-risk activities, driving, and industrial work, increasing susceptibility to eye injuries.

Male predominance was observed in this study, with males accounting for 76% of cases. This finding is comparable with studies conducted by Maurya et al. and Saini and Sharma.[3,4] The higher frequency among males may be attributed to greater involvement in manual labor, agriculture, industrial occupations, and road traffic exposure.

Road traffic accidents constituted the most common mode of injury, followed by occupational trauma. Similar observations have been documented in several Indian studies where increasing vehicular density, lack of protective devices, and unsafe workplace environments significantly contributed to ocular injuries.[4,5] Agricultural and industrial workers formed a major proportion of affected individuals in the present study, reflecting the occupational risk prevalent in rural and semi-urban South India.

Closed globe injuries were more common than open globe injuries in the current study. This finding correlates with the Birmingham Eye Trauma Terminology System (BETTS)-based studies by Kuhn et al. and Pieramici et al.[6,7] Closed globe injuries generally demonstrate better prognosis due to preservation of ocular integrity, whereas open globe injuries are associated with severe tissue damage and poorer visual recovery.

Subconjunctival hemorrhage, periorbital edema, and corneal abrasions were among the most common clinical findings observed. Similar patterns have been reported in previous hospital-based studies on ocular trauma.[3,8] These manifestations are commonly associated with blunt trauma and often respond well to conservative management if treated early.

Radiological investigations played an important role in selected patients with suspected posterior segment involvement and orbital injuries. B-scan ultrasonography was the most commonly performed imaging modality, especially in cases with media opacity preventing fundus visualization. CT scan orbit was useful in detecting orbital fractures and intraocular foreign bodies. Similar observations have been reported in previous studies emphasizing the importance of imaging in ocular trauma evaluation.[9] Early radiological assessment aids in prompt diagnosis and surgical planning, thereby improving prognosis.

Most patients in the present study presented within 24 hours of injury, which contributed to favorable visual outcomes. Early presentation and immediate ophthalmic intervention are considered critical determinants of final visual acuity.[10] Delayed presentation may increase the risk of endophthalmitis, retinal complications, and permanent visual impairment.

Conservative medical management was sufficient in the majority of cases, while surgical intervention was required in severe injuries. Corneoscleral tear repair was the most commonly performed surgical procedure. Advances in microsurgical techniques and better postoperative care have significantly improved visual rehabilitation in ocular trauma patients.[11]

Visual acuity improved substantially after treatment, with most patients achieving good functional vision during follow-up. However, poorer visual outcomes were observed in patients with open globe injuries, retinal detachment, vitreous haemorrhage, and delayed hospital presentation. Similar findings have been reported in studies evaluating predictors of visual prognosis after ocular trauma.[7,12]

The findings of the present study highlight the need for preventive strategies such as the use of protective eyewear, workplace safety measures, road traffic regulation enforcement, and increased public awareness regarding early medical consultation after ocular injuries. Strengthening trauma care services and timely referral systems can further reduce ocular morbidity and prevent avoidable blindness.

CONCLUSION

Ocular trauma is a significant cause of preventable visual impairment, predominantly affecting young adult males. Road traffic accidents and occupational injuries were the major causes in the present study. Early presentation, appropriate radiological evaluation, and timely medical or surgical management resulted in favourable visual outcomes in most

patients. Public awareness, protective eyewear, and workplace and road safety measures are essential to reduce the burden of ocular trauma.

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