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Research Article

A PROSPECTIVE STUDY OF ANALYSIS OF OCULAR MANIFESTATIONS OF BLUNT TRAUMA TO THE EYE

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Abstract

Introduction: Blunt ocular trauma is one of the most common eye injuries, particularly in younger individuals, and blunt objects account for approximately 30% of all such injuries. The primary cause is road traffic accidents, followed closely by occupational hazards. Blunt ocular trauma can result in either open or closed globe injuries. Closed globe injuries, where the outer structure of the eye remains intact, are classified into contusions, caused by blunt impact, and lamellar lacerations, which involve partial-thickness cuts. Open globe injuries, where the outer eye is breached, are categorized into lacerations, caused by sharp objects, and globe ruptures, which occur when the eye is severely damaged by blunt force.

Materials and methods: It is a prospective, interventional study. 200 cases of blunt trauma presented at Department of Opthalmology, Sapthagiri Institute of Medical Sciences, Bengaluru from February 2025 to January 2026 were prospectively studied. Visual acuity was recorded on Snellen's chart, direct ophthalmoscopy, indirect ophthalmoscopy, slit-lamp examination were done. Relevant investigations were carried out such as X-ray orbit, fluorescein staining, lacrimal probing, syringing, gonioscopy, B-scan ultrasonography, CT scan and MRI scan in selected patients. All Cases of Blunt Injury to the Eye, Attending the outpatient department and Casualty department of Department of Opthalmology, Sapthagiri Institute of Medical Sciences are included. All Cases of Chemical injuries, Injuries with sharp instruments (penetrating, perforating) were excluded from the study. Patients who were having serious injuries which led them to life risk and needed priority management by other specialties were also excluded from the study.

Results: In our study, the M: F ratio was 5.25:1 (168:32) with clear male

preponderance. Age incidence study showed that blunt ocular injuries were common in younger age group comprising of 132 patients (66%) i.e. below the age of 35 years (people who are very active and in productive age group). 104 patients (52%) had occupational injuries of which 70% were farmers. Object causing blunt injuries are stone (18%) and stick (12%). Ocular structure involved in blunt trauma mainly are: anterior segment injuries- 188 patients (94%); i.e. conjunctiva- 140 patients (70%), lid- 130 patients (65%), periorbital lesions- 112 patients (56%), ecchymosis of periorbital tissue- 84 patients (42%), lid oedema- 74 patients (37%), iris involvement- 40 patients (20%), lens involvement- 30 patients (15%), cornea involvement- 28 patients (14%), traumatic miosis- 12 patients (6%), traumatic mydriasis- 18 patients (9%); posterior segment- 36 patients (18%) were involved in which retinal detachment- 8 patients (4%), macular oedema- 6 patients (3%) vitreous haemorrhage- 6 patients (3%) and 4 cases with choroidal rupture were seen.

Conclusion: It is clear from this study as well as other epidemiological studies conducted over past 15 years that ocular trauma is associated with varying degrees of loss of vision and earning capacity with social and economic consequences. This is an area for further research; additional investigation is also needed to develop and evaluate new interventions for prevention and management of all types of eye injuries. Interdisciplinary approaches and community-based strategies will be important to make progress in this area of study to save and salvage vision. From this study, we can infer that children and young adults are more prone to blunt ocular trauma, occupational injuries, and road traffic accidents constitute the main bulk of injuries. Injury with stone was the most common (36 cases, 18%), next comes stick injuries (24 cases, 12%; agriculture related injuries) in causation of blunt ocular trauma.

Key Words: Blunt ocular trauma, loss of vision, gonioscopy, traumatic mydriasis.

INTRODUCTION

Blunt ocular trauma is one of the most common eye injuries, particularly in younger individuals, and blunt objects account for approximately 30% of all such injuries. The primary cause is road traffic accidents, followed closely by occupational hazards.[1]

Blunt ocular trauma can result in either open or closed globe injuries. Closed globe injuries, where the outer structure of the eye remains intact, are classified into contusions, caused by blunt impact, and lamellar lacerations, which involve partial-thickness cuts. Open globe injuries, where the outer eye is breached, are categorized into lacerations, caused by sharp objects, and globe ruptures, which occur when the eye is severely damaged by blunt force.[2]

Blunt ocular trauma can result from coup and countercoup forces, as well as anteroposterior compression or horizontal tissue expansion. Coup injuries occur at the site of impact, resulting in conditions such as subconjunctival hemorrhage, corneal abrasions, and subretinal or choroidal

hemorrhages. Contrecoup injuries, on the other hand, occur on the opposite side of the impact due to shock waves passing through the eye, as seen in conditions like commotio retinae.[3]

Ocular trauma is the most important preventable cause of blindness or partial loss of vision in more than half a million people worldwide, the commonest victim is young male. With the knowledge of circumstances of injury, their nature and the damage caused, early appropriate management can be taken, and preventive measures may be advised.[4]

Anterior segment structures are effectively attached to the scleral wall, Iris is attached to the Iris root, lens anchored by the Zonules and the Ciliary body attaches to the scleral spuranteriorly.[5] As the globe is deformed the Mechanical energy is transformed into hydraulic pressure wave. These forces act on the anterior segment structures forcing their untethered ends posteriorly while this is occurring, the attached peripheral ends are directed more equatorially with the expansion of globe in this dimension and the combination of events creates shearing forces, this forceful expansion of tissue results in tears.[6]

MATERIALS AND METHODS

Study Design

It is a prospective, interventional study. 200 cases of blunt trauma presented at Department of Opthalmology, Sapthagiri Institute of Medical Sciences, Bangalore from February 2025 to January 2026 were prospectively studied. Visual acuity was recorded on Snellen's chart, direct ophthalmoscopy, indirect ophthalmoscopy, slit-lamp examination were done. Relevant investigations were carried out such as X-ray orbit, fluorescein staining, lacrimal probing, syringing, gonioscopy, B-scan ultrasonography, CT scan and MRI scan in selected patients.

Inclusion Criteria

All Cases of Blunt Injury to the Eye, Attending the outpatient department and Casualty department of Opthalmology, Sapthagiri Institute of Medical Sciences are included.

Exclusion criteria

All Cases of Chemical injuries, Injuries with sharp instruments (penetrating, perforating) were excluded from the study.

Patients who were having serious injuries which led them to life risk and needed priority management by other specialties were also excluded from the study.

Patients presenting with history of blunt injury to one or both eyes were selected from the out patients and in patients of ophthalmology Patients referred with blunt eye injury from the casualty department of ********** were selected.

The time interval between injury and consultation at these hospitals varied considerably. The earliest injury consultation interval being 2 hours and the longest being 10 days.

When a patient presented with a history of blunt injury. A detailed history regarding

age, sex, occupation, causative agents, duration of injury, direction of force, signs and symptoms occurring following the injury were taken.

A detailed torch light examination was performed. Vision was recorded on Snellen's chart. Ophthalmoscopy was performed in cases wherever possible. Slit-lamp examination was performed in all the cases.

Gonioscopy was performed in all patients except patients with purely subconjunctival haemorrhage and corneal injury and severe lid injury, oedema which prevented from doing gonioscopy.

Plain X-Ray

X-ray of the skull in anteroposterior view, Water's (nose chin) position and parieto-orbital oblique projection were taken whenever necessary and in all medico-legal cases.

B Scan

Ultrasonography was performed in patients, where fundus could not be visualised and wherever suspected to have a vitreous haemorrhage, retinal detachment with or without media opacities.

CT Scan Plain was done for the following cases:

Orbital fracture, Road Traffic accident cases, in patients with history of fall and medicolegal cases with badly injured globe and adnexa and in desirable cases.

MRI

Magnetic Resonance Imaging Scans were done in all medico legal cases and in other cases wherever it was necessary.

RESULTS

In our study, the M: F ratio was 5.25:1 (168:32) with clear male preponderance. Age incidence study showed that blunt ocular injuries were common in younger age group comprising of 132 patients (66%) i.e. below the age of 35 years (people who are very active and in productive age group). 104 patients (52%) had occupational injuries of which 70% were farmers. Object causing blunt injuries are stone (18%) and stick (12%). Ocular structure involved in blunt trauma mainly are: anterior segment injuries- 188 patients (94%); i.e. conjunctiva- 140 patients (70%), lid- 130 patients (65%), periorbital lesions- 112 patients (56%), ecchymosis of periorbital tissue- 84 patients (42%), lid oedema- 74 patients (37%), iris involvement- 40 patients (20%), lens involvement- 30 patients (15%), cornea involvement- 28 patients (14%), traumatic miosis- 12 patients (6%), traumatic mydriasis- 18 patients (9%); posterior segment- 36 patients (18%) were involved in which retinal detachment- 8 patients (4%), macular oedema- 6 patients (3%) vitreous haemorrhage- 6 patients (3%) and 4 cases with choroidal rupture were seen.

Age group	Number of cases	Percentage
0-15	30	15
16-25	30	15
26-35	72	36
36-45	36	18
46-55	16	8
Above 55	16	8
Total	**200**	**100**

Table 1: Age incidence

Gender	Number of cases	Percentage
Male	168	84
Female	16	16
Total	**200**	**100**

Table 2: Gender distribution

Source of injury	Number of cases	Percentage
Occupational injuries	104	52
Sports & Play	46	22
RTA & Assault	44	22
Others	6	3
Total	**200**	**100**

Table 3: Distribution of Cases According to Source of Injury

Object	Number of cases	Percentage
Stone	36	18
Stick	24	12
Iron rod	14	7
Ball	10	5
Fist	24	12
Metallic/Wooden extraocular FB	8	4
Branch of tree	8	4
Bull gore	12	6
Knob of door, Cup board	8	4
Whip lash	8	4
Cycle/Scooter handle	8	4
Handle of handloom/lathe/Silk	6	3

Reeling machine		
Finger nail	4	2
Pencil/Pen blunt end	4	2
Racquet	4	2
Tooth brush	4	2
Others (RTA etc.)	18	9
Total	**200**	**100**

Table 4: Objects Causing Blunt Injury

Ocular Involvement	No. of Cases	Percentage
Periorbital region	112	56
Lids	130	65
Conjunctiva	140	70
Cornea	28	14
Hyphaema (AC)	12	6
Iris	40	20
Angle Recession	12	6
Lens	30	15
Posterior segment	36	18

Table 5: Ocular Structures Involvement

Periorbital Lesions	No. of Cases	Percentage
Ecchymosis	84	42
Lid oedema	74	37
Laceration	16	8
Emphysema	8	4
Fracture	18	9

Table 6: Distribution According to Periorbital Involvement

Conjunctiva	No. of Cases	Percentage
Subconjunctival haemorrhage	88	44
Chemosis	40	20
Laceration	12	6
Total	**140**	**70**

Table 7: Distribution of Cases According to Conjunctival Involvement

Cornea	No. of Cases	Percentage
Abrasion	10	5
Partial laceration	4	2
Descemet's tear	2	1
Oedema	6	3
Ulcer	2	1
Blood staining of cornea	4	2

Total	**28**	**14**

Table 8: Corneal Lesions

Iris	No. of Cases	Percentage
Iridodonesis	6	3
Iridodialysis	16	8
Synechiae	6	3
Total	**28**	**14**

Table 9: Distribution of Cases According to Iris Involvement

Pupil	No. of Cases	Percentage
Miosis	12	6
Mydriasis	18	9
Total	**30**	**15**

Table 10: Pupil Involvement

Lens involvement	No. of Cases	Percent
Subluxation of lens with and without lenticular opacity	4	2
Dislocation of lens	2	1
Partial opacity	14	7
Total opacity	4	2
Pure lenticular opacity (Rosette)	6	3
Total	**30**	**15**

Table 11: Pattern of Lens Involvement

Clinical Findings	No. of Cases	Percent
Vitreous		
Vitreous herniation in to anterior Chamber	4	2
Vitreous haemorrhage	6	3
Retina		
Berlin's oedema	6	3
Retinal oedema	6	3
Retinal detachment	8	4
Choroid		
Choroidal haemorrhage	2	1
Choroidal rupture	4	2
Total	36	18

Table 12: Distribution of Cases as per the Clinical Findings of Posterior Segment Damage

Cranial Nerve Injury	No. of Cases	Percent
Total 3rd nerve paralysis	2	1
4th nerve paralysis	2	1
6th nerve paralysis	4	2
Combined 3rd and 6th nerve paralysis	4	2

Table 13: Cranial Nerve Injuries

Visual Acuity	No. of Cases	Percent
6/6	84	42
6/9	40	20
6/12	34	17
6/18	10	5
6/24	4	2
6/36	2	1
6/60	2	1
1/60	4	2
Cf2mt	4	2
Cf/CF	4	2
Hm/Cf	2	1
Pl++PR+	4	2
Following light	2	1
No PL	4	2

Table 14: Percent of Final Visual Acuity

DISCUSSION

In this study consisting of 200 cases, the age range was from 3 months old child to 80 years old woman. Incidence of ocular injuries were found to be highest in the younger age group and children of 16 to 35 years (51%).[7]

Maximum cases were below the age group of 35 years. It has been observed that children and young adults are more prone to injuries, this may be due to more exposure to risk of blunt injuries, exposure and lack of awareness, regarding injuries among children.

According to Jain BS, Sony SR5 (1993), the maximum incidence of ocular injuries was seen in the age group of 16 to 30 years (63%) and in children below 16 years (23.2%). This is because children left to play unsupervised by their parents.

There were 84% males and 16% females in this study, the male female ratio was 5.25:1, this nearly coincides with the study conducted by Eagling EM6 (1974), the male female ratio was 6.5:1.

Agriculture, the major bulk of our study which was followed by Sports and then Road Traffic Accidents and assault.[8]

The commonest causative agents were stones and sticks followed by injuries with cricket ball, rubber ball and fist. In this study, most common object causing blunt trauma to the eye was stone (18%) followed by stick (12%), fist (12%), road traffic accident (9%), iron rod (7%), bull gore (6%), ball (5%), branch of tree (4%), etc.

The commonest mode of injuries was by stones.[9]

In this study, black eye or periorbital contusion was the most common clinical finding seen in 56 cases (56%). This involved ecchymosis to the eye lid and or periorbital region. This is in accordance with the study conducted by Orlando and Doty JH (1996) in which they evaluated 125 patients with sports related ocular injuries and reported an incidence of 36% of lids of periorbital contusion injuries. Other findings included periorbital oedema (36.5 to 39%), periorbital laceration 32 cases (8%), crepitus (emphysema) (2 to 2.5%), lid oedema (39%), lid abrasion (7%) and lid laceration (8%). There were 88 patients with purely subconjunctival haemorrhage. 72 patients had subconjunctival haemorrhage associated with other findings.[10]

2 cases (1%) of traumatic total 3rd nerve paralysis was seen, 2 cases (1%) of 4th nerve paralysis was seen, 4 cases of combined 3rd and 6th nerve paralysis and 4 cases of isolated 6th nerve paralysis were reported. In traumatic 3rd nerve paralysis, ocular movements were restricted in all the directions except abduction. Pupil in the affected eye was dilated and fixed.

CONCLUSION

It is clear from this study as well as other epidemiological studies conducted over past 15 years that ocular trauma is associated with varying degrees of loss of vision and earning capacity with social and economic consequences. This is an area for further research; additional investigation is also needed to develop and evaluate new interventions for prevention and management of all types of eye injuries. Interdisciplinary approaches and community-based strategies will be important to make progress in this area of study to save and salvage vision.

From this study, we can infer that children and young adults are more prone to blunt ocular trauma, occupational injuries, and road traffic accidents constitute the main bulk of injuries.

Injury with stone was the most common (36 cases, 18%), next comes stick injuries (24 cases, 12%; agriculture related injuries) in causation of blunt ocular trauma.

In this study, anterior segment was more often affected (188 cases, 94%). Many of the injuries could have been prevented, if the patients had used protective eyewear during work or play. We need to stress more on the importance of preventive measures by which incidence of these cases can be reduced. In an unfortunate event of trauma, the patient must be seen as early as possible, referred to an ophthalmologist for adequate management. Early referral, prompt evaluation and treatment will reduce the sight threatening complications in these cases. Patients should be explained about the importance of protective measures like protective glass, helmets, etc. in occupations such as sports and travel.

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