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# Head injury and ocular co morbidities

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## Abstract

**Purpose**- The close proximity between the visual system and the skull base makes the former quite vulnerable to the effects of skull injury, brain swelling and intracranial hypertension all of which are well known side effects of head trauma. This study is done with aim of knowing the significance of ocular co morbidities, impact on vision, management and over all prognosis of head injury patients**.**

**Method-**this study includes 150 cases of head injury patients, 128 (85.33%%) were males and 22 (14.66%) were females. Detailed history regarding the injury was taken and the clinical details were entered into a standard clinical proforma. Glasgow Coma Scale (GCS) and the Revised Trauma Score (RTS) were applied to grade the severity of the head injury and to assess the prognosis in all cases. Ophthalmic assessment of all the patients was done at two stages. Bedside examination on admission and evaluation in outpatient department after patient was ambulatory.

**Result**-The ocular and visual complications of head injury observed in 129(86%) cases. The vision threatening ocular injury was associated with severe head injury whose GCS was less than or equal to 8 on admission.

**Conclusion**-Road traffic accident was the most common cause of head injury. Various forms of injury can occur to the ocular and visual system in patients with head injury. Vision threatening ocular injuries mainly involve posterior segment and this emphasizes the importance of integrating ophthalmic assessment into the routine.

**Keywords:** GCS, RTS, Head Injury

## Introduction

Head injury as defined by National Advisory Neurological diseases and Stroke council is "a morbid state resulting from gross or subtle structural changes in the scalp, skull and/or contents of skull, produced by mechanical forces".(1) Head injury occur most commonly in young age group and being one of the main causes of death or permanent disability continues to

remain as a major health problem with significant socioeconomic impact.

Man's endeavor to attain higher and still higher speeds in travel, to mechanize civilian industry with machines of greater power heighten the incidence of head injuries to an extent unknown to a previous generation. At the same time the increased efficiency in dealing with such injuries has achieved a survival rate, and therefore knowledge of their immediate and remote aftereffects, is steadily growing. Many of these have profound ophthalmological significance and the ocular symptoms and sign are frequently of great importance in the general assessment of patients, and an appreciation of their importance is necessary for adequate treatment and prognosis. The ocular trauma secondary to head injury in the causation of blindness and overall prognosis of patient has been a subject of immense importance. (2 )

The close proximity between the visual system and the skull base makes the former quite vulnerable to the effects of skull injury, brain swelling and intracranial hypertension all of which are well known side effects of head trauma. Ocular cranial nerve palsies may disrupt monocular stereoscopic vision and thereafter interfere with visual activity. Visual field defects have been demonstrated to be a reliable index of the severity of brain damage and long-term neuropsychological performance after head injury (Uzzell, Dolinskas et al 1987). The manifestations of head injury and its numerous other systemic findings are so compelling that damage to the visual system is likely to be overlooked.(3) Ophthalmic manifestation of head injury furnishes the surgeon with valuable information in localizing site, side and severity of head injury.( 4,5) Also the high incidence of cranial nerve injury and posterior segment changes, in head injury, without any external ocular findings necessitate the integration of the services of a neurosurgeon and an ophthalmologist for early detection of various injuries and prompt intervention. This study is done with aim of knowing the significance of ocular co morbidities in localizing the site of injury, impact on vision, management and over all prognosis of head injury patients.

**Material and methods**

This prospective observational study was conducted in a tertiary hospital in jammu from december2021 to December 2022 after approval from Institutional Ethics Committee (ASCOMS & H) and adheres to the tenets of the Declaration of Helsinki. Data were collected after written informed consent from the patient and/or relatives. The details of demographic profile of the patient were noted. Detailed history regarding the injury was taken and the clinical details were entered into a standard clinical proforma. Glasgow Coma Scale (GCS) and the Revised Trauma Score (RTS) were applied to grade the severity of the head injury and to assess the prognosis in all cases. Ophthalmic assessment of all the patients was done at two stages. Bedside examination on admission and evaluation in outpatient department after patient was ambulatory. Bedside examination included extra orbital injury assessment, pupillary response by torchlight, vision by counting fingers at 2 mt distance bedside, extra ocular movement examination, visual field assessment by finger confrontation and digital tonometry was done where possible.

Evaluation in outpatient department included assessment of visual acuity with pinhole using snellen's chart, anterior segment evaluation was done with slit lamp, Posterior segment assessment was done on dilated eye by direct and indirect ophthalmoscopy. Intraocular pressure by Goldmann applanation tonometer was done when

needed. Neurological visual field defects were assessed using HFA. patients with pupillary involvement and suspected field defect on confrontation. Diplopia charting was done whenever the patient complained of diplopia or restricted movement. Gonioscopy was done if necessary for the case studied. Computed tomography of brain, skull and spine, MRI and B-Scan was taken whenever appropriate. Any ocular manifestation requiring treatment-medical or surgical were treated as per standard medical and surgical practices.

**Inclusion criteria** All patients who had sustained head injuries presenting for the first time with any modes of injury. Patients of all age group, both sexes having unilateral or bilateral presentation were also included in this study.

**Exclusion criteria** Patients who had a history of previous head injury or ocular injury or who had congenital ocular anomalies were excluded.

**Observation and result**

This study includes 150 cases of head injury patients, 128 (85.33%%) were males and 22 (14.66%) were females. (table 4). The age ranged from 8 to 73 years. A majority of the 150 patients with head injury in our study were victims of road traffic accidents (58%), closely followed by assaults (34%). Other causes of head injury included fall, sports injury (table 1) GCS (Glasgow coma scale) score was recorded for all patients (table 2). Significant no of patients (16%) have GCS score between 3 -8(severe category). The ocular and visual complications of head injury observed in 129(86%) cases and these are classified into vision threatening (22.48%)and non- vision threatening(77.51%) ocular involvement( table7). The vision threatening ocular injury was associated with severe head injury whose GCS was less than or equal to 8 on admission.

Table 1: Distribution of patients according to Modes of head injury (n=150)

| Causes | No. of patients | Percentage |
|---|---|---|
| Road Traffic Accident (RTA) | 87 | 58% |
| Assault | 51 | 34% |
| Fall from Height | 8 | 5.33% |
| Fall on ground | 3 | 2% |
| Gun shot | 1 | 0.66% |
| Total | 150 | 100% |

Table 2 Glasgow coma score in head injury patients

| GCS score | No. of patients | Percentage |
|---|---|---|
| =or > 15( good) | 26 | 17.33% |
| 13-15 (mild) | 69 | 46% |
| 9-12 (moderate) | 31 | 20.66% |
| 3-8 (severe) | 24 | 16% |
| Total | 150 | 100% |

Table 3: Incidence of ocular involvement in Head Injury patients (n=150)

| Manifestations | No. of Patients | Percentage |
|---|---|---|
| Ocular | 129 | 86% |
| Non-ocular | 21 | 14% |
| Total | 150 | 100 % |

Table 4 distribution of patients according to gender

| Gender | No. of patients | Percentage |
|---|---|---|
| Male | 128 | 85.33% |
| Female | 22 | 14.66% |
| Total | 150 | 100 % |

Table 5 Age distribution of head injury

| Age Group | No. of Patients | Percentage |
|---|---|---|
| Les s than 10 | 2 | 1.33% |
| 11— 20 | 12 | 8% |
| 21- 30 | 61 | 40.66 % |
| 31- 40 | 40 | 26.66 % |
| 41- 50 | 17 | 11.33 % |
| 51- 60 | 15 | 10 % |
| 61- 70 | 2 | 1.33 % |
| 71- 80 | 1 | 0.66 % |
| Total | 150 | 100 % |

Table 6

| Sn. | Pupillary abnormalities | No. of patients | Percentage |
|---|---|---|---|
| 1. | Pupils fixed widely dilated of both eyes(BFD) | 21 | 14 % |
| 2. | Unilateral dilatation with fixed pupil Hutchinson' pupil (UFD) | 7 | 4.66% |
| 3. | Relative afferent pupillary defect (RAPD) | 5 | 3.33% |
| 4. | Traumatic mydriasis (TM) | 3 | 2% |
| 5 | Pupils contracted and sluggishly reacting to light (PC) | 2 | 1.33% |
| 6. | Total | 38 | 25.33% |

Table 7 Occular findings in head injury patients (n 129)

| Features | No of patients | Percentage |
|---|---|---|
| A. Vision threatening | | |
| Corneal tear | 7 | 5.42% |
| Traumatic catract | 5 | 3.87% |
| Vitrious hamerhage | 1 | 0.77% |
| Berlin's edema | 5 | 3.87% |
| Terson's syndrome | 2 | 1.55% |
| Optic atrophy (traumatic) | 2 | 1.55% |
| Globe rupture | 1 | 0.77 |
| papillidema | 3 | 2.32% |
| Exposure keratitis | 3 | 2.32% |
| B. Non vision threatening | | |
| Periorbital echymosis | 43 | 33.33% |
| Lid laceration | 16 | 12.40% |
| Subconjunctival hamerhage | 15 | 11.6% |
| ptosis | 4 | 3.10% |
| hyphema | 12 | 9.30% |
| EOM ristriction | 7 | 5.42% |
| Orbital wall fracture (lateral wall | 3 | 2.32% |

Most Patients had a combination of two or more ocular findings such as ecchymosis, subconjunctival haemorrhage, orbital fracture, hyphaema, and scleral tears. The more severe injury was taken as the main ocular finding in head injury. The lids and conjunctiva in the anterior segment of the eye were more commonly involved in head injuries than the posterior segment, ocular cranial nerves, or the bony orbit and it is usually non –vision threatening. Injuries to this segment result from direct impact on the rigid frontal bones and orbital margins, producing periorbital ecchymosis, lid laceration, subconjuctival haemorrhage, and chemosis .The vision

threatening injury mainly involves posterior segment and optic nerve. In our study 25.33% of patients had pupillary involvement.

**Discussion**

In the evaluation of 129 patients who had head injury with ophthalmic manifestations, a wide spectrum of ophthalmic manifestations were found in this study, Most of the patients in this study were males who constitute 85.33% and females were 14.66%. kulkarni et al in their study also found that many of the head injury patients were young adult male and they were in the age group of 21-40 years(6). This data is compared with study carried out by R.Gupta et al. **(6)** Where also males dominate by 81.6% compared to females who constitute 18.4%.(7)

Prevalence of ocular involvement in our study was 86% while Kulkarni et al. and Sharma et al. have reported a prevalence of 83.5% and 49.7%, respectively, in their case series. Similar results are reported by Raju who has shown 100% ocular involvement (8). These variable percentages may be due to the difference in the patient population.

In present study, the most common cause of head injury leading to ocular manifestations in present study was road traffic accident (58%), second most common was assault (34%) followed by fall from height (5.33% )and fall on ground (2%).one case of gunshot injury was recorded. This finding is consistent with Sharma B (9), where road traffic accident was most causative factor (86%). It also matches with Raju NSD where road traffic accident (47.5%) was most common causative factor. Similar finding was found in the study by T O Odebodeet Kulkarni AR et.al, T.O. Odebode et.al, Raju NSD and Sharma et.al. A relatively higher incidence of road traffic accident as the prominent cause of head injury in present study was due to the location of highway nearer to the hospital among the other causes.

The patients had pupillary involvement is associated with severe GCS score Pupillary involvement has a significant association with severity of head injury. RAPD being most common and best early indication to post-traumatic reduced vision does not play a major role in causing final poor visual.

We found 7 (5.42%) cases of traumatic extra ocular movement restriction which is not always be associated with residual cranial nerve palsy. Lateral orbital wall in spite being the strongest boundary of orbit was most commonly fractured (2.32%) which can be due to force of impact being on lateral aspect of orbit during RTA.(10)

In our study we, found vision threatening ocular involvement like vitrious haemorrhage in1(0.77%) case, berlin's edema was seen in 5(3.87%) cases, tersion syndrome in 2(1.55%) cases. Van sttavern GP found terson's syndrome in 3.2% cases (11) . some studies have reported berlins edema in 1.5% (12). Traumatic optic atrophy was seen in 2 (1.55%) cases and globe rupture was seen in 1 (0.77%) case and these patients later succumb to their injuries

Exposure keratitis was seen in 2.32% unconcious patients and corneal tear was seen in 5.42% patients . kulkarni AR et al found corneal tear in 2% of cases (6) Sharma B et al found exposure keratitis in 4.21% cases.(13) Traumatic cataract was seen in 3.87% of cases which was later managed by surgery. Masila Faith et al in her study found 1.1% of traumatic cataract cases.(14)

This study highlights the importance of a detailed early ophthalmological assessment in correlation with GCS in head injury patients to prognosticating outcomes. This should be repeated at regular intervals to monitor the signs of progress and deterioration.

**Conclusion**

Road traffic accident was the most common cause of head injury. Various forms of injury can occur to the ocular and visual system in patients with head injury, some leading to various degree of visual impairment including blindness. Apart from traumatic cataract, vision threatening ocular injuries involve posterior segment and this emphasizes the importance of integrating ophthalmic assessment into the routine head injury assessment.

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