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Clinical Profile and Management of Patients of Head Injury at a Tertiary Care Hospital – A Prospective Study

Hemant Borse[1]* and Chetan Rathod[2]

[1]Professor, Department of Surgery, Dr. Vasantrao Pawar Medical College, Hospital and Research Centre, Nashik - 422003, Maharashta, India; drhborse@gmail.com
[2]Consultant Neurosurgeon, Datta Meghe Institute of Medical Sciences, Sawangi, Wardha, Maharashtra, India; ctrathod@gmail.com

Abstract

Head injury is one of the commonest emergencies in surgical practice. It is one of the most common cause of death and disability among the young population between the age of 15 to 25 years. This is a cross-sectional study among 100 patients with head injury at a medical college and tertiary care hospital. **Aims and Objectives**: To study the clinical profile and outcome of patients with head including the role of the Glasgow Coma Scale in their prognosis. To study the CT scan findings of the brain and the clinical outcome. **Materials and Methods:** This is a prospective observational study conducted at a Medical college and tertiary care hospital. 100 patients with head injury were enrolled in this study. Duration of the study was between December 2009 to November 2011. **Conclusion**: The commonest cause of head injury is road traffic accidents. Head injury is common in the young age of group of 21-30 years. Male: Female ratio of the head injury is 3:1 Almost one third of the patients had history of alcohol ingestion prior to the head injury. The commonest lesion in head injury is subdural hematoma. It is also the most lethal. Most of the head injuries were of mild type and only 5% patients required surgery. Only 10% of the patients had poor clinical outcome. Glasgow Coma Scale is very helpful in predicting the severity and clinical outcome of head injury patients..

Keywords: Alcohol Intake, Head Injury, Subdural Hematoma, RTA, Traumatic Injury

1. Introduction

Head injury is the most common emergency in surgical practice. It is associated with traumatic brain injury and it is the most common cause of death in young adults[1]. Road traffic accident is the most common cause of traumatic brain injury followed by fall and assault.

Primary brain injury occurs at the time of impact and includes injuries such as brain stem and hemispheric contusion, diffuse axonal injury and cortical lacerations. Secondary brain injury occurs sometime after the primary impact and is often preventable. The principal causes of such injuries are hypoxia, hypotension, raised intra cranial pressure, reduced cerebral perfusion pressure and pyrexia. Prevention of secondary brain injury results in improved neurological outcome in head injury[1].

Early diagnosis by clinical examination and CT-scan Brain followed by immediate treatment, if required craniotomy is most important. Delay in the treatment may result in permanent neurological deficit resulting in long term hospitalization, nursing care, financial loss to the patient and their families.

This is a prospective study among 100 patients with head injury at a Medical college and tertiary care hospital. In this study we have studied clinical profile, Glasgow

*Author for correspondence

coma scale, CT scan brain findings and outcome of patients with head injury.

2. Aims and Objectives

- To study the clinical profile and outcome of patients with head injury
- To study role of Glasgow coma scale in predicting the clinical outcome.
- To study CT scan Brain findings and it's clinical outcome.

3. Materials and Methods

This is a prospective observational study conducted at a medical college and tertiary care hospital. 100 patients of head injury were enrolled in this study. Duration of the study was between December 2009 to November 2011.

3.1 Inclusion criteria

All patients with head injury presenting to the casualty or Out Patient Department.

3.2 Exclusion criteria

Patients or relative not giving consent for the study.

3.3 Materials and Methods

All patients of head injury presenting to the casualty or Out Patient Department were enrolled in the study. The patients were evaluated within 10-15 minutes of admission.

Special attention was given to rule out:

-Airway obstruction

-Hypovolemic shock

-Associated chest or abdominal injuries.

In these patients life threatening emergencies were treated first.

Neurological examination was done and recorded in the proforma. Patient were followed up in the wards and their progress was recorded. If any patient required craniotomy, then the intraoperative findings were noted and the post operative course in the ward was recorded till the time of discharge. Patients were followed up for 3 months after discharge from the hospital.

4. Observations and Results

Table 1. Age distribution of head injury

Age (Years)	Male (Number)	Male (Percentage)	Female (Number)	Female (Percentage)	Total
0-10	4	5.12	2	9.09	6
11-20	7	8.97	1	4.45	8
21-30	26	33.33	5	22.72	31
31-40	14	17.94	4	18.18	18
41-50	15	19.02	4	18.18	19
51-60	11	14.10	2	9.09	13
Above 61	1	1.28	4	18.18	5
Total	78		22		100

Table 2. Sex distribution of head injury

In our study the head injury was more common in male (78 patients) than in females (22 patients)

Sex	No of cases	Percentage
Male	78	78
Female	22	22
Total	100	

Table 3. Modes of injury

Mode on injury	No of cases	Percentage
RTA	76	76
Fall	20	20
Assault	2	2
Others	2	2
Total	100	100

Table 4. Severity of head injury

Severity as per GCS	No of cases	Percentage
Mild (13-15)	53	53
Moderate (9-12)	22	22
Severe (< 8)	25	25
Total	100	100

Table 5. Various lesions on CT scan

Lesions	Cases	Percentage
Normal	9	9
Subdural hematoma	19	19
Extradural Hematoma	16	16
Intracerebral hematoma	6	6
Subarachanoid hemorrhage	17	17
Contusion	18	18
Diffuse axonal injury	6	6
Fracture skull bones	31	31

Table 6. Signs and symptoms

Signs /Symptoms	No of patients	Percentage
Vomiting	41	41
Convulsion	8	8
ENT bleed	28	28
Unconsciousness	43	43
Bradycardia	4	4
Pupillary abnormalities	32	32

Table 7. Findings associated with poor outcome on CT scan brain

Injury	No of cases	Deaths	Percentage
Subdural hematoma	19	3	15.78
Contusion	18	3	16.66
Total		6	

Table 8. Association between Glasgow coma scale and clinical outcome

Clinical outcome					**Chi square test with Yates correction**	**Chi square test with Yates correction**
	Mild GCS 15-13	Moderate GCS 12-9	Severe GCS <8	Total	X^2 value, df significance e value	P value
Survived	53	22	19	94		
Death	0	0	6	6	13.66;2;9.21	**P<0.01
Total	53	22	25	100		

Hence there is statistically significant association between severity of head injury according to Glasgow Coma Scale and clinical outcome of the patient.

Table 9. Glasgow outcome scale

Glasgow outcome scale	**No of patients**	**Percentage**
Death (1)	6	6
Vegetative state (2)	4	4
Severe disability (3)	13	15
Moderate disability (4)	5	5
Complete recovery (5)	72	72

Table 10. Surgical management

Injury	**No of cases**	**Surgery done**	**Percentage**
Subdural hematoma	19	5	26.31
Extradural hematoma	16	1	6.25
Total		6	

5. Discussion

In this modern era of mechanization, people are exposed to more and more accidents. There is an increase in the population, continuous growth in the number of vehicles, there are better roads, people are always in a hurry and want to spend as less time as possible in travelling by increasing the speed of their vehicle. Most of the time the safety precautions like wearing seat belts, wearing helmets etc, are not followed. This leads to a rise in the number of road traffic accidents.

India has experienced rapid growth in motorization in the last decade with concomitant increase in the road traffic injuries (RTI)[1,2]. Pedestrian, motor cycle users are the most vulnerable to RTI and the associated fatalities[2, 4-7].

Fatalities due to RTI is expected are likely to increase by 150% by the year 2025[6,7].

India accounts for about 10% of road traffic accident fatalities world wide[8]. Road traffic injuries (RTI) are among the three leading causes of death in the economically productive age groups (15-45 years). All national reports and independent studies point out that males are killed in greater number than females. Male to female ratio vary between 4:1 to 5:1 according to NCRB report (2005)[9].

Head injury contributes significantly to the outcome in over half of the trauma related deaths. There is a wide spectrum of head injury from mild concussion to severe brain injury resulting in death. Management of head injury depends on early identification of the underlying pathology and its treatment.

Results of a large published study[10] states that head injury accounts for the major proportion of injuries sustained in motorized two wheeler vehicles users. Riding without helmet was associated with an increased risk of serious injuries.

In a study done in Rhode Island by Daniel *et al.,*[11] it was found that motor vehicle accidents were the common cause of head injury.

5.1 Age and Sex

In our study the maximum patients were in the age group of 21-30 years. (table 1). The incidence of head injury is more among males than females.

In our study (table 2) 78% of patients were male. Male is to female ratio was almost 3:1. This is more so because in most of the families in urban areas the bread earner for the family is male. Males travel frequently than females for various reasons like job, agriculture etc. More over most of the vehicles, Public or Private are driven by males.

Various studies have shown that the incidence of head injury is more in males. Hyder *et al.,*[12] stated that the incidence of head injury is twice times more in males as compared to females. In their study they also mentioned that middle income countries face a higher prepondence of risk factors for cases of traumatic brain injury and have inadequately prepared heath care system to take care of these patients. This is at least partly true for the region included in our study.

The association of head injury and alcohol intoxication is proven by many studies[13,14,15].

Similar observation was seen in most of the studies in the literature. People in this age group are earning members of the family hence any disability or mortality in this age group is a major financial loss for the family.

5.2 Mode of Injury

Most common cause of head injury is road traffic accident. The other causes are history of fall and assault. Motorcycle riders are at higher risk of head injury (table 3).

5.3 Level of Consciousness

The cause of unconsciousness immediately after an accident could be due to a direct neuronal damage either in the cerebral hemisphere, in basal ganglion or in brainstem. It can also be due to a combination of damage in all the three regions. Reticular activating system is responsible for maintaining state of consciousness. It was first demonstrated by Houruzzi and Kagun[16].

In our study 45 patients had a history of loss of consciousness. Among them 10 patients had mild type of head injury (GCS 15-13). On CT scan brain 30% of them had sub arachnoid hemorrhage, 30% had subdural hematoma and 30% had extradural hematoma. All these patients had complete recovery. 12 patients had moderate head injury (GCS 12-9). On CT scan 41% had subdural hematoma, 41.66% had cerebral contusions, 41% had skull bone frac- ture and 33% had subarachnoid hemorrhage. Out of these, 3 patients required decompressive craniotomy. Five patients had complete recovery (GOS 5), 2 patients had moderate disability (GOS 4), 3 patients had severe disability (GOS 3) and 1 patient remained in a vegetative state (GOS 2).

Twenty three patients had severe type of head injury (GCS < 8). Among these 43% had skull bone fractures, 34% had sub- dural hematoma, 34% had subarachnoid and 39% had diffuse axonal injury. Out of these, 2 patients required decompressive craniotomy, 5 patient had complete recov- ery (GOS 5), 2 patient had moderate disability (GOS 4), and were able to live independent lives, 9 patients had severe disability (GOS 3) and were dependent on others for carrying out their day to day activities. 5 patients with severe head trauma succumbed to their injuries (GOS 1) (table 4).

5.4 Vomiting

Vomiting may be due to raised intracranial tension leading to transient changes in the brain stem causing stimulation of vomiting center in the reticular formation of lateral medulla, the exact pathways are yet to be identified. The vomiting may also be due to irritation of stomach due to swallowed blood.

In our study 42 patients had history of at least one epi- sode of vomiting. Among them, 27 had mild type of head injury (GCS 15-13). CT scan of the brain showed cerebral edema, subarachnoid hemorrhage and fracture skull bones. A complete recovery was seen in 26 patients (GOS 5), while 1 patient developed moderate disability. Moderate head injury was seen in 9 patients (GCS 12-9). On CT scan the findings were fracture of skull bones, subdural hematoma and, subarachnoid bleed. A complete recovery was seen in 5 patients (GOS 5), while 4 of the others developed moderate disability (GOS 4). 5 patients had severe head injury. On CT scan the findings were extradural hematoma, subarachnoid bleed. 2 patients had complete recovery (GOS 2); 1 patient had severe disability (GOS 2) and there was death of one patient in this group (table 5).

Thus, history of vomiting is important as it indicates severity of head injury. Nee *et al.*,[17] stated that their results support the incorporation of enquiry about vomiting into the guideline of skull radiography and one episode of vomiting seems to be as significant as multiple episodes (table 6).

5.5 Convulsion

Several studies have shown that patients of traumatic brain injuries are at increased risk of developing seizure disorder if they have one or more of the following risk factors –

- GCS < 10
- Cortical contusion
- Depressed fracture of skull
- EDH
- SDH
- Intracerebral bleed
- Penetrating head wound
- Seizure within 24 hours of head injury[17]

In our study 8 patients presented with seizure either before or following admission.

Five patients presented with mild head injury (GCS 15-13) and on CT scan findings showed extradural hematoma and subdural hematoma. All patients with mild head injury had complete recovery (GOS 5) (table 7).

One patient had moderate head injury (GCS 12 - 9) with the presence of extradural hematoma on CT scan (table 8 & 9).

Another patient had severe head injury with CT scan showing extradural bleed who underwent decompressive craniotomy but later succumbed.

5.6 ENT Bleed

In this series 29 patients had ENT bleeding

Fourteen patients had mild head injury (GCS 15-13). On CT scan brain the most common findings were fracture skull bone. Fracture of temporal bone was very common. Thirteen patients had complete recovery (GOS 5) while 1 patient developed moderate disability (GOS 4).

Five patients with ENT bleed had moderate head injury (GCS 12-9). CT scan brain showed contusion, fracture skull bone, subdural hematoma. Two patients had complete recovery (GOS5) while 3 patients developed severe disability.

Table 5, ten patients had severe head injury (GCS <8), on CT scan the common findings were hemorrhagic contusions, skull bone fractures, subdural hematoma. One patient had complete recovery (GOS 5) while 4 patients had severe disability (GOS 3) and there were 2 deaths (GOS1) in (table 6) patients with history of ENT bleed.

5.7 Scalp Laceration

In our series 24 patients had scalp laceration. 15 patients had mild head injury of which 60% had skull bone fractures, 20% had subdural hematoma on CT scan. All patients had complete recovery.

5 patients had moderate head injury (GCS 15-13). The findings on CT scan brain showed subdural skull bone fractures. Three patients had complete recovery, 1 patient had moderate disability and 1 patient had severe disability.

Four patients of scalp laceration suffered severe head injury of which 50% had extradural hematoma and 50% had cerebral contusion. One patient underwent craniotomy following which he had severe disability, 2 patients were in vegetative state and there was 1 death.

5.8 Pupillary Abnormalities

Pupillary size and reaction to light is very important in accessing the severity of head injury.

In our study various pupillary abnormality were present in 32 patients. Out of these 8 patients had mild head injury, 8 patients had moderate head injury and 16 patients had had severe head injury. There were 5 deaths among patients with pupillary abnormalities.

5.9 Bradycardia

Bradycardia in an unconscious patient is a grave sign and it indicate raised intracranial pressure.

In our series 4 patients had bradycardia either at the time of admission or during their hospital stay. Out of these, 3 patients were having subdural hematoma and 1 patient had subarachnoid bleed.

5.10 Alcohol Intoxication

Alcohol is a major risk factor for road traffic accidents because alcohol impairs judgement and it increases the possibility of involvement in high risk behaviour (e.g., speeding, violating traffic rules etc.)

The association between alcohol ingestion and head injuries has been well established. It has also been demonstrated that recent intake of alcohol can complicate assessment of level of consciousness after head injury and delay in diagnosis of complications[18].

In our study 33% patients were found to be under the influence of alcohol. A study of casualty department of New Delhi hospital revealed that 7% of road traffic accident patients had consumed alcohol[19]. Another study shown showed that 29% of two-wheeler victims were under influence of alcohol[20].

6. CT Scan Brain-findings

6.1 Cerebral Edema

Cerebral edema occurs within 20 minutes following a head injury. It is not related to severity of primary brain injury.

- CT scan findings are –
- Bilateral compression of ventricles
- Nonvisualization of cortical sulcus spaces
- Effacement of basal cistern.

Cerebral edema occurs to some extent in all patients of head injury.

In our study cerebral edema was seen in 19% of the patients

6.2 Contusions

Focal brain contusions may develop directly at the site of contact or by counter coupe mechanism. Common sites are beneath a depressed fracture or temporal lobes where gyral crests are bruised by jagged edges of bones.

CT scan findings shows heterogeneous hyperdense areas with irregular hypo dense areas. There may also be a thin strip of extradural hematoma masked by a contusion. Cerebral contusions are usually associated with cerebral edema giving rise to signs of raised intracranial tension. In our study 18% of patients were having contusions.

6.3 Intra cerebral Hemorrhage

Intracerebral hemorrhage is frequently seen in the frontal and temporal lobes, less frequently in the parietal and occipital lobes. They are usually superficial. They usu- ally occur immediately but may be delayed following a head injury. Delayed intracranial hemorrhage can occur due to impaired cerebral auto regulation. Intra cerebral hemorrhage often occurs within 48 hours but may be seen 2 weeks after injury.

CT scan appearance – appears as a homogeneous hyperdense lesion (70-100 Hounsfield units) with smooth but regular margins surrounded by edema. After 7-21 days of injury, a peripheral ring enhancement is seen in the hematoma and it diminishes in intensity. For detecting intra cerebral hematoma in brain stem and cerebellum high resonance scanners are required.

Clinically patients usually are deeply unconscious and show signs of raised intra cranial tension. The associated mortality is due to secondary effects like cerebral edema and white matter shearing.

In our study 6 patients were having intra cerebral hemorrhage.

6.4 Subdural Hematoma

The source of bleeding in subdural hematoma may be the laceration of dura or its venous sinuses, veins bridging the subdural space (Mitten Weir space), intracerebral bleed with parenchymal damage.

In severe head injury the combination of parenchymal damage and mass effect of acute subdural hematoma combine in varying degrees to produce signs and symptoms of neurological dysfunction. The prognosis of acute subdural hematoma with neurological dysfunction is poor. Even with surgical intervention the mortality rate is 60-80%. This is due to parenchymal damage. A remarkable decrease in the mortality in patients operated within 4 hours of trauma can occur. Hence the importance of early diagnosis, prompt CT scanning and appropriate surgical management. In less severe trauma, acute subdural hematoma is small and there is minimal parenchymal damage. The subdural hematoma will clot and over the next several days to weeks it will undergo liquefaction or organization . In our study we had 19 cases (19%) of subdural hematoma. Five patients under went decompressive craniotomy for evacuation of hematoma, there were 3 deaths.

6.5 Extradural Hematoma

Extradural hematoma is collection of blood between the inner table of the skull and dura.

The cause may be laceration of the middle and posterior meningeal artery or damage to meningeal emissary veins or venous sinuses

CT Scan appearance – Well localized hyperdense extra cerebral lesion with biconvex or reticular shape with sharp margin which bulges inwards towards brain parenchyma. Acute bleeding is suggested by an irregular swirl (The Swirl sign) one margin of which can be traced to the inner margin of the Dura or fracture.

In addition other signs of active bleeding are pseudo meniscus sign, multi laminar appearance of EDH / reverse meniscus sign.

In our series there were 16 cases of extradural hematoma.

CT Scan findings suggestive of poor prognosis

In our series CT Scan findings suggestive of poor prognosis are

1. Subdural and Subarachnoid hematoma - Out of 19 patients of subdural hematoma 3 patients died and out of 17 patients with subarachnoid hematoma 2 patient died.
2. Contusions and mixed lesions –3 patients of mixed lesions died.

7. Surgical Treatment

In our series 6 patients required surgery (table 10). The indications for surgery were as follows –
Extradural hematoma – 1
Subdural hematoma – 5

8. Conservative Treatment

In our series 95 patients were managed conservatively.

9. Deaths

In our series there were 5 deaths.
Our of 19 subdural hematoma 3 patients died.
Out of 18 patients of cerebral contusion 2 patients died.
Out of 16 patients of extradural hematoma there were no deaths.
Most of the them there were combinations of lesions on CT scan.
Subdural hematoma are most lethal followed by cerebral contusions.
Extradural hematoma if treated in time have better prognosis.

10. Follow Up

Follow up and complete neurological assessment of all patients was done with Glasgow Outcome Scale (GOS) on discharge and 7 days after discharge. Patients with head injury who were doing well with no clinical deficit generally did not have follow up at our institution. Patients with moderate to severe disability were followed up 3 months after discharge.

11. Summary and Conclusion

In the patient with head injury, the commonest cause is road traffic accidents (76%). The other common causes were fall (20%) and other injuries (4%).

Peak incidence is between 21- 30 years of age. Head injury is more common in males than in females and the ratio is M:F 3.7:1.

Two-wheeler riders were more vulnerable for head injury. 33% of patients of head injury were under influence of alcohol. Majority of patient were having mild head injury.

Out of the 100 patients, 53% had mild head injury (GCS 15-13), 22% had moderate head injury (GCS 12-9) and 25% had severe head injury (< 8).

The lesion found on CT Scan brain were in their order of frequency are subdural hematoma (19%), contusions (18%), subarachnoid hemorrhage (17%), extradural hematoma (16%).

There is correlation between the Glasgow coma scale and clinical out come of the patients in terms of morbidity/ disability and mortality.

10% of the patients had poor clinical outcome – 6% death and 4% were in persistent vegetative state. 13% had moderate disability and were dependent on some one to carry out day to day activity. 77% had good clinical out come and were able to live independent lives.

Subdural hematoma was commonest cause of morbidity and mortality in head injury.

Early diagnosis and timely surgical intervention if required improves chances of survival of patients. 94% of the patient were managed conservative, only 6% required surgery.

Not all patients of intra cranial hematoma require surgical intervention.

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