E-ISSN 2250-0944

ISSN 2250-1150
doi: 10.31838/ijprt/15.01.27

Research Article

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

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Received: 20-04-2025, Accepted: 02-05-2025, Publication: 09-May-2025

Abstract

Introduction: Ocular blunt trauma is one of the major yet avoidable causes of monocular blindness throughout the world. As seen from study data, the people of the most active and productive age groups were involved in occupational hazards and RTA, which leads to visual impairment, cosmetic disfigurement and serious economic loss to the community. Males are commonly injured in RTA which is probably related to both exposure and risk-taking behavior.

Materials and methods: It is a prospective, interventional study. 50 cases of blunt trauma presented at Department of Pharmacology, Annaii Medical College and Hospital, Pennalur, Sriperumbudur, Chennai from January 2024 to December 2024 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.

Results: In our study, the M: F ratio was 5.25:1 (42:8) with clear male preponderance. Age incidence study showed that blunt ocular injuries were common in younger age group comprising of 33 patients (66%) i.e. below the age of 35 years (people who are very active and in productive age group). 26 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- 47 patients (94%); i.e. conjunctiva- 35 patients (70%), lid- 33 patients (65%), periorbital lesions- 28 patients (56%), ecchymosis of periorbital tissue- 21 patients (42%), lid oedema- 18 patients (37%), iris involvement- 10 patients (20%), lens involvement- 7 patients (15%), cornea involvement- 7 patients (14%), traumatic miosis- 3 patients (6%), traumatic mydriasis- 5 patients (9%); posterior segment- 9 patients (18%) were involved in which retinal detachment- 2 patients (4%), macular oedema- 2 patients (3%) vitreous haemorrhage- 2 patients (3%) and 1 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.

Key Words: Ocular blunt trauma, anterior segment injuries, RTA, traumatic miosis.

INTRODUCTION

Ocular blunt trauma is one of the major yet avoidable causes of monocular blindness throughout the world. As seen from study data, the people of the most active and productive age groups were involved in occupational hazards and RTA, which leads to visual impairment, cosmetic disfigurement and serious economic loss to the community. Males are commonly injured in RTA which is probably related to both exposure and risk-taking behavior.[1]

In developing countries, activities such as agriculture, hammering and carpentry are responsible for many eye injuries. Blunt trauma forms a chief part of ocular trauma. Cricket balls, Road traffic accidents, Assault, elastic luggage straps, falls and animal tail or horn are the most common causes of blunt ocular trauma.[2] It causes ocular damage by the coup and contrecoup mechanism or by ocular compression. Concept of coup and contrecoup injury was first introduced to explain brain damage caused by blunt trauma to the head by Courville. This was later used by Wolter to explain eye injuries during blunt trauma.[3]

Corneal abrasions, subconjunctival haemorrhages, commotio retinae, choroidal haemorrhages, and retinal necrosis are few examples of a contrecoup injury. The basic patho-physiology is that

the volume of eye globe doesn't change and therefore, when the eye is compressed along its anterior–posterior axis, it either expand in its equatorial plane or rupture.[4] Hence, the extent of injury suffered is determined by:

1. Total energy shifted to globe and orbit.

2. The physical characteristics of the object.

3. Impact area location.

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 spur anteriorly. 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.[5]

MATERIALS AND METHODS

Study Design: It is a prospective, interventional study. 50 cases of blunt trauma presented at Department of Pharmacology, Annaii Medical College and Hospital, Pennalur, Sriperumbudur, Chennai from January 2024 to December 2024 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 Annaii Medical College and Hospital, Pennalur, Sriperumbudur, Chennai 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 KIMS, Hubli 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 (42:8) with clear male preponderance. Age incidence study showed that blunt ocular injuries were common in younger age group comprising of 33 patients (66%) i.e. below the age of 35 years (people who are very active and in productive age group). 26 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- 47 patients (94%); i.e. conjunctiva- 35 patients (70%), lid- 33 patients (65%), periorbital lesions- 28 patients (56%), ecchymosis of periorbital tissue- 21 patients (42%), lid oedema- 18 patients (37%), iris involvement- 10 patients (20%), lens involvement- 7 patients (15%), cornea involvement- 7 patients (14%), traumatic miosis- 3 patients (6%), traumatic mydriasis- 5 patients (9%); posterior segment- 9 patients (18%) were involved in which retinal detachment- 2 patients (4%), macular oedema- 2 patients (3%) vitreous haemorrhage- 2 patients (3%) and 1 cases with choroidal rupture were seen.

Age group	Number of cases	Percentage

Birth to 15	7	7
16-25	8	8
26-35	18	18
36-45	9	9
46-55	4	4
Above 55	4	4

Table 1: Age distribution

Gender	Number of cases	Percentage
Male	42	84
Female	8	16
	50	100

Table 2: Gender Distribution

Source of Injury	Number of cases	Percentage
Occupational injuries	26	52
Sports & Play	12	22
RTA & Assault	11	22
Others	2	3
Total	50	100

Table 3: Distribution of Cases According to Source of Injury

Object	No of cases	Percentage
Stone	9	18
Stick	6	12
Iron rod	4	7
Ball	3	6
Fist	6	12
Metallic/Wooden extraocular FB	2	4
Branch of tree	2	4
Bull gore	3	6
Knob of door, Cup board	2	4
Whip lash	2	4
Cycle/Scooter handle	2	4
Handle of handloom/lathe/Silk	1	2
Reeling machine	1	2
Finger nail	1	2
Pencil/Pen blunt end	1	2

Racquet	1	2
Tooth brush	1	2
Others (RTA etc.)	4	8
Total	**50**	**100**

Table 4: Objects Causing Blunt Injury

Ocular Involvement	Number of cases	Percentage
Periorbital region	28	56
Lids	33	66
Conjunctiva	35	70
Cornea	7	14
Hyphaema (AC)	3	6
Iris	10	20
Angle Recession	3	6
Lens	7	14
Posterior segment	9	18

Table 5: Ocular Structures Involvement

Periorbital Lesions	Number of cases	Percentage
Ecchymosis	21	21
Lid oedema	18	18
Laceration	4	4
Emphysema	2	2
Fracture	5	5

Table 6: Distribution According to Periorbital Involvement

Conjunctiva	Number of cases	Percentage
Subconjunctival haemorrhage	22	22
Chemosis	10	10
Laceration	3	3
Total	35	35

Table 7: Distribution of Cases According to Conjunctival Involvement

Cornea	Number of cases	Percentage
Abrasion	3	3
Partial laceration	1	1
Descemet's tear	1	1
Oedema	2	2
Ulcer	1	1
Blood staining of cornea	2	2
Total	10	10

Table 8: Corneal Lesions

Iris	Number of cases	Percentage
Iridodonesis	2	3.0
Iridodialysis	4	8.0
Synechiae	1	2.0
Total	7	14.0

Table 9: Distribution of Cases According to Iris Involvement

Pupil	Number of cases	Percentage
Miosis	3	6
Mydriasis	5	5
Total	8	11

Table 10: Pupil Involvement

DISCUSSION

In this study consisting of 50 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%).[6]

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.[7]

According to Jain BS, Sony SR (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.[8]

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.[9]

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.

In this study, black eye or periorbital contusion was the most common clinical finding seen in 28 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 16 cases (8%), crepitus (emphysema) (2 to 2.5%), lid oedema (39%), lid abrasion (7%) and lid laceration (8%).

There were 22 patients with purely subconjunctival haemorrhage. 18 patients had subconjunctival haemorrhage associated with other findings.

After excluding 22 cases (eyes) of subconjunctival haemorrhage out of 50 cases, 7 eyes (14%) had corneal findings, out of which 3 eyes had corneal abrasion, 2 eyes had corneal oedema, and 1 cases had blood staining of cornea.

There were 2 patients with a partial thickness corneal tear of which 1 was in the superotemporal area just away from the limbus. In this study, there were 2 patients with blood staining of the cornea. 6 cases of hyphaema were present, most involved 1/3 to ½ of the anterior chamber, 2 cases had only marginal increase in IOP but none of them had significant raise in IOP.

Involvement of the iris and pupil constituted major number of clinical findings. Out of total cases, traumatic mydriasis was present in 4 eyes (9%) which was the commonest followed by miosis in 3 eyes (6 %), synechiae in 2 cases (2%).

Our study corresponds to the study of 205 cases by Canavan and Archer in which 79 cases had iris and pupillary injuries.

7 eyes had lenticular involvement in the form of subluxation, dislocation, lenticular opacities with or without rupture of anterior capsule as opposed to the 52 eyes out of 212 in a study by Canavan and Archer. In this study, in 67 (33.5%) eyes with lens and pupillary damages, 31 eyes had simultaneous lenticular damage as opposed to 44 and 79 eyes with lens or pupillary abnormalities in the study conducted by Canavan and Archer.[9]

There were a total of 18 cases of posterior segment involvement. 3 eyes in this study had vitreous haemorrhage, 3 had Berlin's oedema. Siegfried found 167 cases (12.5%) had Berlin's oedema. There were 4 cases of retinal detachment which could be appreciated on indirect ophthalmoscopy and was confirmed by B-Scan.[10]

A total of 3 cases of retinal oedema were observed, the vision returned to normal in most of the cases as the oedem subsided over a period of 1-2 months. 2 cases of choroidal rupture, 1 case of choroidal haemorrhage

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.

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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