CONSERVATIVE MANAGEMENT OF TRAUMATIC BRAIN INJURY

Neha S. Jadhav1, Avinash S. K2

1MCh Resident, Department of Neurosurgery, KEM, Mumbai, Maharashtra, India.
2Senior Resident, Department of General Surgery, GMCH, Miraj, Maharashtra, India.

ABSTRACT

BACKGROUND
Traumatic brain injuries are a major cause of morbidity and mortality in modern times and it is a huge health sector burden. Understanding the mechanism of traumatic brain injury leads to the development of guidelines for the management of traumatic brain injury. This study aims at evaluating the conservative management of traumatic brain injury.

MATERIALS AND METHODS
It is a retrospective and descriptive study conducted from January 2015 to December 2016 in the surgical department of our tertiary care hospital. 185 non-operated cases of traumatic brain injury were enrolled in the study.

RESULTS
The mean age was 29.84 years. The sex ratio was 6.4. Road traffic accidents were responsible for injury in 82.16% of the cases. 48.65% of patients had a moderate brain injury (GCS 9 to 12), while 10.81% had a severe brain injury (GCS 3 to 8). Radiological evaluation demonstrated the brain contusion in 48.65% of the cases. Prevention of post-traumatic seizure was done with the use of phenytoin. Mannitol was used for its osmotic properties to reduce cerebral oedema. Favourable outcome was noted in 56.75% of the cases. Common complications were lower respiratory tract complications, chronic neurological sequelae, urinary infection and hyponatremia. Mortality was recorded at 15.13%.

CONCLUSION
Conservative management of traumatic brain injury involves use of the ventilatory assistance in all severe traumatic brain injuries, treatment of infectious complications and prevention of electrolyte imbalance.

KEY WORDS
Conservative Management.


2. Secondary Brain Injury: Develops subsequent to the initial injury. Includes injury from intracranial haematomas, oedema, hypoxemia, ischaemia (primarily due to elevated intracranial pressure and/or shock)

The routine use of sedatives and paralytics in neurotrauma patients may lead to a higher incidence of pneumonia, longer ICU stays and possibly sepsis. These agents also impair neurological assessment. Use, therefore should be reserved for cases with clinical evidence of intracranial hypertension, for intubation or where use is necessary for transport or to permit the evaluation of patient (eg: to get a combative patient to hold still for a CT scan).

Indications for Intubation in Traumatic Head Injury-
1. Depressed level of consciousness: usually GCS less or equal to 7.
2. Need for hyperventilation.
3. Severe maxillofacial trauma.
4. Need for pharmacological paralysis for evaluation or management.

Cautions Regarding Intubation-
a. If a basal skull fracture through cribriform plate is possible, avoid nasotracheal intubation (to avoid intracranial entry of tube). In such cases use orotracheal intubation.
b. Prevents assessment of patient’s ability to verbalise, e.g for determining Glasgow coma scale score. This
ability should be noted (none, unintelligible, inappropriate, confused or oriented) prior to intubation.
c. Risk of lower respiratory tract infection.

Indications of Mannitol in Traumatic Head Injury Patients-
1. Evidence of intracranial hypertension.
   a. Pupillary dilatation (Unilateral or bilateral).
   b. Asymmetric pupillary reaction to light.
   c. Decerebrate or decorticate posturing (Usually contralateral to fixed and dilated pupil).
   d. Progressive deterioration of the neurologic exam, not attributable to extracranial factors.
2. Evidence of mass effect (Focal deficit, e.g. hemiparesis).
3. Sudden deterioration prior to CT (Including papillary dilatation).
4. After CT, if a lesion is associated with increased ICP is identified.
5. To assess salvageability: In patients with no evidence of brainstem function, look for return of brainstem reflexes.

Contraindications to Mannitol Use-
1. Prophylactic administration is not recommended due to its volume depleting effect. So it should be used only in appropriate indications.
2. Hypotension or Hypovolaemia: Hypotension can negatively influence outcome.[7] Therefore, when intracranial hypertension is present, first utilise sedation and/ or paralysis, and CSF drainage. If further measures are needed, fluid resuscitate the patient before administering mannitol. Use hyperventilation in hypovolaemic patients until mannitol can be given.
3. Relative contraindication: Mannitol may slightly impede normal coagulation.
4. Congestive Heart Failure: Before causing diuresis, mannitol transiently increases intravascular volume. So, use with caution in congestive heart failure may need to pre-treat with furosemide.

Routine use of Prophylactic Antiepileptic Drugs in Traumatic Brain Injury is Ineffective in preventing the Late Development of Post-traumatic Seizures and has been shown to be useful only in certain Circumstances.[8,9]
1. Acute subdural, epidural or intracerebral haematoma.
2. Open depressed skull fracture with parenchymal injury.
3. Seizure within the first 24 hrs. after injury.
4. Glasgow coma scale score < 10.
5. Penetrating brain injury.
6. History of significant alcohol abuse.
7. Haemorrhagic contusion on CT.

Management of severe traumatic brain injury involves mechanical intubation, ventilator support and radiological assistance. Management of primary and secondary lesions require a multidisciplinary team made of an anaesthetist, radiologist and neurosurgeons, nursing staff and physiotherapist.[10]

Materials and Methods
This study is a retrospective descriptive study conducted from January 2015 to December 2016 at our tertiary care centre. 185 non-operated cases of traumatic brain injury were enrolled in the study.

Inclusion Criteria
Patients with traumatic brain injury admitted in our hospital were included in the study.

Exclusion Criteria
1. Cases in which the radiological data were absent were excluded from the study.
2. Multiple trauma cases that were operated for an associated lesion other than head trauma.

Clinical parameters, diagnosis, management and outcome of the management are evaluated. Data was collected from hospital register.

Results
Age and Sex
The mean age was 28.76 years with extreme ranging from 3 to 85 years. There were total 160 men and 25 women and the sex ratio was 6.4.

Clinical Aspects
Predisposing Factors-
1. Alcoholics 50 (27.03)
2. Diabetes 10 (05.40)
3. Hypertension 15 (08.11)

Among the predisposing factors, alcohol was the most common factor.

Mode of Injury
1. Road traffic accident 152 (82.16)
2. Assaults, falls 33 (17.84)

Road traffic accident is by far the most common mode of injury.

Neurological Examination
Glasgow Coma Scale (GCS): Average GCS score was 11
a. 3 - 8 20 (10.81)
b. 9 - 12 90 (48.65)
c. 13 - 15 75 (40.54)

Seizures 11 (05.94)
Neurological deficit 21 (13.51)

Related Injuries
1. Thoracic 15 (08.11)
2. Cervical spine 12 (06.48)
3. Orthopaedic 21 (11.35)

Delay in admission- CT scan Average = 5 days (30 minutes to 8 days).
The average hospital stay for these patients with complication was 17 days. 28 patients of the series died (15.13%) during the study period. Mortality was due to a complicated lower respiratory infection due to altered consciousness in 19 patients, 6 cases due to neurological problems, 3 cases due to electrolyte disturbance.

**Table 1. Radiological and Diagnostic aspects on Admission**

<table>
<thead>
<tr>
<th>Radiological Technique</th>
<th>Number of Patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-ray cervical spine</td>
<td>90</td>
<td>48.64</td>
</tr>
<tr>
<td>X-ray chest</td>
<td>72</td>
<td>38.92</td>
</tr>
<tr>
<td>X-ray base of skull</td>
<td>7</td>
<td>3.78</td>
</tr>
<tr>
<td>CT brain plain</td>
<td>165</td>
<td>89.19</td>
</tr>
<tr>
<td>MRI brain plain</td>
<td>20</td>
<td>10.81</td>
</tr>
</tbody>
</table>

**Table 2. Findings on CT and MRI as are Follows**

<table>
<thead>
<tr>
<th>Findings</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haemorrhagic Contusions</td>
<td>90</td>
<td>48.64</td>
</tr>
<tr>
<td>Subarachnoid Haemorrhage</td>
<td>33</td>
<td>17.66</td>
</tr>
<tr>
<td>Normal CT scan</td>
<td>30</td>
<td>16.22</td>
</tr>
<tr>
<td>Acute Subdural Haematoma</td>
<td>20</td>
<td>10.81</td>
</tr>
<tr>
<td>Pneumocephalus</td>
<td>15</td>
<td>0.81</td>
</tr>
<tr>
<td>Extrudal Haematoma</td>
<td>10</td>
<td>0.54</td>
</tr>
<tr>
<td>Diffuse Cerebral Oedema</td>
<td>06</td>
<td>0.34</td>
</tr>
</tbody>
</table>

**Table 3. Types of Complications in our Study**

<table>
<thead>
<tr>
<th>Complications</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower respiratory tract infection</td>
<td>29</td>
<td>48.33</td>
</tr>
<tr>
<td>Altered consciousness</td>
<td>15</td>
<td>25.00</td>
</tr>
<tr>
<td>Urinary tract infection</td>
<td>09</td>
<td>15.00</td>
</tr>
<tr>
<td>Hyponatremia</td>
<td>07</td>
<td>11.66</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td>100</td>
</tr>
</tbody>
</table>

**DISCUSSION**

This was a retrospective study, so data collection was limited by difficulty in reaching patients who were discharged. In addition, there is influence of GCS in clinical evolution of patients. Alcohol is the most common predisposing factor and road traffic accident was the most common mode of injury. The management of severe brain trauma involves tracheal intubation and ventilatory support with continuous sedation.[10],[11] In our study, among the 20 patients admitted to intensive care, all were managed by intubation and ventilation. Sedation aims for cerebral protection and control of intracranial pressure and facilitation of care.[12,13] Prophylactic treatment of seizures was administered in 75 patients (40.54%); post-traumatic seizures are classified according to time of occurrence[14] as immediate (within 24 hours), early (within a week) and late (over a week). Frequency of post-traumatic seizures is estimated between 5% and 7%. It is related to the severity of the trauma (11%) and mode of injury [eg. more with sharp object injuries].[15,16] Phenytoin is the preferred anti-epileptic for prophylactic treatment of seizures. In our study, drug used was phenytoin. Mannitol[17] was used for its osmotic properties to reduce cerebral oedema. The recommended dose is 50 - 100 mg/kg over 25 minutes. It improves cerebral perfusion pressure and microcirculation. However, its use is preferable when the blood-brain barrier is intact and it may predispose to hypotension or hypovolaemia, because of its volume depleting effect and it has to be used with caution in patients with congestive heart failure. The effects of hypertonic saline[18,19] is comparable to mannitol, and it is more useful when haemorrhagic shock is associated with head injury. But it was not used in our study, because of lack of availability. Common complications were lower respiratory tract infections, more common with intubated patients.[20] Other common complications are electrolyte imbalance. Hyponatremia was the most common in our study (11.66%), and would be related to salt wasting syndrome or syndrome of inappropriate antidiuretic hormone secretion.[21] Hospital mortality in traumatic brain injury is variable, ranges from 8.5% to 38%.[22],[23],[24] In our study, the mortality of 15.13% for deaths occurred during the study period. It is linked to neurological and infectious complications.

**CONCLUSION**

Among traumatic brain injuries, most injuries can be managed conservatively. Among intracranial lesions, cerebral contusions are predominant. Conservative management of brain injury involves prevention of secondary insult to brain which is usually of systemic origin, which in our study is respiratory complications followed by infection and electrolyte disturbances. The management of severe head trauma involves ventilatory assistance, prevention of post-traumatic seizures and the use of osmotic diuretics.

**REFERENCES**

https://doi.org/10.1097/00005373-198803000-00003


