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A PROSPECTIVE STUDY OF OCULAR MANIFESTATIONS IN HEAD INJURY PATIENTS FROM A TERTIARY CARE CENTRE

Ophthalomology

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ABSTRACT

Introduction: Head injuries are frequently associated with ophthalmic problems. Ophthalmic findings are often ignored in these patients, which leads to delay in their proper management which may result in permanent visual impairment. Our study aims to evaluate various ocular manifestations in cases of head injury patients, correlate them with the patient's neurological status and to analyze any association between them. **Materials and methods:** We examined 120 patients with ophthalmological manifestations in closed head injury in the neurosurgery ward in our institute. We applied GCS to grade the severity of head injury. Neuro-ophthalmological signs, like abnormal pupillary reaction and EOM restriction and GCS were then correlated to prognosticate the visual outcome and survival rate of the patients. Patients were managed by a multidisciplinary approach. **Results :** In 120 patients of ocular involvement with head injury, 90 (75%) were male and 30 (25%) were females in age range of 5-75 years. Young adult male (21-30years) were more vulnerable to head injury. Road traffic accidents were the most common cause of head injury in 58.33 % leading to soft tissue injuries to the globe and adnexa. The most frequently encountered neuro-ophthalmological manifestation was pupillary involvement as RAPD in 36 (30%) cases followed by EOM affection in 35 (29.17)% cases. **Conclusion :** Pupillary involvement has a significant association with severity of head injury. There was a significant correlation of the GCS, neurological deficits and the ocular signs with the visual outcome. RAPD being most common and best early indication to post traumatic reduced vision does not have much bearing in the determination of final outcome.

KEYWORDS

GCS (Glasgo coma scale), RAPD (Relative afferent papillary defect), EOM (Extra ocular muscles), Neuro-ophthalmological signs.

INTRODUCTION

A head injury occurs every 15 seconds and a patient dies every 12 minute[1]. Head injuries are a cause of hospitalization of 200-300 persons per 1,00,000 population per year[1] in which about 25% are associated with ocular injuries and visual defects.

Ocular injuries are the cause of blindness in more than half a million people all over the world and of partial loss of vision in many more and it is often considered as the leading cause of unilateral loss of vision, particularly in developing countries[2]. Almost 50% of all deaths due to trauma are associated with head injury and around 60% of vehicular trauma deaths are due to head injuries[1]. Many of the ophthalmic findings are often ignored and they present quite later to specialist neuro-ophthalmic clinics.

Therefore clinical correlation of the ophthalmic findings is important in early localization of the site of injury, better management and improved visual prognosis of the patients with head injury.[3,4]

The aim of our study was to evaluate various ocular manifestations in cases of closed head injury patients and correlate them with the patient's neurological status and to analyse any association between them.

MATERIALS AND METHODS

This was a prospective observational study including 120 patients diagnosed as having closed head injury with ocular involvement by neurosurgical team. Study was conducted in department of neurosurgery in association with department of ophthalmology, Moti lal Nehru medical college, Prayagraj, Uttar Pradesh, a tertiary care centre in north India. The study was conducted in patients who were hospitalized for various duration, during span of 1 year from April 2023 to March 2024. Demographic profile of patients was noted. Detailed history about mode of injury was evaluated.

Consciousness of patients was assessed using Glasgow Coma Scale (GCS). Uncooperative patients were excluded from the study. Patients having eye injuries were assessed by ophthalmologist at two stages, first bedside examination on admission and second evaluation was done in outpatient department at the patient's first follow up visit. Bedside examination included adnexal and orbital injury assessment, pupillary reaction by torch light, vision by counting fingers at 2 metres distance at bedside, extra ocular movement examination, visual field assessment by confrontation test and fundus examination using direct ophthalmoscope.

Evaluation in outpatient department included assessment of visual acuity with pin hole using snellen's chart, anterior segment examination done with slit lamp, posterior segment examination done on dilated pupil by direct and indirect ophthalmoscopy. IOP (intra ocular pressure) was measured by Goldman's applanation tonometer when needed. Neurological visual field defects were assessed using HFA SITA on patients with pupillary involvement and suspected field defects on confrontation. In patients with complaints of diplopia or restricted movement of eyes, diplopia charting was done. Computed tomography (CT scan) of head was done to assess head injury component in all patients. MRI orbit and brain and B scan were done as required. Any ocular manifestations requiring treatment either medical or surgical were treated as per standard medical and surgical practices.

RESULTS

We have selected 120 patients who were having ocular manifestations along with closed head injury. Out of these, 90 (75%) patients were male and 30 (25%) were female, in the age range of 5-75 years (Table 1) .We found that young adults of age 21-30 were most vulnerable to head injury. There were 55 patients (45.83%) in this age group. The second common group was the patients in age group of 31-40 years (30 patients, 25%). The incidence of head injury was less during childhood, peaked in the 3rd and 4th decade of life, and thereafter declined further.

We found that road traffic accident was the commonest cause of head injury in 70 cases (58.33%) which leads to soft tissue injury to globe and adnexa. Second most common cause of head injury was assault in

30 cases (25%). The remaining 20 patients of head injury were due to fall from height and pedestrian hit by motor vehicle or cattle (Table 1). In120 patients of ocular and visual complications, soft tissue injury occurred in 72 (60%) patients, orbital fracture in 18 (15%) patients, and neuro-ophthalmic complications in 30 (25%) patients. (Table 2)

The most frequent soft tissue injuries were periorbital ecchymosis in 60 (50%) patients, followed by sub-conjuctival hemorrhage in 52 (43.3%) patients. Other soft tissue injuries were lid lacerations in 4 (3.33%) patients, proptosis in 6 (5%) patients, ptosis in 7 (5.83%) patients, corneoscleral rupture in 3 (2.5%) patients leading to surgical repair. In orbital wall fracture, we found lateral wall fracture in 8 (6.67%) patients. It was also associated with multiple facial bone fractures. Rest of the orbital wall fractures included 4 (3.33%) patients with medial wall fracture, 5 patients (4.17%) of orbital floor fracture and 1 (0.83%) patient of orbital roof fracture. (Table 2)

The most frequently found neuro-ophthalmic manifestation was pupillary involvement in the form of abnormalities of pupillary size and reaction in one or both eyes in 36(30%) patients. A combination of two or more ocular findings such as ecchymosis, sub conjuctival hemorrhage, orbital fracture, hyphaema and sclera tear was present in 86 (71.66%) patients. The most severe injury was taken as the main ocular findings for assessing prognosis in head injury. Among 35 patients with extra ocular movement restriction, only 10 cases were associated with cranial nerve palsy, 3rd cranial nerve in 5 (4.16%), 4th cranial nerve in 3 (2.5%) patients, and 6th cranial nerve in 2 (1.66%) patients. Rest of the cases with extratraocular movement restriction was because of local mechanical restriction which resolved eventually. The association of cranial nerve palsy among patients with extra ocular muscle restriction was found to be significant with p value of 0.0001.Pupillary involvement was present in 36 cases of which 35 were RAPD and remaining one patient had traumatic anisocoria due to sphincter tear. Among RAPD patients, 6 had vision of perception of light (PL +ve) and rest had a bedside vision of finger counting at 2 meters. Of all the patients of RAPD (36 patients), only 8 patients had a vision of <6/60, and remaining patients had a vision of >6/60 at initial examination.

When compared with grade of RAPD with visual outcome, we found that if grade of RAPD was <2, most of the patients (29) were having vision >6/60 with p value 0.0031which is clinically significant.

Among 48(40%) patients with GCS <10, 32(26.67%) patients had associated pupillary involvement indicating significant association between pupillary involvement and severity of head injury with p value of 0.0001 (Table 3).

Table 1: Clinical profile of patients with head injury

1. Sex ratio Male Female	n% 90 (75%) 30 (25)
2. Age distribution Range <10 yrs 11-20 21-30 31-40 41-50 51-60 >60 yrs	 (5-75yrs) 4(3.33%) 6(5%) 55(45.83%) 30(25%) 10(8.33%) 9(7.5%) 6(5%)
3. Mode of injury • Road traffic accident • Assault • Others (Fall from heights, pedestrian hit)	 70 (58.33%) 30 (25%) 20 (16.67%)

Table 2: Profile of ocular trauma in head injury patients-

Type of Injury	n	Percentage
A . Soft tissue injury	72	
1.Periorbital ecchymosis	60	50%
2.Lid laceration	4	3.33%
3.Sub conjunctival hemorrhage	52	43.3%
4.Proptosis	6	5%
5.Ptosis	7	5.83%
6.Corneoscleral rupture	3	2.5%
7.Hyphema	6	5%
8.VH	4	3.33%
9.Macular oedema	6	6%
10.Retinal Oedema	2	1.67%
B. Orbital fracture	18	
1. Lateral wall	8	6.67%
2.Medial wall	4	3.33%
3.Floor	5	4.17%
4.Roof	1	0.83%
C. Neuro-ophthalmological complications-	71	
1.Abnormal pupil reaction(RAPD)	36	30%
2.EOM restriction	35	29.17%

Table -3

A. Association of EOM restriction and cranial nerve palsies-				
	Cranial Nerve Palsy +	Cranial Nerve Palsy -	Total	p value
EOM restriction present	10	25	35	0.0001
EOM movement normal	0	85	85	
Total	10	110	120	
B. Association of RAPD with vision-				
	Vn <6/60	Vn >6/60	Total	p value
RAPD+	8	28	36	0.009
RAPD-	18	66	84	
Total	26	94	120	
C. Relation of RAPD with visual outcome				
RAPD	Vn ≤6/60	Vn ≥6/60	Total	p value
<grade 2	0	29	29	0.0031
≥grade 2	3	3	6	
Total	3	32	35	
D. Association of severity of head injury (GCS <10) and pupillary involvement				
Pupillary involvement	Present	Absent	Total No. of Patients	p value
GCS<10	32	16	48	0.0001
GCS≥10	10	62	72	
Total	42	78	120	

DISCUSSION

Head injuries can be defined as those in which there is evidence of involvement of the brain including concussion, with loss of consciousness or post traumatic amnesia, neurological signs of brain injury or skull fractures[5]. Glasgow coma scale and the Revised trauma scores are most commonly used in grading the severity of head injury. Most head injury cases are mild and can be treated as out-patients. Those patients who need neuro-observation are treated as in-patients for 24-48 hours. About less than one in 100 patients have severe injury of the brain[6].

The eyes are often involved in head injury (directly or indirectly) with neuro ophthalmic deficits.[8, 10,11,12,13,14,17,18]. When an ophthalmologist examines a head injury patient with ocular involvement, the focus is mostly on obvious manifestations such as contusions and laceration. Neuro ophthalmic evaluation is challenging in the patients of head injury as patients have reduced consciousness or coexisting injuries. It has been reported the incidence of head injury is around 109 per 10,0000cases [7].

In our study we found that the high velocity RTA is the commonest cause of head injury with involvement of young male most frequently. The patients with trauma often have multiple injuries including ocular involvement. There are several retrospective studies which have reported neuro ophthalmic findings a few months after head trauma[8-14]. We conducted this study on 120 patients of head injury with ocular involvement who were admitted in neurosurgery ward. The age of patients was ranging from 5-75 years, with highest in 3rd decade of life(table 1). We found that out of 120 patients, 90(75%) were males and 30(25%) were females. This is because males are more exposed to vehicular accidents and assault.

In our study we found that the lateral orbital wall was found to be the most commonly fractured in 8(6.67%) patients among all fractures in spite of being strong boundary (table 2). It can be attributed to the

mechanism of impact during RTA where lateral wall of orbit gets injured most of the time on verge of protecting the eyeball as orbital injury in RTA is commonly due to force of impact being on lateral aspect of the orbit.

In our study we reported 10(8.33%) patients with the cranial nerve palsy out of 35 patients of extraocular movement restriction. Association between two was clinically significant with p value 0.0001(Table 3). Few retrospective studies like Master et al [5] reported 3rd cranial nerve palsy in 30%, 4rth cranial nerve in 26% and 6th cranial nerve palsy in 22% patients. It can be said that the initial restriction of extra ocular muscle movement may be because of local entrapment of muscle with associated features of orbital wall and swelling of surrounding soft tissue.

To assess the pupil for size and reaction to light is very important during initial examination in head injury patient. Apart from pupillary signs of uncal herniation and associated primary injuries to the globe, the ocular findings are of secondary importance during emergency management of the patients [2,15] Early signs of temporal herniation include ipsilateral miosis due to oculomotor nerve irritation (Hutchinson's stage 1) followed by paresis causing ipsilateral pupillary dilatation and a sluggish response to light (Hutchinson's stage 2). Progressive dilatation of ipsilateral pupil and miosis of the contralateral pupil (Hutchinson's stage 3) heralds progressive 3rd nerve palsy due to temporal lobe herniation, followed by bilateral dilatation of the pupil (Hutchinson's stage 4)[4].

We have found in our study that among 48 (40%) patients with GCS less than 10, 32(26.67%) has associated pupillary involvement with p value of 0.001 which was statistically significant (Table 3). Out of 36 patients with RAPD, 8 (6.67%) recovered vision of 6/6, only 3 patients (2.5 %) were left with vision less than 6/60 and rest recovered vision ranging from 6/9 -6/60. This signifies that RAPD does not always have poor visual prognosis. Similar studies like International optic nerve trauma study [15] also showed visual acuity improvement of more than 3 lines in 57% untreated group, 52% of the group that received steroid alone and 32%of the group that underwent surgery.

CONCLUSION

This study highlights the importance of a detailed early ophthalmological assessment in correlation with an overall clinical assessment in patients of head injury in prognosticating outcomes. It can be concluded that 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 vision.

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