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Study of closed globe injury at a tertiary hospital

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Abstract
Background: *Ocular trauma is one of the most common causes of ophthalmic morbidity and monocular blindness worldwide. The purpose of this study is to assess the clinical presentation of closed globe injuries and to determine the final visual outcome of closed globe injuries after treatment.*
Materials and methods: *This was a hospital-based prospective longitudinal study conducted over 24 months at RIMS, Manipur, India. A total of 102 patients of closed globe injuries were included in the study. All patients underwent complete eye examination. Findings were analysed by proper statistical methods using SPSS software version 21(IBM).*
Results: *The results obtained showed that young adults were more commonly affected by closed globe injuries with male to female ratio of 3:1. Incidence of injuries were more common in rural dwellers with occupational work and the most common etiological factor was observed to be blunt objects. Majority of patients reported to our hospital within 24 hrs from the time of injury. The spectrum of injuries presented were subconjunctival haemorrhage, conjunctival tear, corneal foreign bodies, corneal abrasion, corneal lamellar laceration, hyphaema, iridocyclitis, mydriasis, angle recession, cataract or dislocated lens, vitreous haemorrhage and retinal detachment. At the time of presentation, 68.6% of eyes had normal vision, 21.6% of eyes had low vision while 9.8% of eyes were under blindness category. However, at 3 months follow-up, 93.2% of eyes presented with normal vision, while 4.8% of eyes were reported to have low vision and only 2.0% were under blindness category.*
Conclusion: *Emphasis should be made on the need to implement appropriate preventive measures at potentially hazardous places and also promote safe riding practices to prevent ocular trauma causing ocular morbidity.*
Key word*: closed globe injury, ocular trauma, clinical presentations, visual outcome.*

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I. Introduction

In this era of high speed traffic and industrialization, the incidence of injuries is increasing in general. Like any part of the body, eyes are also not exempted from these injuries. Ocular trauma remains an important cause of avoidable and, predominantly, monocular visual morbidity (visual impairment and blindness).[1] Regardless of eyes representing only 0.1% of the total body surface, their significance is disproportionally greater. The annual incidence rate of hospitalization for eye injuries per lakh population/year is 5-6% worldwide.[2] Several risk factors, including male gender, work place, road accidents, and lower socio-economic status, have been reported for ocular trauma.[3,4,5] 90% of all eye injuries are preventable as ocular trauma is one of the leading causes of preventable blindness in the world today.[6] Even then ocular trauma has been described as a neglected issue.[7] These should not be neglected because early intervention can make huge impact on final visual outcome. Ocular trauma has huge impact in terms of need for medical care, loss of income and cost of rehabilitation services and points towards the need for strengthening of preventive measures.

II. Objectives

1. To assess the clinical presentation of closed globe injuries.
2. To determine the final visual outcome of closed globe injuries after treatment.

III. Materials And Methods

Study design: Prospective longitudinal study

Study setting: The study was conducted in the Department of Ophthalmology, Regional Institute of Medical Sciences, Imphal, Manipur.

Duration of study: The study was carried out for a period of 24 months with effect from September 2018 to August 2020.

Study population: Patients with closed globe injuries.

Inclusion criteria:

I. All age groups
II. Patients who are willing to participate

Exclusion criteria:

I. Patients who refused to participate
II. Patients with birth injuries, war injuries, thermal injuries, ultrasonic injuries and radiation injuries
III. Patients with open globe injuries
IV. Patients with history of previous intraocular surgeries
V. Patients with associated head injury, which affects visual acuity
VI. Patients with co-morbid emergencies
VII. Patients who were lost to follow up in 3 months

Sample size:

Based on the study conducted by Karve S et al,[8]

41.05% = proportion of contusion in closed globe injuries (P)

Sample size was calculated by using the formula as follows:

$$n = P(100-P) / \mathcal{E}^2$$

where,

$\mathcal{E}$ = standard error = $L/Z\alpha_{/2}$

$Z\alpha_{/2}$ = if 95% confidence level is 1.96

L = absolute allowable error at 10%

So, $41.05(100-41.05)/ \{10/1.96\}^2$

= 93

Assuming 10% loss to follow up,

Total sample size =102

Study variables:

I. Personal information- age, sex, address, occupation.
II. History taking- type of trauma (sharp or blunt), location and nature of trauma, time elapse between trauma and the time of presentation.
III. Examination: general physical examination, local examination.
IV. Ophthalmologic evaluation- distant visual acuity with Snellen's chart, Intraocular pressure measurement with Schiotz tonometer or Non-contact Tonometer, Slit Lamp Biomicroscopy, fundoscopy with Direct and Indirect ophthalmoscope (if possible). In relevant cases, 90D lens examination and gonioscopy.
V. Radiological investigation- X-ray orbit, ultrasound B scan, CT brain, MRI brain in relevant cases.

Working definitions:

Closed globe injury-ocular injury without a full-thickness defect of the coats. They are further divided into:

I. Contusions: closed globe injury resulting from blunt trauma, direct energy delivery (e.g. choroidal rupture) or due to change in shape of the globe (e.g. angle recession).
II. Lamellar laceration: partial thickness wound of the eye wall resulting from sharp objects or blunt trauma.

Procedure:

I. Complete medical history and informed consent was taken from each patient.
II. Visual Acuity was measured using Snellen's distant visual acuity chart and converted to logMAR value.
III. Local examination of the eye including inspection head posture, forehead, eyebrows, eyelids, lacrimal apparatus and eyeball were done.
IV. Anterior segment examination was performed with the torch light and slit lamp biomicroscopy.
V. Intraocular pressure was measured with Schiotz tonometer or NCT.
VI. Fundus examination (if possible) was done by direct and indirect opthalmoscope and 90D lens.

VII. In relevant cases, gonioscopy was done.
VIII. Follow up - All patients were followed up at 1week, 2 weeks, 6weeks and 3months. During their visits, visual acuity, IOP, fundoscopy and slit lamp examination were done. Final visual outcome of the patient and complications as a sequelae of closed globe injuries were evaluated.

Statistical analysis:

Data were entered and analysed using IBM SPSS software version 21.0. (IBM Inc. Armonk, NY:IBM Corp.). Description statistics like mean, median, standard deviation and proportion were used.

Ethical issues:

Ethical approval was obtained from the Research Ethics Board, Regional Institute of Medical Sciences, Imphal. Proper written informed consent or assent was obtained from all the participants. Confidentiality and privacy were maintained.

IV. RESULTS

Out of 102 eyes with closed globe injuries, the age group of 16 to 30 years has the highest incidence with 33(32.4%) cases, followed by 25(24.5%) cases in the age group of 31 to 45 years (Table 1). Mean±SD was found to be 30.39±17.81years.

Table 1: Age distribution of patients studied (N=102)

Age (years)	No. of patients	Percentage
0-15	23	22.5
16-30	33	32.4
31-45	25	24.5
46-60	14	13.7
61-75	7	6.9

Males were more commonly affected than females with a male to female ratio of 3:1 (table 2).

Table 2: Gender distribution of patients studied (N=102)

Gender	No. of patients	Percentage
Male	77	75.5
Female	25	24.5

In the population studied, the closed globe injuries were more frequently observed in rural residents as compared to urban dwellers (table 3).

Table 3: Geographical distribution of patients studied (N=102)

Address	No. of patients	Percentage
urban	36	35.3
rural	66	64.7

Majority of the patients sustained injuries due to occupational work. Other incidences of injury were road traffic accidents, domestic injuries and assault (table 4).

Table 4: Incidence of injury distribution of patient studied (N=102)

Incidence of injuries	No of patients	Percentage
Occupational	39	38.2
Road traffic accidents	30	29.4
Domestic	27	26.5
Assault	6	5.9

The most common cause of closed globe injuries were blunt objects. Other etiological factors were foreign bodies, vegetative matter, sharp objects, finger, sports equipments and animals (Table 5).

Table 5: Etiological factors distribution of patients studied (N=102)

Etiological Factors	No. of eyes	Percentage
Blunt objects	33	32.4
Sharps	8	7.8
Foreign body	32	31.4
Vegetative matter	12	11.8
Sports equipment	6	5.9
Finger or fist	7	6.9
Animal parts	4	3.9

Majority of the patients presented to the hospital within 24 hrs from the time of injury (Table 6).

Table 6: Reporting time distribution of patients studied (N=102)

Time of reporting	No. of patients	Percentage
24 hr	69	67.6
72 hr	26	25.5
7 days	3	2.9
15 days	4	3.9

The spectrum of injuries showed that subconjunctival haemorrhage was the most common presentation followed by corneal abrasion, corneal foreign body and hyphaema. In this study, the posterior segment injuries reported were vitreous haemorrhage and retinal detachment (Table 7).

Table 7: Pattern of injury distribution of patients studied (N=102)*

Pattern of injury	No. of eyes	Percentage
Subconjunctival haemorrhage	58	56.9
Conjunctival tear	12	11.8
Corneal foreign body	40	39.2
Corneal abrasion	43	42.2
Corneal lamellar laceration	5	4.9
Hyphaema	20	19.6
Iridocyclitis	16	15.7
Traumatic mydriasis	19	18.6
Traumatic angle recession	14	13.7
Cataract/dislocated lens	4	3.9
Vitreous haemorrhage	5	4.9
Retinal detachment	6	5.9

*Multiple response

The Snellen's best corrected visual acuity at the time of presentation was 6/60 or better in 80.3% of eyes. At the end of 3 months 96.1% of eyes attained BCVA 6/60 or better while poor visual outcome of less than 6/60 or worse at 3 months follow-up was seen in 3.9% of eyes (Table 8).

Table 8: Best corrected visual acuity (BCVA) of patients studied (N=102)

BCVA	No. of eyes (%)				
	On presentation	At 1 week	At 2 weeks	At 6 weeks	At 3 months
6/6-6/18	68.6	81.4	87.3	91.2	93.2

<6/18-6/60	11.7	8.8	6.8	3.9	2.9
<6/60-3/60	9.9	3.9	3.9	2.9	1.9
<3/60-NLP*	9.8	5.9	2	2	2

*****NLP-No light perception

V. Discussion

Out of the total 102 cases who presented to the department of ophthalmology, RIMS, Imphal, with closed globe injuries, within a span of 24 months, the patients belonging to the age group of 16-30 years have the highest incidence (32.4%). This age group constitute the productive age group with more social and outdoor activities at work place. While the least were in patients aged more than 60 years (6.9%). These findings correspond to the study conducted by Karve S et al[8] who observed that 36.25% of cases were in the age group of 16 to 30 years.

The current study showed male dominance with male to female ratio of 3:1. This male preponderance could be related to occupational exposure and driving under the influence of alcohol. Similar results were observed in other studies such as Pandita A et al[9] which also reports 74% male and 26% female. Majority of the patients were from rural areas (64.7%) which correspond to the study done by Syal E et al[10] which showed 74% of cases from rural areas. Most patients from rural areas were from poor economic background with limited access to emergency eye care facilities.

The closed globe injuries were most commonly associated with occupational workplace (38.2%) which resulted mostly due to exposure to occupational hazards without adequate protective measures. The results were in agreement with studies conducted by Krishnaiah S et al.[11] Road traffic accident (29.4%) is the second most common cause which occurred mostly as a result of rash driving under the influence of alcohol or driving without the use of protective measures. Domestic cause of ocular trauma was seen in 26.5% while the least incidence was seen with assault (5.9%). The study conducted by Sthapit PR et al[12] showed contradicting results with workplace injuries associated with 17.9% cases, domestic injuries with 56% cases, and assault with 15.2% cases.

Blunt tauma was found to be the most common (32.4%) etiological factor of closed globe injuries followed by foreign bodies (31.4%). In this study, most of the foreign bodies were found on the cornea. Other etiological factors were vegetative matter (11.8%), sharp objects (7.8%), finger or fist (6.9%) usually during assault, and animal parts (3.9%) like fur or bite. These findings roughly correlates to those reported by Karve S et al[8] which also reported blunt objects (25.56%) as the most common cause followed by foreign bodies (21.09%).

In this study, 67.6% of cases reported to hospital within 24 hours from the time of injury while 25.5% of cases were reported within 72 hours. 2.9% of patients were reported in 1 week and 3.9% of patients were reported in 2 weeks. Studies done by Elhesy AE[13] was comparable with the findings of this study who observed that 69.5% of cases reported to hospital within 24 hours. Patients presenting late were mostly due to inadequate facilities for transport and emergency care. Early initiation of treatment resulted in better prognosis whereas even minor injury proved blinding with delayed treatment.

Anterior segment was most commonly involved in this study. The presentation of anterior segment injuries were subconjunctival haemorrhage (56.9%), conjunctival tear (11.8%), corneal foreign bodies (39.2%), corneal abrasion (42.2%), corneal lamellar laceration (4.9%), hyphaema (19.6%), iridocyclitis (15.7%), traumatic mydriasis (18.6%), traumatic angle recession (13.7%), and traumatic cataract or dislocated lens (3.9%). In our study, the posterior segment injuries observed were vitreous haemorrhage (4.9%) and retinal detachment (5.9%). As several patients presented with more than one pattern of injuries, the total number of injuries was more than the number of eyes.

The best corrected visual acuity (Snellen's chart) at the time of presentation was 6/18 or better in 68.6% of eyes and <6/18 to 6/60 in 11.7% of eyes, <6/60-3/60 in 9.9% of eyes and <3/60 in 9.8% of eyes. According to the ICD definitions of visual impairment,[14] at the time of presentation, 68.6% of eyes had normal vision, 21.6% of eyes had low vision while 9.8% of eyes were under blindness category. These patients were initiated with the required treatment and followed up. At 3 months follow-up, 93.2% of eyes were observed to have BCVA of 6/18 or better (normal vision), with a percentage difference of 24.60% from the time of presentation. While 2.9% of eyes were reported to have BCVA of <6/18 to 6/60 and 1.9% of eyes reported BCVA of <6/60 to 3/60. However, 2.0% of eyes were presenting with BCVA of <3/60 or worse even after treatment. Thus, by 3 months, 4.8% of eyes were reported to have low vision and only 2.0% were under blindness category. The findings were comparable with those reported by Gahlot A et al[15] and Raiturcar TA et al[16] where 89.34% and 87.4% of eyes respectively were observed to have normal final visual acuity. The final visual acuity depended on various factors such as pattern and extent of injury, time delay between injury and presentation to the hospital, type of treatment given, and the presence of pre-existing ocular comorbidities.

VI. Conclusion

Ocular trauma is a major cause of ocular morbidity and mortality. Ocular injuries are more commonly seen in 2nd and 3rd decade of age, i.e, the young wage earner age group and seen more commonly in males. Closed globe injuries occur more commonly at occupational work place with blunt object as the major cause. Prevention is always better than cure, so emphasizing the need to implement appropriate preventive measures at potentially hazardous places and promoting safe riding practices with strict implementation of traffic rules is needed to prevent ocular trauma causing ocular morbidity. In ocular trauma, delay in seeking medical help could increase the severity of the disease and affects the final visual outcome. So, prompt transfer to good eye facility and early management are key factors in preventing visual mortality. The impact of ocular trauma in terms of medical care, loss of productivity, and cost of rehabilitation services, clearly highlight the importance of preventive strategies. Eye care programmes need to emphasize ocular trauma as a priority in the rural population.

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