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CLINICAL ASSESSMENT AND ASSOCIATION OF OCULAR MANIFESTATIONS WITH NEUROLOGICAL RESULTS IN CLOSED-HEAD INJURY PATIENTS

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Abstract

Background: India has the very unenviable distinction that it has the highest incidence in the world of head injury. About 100,000 lives are lost every year in India, with more than 1 million suffering from severe head injuries. Men, women and children suffer head injuries each day.

Aims & objectives: To assess clinically the ocular manifestations and correlate them with neurological findings in patients with closed head injury.

Materials and Methods: The study involved 300 patients from a closed brain injury tertiary healthcare center who were subjected to comprehensive ocular assessment as early as possible after determining the seriousness of head injury with the Glasgow coma scale (GCS) and Updated Trauma Score (RTS). The results were later identified. When required, patients were monitored by a multidisciplinary approach.

Results: Out of 300 patients with head injury, 272 were male (91 percent) and 28 were female (9 percent). With an average of 30.56 years, the age varied from 7 years to 60 years. Young adults are the common age group and the common mechanism is the road traffic accident with 180 patients out of 300 (60 percent) leading to head injury and eye manifestations. Out of 300 patients, 204 patients (68 percent) had ocular manifestations. The most common ocular injury is soft tissue injury involving ocular adnexa, with abrasions and lacerations across the globe. Traumatic optic neuropathy, often affecting the pupillary reaction, was the most common form of neuro-ophthalmological manifestation noted.

Conclusion: A statistically significant correlation was observed when patient outcomes were linked to ocular manifestations (p value < 0.05). GCS and ocular symptoms were also associated with the finding. Any type of ocular involvement was present in all patients who died in the study. Together with GCS, RTS, ocular manifestations may serve as an effective predictor of the final outcome.

Keywords: Head injury, ocular manifestations, Glasgow coma scale, Revised Trauma Score.

Introduction

Head injuries can be described as those in which there is evidence of brain involvement, including concussion, loss of consciousness, neurological symptoms of brain injury after traumatic amnesia, or skull fractures. These everyday accidents can vary in severity from concussion to coma, such as a trip or fall, a car accident, a sports injury[1,2]. There will be some sort of ocular manifestations in about 25 percent of patients with head injuries and 11 percent of them will develop blindness. Therefore in causing blindness and the overall prognosis of patients, the role of ocular injuries secondary to head trauma has become an extremely important issue[3,4]. The visual morbidity following head trauma is most frequently overlooked and the damage causing irreparable visual loss is present much later in the day[5]. Ophthalmic symptoms and consequent visual morbidity are frequently correlated with head trauma, but many of the ophthalmic results are often overlooked and presented to specialist neuro-ophthalmic clinics far later[6]. Therefore in early localization of the site of injury, improved treatment and improved visual prognosis of the patient with head injury, clinical correlation of the findings is significant. The aim of this study was to assess different ocular manifestations in cases of patients with head injury, compare them with the neurological condition of the patient and examine any correlation between them[7,8].

Aims & objectives: To assess clinically the ocular manifestations and correlate them with neurological findings in patients with closed head injury.

Materials and Methods

This prospective research was conducted over a span of 3 years at a tertiary care centre in Central India. The initial review of all 300 patients involved in the study included the compilation of demographic data, the brief background of the nature of the injury, and the details of the proforma. The level of consciousness of patients was measured using

the Glasgow coma scale. The updated trauma score (RTS) included GCS, systolic blood pressure, and the patient's respiratory rate, which determined the seriousness of the head injury. Poorer patients with GCS and RTS scores have less survival chances. We attempted, however to equate the possibility with the neurological significance of the ophthalmic signs. Patients who were uncooperative were removed from the sample for review. An on-duty neurologist conducted the initial neurological assessment of the patient and then thorough examination with the necessary investigations whenever a neurosurgeon needed them. Similarly, at the initial stage, ophthalmological review included bedside evaluation of any external ocular injury with special significance for pupillary reaction assessment. B scan ultrasonography, X-ray orbit, CT orbit, MRI brain and orbit, is performed in selected patients. Accordingly, eye disorders or neurological conditions requiring surgical intervention have been addressed. With the support of SSPS software version 20, statistical analysis was conducted and a value of less than 0.05 was taken as significant.

Results

The total number of patients recruited in the closed head injury study was 300. Among those 300, 272 patients (91 percent) were males and 288 women were females (9 percent). The patients ranged from 7 to 60 years of age, and the mean age was 30.56 years. It was very clear in our research that young adults aged 15-30 were the most vulnerable demographic. A road traffic accident is the most frequent cause of head injury in our sample population. A total of 180 (60%) out of 300 patients had a history of RTA. Approximately 66 patients (22%) had a history of attack and the remaining 54 patients had a history of numerous other forms of injuries such as dropping, stone hitting, playing accident, and cattle injury.

Table 1: Patients' demographic data

Demographic data	N= 300
Sex ratio	
Male	272 (91%)
Female	28 (9%)
Age distribution (7-60 years)	
5-10	6 (2%)
10-20	14(5%)
20-30	108 (36%)
30-40	78 (26%)
40-50	48 (16%)
50-60	46 (15%)
Laterality of eye involvement (N=204)	
Right eye	52
Left eye	80
Both eyes	72

Table 2: Mechanism of injury

Mode of injury	Number
Road traffic accident	180 (60%)
Assault	66 (22%)
Others	54 (18%)

Of the 204 patients with eye damage, 52 cases had right eye involvement, 80 cases had left eye involvement, and 72 cases had both eyes. In our study, the forms of eye injuries included: soft tissue injury of the globe and adnexae in 136 patients (45%), neuro-opthalmic injury in 96 patients (32%), orbital wall fracture in 60 patients (20%) and globe rupture in 20 patients (7%). Peri-orbital ecchymosis and oedema were the most common form of soft tissue injury seen in 100 patients (33%), subconjunctival hemorrhage was seen in 68 patients (23%), lid laceration was seen in 30 patients (10%), corneo-scleral tear was seen in 20 patients (7%), and macular edema was seen in 14 patients (5 percent). The lateral wall fracture seen in 30 patients was the most common orbital wall fracture (10 percent). Others included fractures of the floor, superior and medial wall. In 96 patients, the neuro-ophthalmic manifestation typically seen was associated with the pupil in the form of change in form, size and reaction (RAPD) (32 percent). A further limitation of extra-ocular movement was seen in 74 patients (25 percent). Some symptoms of traumatic optic neuropathy occurred in 48 patients (16 percent).

Table 3: Profile of ocular damage in patients with injury to the head

Type of injury	N
Soft tissue injury (N=136)	
Peri-orbital ecchymosis	100 (33%)
Lid laceration	30 (10%)
Sub-conjucntival hemorrhage	68 (23%)
Proptosis	4 (1%)
Neurogenic Ptosis	4 (1%)
Corneo-scleral tear	20 (7%)
Hyphaema	16 (5%)
Vitreous hemorrhage	8 (3%)
Macular oedema	14 (5%)
Retinal detachment	2 (1%)
Orbital fracture (N=60)	
Lateral wall	30 (10%)
Medial wall	12 (4%)
Floor	6 (2%)
Roof	2 (1%)
Neuro-ophthalmological deficits (N=96)	
Relative afferent pupillary defect	60 (20%)
Extraocular muscle restriction	74 (25%)
Optic neuropathy	48 (16%)

* Many patients had a combination of all of these or some of these ocular injuries

For both these and any of these ocular injuries, several patients had a combination. Subconjunctival haemorrhage, echymosis, orbital wall fracture, hyphaemia is present in 190 patients (63 percent) of them. In 44 patients (15%), other body organs, such as the stomach, belly, and long bones, along with the head and eyes, were damaged. Out of 60 patients with an orbital wall fracture, 34 had multiple facial bone fractures associated with it.

Table 4: Combination of injuries

Multiple injuries	N
SCH, Echymosis, orbital wall fracture, Hypheama	190 (63%)
Chest, abdomen and long bones	44 (15%)
Multiple facial bone fractures	34 (11%)

Table 5: Ophthalmic signals of neurological concern

Signs	N=140	No. of deaths N=48
Relative afferent pupillary defect	60	20
Papilloedema	18	10
Sixth nerve palsy	10	4
Neurogenic ptosis	4	None
Traumatic optic neuropathy	48	14

The differences in pupil reaction were also measured in patients who had a GCS of less than 10. 36 patients had a GCS of less than 10 and all 36 patients had a papillary manifestation associated with it. This number revealed an important link between head injury and the presence of the student. By contrasting them to GCS and RTS scores, the next part of our study was to compare ocular results with the seriousness of head injury. There were 220 (73 percent) moderate head injury patients (GCS 13-15 and RTS 10-12), out of which 128 patients had eye involvement and 20 patients had neurological involvement. None of these patients have passed away. Severe head injury (GCS 11-12) consisted of 44 patients (15 percent) with eye-related manifestations in 40 patients. Of these, 40 patients had severe cognitive deficits and 12 died. There were 36 severe head injury patients, of which all 36 patients had neurological eye signs and all died.

Table 6: Correlation between head injury and ocular neurological symptoms and patient's final status

GCS	RTS	Cases of head injury N=300	Cases of ocular injury N=204	Patients with neuro ophthamic signs N=96	Final status of patient
3-5	1-3	4	4	4	4 deaths
6-8	4-5	12	12	12	12 deaths
9-10	6-7	20	20	20	20 deaths
11-12	8-9	44	40	40	12 deaths
13-15	10-12	220	128	20	No deaths

Discussion

As India is one of the developing countries that is rapidly adapting to cosmopolitan society, the RTA will play a major role in young people's physical misery. Recent statistics state that approximately 10% of global RTA cases are accounted for by India. The most common cause of head injury due to high-speed impact was RTAs. Other studies have also shown almost equivalent findings. 47.5 percent of cases due to RTA and 32.5 percent of cases due to height decline were reported by Raju[9]. RTA accounted for 90 percent of patients with head injury. Similar statistical results were found in our study. This research was performed with ophthalmic results on 300 head injury patients admitted to neuro-surgery wards. The patients ranged in age from 7 to 60 years, with an average of 30.56 years. The largest category that suffered head injury was young adult males (15-30 years). For example, Kulkarni et al[7] found that young adult males (21-30 years) were more vulnerable. Our study findings are similar to the results of other studies. During the third decade (21-30 years of life, Odebode et al[8] demonstrated a peak. Within 21-40 years, Sharma et al[10] showed a peak. The increased interaction with outdoor activities is due to this weakness of the young. In our sample, none of the patients had diplopia or nystagmus. Diplopia is a finding often found in patients with head injury. In our sample, 33% of patients had peri-orbital echchymosis, 23% had sub-conjunctival hemorrhage, and 32% had pupillary manifestations. These results were similar to other research. Lateral wall fracture is the most prevalent fracture in our sample among the orbital wall fracture, which can be due to the impact mechanism during RTA where the lateral wall is damaged most of the time on the verge of shielding the eyeball[11]. There were 18 patients with related cranial nerve paralysis in our sample who also had EOM restriction, and the correlation is statistically important. In head injury patients, Moster et al[12] reported cranial nerve injuries with associated ocular signs. In 12 patients who underwent a brain autopsy after death, Mariak et al reported severe cranial nerve damage. For the initial assessment of patients with head injury, the examination of the pupil for its scale, shape and its response to light plays a very important role. In our study, 100% of all 36 patients with GCS <10 had an irregular pupil, suggesting a very important correlation between papillary involvement and head injury. Similar pupillary findings in head injury patients were documented in the international trauma study and vision improvement in patients with pupillary defects following steroid injection was reported as a treatment. Our research reports that GCS in all patients with head injury has a statistically important correlation with the number of deaths, GCS in patients with ocular involvement and the number of deaths, GCS in neuro-

ophthalmic deficits and the number of deaths. A strong association between serious head injury (GCS < 8) and the incidence of ocular signs was seen in a study by Masila et al[13].

Conclusion:

Our research emphasizes once again the significance of full ophthalmological evaluation in patients with head injury to determine the final outcome of the injury at the earliest in accordance with the Glasgow coma scale. The ophthalmological test also serves as a prognostic marker, so tracking the symptoms of deterioration and recovery should be replicated at regular intervals. Therefore, our research stresses the importance of integrating ophthalmic examination into routine assessment of head injury. Our analysis also had a few disadvantages that may have influenced the final result, such as it was not possible to test eye motility in coma patients. In a few patients, tests such as Visually Evoked Potential concerned with optic nerve function in picking up subtle optic nerve damage were not conducted due to lack of availability in certain situations or due to patient-side financial constraints.

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