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Original Research Paper

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A STUDY ON EPIDEMIOLOGY, DIAGNOSTIC MODALITY, MANAGEMENT AND OUTCOME OF PATIENTS WITH TRAUMATIC BRAIN INJURY(TBI)

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ABSTRACT

Background: Traumatic brain injury (TBI) has been called the 'silent epidemic' of modern times, and is the leading cause of mortality and morbidity in children and young adults in both developed and developing nations worldwide. Treatment of TBI can be complex and expensive. Early intervention plays a crucial role in severe traumatic injury. In advent of same the present study aimed to evaluate the diagnostic modality, management and outcomes of patients with traumatic brain injury. **Material and Method:** This cross-sectional observational study was undertaken on 26 patients admitted in surgical ward and SICU of Index Medical College, Indore with history of traumatic brain injury. Detailed information regarding the mechanism of injury, history, examination and follow up recorded systematically. Common presentations were unconsciousness, vertigo, headache & confused state. Statistical analysis was done. **Results:** Out of 26 patients, majority of subjects belonged to age groups 16-40 years of which 80% of subjects were males. Majority of patients had 15-20 days stay in hospital. Road traffic accidents are the most common mechanism of injury and involved mostly two wheelers' accidents. Loss of consciousness and chakkar were the most common complains and GCS in the majority ranged from 9-13. SDH and hemorrhagic contusions (60%) followed by extradural hematoma (15%) were the most common CT findings. About 20% patients were operated with 12 % mortality rate. **Conclusion:** Imaging modality in early stage plays an important role in early management and improved outcome following TBI. GCS also plays an important role for deciding early resuscitation and defining the severity of brain injury in precise terms.

KEYWORDS : traumatic brain injury, GCS, amnesia.

INTRODUCTION

'A spill, a slip and a hospital trip'. Traumatic brain injury (TBI) has been called the 'silent epidemic' of modern times, and is the leading cause of mortality and morbidity in children and young adults in both developed and developing nations worldwide. It is among the most severe types of injury in terms of both case fatality[1] and long-term implications for survivors.[2] More than 20 million people worldwide suffer TBI serious enough to result in death or hospitalisation and also accounts for a much larger proportion of lifelong disability. TBI has a prevalence of one death every 4 min in India due to head trauma. Road Traffic accidents are the leading cause (60%) of TBI followed by falls (20-25%) and violence (10%). Alcohol intake is also seen among 15-20% of TBI at the time of injury.

Traumatic brain injury is defined as brain damage resulting from external forces, as a consequence of direct impact, rapid acceleration or deceleration, a penetrating object or blast waves from an explosion.

The term head injury is often substituted for traumatic brain injury (TBI), but it is broader because it may include injuries to the face and scalp, such as lacerations and abrasions, which may occur without underlying brain trauma.

Treatment of TBI can be complex and expensive.[3] Upon clinical examination, TBI is most commonly sub-divided into mild, moderate, and severe, according to the Glasgow Coma Scale (GCS).[4,5] Such categories have been found to be predictive of a patient's long-term outcome,[6] although other measures and models also have been tested.[7,8]

In recent years, the treatment of TBI has undergone a paradigm shift. The management of severe TBI is ideally based on protocol-based guidelines provided by the Brain Trauma Foundation. The aims and objectives of its management are prophylaxis and prompt management of intracranial hypertension and secondary brain injury, maintenance of cerebral perfusion pressure, and ensuring adequate oxygen delivery to injured brain tissue.[9]

In advent of same the present study was undertaken with an aim to evaluate the diagnostic modality, management and outcomes of patients with traumatic brain injury. Further, the study had following objectives:

- To assess, diagnose, treat and post treatment followup of patients treated mainly with subdural hematoma and extradural hematoma.
- Establishing role of Glasgow coma scale in early diagnosis and management of traumatic brain injury.

MATERIAL & METHODS

After approval from the institutional ethical committee, the present cross-sectional observational study was undertaken at SICU and Surgical ward at Index Medical College Hospital & Research Centre, Indore for a period of 1 year i.e., August 2020 to September 2021; on 26 patients who had undergone head injury after road traffic accident and fall from height (SDH 10 , EDH 06 , SDH + EDH -05 ,SAH + SDH/ EDH-05) and visited the emergency section and OPD (within 2 days) of the injury are admitted in A written informed consent was taken from the guardians/caretaker before enrolling them for study.

Inclusion Criteria

- Patients presenting in the emergency section and in OPD (within 2 days) with traumatic head injury in road accidents, fall from height and violence.
- Patients presenting with any one – headache, nausea, vomit, history of loss of consciousness, seizures after history of trauma will be included after an informed written consent.
- Patients who consented for the study

Exclusion Criteria

- Patients not admitted following traumatic brain injury.
- Patient not willing to be part of the study.
- Patients brought dead in emergency department

METHOD

Detailed study of the cases was done including history taking, record of general and systemic examination, investigations, treatment and follow up. Diagnostic modalities included NCCT Head, Chest Xray PA view, USG whole abdomen and blood investigations. Early GCS scoring was done in all, especially unconscious patients which helped in early assessment and treatment among them. Mechanism and mode of injury also helped in assessing the severity of injury.

Statistical Analysis

All data were recorded on a structured proforma and tabulated. Statistical analysis of the demographic data was performed using SPSS Software Version 20.0. The differences in the variables between the were analyzed by Student t test and chi square test. $P < .05$ was considered to be statistically significant.

RESULTS

Of the 26 patients studied 23(88.4%) were male among which 16(69.5%) were in the age group of 16- 25 years. 21 (80.7 %) subjects came after Road traffic accident and 5 (19.2%) after a fall from height.

Of the total subjects, 22(84.6%) patients presented with the history of loss of consciousness after incident of trauma.

All patients came with the complain of at least one of the following –vomit, seizures, ENT bleed and headache were advised NCCT head.

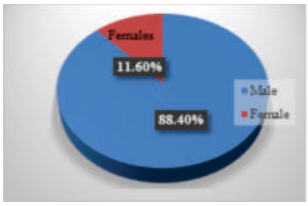
Early GCS scoring was done in all, especially unconscious patients which helped in early assessment and treatment among them. Mechanism and mode of injury also helped in assessing the severity of injury among 5 of the patients which were unconscious and had no relatives with them.

22(84.6%) patients were treated conservatively (antiepileptics, antibiotics, neuroprotective agent, diuretics except in EDH and strict vitals monitoring) of which 4 were intubated and undergone long hospitalization and other 4 were taken for immediate surgical evacuation of hematoma. Among 6 Subjects with EDH, 4 were hospitalized for around 6-8 weeks compared to shorter 4-6 weeks hospitalization in patients with other head injury.

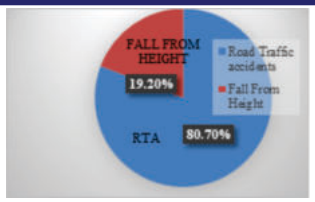
GCS scoring was done of all patients immediately and then routinely. Out of all the patients 06 were of severe head injury status (GCS score less than 8), 5 patients with moderate (score 9-13) and 15 with mild head injury (score 13-15).

Of all the components motor component was most sensitive for the initial assessment of patient although none of them had similar outcomes as it cannot be said that every patient will improve or react the same way as other.

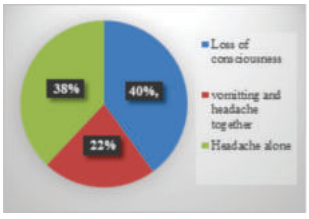
Of 26, 7 patients experienced post-concussion symptoms like headache, dizziness, nausea /vomit, sleep disturbances, fatigue, poor concentration, irritability while others recovered fully after complete treatment from hospital and 2 with severe head injury got declared dead.



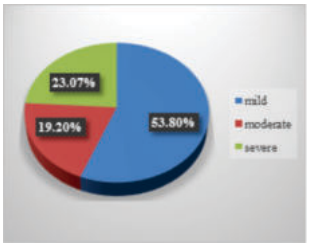
Graph 1: Distribution Of Study Participants According To Gender



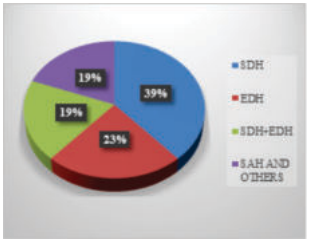
Graph 2: Distribution Of Study Participants According To Cause Of Injury



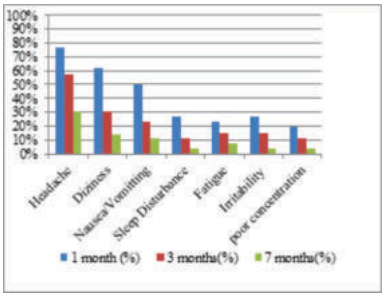
Graph 3: Distribution Of Study Participants According To Symptoms



Graph 4: Distribution Of Study Participants According To Severity Of Head Injury



Graph 5: Distribution Of Study Participants According To Injuries



Graph 6: Post Concussive Symptoms 1 Month ,3 Months And 7 Months After Discharge

Table 1. Glasgow Coma Scale

BEHAVIOUR	RESPONSE	SCORE
Eyes open	Spontaneous To speech To pain None	04 03 02 01
Best verbal response	Oriented Confused but obeys command Inappropriate words Incomprehensible sounds None	05 04 03 02 01

Best Motor response	Obeys orders	06
	Localize pain	05
	Flexion (withdrawal) to pain	04
	Abnormal Flexion (Decorticate rigidity)	03
	Abnormal extension (Decerebrate rigidity)	02
	None	01

DISCUSSION

Assessment

Traumatic Brain Injury is common and when severe leads to poor outcome. Patients with mild brain injury have a good prognosis providing treatable complications are not missed. Mortality for those with GCS <8 after resuscitation may be as high as 50 %.

Classically traumatic brain injury has been divided into two distinct periods: Primary and secondary injury. The primary is due to initial, mechanical forces, resulting in shearing and compression of neuronal, glial and vascular tissue. The secondary injury is defined as consequence of further physiological insults, such as ischemia, reperfusion and hypoxia to areas of "at risk" brain in period after initial injury.[10] Many patients obey commands or talk before their deaths suggesting that the initial injury per se is not lethal but the consequences are.

GCS was devised by Teasdale and Jennett in 1974 as a practical scale to describe the depth of coma objectively.[11] Although the GCS is by far the most widely used tool for assessment of consciousness, it is not perfect and other methods do exist. Eye opening and verbal responses are influenced by local trauma, swelling and tracheal intubation. This study and many others like it have brought a conclusion that every response to a similar injury, is different for different patients. It was also seen that deterioration in GCS helped in predicting the need for evacuation of traumatic sub dural hematoma.

Out of the three components, eye responses were of lowest stature in predicting GCS. The number one predictor in this study was found to be motor response.

CT Findings

Patients with mild head injury have an abnormal CT rate when compared with patients with severe head injury. The most consistent individual abnormalities are midline shift, compression of basal cisterns and traumatic subarachnoid hemorrhage.

The strength of association between abnormalities and outcome varies with other patient factors like age, pupillary signs and GCS. The earlier scans have a good prognosis risk missing operable lesions which develop later in the course compared to later scans with worse outcomes.

Surgical Management

Craniotomy and craniectomy: They are commonly used in the setting of intracranial hematoma after trauma. These are only guidelines, but individual's patient may require surgery for smaller hematomas or may not be surgical candidates despite meeting the below requirements. Significant variability exists between neurosurgeons with regard to treatment.[14]

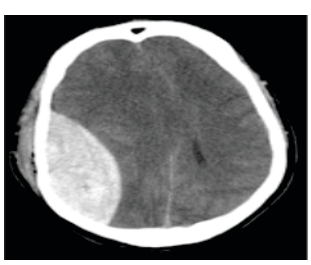


Figure 1. CT Scan In Patient With EDH: Biconvex Shaped

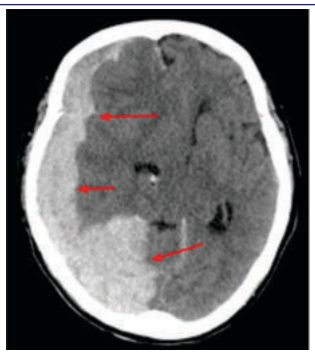


Figure 2. CT Scan In Patient With SDH: Concavo Convex

Table 2. Acute Decision Rules For Neuroimaging In Head Trauma

CANADIAN HEAD CT RULE	NEW ORLEANS CRITERIA
1. > 65 years old	1. >60 years old
2. Dangerous mechanism	2. Intoxication
3.Vomit > 1 episodes	3. Headache
4. Amnesia loner than 30 minutes	4. Any vomitting
5. GCS <15 at 2 hour	5. Seizure
6. Suspected open, depressed or basal skull fracture	6. Amnesia
	7. Visible trauma above the clavicle
CONSIDER CT HEAD IN PATIENTS WITH 1 OR MORE THAN 1 ABOVE CRITERIA	CONSIDER CT HEAD IN PATIENTS WITH 1 OR MORE THAN 1 ABOVE CRITERIA

Table 3. Management Of Traumatic Brain Injury[12,13]

ABCDE	KEY MANAGEMENT STEPS
Airway	Keep airway patent, use nasopharyngeal airway (if no facial trauma) or oropharyngeal airway (if no gag reflex) when needed. If GCS <8 intubation for airway protection
Breathing	Maintain normoxia by providing oxygen to keep saturation above 90% and paO2 more than 60 mm hg and also avoid hyperoxia by avoiding 100 % oxygen at NRB for prolonged periods. Avoid aspiration and place NGT if no facial trauma
Circulation	Maintain SBP > 110, MAP 80-90 mmh g giving isotonic fluids or vasopressors if needed (epinephrine or norepinephrine)
Disability	Check blood Glucose and give dextrose for hypoglycemia Elevate the head end of bed to >30 degrees Loosen cervical collar if used for decreasing venous pressure Antiepileptic if seizure, bleeding, edema or midline shift on CT Early pain control and sedation to avoid ICP spikes with close monitoring of airway if patient not intubated.
Environment	Avoid Hyperthermia and give PCM if needed (avoiding passive cooling techniques) Avoid Hypothermia (covering patients)

Table 4. Indication Of Surgical Evacuation Of Intracranial Hematoma With Respect To Decline In Mental Status

TYPE OF HEMATOMA	WITHOUT RESPECT TO DECLINE	WITH RESPECT TO DECLINE

SUBDURAL	Thickness of 10 mm or more, midline shift of 5 mm or more	Thickness <10 mm and midline shift <5 mm If GCS decreased by 2 points or more since presentation
EPIDURAL	Volume is 30 cc or more	GCS 8 or less with anisocoria
INTRAPARENCHYMAL	Elevated ICP refractory to medical management, signs of mass effect on CT, lesion volume is 50 cc or more	Signs of deterioration referable to the lesion, GCS 6-8 and >20 cc of frontal or temporal contusions and midline shift > 5mm or more and cistern compression.

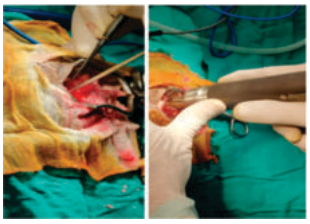


Figure 3. Surgical Management Of Traumatic Brain Injury

CONCLUSION

It was concluded after study that Glasgow coma scale that it helped in assessing the severity of head injury but it too has drawbacks like

- difficulty in scoring in patient taken alcohol before incident.
- no incorporation of brainstem reflexes.
- Same GCS score provides different outcome in terms of mortality like GCS 4 (1+1+2) with mortality rate of 48% and GCS with 4 (2+1+1) with mortality rate of 19%.

It is also concluded that early care of the patients with head injury plays an important role to avoid secondary insults. Demographic, medical history and injury characteristics are important in the prediction of outcome after mild traumatic brain injury. It was also seen that patient who were treated in primary care with oxygenation had better outcome in comparison to patients received no treatment before coming to our institute. There is no single treatment which dramatically improve the outcome in patients with traumatic brain injury. Despite the facts early hospital care, post treatment follow up, proper rehabilitation after discharge helped substantially in improving the life after traumatic brain injury.

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