

A Clinical Study on Anterior Segment Injury of Eye and its Visual Outcome

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Abstract: Ocular injuries constitute a major cause of visual morbidity, with a significant socioeconomic impact. This study was a hospital based prospective study undertaken to identify the various types of anterior segment injuries and its presentation and to find out the visual outcome after treatment. **Results:** A total of 78 patients of trauma were evaluated with majority in the age group of 20–29 years (32.05%), males 58 (74.36%) being predominantly affected. The majority of ocular injuries 31 (39.74%) occurred during agricultural work. 50 (64.10%) patients presented with closed Globe Injury. Majority of the patients 44 (56.41%) required surgical intervention. The visual acuity at presentation and after 3 months of treatment were compared and analyzed with the Chi square test, and was found to be statistically significant ($p < 0.001$). **Conclusion:** Agricultural trauma accounts for a great majority of the cases with eye injuries. But early intervention can give satisfactory visual results.

Keywords: Ocular trauma, closed globe injury, open globe injury, visual outcome

1. Introduction

Ocular injuries constitute a major cause of visual morbidity, with a significant socioeconomic impact. They are also considered an important, preventable, public health problem the world over.¹ Nature has provided considerable protection to the eyes. The bony structures of the orbit protect the eye and also allows it to move freely in a wide arc. The upper and lower eyelids form a mechanical barrier that protects the eye from foreign objects. Conjunctiva protects the sensitive tissues underneath it. Tears keep the surface of the eye moist. Moreover, it contain enzymes and antibodies that help prevent infection². Still eyes are exposed to various forms of trauma, most of which are preventable. Trauma can be in the form of blunt injuries, penetrating or perforating injuries, chemical injuries, thermal injuries, foreign body etc. The occurrence of ocular trauma is a facet of everyday life and prevalent in all societies. Within community surveys, ocular trauma is one of the leading cause of unocular visual impairment³. It is also the leading cause of non congenital unilateral blindness and monocular visual disability in children⁴

Worldwide, 55 million eye injuries occur each year restricting activities more than one day; approximately 1.6 million people are blind from injuries, an additional 2.3 million people with bilateral low vision from this cause⁵. More than 2.5 million eye injuries occur in the United States each year, and 50,000 people permanently lose part or all of their vision^{6,7}. The incidence of eye injuries may be higher in developing countries^{8,9}. In the Indian context, injury as a cause of blindness constitutes 1.5% of total cases (NPCB 2002)¹⁰. Persons of lower educational levels and lower socioeconomic class are more likely to be injured. Ignorance and illiteracy among the poor and rural folks contribute in a big way to ocular morbidity.

2. Materials and Methods

This study was a hospital based prospective study

undertaken in the Department of Ophthalmology, Assam Medical College & Hospital, Dibrugarh over a period of 1 year from 1st July 2016 to 30th June 2017 and cases of mechanical ocular injuries were included in the study with the following aims and objectives:

- To identify the various types of anterior segment injuries and its presentation.
- To find out the visual outcome after treatment.

Inclusion Criteria

- All cases of mechanical ocular injuries involving anterior segment.
- Age more than 5 years.

Exclusion Criteria

- Age less than 5 years of age.
- Pre existing ocular disease.
- Injuries involving posterior segment.
- Extra ocular injuries only without associated globe injury.
- Prior history of intra ocular surgery.

3. Methodology

- 1) Patients were explained the nature of study and prior consent was taken from every patient. The study was registered with the Institutional Review Board and ethical clearance was obtained from the Institutional Ethics Committee.
- 2) All patients presenting with ocular injury involving the anterior segment in the age group of more than 5 years were subjected to a detailed history and a thorough ocular examination. B-scan ultrasonography was performed in those cases with media opacities to rule out posterior segment abnormality following injury.
- 3) The type of injury was classified according to the Birmingham Eye Trauma Terminology system (BETTS classification).
- 4) Patients were managed medically and / or surgically (as required), with some patients admitted for further management and specialized care.

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5) Patients were followed up at 1 month and 3 months and the best corrected visual acuity was noted on each follow up.

4. Results

The study shows that the majority of the patients, 25 (32.05%) out of 78 patients of ocular injuries were in the age group of 20–29 years, followed by 18 (23.08%) in the age group of 30–39 years.

Table 1: Age Distribution

Age Group (in years)	Number (n)	Percentage (%)
<10	7	8.97
10–19	11	14.1
20–29	25	32.05
30–39	18	23.08
40–49	11	14.1
50–59	4	5.13
>= 60	2	2.56
TOTAL	78	100
Mean ± S.D.	27.94 ± 13.26 years	

Also the incidence of ocular injury is found to be higher in Males 58 (74.36%) as compared to females 20 (25.64%). This is probably because males are more exposed to outdoor activities and occupation

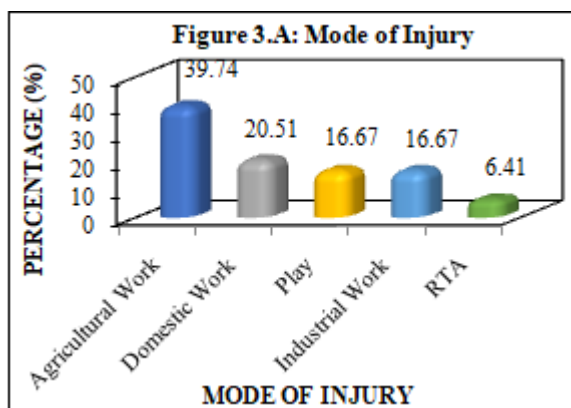
Table 2: Sex Distribution

Sex	Number (n)	Percentage (%)	Ratio (M: F)
Male	58	74.36	2.9: 1
Female	20	25.64	
Total	78	100	

The majority of ocular injuries occurred during agricultural work 31 (39.74%), followed by Domestic Work 16 (20.51%), Industrial work 13 (16.67%), Play 13 (16.67%) and RTA–5 (6.41%). Agricultural work is the commonest mode of injury probably because agriculture is the main occupation in this area, where the present study is undertaken.

Table 3: Mode of Injury

Mode of Injury	Number (n)	Percentage (%)
Agricultural Work	31	39.74
Domestic Work	16	20.51
Play	13	16.67
Industrial Work	13	16.67
RTA	5	6.41
Total	78	100



The most common object causing ocular injury was Wooden Stick 14 (17.95%) followed by Vegetative matter 11 (14.10%), Stones 11 (14.10%), Wire 8 (10.26%), Sharp Particles 8 (10.26%), Ball 7 (8.97%), Metal Rod 6 (7.69%), Round Object (eg. betel nut, marble etc) in 3 (3.85%). The others 10 (12.82%) included injury with finger nail, screw, meatbone, firecracker, torch, fall etc. Wooden stick was the commonest material causing ocular injury probably because it is used in farmland as well as in different domestic work in this region.

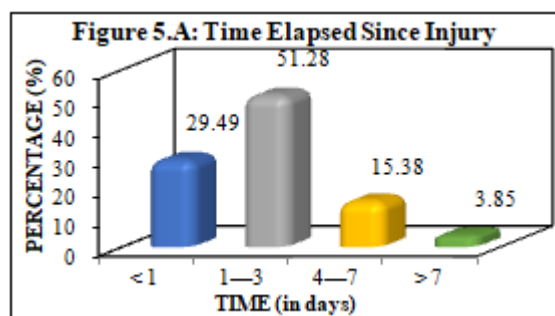
Table 4: Object Causing Injury

Object Causing Injury	Number (n)	Percentage (%)
Wooden Stick	14	17.95
Vegetative Matter	11	14.1
Stone	11	14.1
Metal Rod	6	7.69
Wire	8	10.26
Ball	7	8.97
Round Object	3	3.85
Sharp Particles	8	10.26
Others	10	12.82
TOTAL	78	100

Majority of the patients 40 (51.28%) in the present study attended the hospital between 1–3 days. 23 (29.49%) patients arrived in less than 24 hours, 12 (15.38%) patients between 4–7 days and 3 (3.85%) patients attended hospital after 7 days. Late attendance in the present study is probably due to lack of eye care awareness, poverty and lack of proper road transportation facilities

Table 5: Time Elapsed Since Injury (in Days)

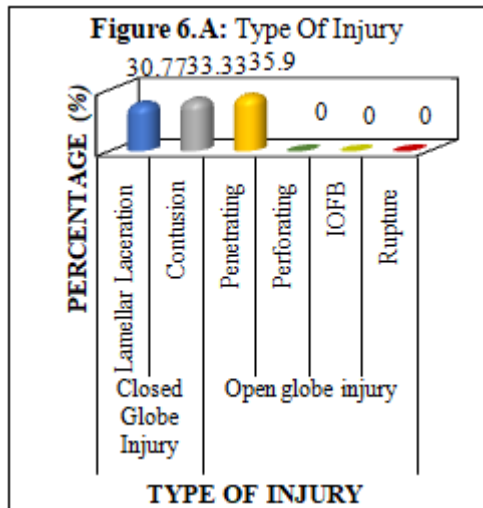
Time Elapsed Since Injury	Number (n)	Percentage (%)
< 1	23	29.49
1–3	40	51.28
4–7	12	15.38
> 7	3	3.85
TOTAL	78	100



The type of injury in the present study is classified according to the Birmingham Eye Trauma Terminology system. Out of 78 patients, 50 (64.10%) patients presented with closed Globe Injury and 28 (35.90%) patients presented with Open Globe injury. 24 (30.77%) patients out of closed Globe injury had Lamellar Laceration and 26 (33.33%) had contusion. In the Open Globe injury, all 28 (35.90%) patients had penetrating injuries.

Table 6: Type of Injury

Type of Injury	Number (n)	Percentage (%)
Closed Globe Injury		
♦ Lamellar Laceration	24	30.77
♦ Contusion	26	33.33
Open globe injury		
♦ Penetrating	28	35.9
♦ Perforating	0	0
♦ IOFB	0	0
♦ Rupture	0	0



Out of 78 patients, 28 (35.90%) patients presented with Corneal Laceration (full thickness), 17 (21.79%) patients had Corneal Abrasion, 6 (7.69%) had Corneal Ulcer and 2 patients (2.56%) had Corneal Foreign Body. In the anterior chamber, Hyphaema was present in 25 (32.05%) patients, Hypopyon in 3 (3.85%) and Lens matter in anterior Chamber was present in 3 (3.85%) patients. Iris prolapse was present in 18 (23.08%) patients and 2 (2.56%) patients had iridodialysis. Traumatic Mydriasis was seen in 7 (8.97%) patients. In the Lens, 7 (8.97%) patients presented with traumatic cataract, 5 (6.41%) patients had subluxation of lens and 2 (2.56%) patients presented with dislocation of the lens. Tear of the anterior capsule was seen in 3 (3.85%) patients

Table 7: Involvement of Ocular Structures Following Eye Injury

Clinical Presentation Following Eye Injury	Number (n)	Percentage (%)
Conjunctival involvement	31	39.74
Corneal involvement	62	79.48
Scleral involvement	1	1.28
Hyphaema	25	32.05
Hypopyon	3	3.85
Iris involvement	22	28.2
Traumatic mydriasis	7	8.97
Lens involvement	17	21.79

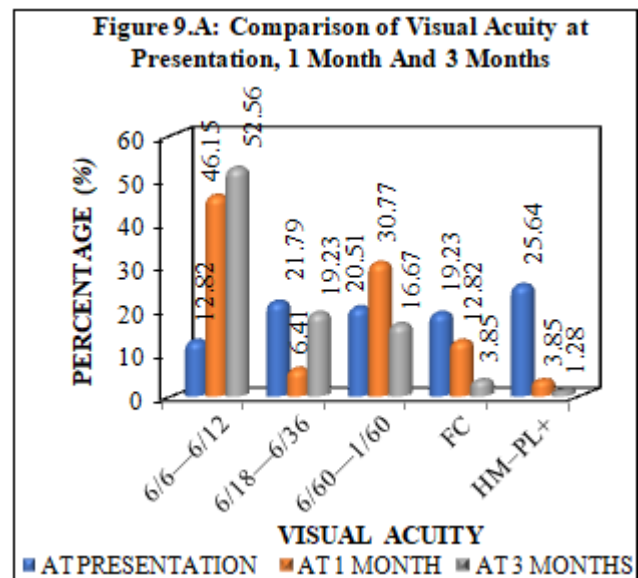
Majority of the patients 44 (56.41%) required surgical intervention with different surgical procedures and 34 (43.59%) patients were managed conservatively.

Table 8: Type of Management

Treatment	Number (n)	Percentage (%)
Conservative	34	43.59
Surgical:		
• Repair	23	29.49
• Paracentesis	8	10.25
• IOL implantation	17	21.79
• FB removal	2	2.56

Table 9: Comparison of Visual Acuity at Presentation, 1 Month and 3 Months

Visual Acuity	At presentation		At 1 month		At 3 months		χ^2	p value*
	n	%	n	%	n	%		
6/6-6/12	10	12.8	36	46.1	41	52.6	64.0533	< 0.001
6/18-6/36	17	21.8	5	6.41	15	19.2		
6/60-1/60	16	20.5	24	30.8	13	16.7		
FC	15	19.2	10	12.8	3	3.8		
HM-PL+	20	25.6	3	3.85	1	1.3		
Total	78	100	78	100	73	94		



Chi square test was employed to compare the visual acuity before and after treatment, with a p value of less than 0.05 being considered significant.

It was observed in the present study that majority of the patients 41 (52.56%) achieved good vision in the range of 6/6-6/12 at the end of 3 months following treatment. 15 (19.23%) had visual acuity in the range of 6/18-6/36 and 13 (16.67%) in the range of 6/60-1/60. Only 3 patients (3.85%) had finger counting and 1 (1.28%) patient had hand movement at the end of 3 months. However 5 patients didn't come for follow up at the end of 3 months.

The visual acuity before and after 3 months of treatment were compared and analyzed with the Chi square test, and the visual outcome of management in this study was found to be statistically significant (p<0.005).

5. Discussion

In the present study most of the ocular injuries (55.12%) occurred within the first three decades of life. It shows highest incidence of ocular trauma in third decade (32.05%)

which is in close relation with Bharat Kumar Jain *et al*¹¹ (2015) who reported highest incidence of ocular trauma (57.9%) in 20–30 years. The incidence of ocular injury was found to be high in males (74.36%). This is probably, they are more exposed to outdoor activities. Similar male predominance were shown by Somen Misra *et al*¹² (2013) and G.S. Gopinath *et al*¹³ (2015)

The majority of ocular injury in the present study was related to Agricultural Work (39.74%) which is similar to Nirmalan *et al*¹⁴ (2004) where most of the ocular trauma occurred during agricultural work (46.9%). This is probably because agriculture is the main occupation of the people in this area where the present study is undertaken.

The most common object causing ocular injury in the present study is Wooden Stick (17.95%) followed by Vegetative Matter (14.10%). This correlates well with Sana Nadeem *et al*¹⁵ (2013) and Govind Singh Titiya *et al*¹⁶ (2013), Majority of the patients presented with Closed Globe injuries (64.10%) which is similar to Karaman K *et al*¹⁷ (2004) and G.S. Gopinath *et al*¹³ (2015)

In the present series, Cornea was affected in 79.48% of the patients, out of which corneal abrasion and ulceration constituted 29.48%. In the anterior chamber (AC), present study reported hyphaema (32.05%), Hypopyon (3.85%) and Lens matter in AC (3.85%). Similar findings are reported in a study by Dongre *et al*¹⁸ (2016) where corneal lesions were seen in 78% cases, Hypopyon in 3% and Lens Matter in AC in 5% cases. However, he reported a lower incidence of hyphaema (12%). Out of 78 patients iris involvement was seen in 22 (28.02%) cases. This is similar to the finding reported by Sana Nadeem *et al*¹⁵ (2013) who found iris prolapse in 28.9% cases. Traumatic Mydriasis was seen in 7 (8.97%) patients. Dongre *et al*¹⁸ (2016) reported traumatic mydriasis in 10% cases. In the lens, Anterior Capsular Tear was seen in 3.85%, Subluxation in 6.41% and traumatic cataract in 8.97%. MA Rani Sujatha *et al*¹⁹ (2015) in her study on ocular trauma found subluxation in 2% cases and traumatic cataract in 9% cases.

Regarding management, 34 (43.59%) out of 78 patients were managed conservatively, while the rest (56.41%) required surgical intervention. Similar findings were reported by Sana Nadeem *et al*¹⁵ (2013) where 43.4% cases were managed conservatively, and 56.6% required surgery.

In the present study, it was found that, at presentation 10 (12.82%) patients had vision in the range of 6/6–6/12, 17 (21.79%) patients in the range of 6/18–6/36, 16 patients (20.51%) in the range of 6/60–1/60, 15 (19.23%) patients with counting finger, 15 (19.23%) patients with hand movement and 5 (6.41%) patients had only perception of light. At the end of 3 months of treatment, there was a significant improvement in the visual acuity with 41 (52.56%) patients achieving good vision in the range of 6/6–6/12, 15 (19.23%) patients in the range of 6/18–6/36, 13 (16.67%) in the range of 6/60–1/60 and only 4 (5.12%) in the range of counting fingers to perception of light. However 5 patients didn't come for follow up at 3 months. Similar findings were shown by Avinash Mishra *et al*²⁰ (2014) and Sanjeev K. Nainiwa *et al*²¹ (2016)

6. Conclusion

Ocular trauma is one of the most common causes of ocular morbidity, especially in rural areas. It can occur at any age. In India, ocular trauma due to agricultural work accounts for a great majority of the cases. The incidence of eye injuries can be decreased by the use of protective glasses during work. The visual outcome following trauma depends upon many factors such as site of injury, extent of injury, type of injury etc. But early intervention can give satisfactory visual outcome. However attempt should be made to prevent ocular trauma by proper counseling of the farmers and workers regarding the usage of protective glasses and also by creating a basic awareness among parents and teachers to prevent ocular trauma in children.

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