

Spectrum of Severe Head Injury with Management and Outcome: A Single Tertiary Care Centre Study

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Abstract

Introduction: Head injury continues to be a challenge not only for the public but also for the neurosurgeon. India has the distinction of having the highest rate of head injury in the world.

Materials and Methods: This is a prospective observational study of severe head injury patients admitted to our hospital during the period August 2003 to June 2005. A total of 150 severe head injury patients of all age groups were admitted and treated. In all cases; age, sex, mechanism, severity, other associated injuries, computed tomography (CT) findings, management, and Glasgow outcome scale were analyzed.

Results: The incidence of severe head injury was maximum in the third decade (27.3%). Males were more commonly involved than females, M:F = 4:1. Road traffic accidents were the major cause of head injury (52.6%). Road traffic accidents and assaults were the main cause in adults while fall was the leading cause in children. 41.9% cases of were admitted within 5 h of injury. 64% cases were referred from other hospitals, maximally from district hospitals. Alcohol intoxication was present in 18.6% cases. In 55% cases, associated injuries were recorded in the study with clavicle fracture as a most common fracture. Contusions were the most common intracranial lesions on CT imaging. Skull fractures were recorded in 26% cases with frontal bone as the most common site. Surgery was required in 33.3% patients and 20% required tracheostomy. Overall mortality was 40.7%. Poor prognostic factors which are recorded: Delay in admission, advanced age >60 years, CT findings: Brain edema, acute subdural hemorrhage, subarachnoid hemorrhage, dilated pupil, and Glasgow coma scale 3-5.

Conclusion: Outcome of head injury depends on initial presentation. Early recognition and prompt management contribute to decrease mortality and disability. CT scan facility in district hospitals; early referrals of head injury patients to higher centers and neurosurgical intensive care can decrease mortality in head injuries.

Key words: Computed tomography, Glasgow coma scale, Glasgow outcome scale, Head injury, Severe head injury

INTRODUCTION

Head injury continues to be a challenge not only for the public but also for the neurosurgeon. It is an important cause of high morbidity and mortality, particularly in young and productive age group patients. In spite of marked improvements in pre-hospital care, operative skills and overall management of head injuries, mortality/morbidity of severe head injury has not changed over the last 30 years

due to urbanization, industrialization, and increase in vehicular population.¹

Over 5.56 million accidents occur worldwide per year with 1.2 million deaths annually and 3400 death/day. India has the distinction of having the highest rate of head injury in the world. In 1990, 80,000 people were killed in road traffic accidents, which increased to 150,000 deaths per year in 2011. Pedestrians and motorcyclists are the most common victims of road traffic accidents in India. Traumatic brain injuries are a leading cause of morbidity, mortality, disability, and socio-economic losses in India and other developing countries.

Head injuries can be classified according to severity 80% as mild (Glasgow coma scale [GCS] 13-15), 10% moderate (GCS 9-12), the remainder are severe in nature (GCS 3-8).

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Severe head injury accounts for more than 50% of trauma-related deaths; these usually occur following road traffic accidents, assaults, and falls.

Assessment of the head injury patient begins with the advanced trauma life support protocol of ensuring patency of the airway with cervical spine control while maintaining good oxygenation and tissue perfusion.² This aims to prevent the development of secondary brain injury. Between 5% and 10% of head injuries have an associated cervical spine injury.³ Such an injury can be excluded in almost all cases with a combination of computed tomography (CT), magnetic resonance imaging, or flexion-extension radiography of the neck and should clinical suspicion indicate it. Once the clinician is satisfied that the patient is resuscitated with a stable cardiorespiratory status, neurological assessment can occur. The neurological examination begins with an assessment of patient's conscious level using the GCS. The severity of the head injury can be based on this initial GCS score. Pupil size and reaction to light are also assessed. Asymmetry of limb movement may help in diagnosing an underlying intracranial lesion. Observations on the blood pressure, pulse, and respiratory rate are also essential.

All patients with multiple injuries and those with severe head injuries should have blood samples analyzed for baseline estimations - full blood count, electrolytes and urea, coagulation screen, blood gases, alcohol level, and blood group.

Although the severe head injury is only a relatively small part of the head injury picture, mild, and moderate injuries combined are 5 times as common surgeons are more involved in the care of patients with severe head injuries where care is more complicated. Maximum mortality occurs in this severe group.

The present prospective observational study is designed to elucidate demographic profile, epidemiology, management, and outcome of severe head injury patients.

MATERIALS AND METHODS

This prospective observational study was carried out in the Department of General Surgery Maharaja Yaswant Hospital, Indore, Madhya Pradesh, India, from August 2003 to June 2005. All head injury patients were registered, and the study was carried out on severe head injury group patients after getting post-resuscitation GCS. Detailed history and careful clinical examination were performed on each patient. GCS was noted in each case. Laboratory investigations done were hemoglobin, total and differential

leukocyte counts, hematocrit, blood urea and serum creatinine, random blood sugar, and serum electrolytes, X-rays skull, chest, limbs, and spine (where indicated) were done. Plain CT head was done every case. Patients were managed into conservative and surgical groups. Outcome was measured at the time of discharge using Glasgow outcome scale.

RESULTS

A study regarding the epidemio-clinical and management aspects of 150 severe head injury cases in Maharaja Yeshwantrao Hospital, Indore, has been conducted from August 2003 to June 2005. Following were the results.

The incidence of severe head injury was maximum in the third decade (27.3%) (Table 1). Males were more commonly involved than females (Table 2), M:F = 4:1. Road traffic accidents were the major cause of head injury (52.6%). Road traffic accidents and assaults were the main cause in adults while fall was the leading cause in children (Table 3). 41.9% cases were admitted within 5 h of injury, and out of this,

Table 1: Age distribution (severe head injury)

Age group (years)	Number of cases (%)
Up to 10	29 (16.0)
11-20	20 (13.3)
21-30	41 (27.3)
31-40	35 (23.3)
41-50	15 (10.0)
51-60	5 (8.3)
Above 60	10 (6.6)
Total	150 (100)

Table 2: Sex distribution (severe head injury)

Age group (years)	Male	Female
Up to 10	29	16
11-20	18	2
21-30	37	4
31-40	33	4
41-50	13	2
51-60	4	1
Above 60	4	6
Total	118	32

Table 3: Causes of severe head injury

Mode of injury	Number of cases (%)
Road traffic accidents	79 (52.6)
Fall from height	31 (20.6)
Assaults	26 (17.3)
Falling objects	3 (2.0)
Miscellaneous	11 (7.3)
Total	150

22.6% were brought within 24 h. 12.6% were brought after 24 h (Table 4). Alcohol intoxication was present in 18.6% cases. In 55% cases, associated injuries were recorded with clavicle fracture as most common associated injury. CT scanning of the head was done in all patients with contusions (50%) as most common intracranial lesions. Other findings were fractures, extradural hematoma, subdural hematoma, subarachnoid bleed, brain edema, diffuse axonal injury, and intraventricular bleed (Table 5). Skull fractures were recorded in 26% cases with frontal bone as the most common site. 33.3% cases undergone surgical intervention (Table 6) and 20% cases required tracheostomy. Overall mortality was 40.7%, good recovery occurred in 48%, moderate disability in 3.3%, severe disability in 5.3%, and persistent vegetative state was observed in 2.7% patients (Table 7). Poor prognostic factors, which are recorded in this study: Delay in admission, advanced age >60 years, CT findings: Brain edema, acute subdural hemorrhage (SDH), subarachnoid hemorrhage (SAH), pupillary changes, and GCS 3-5.

DISCUSSION

In severe head injury group, the highest incidence (27.3%) was found in the third decade followed by 23.3% in the

fourth decade which is similar various studies,^{4,7} in which the highest incidence of severe head injuries reported in the third decade. Incidence in males (79%) is higher than females (21%). Road traffic accident was the leading cause of severe head injury accounting for 52.6% of patients. It was followed by fall with the incidence of 20.6% and assault with incidence of 17.3% which is in unison with other similar studies.^{5,8,9} In the present study, 42% cases were brought to the hospital within 5 h of injury, and out of this, 22.6% were brought within 24 h. 12.6% were brought after 24 h. Our percentage of patient's referral within 6 h of injury is lower than studies from developed countries.^{9,10} This stresses the need of good transportation facility from primary health centers and district hospitals to tertiary centers in India. Compared to the study of Jennett *et al.*, alcohol positivity (38.3%) is lower in the present study (19%). 83 cases (55%) have associated injury, which is higher from similar studies.^{9,11}

The higher incidence of associated injuries is attributed to maximum cases of soft tissue injuries in present series. Contusion was the most common finding on CT imaging 75 cases (50%) showed contusions; frontal lobe is the most common site. Other findings were fractures, extradural hematoma, subdural hematoma, subarachnoid bleed, brain edema, diffuse axonal injury, and intraventricular bleed. Findings of present series are more or less similar to CT findings of Selladurai *et al.*¹⁰ Contusion is the most common finding in both the studies.

Surgical intervention was required in 50 patients (33.3%), out of which, 9 cases died postoperatively. The remaining cases of severe head injury were managed conservatively with proper chest physiotherapy, tracheostomy (where prolonged intubation required), ventilatory support, RT feeding, and nursing care. Tracheostomy was required in 30 patients. Percentage of surgical management varies from

Table 4: Time interval between injury and admission

Time interval (h)	Number of cases (%)
Within 2	34 (23.6)
2-5	29 (19.3)
5-8	16 (10.6)
8-11	15 (10.0)
11-18	13 (8.6)
18-24	16 (10.6)
Above 24	19 (12.6)
Not known	8 (5.3)
Total	150

Table 5: Lesion on CT scan in GCS 3-8 (150 cases)

Lesions	Number of cases
Extradural hematoma	40
Subdural hematoma	30
Contusions	75
Frontal	40
Temporal	13
Parietal	10
Occipital	2
Multiple	10
Brain stem lesions	2
Intraventricular blood	8
Subarachnoid bleed	30
Infarcts	5
Brain edema	20
Diffuse axonal injury	20
Pneumocephalus	15
Fractures	70
Subdural effusions	5

CT: Computed tomography, GCS: Glasgow coma scale

Table 6: Management in severe head injury

Authors	Cases	Non-surgical (%)	Surgical (%)
Jennett <i>et al.</i> (1977)	531	72	28
Saul and Ducker (1982)	106	69	31
Levati <i>et al.</i> (1982)	215	46.5	53.5
Lobato <i>et al.</i> (2005)	56	86	14
Present series	150	66.7	33.3

Table 7: Outcome in severe head injury cases

Outcome	Number of cases (%)
Death	61 (40.7)
Persistent vegetative state	4 (2.7)
Severe disability	8 (5.3)
Moderate disability	5 (3.3)
Good recovery	72 (48.0)
Total	150 (100)

Table 8: Outcome according to GOS in severe head injuries

Authors	Cases	GOS				
		Recovery	Moderate disability	Severe disability	Vegetative state	Death
Jennett <i>et al.</i> (1977)	700	22	15.8	8.8	2	51
Levati <i>et al.</i> (1982)	215	35.8	10.7	4.2	1	39.5
Selladurai <i>et al.</i> (1992)	109	26.6	11	14.7	7.3	40.4
Present series (11 cases not specified)	150	48	3.3	5.3	2.7	40.7

GOS: Glasgow outcome scale

study to study^{6,9,12} (Table 6). This may be due to the type of head lesions in different patients varies from study to study.

Overall mortality was 40.7%, recovery 48%, and severe disability 5.3%. These results are comparable to the study of Levati *et al.*¹³ In the present study, the outcome was evaluated according to the state of the patient at the time of discharge. Other studies^{9,10} drawn results from serial follow-up (Table 8). This is the reason for the variation in results of the outcome.

The factors related with bad prognosis were delayed (>1 day) interval between injury and admission, patients with GCS 3-5, age >60 years, CT findings: Brain edema, acute SDH, SAH, and dilated pupil. Chaudhury *et al.*,¹⁴ in 472 cases of severe head injuries, found GCS<8, advanced age, dilated pupil, extensor rigidity, and altered blood pressure as risk factors with bad prognosis.

CONCLUSION

Tremendous increase in number of head injury, the management of head injury has gained an important place today. Most effective way to decrease the burden is to do prevention. Enforcing traffic rules, wearing helmet while driving, laws against alcoholism can decrease head injury. The outcome of head injury is drastically correlated to the quality of pre-hospital care and the rapidity with which they are transferred to a specialized center, where they can be managed promptly and effectively. Development of strong transportation system and initial care at primary health centers and district hospitals in India can decrease morbidity and mortality. Finally, dedicated trauma units should be established to give comprehensive care to head injury victims.

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REFERENCES

- Palmer S, Bader MK, Qureshi A, Palmer J, Shaver T, Borzatta M, *et al.* The impact on outcomes in a community hospital setting of using the AANS traumatic brain injury guidelines. *American Association for Neurologic Surgeons. J Trauma* 2001;50:657-64.
- Kortbeek JB, Al Turki SA, Ali J, Antoine JA, Bouillon B, Brasel K, *et al.* Advanced trauma life support, 8th edition, the evidence for change. *J Trauma* 2008;64:1638-50.
- Holly LT, Kelly DF, Counelis GJ, Blinman T, McArthur DL, Cryer HG. Cervical spine trauma associated with moderate and severe head injury: Incidence, risk factors, and injury characteristics. *J Neurosurg* 2002;96 3 Suppl:285-91.
- Aguèmon AR, Padonou JL, Yévègnon SR, Hounkpè PC, Madougou S, Djagnikpo AK, *et al.* Intensive care management of patients with severe head traumatism in Benin from 1998 to 2002. *Ann Fr Anesth Reanim* 2005;24:36-9.
- Masson F, Thicoipe M, Mokni T, Aye P, Erny P, Dabadie P. Aquitaine group for severe brain injury study. Epidemiology of traumatic comas: A prospective population-based study. *Brain Inj* 2003;17:279-93.
- Saul TG, Ducker TB. Effect of intracranial pressure monitoring and aggressive treatment on mortality in severe head injury. *J Neurosurg* 1982;56:498-503.
- Woertgen C, Rothoerl RD, Metz C, Brawanski A. Comparison of clinical, radiologic, and serum marker as prognostic factors after severe head injury. *J Trauma*. 1999;47:1126-30.
- Mittal B. Management of severe head injuries in Eastern Libya. *Neurol India* 1989;37:341-8.
- Jennett B, Teasdale G, Galbraith S, Pickard J, Grant H, Braakman R, *et al.* Severe head injuries in three countries. *J Neurol Neurosurg Psychiatry* 1977;40:291-8.
- Selladurai BM, Jayakumar R, Tan YY, Low HC. Outcome prediction in early management of severe head injury: An experience in Malaysia. *Br J Neurosurg* 1992;6:549-57.
- Lehmann U, Pape HC, Seekamp A, Gobiet W, Zech S, Winny M, *et al.* Long term results after multiple injuries including severe head injury. *Eur J Surg* 1999;165:1116-20.
- Lobato RD, Alen JF, Perez-Nuñez A, Alday R, Gómez PA, Pascual B, *et al.* Value of serial CT scanning and intracranial pressure monitoring for detecting new intracranial mass effect in severe head injury patients showing lesions type I-II in the initial CT scan. *Neurocirugia (Astur)* 2005;16:217-34.
- Levati A, Farina ML, Vecchi G, Rossanda M, Marrubini MB. Prognosis of severe head injuries. *J Neurosurg* 1982;57:779-83.
- Choudhury SR, Sharma BS, Gupta VK, Kak VK. Risk factors in severe head injuries. *Neurol India* 1996;44:187-94.

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