CASE REPORT

CT SCAN: THE TOUR GUIDE FOR THE MANAGEMENT OF THE EDH
S. N. Somashekhar¹, Vikram T. P²

HOW TO CITE THIS ARTICLE:

ABSTRACT: EDH is considered as common and one of the important preventable complications in head injury. This condition may require aggressive management depending on the various clinical and radiological factors on continuous assessment of the patients. This study was carried out to evaluate the presentation of patients with extradural haematoma secondary to head injury and to assess the factors influencing the mode of management and also the outcome. 50 patients with cranial extradural haematoma were admitted in the neurosurgical department during the period of 2 years. All the patients with head injury on CT scan diagnosed to have EDH were included in the study. The management includes conservative measures and/or decompressive craniotomy. Temporo-parietal (20%) and temporal region(20%) was the most common location of EDH. The most significant factors which influences surgical mode of management were higher age group, lower GCS and the CT scan variables showing greater clot volume and thickness. Increased interval between the times of trauma to surgery and lower GCS was very significantly associated with unfavourable outcome along with CT scan variables irrespective of mode of management. From this study we concluded that neurological status of the patients on presentation and the volumetric details of EDH are the most important factors in management and outcome of EDH. With early detection and treatment due to better connectivity of the patients to hospitals, with the help of CT scan and good hospital care, we can expect a decrease in the number of unfavorable outcomes.

KEYWORDS: GCS, CT scan, Extradural haematoma, Conservative management, Decompressive craniotomy.

INTRODUCTION: Traumatic brain injury affects up to 2% of population per year, and constitutes the major cause of death and severe disability among young people.¹,²

Extradural haematoma (EDH) is an abnormal collection of blood between the dura and the cranium, usually from a torn middle meningeal artery, but it may be due to torn venous sinuses or bleeding from fracture lines. The overall incidence of EDH among traumatic brain injury (TBI) patients has been reported to be in the range of 2.7 to 4%.¹ The peak incidence of extradural haematoma is in the second decade of life. Traffic-related accidents, falls and assaults accounts for 53%, 30%, 8%, respectively of all EDH.¹,⁵-⁹ Among patients in coma up to 9% harbored EDH requiring craniotomy.¹,³-⁴ Mortality rate vary from 10 – 40% and is an index of alertness and efficiency of health care and hospital setup in the country.

The availability of computerized tomography has increased the diagnosis of extradural haematomas and hence facilitating early treatment and intervention.

MATERIALS AND METHODS: The present study includes 50 patients aged between 15-70 years with head injury on CT scan diagnosed to have isolated EDH were included in the study.
over a period of 2 years. Patients with associated other intracranial haematomas and other systemic injuries were excluded.

The management includes conservative measures and/or decompressive craniotomy. The volume of the EDH was calculated using the Peterson and Espersen equation \( V = \frac{1}{2}abc \), where \( a, b, \) and \( c \) represented diameters of the hematoma in the sagittal, axial and coronal planes. Depending on the clinical findings along with CT findings patients were subjected to conservative/surgical mode of management accordingly and the results were analysed.

The differences between the two management groups (surgery versus conservative) and the two outcome groups (favourable versus unfavourable) were analysed using Chi-square test/Fisher’s exact test and unpaired ‘t’ test.

RESULTS: During the study period 50 head injured patients were admitted at our institute. Largest number of patients having head injury belong to the age group of 21 to 30 years (n=25). Male and female ratio is 4:1. Mode of head injury in majority of the patients was due to road traffic accident accounting 31 patients, 13 patients were due to self-fall and 6 patients were due to assault.

Majority of the patients (n=25) had GCS of 14-15 having mild head injury. 18 patients with GCS of 9-13 having moderate head injury and 7 patients had GCS of 3-8 having severe head injury. Most of the patients (36%) presented with lucid interval, other modes of clinical presentation were anisocoria (24%) and hypoxia/hypotension(4%).

Common site of EDH was temporal (n=10) and temporo-parietal (n=10) regions. 28 patients had EDH on right side, 4 patients had bilateral EDH, remaining on the left side. Clot volume of more than 30cc is found in 24 patients and less than 30cc in the rest. Midline shift was noted in 21 patients and was absent in the rest. Clot thickness of more than 1.5cm was noted in 24 patients and less than 1.5cm was noted in the rest. Herniation was noted in 4 patients.

Out of 50 patients, 31 patients were conservatively managed of whom, 28 had favourable outcome, 2 had unfavourable outcome and 1 death. Among 19 patients who were surgically managed 16 had favourable outcome, 2 had unfavourable outcome and 1 death.

The most significant clinical variable which indicates surgical mode of management was lower GCS (<8). However, time from trauma to hospital was not significant in deciding upon the mode of management. The significant CT scan variables which indicates surgical management were greater clot volume (>35cc), greater clot thickness (>1.5cm) and midline shift (>0.5mm). Haematomas in temporo-parietal region underwent surgical mode of management when compared to haematomas at other regions.[Table 1]

The outcome groups have been divided into two, the favourable and the unfavourable. Favourable outcome group consists of patients with good recovery and mild to moderate disability. The unfavourable outcome group consists of patients with severe disability, vegetative state or dead.

The significant clinical factor associated with unfavourable outcome in this study increased interval between the time of trauma to surgery (>12hours). GCS (<8) was very significantly associated with outcome. However there was no significance associated with clinical factors like age,hypoxia/hypotension, and anisocoria. The significant CT scan factors associated with
unfavourable outcome in the present study were greater clot volume (>35cc), greater clot thickness (>1.5cm), midline shift (>0.5mm) and herniation irrespective of mode of management, i.e. conservative or surgical. Haematomas in temporo-parietal region were associated with unfavourable outcome when compared to haematomas at other locations.[Table 2]

<table>
<thead>
<tr>
<th>Category</th>
<th>Conservative (n=31)</th>
<th>Surgery(n=19)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCS</td>
<td>13.8+/-2.54</td>
<td>9.42+/-2.31</td>
<td>0.0001</td>
</tr>
<tr>
<td>MLS Present</td>
<td>4</td>
<td>17</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Clot volume</td>
<td>20.16+/-15.84</td>
<td>49.97+/-23.49</td>
<td>0.0001</td>
</tr>
<tr>
<td>Clot thickness</td>
<td>1.06+/-0.68</td>
<td>2.06+/-0.67</td>
<td>0.0001</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td></td>
<td></td>
<td>0.027</td>
</tr>
<tr>
<td>T</td>
<td>8</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>T-P</td>
<td>1</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td><strong>Outcome</strong></td>
<td>28 favourable</td>
<td>16 favourable</td>
<td>0.51</td>
</tr>
</tbody>
</table>

Table 1: Factors affecting the mode of management of EDH

<table>
<thead>
<tr>
<th>Category</th>
<th>Favourable (n=44)</th>
<th>Unfavourable (n=6)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCS</td>
<td>12.93+/-2.45</td>
<td>6.33+/-2.42</td>
<td>0.0001</td>
</tr>
<tr>
<td>MLS Present</td>
<td>15</td>
<td>6</td>
<td>0.002</td>
</tr>
<tr>
<td>Clot volume</td>
<td>28.15+/-22.94</td>
<td>55.98+/-15.49</td>
<td>0.0061</td>
</tr>
<tr>
<td>Clot thickness</td>
<td>1.31+/-0.75</td>
<td>2.41+/-0.74</td>
<td>0.0015</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td></td>
<td></td>
<td>0.023</td>
</tr>
<tr>
<td>T</td>
<td>10</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>T-P</td>
<td>9</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Time from trauma to surgery</td>
<td>&gt;12 hrs</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>&lt;12 hrs</td>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>Mode of management</td>
<td>Surgery</td>
<td>16</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Conservative</td>
<td>28</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 2: Factors affecting the outcome of treatment of EDH
**DISCUSSION:** In the present study patients in the age group of 21-30 years formed the bulk of the study (50%). The male-female ratio in the present study was 4:1. Studies done by Araujo et al., R. J. Cook et al. also shows that the younger age group predominantly males were most commonly involved. This is clearly evident that majority of number of patients were in most active period of life who are susceptible for head injury. This may be due to reflection of our social culture where most of the females are housewives and are not exposed to external works.

The classic “lucid interval”, described as loss of consciousness followed by a lucid period and the quick deterioration into coma, was observed in 36% of patients in this study. Jamieson reported only 20 from 167 (12%), Bricolo 21% and Keet 22%. A lucid period in EDH, therefore, probably occurs in 1~30% of patients; furthermore, it is not specific for extradural haemorrhage, being observed in other head injuries. Other significant clinical findings noted were anisocoria which were present in 24% of our patients. However no neurological deficit or lateralizing signs noted in this study at the time of presentation.

Temporo-parietal and temporal region was the most common location of EDH. It was present in 20% each of our patients. Next common locations were parietal and frontal respectively which were present in 16% of the patients each. R. J. Cook et al. also shows temporo-parietal region as the most common site but followed by temporal and frontal regions as the common site. Araujo et al. also shows temporo-parietal region as the most common location followed by temporal region. But Dubey A et al. shows temporal region is the most common location followed by temporo-parietal region.

**MANAGEMENT:** The most significant clinical variable which influences surgical mode of management was lower GCS (<8). Hamilton and Wallace et al and Dubey. A et al. also showed in their study that GCS is a single most important clinical variable for predicting surgical intervention.
CASE REPORT

The significant CT scan variables [Figure 1] which indicates surgical management were greater clot volume (>35cc), greater clot thickness (>1.5cm) and midline shift (>0.5mm). Haematomas in temporo-parietal region indicates surgical mode of management when compared to haematomas at other regions, since haematomas in this region is highly associated with unfavourable outcome due to proximity to the brainstem structures. Bejjani et al, Hamilton and Wallace et al, Chen et al\(^1\) and Dubey A et al\(^{15}\) reported that supratentorial EDH with volume more than 30ml, a thickness more than 15 mm and a midline shift more than 5 mm tended to require surgery.\(^1\)

OUTCOME: The significant clinical factor associated with unfavourable outcome in this study increased interval between the time of trauma to surgery (>12hours). GCS (>8) was very significantly associated with outcome. However there was no significance associated with clinical factors like age, hypoxia/hypotension and anisocoria. According to Bricolo A et al, Kuday C et al, Gennarelli T et al and various authors, admission GCS or GCS before surgery is the single most important predictor of outcome in patients with EDH undergoing surgery.\(^{15}\)

The significant CT scan factors associated with unfavourable outcome in the present study were greater clot volume (>35cm), greater clot thickness (>1.5cm), midline shift (>0.5mm) and herniation irrespective of mode of management, i.e. conservative or surgical. Haematomas in temporo-parietal region [Figure 2] were associated with favourable outcome if operated early. Lobato et al, Lee et al, Servadei et al and Dubey et a have reported that outcome was highly influenced by GCS and EDH volume among other factors.\(^{15}\)

There are reports on the effect of the age on the outcome of the patients with extradural haematoma. Dhelemmes P et al, Heiskanen O et al and Jamieson KG et al\(^1\) showed in their respective series that mortality and morbidity rates were lower in younger patients. However, the effect of age on outcome was not significant in series done by Kuday C et al.\(^6\)

The effect of surgical timing on outcome from EDH is relevant for a subgroup of patients in whom the EDH causes compression of brain structures that, with time, could cause poor outcome. This subgroup is usually categorized as having pupillary abnormalities and/or a GCS score less than 9 (coma). Studies do not find a relationship between surgical timing and outcome of patients if all GCS scores are included.

It was observed that the outcome was better in patients with an EDH volume of less than 30 ml compared to those with more than 30 ml. This finding corroborates the finding of Bezircioglu et al\(^1\) that patients with an EDH volume less than 30ml could be treated conservatively except when they were temporal in location with a heterogeneous density and the CT was performed less than six hours after trauma.

CONCLUSION:

- EDH commonly affects male patients of age group 21-30 years.
- Road traffic accident is the commonest mode of injury presenting with lucid interval as the most common clinical finding followed by anisocoria.
- CT scan features are very significant in the diagnosis and the management of EDH.
In patients with isolated EDH, decompressive craniotomy is preferred if patient is having GCS< 8 and with large haematoma having >35cc volume, >1.5cm thickness and causing >5mm of midline shift. Early intervention and good hospital care improves the outcome of EDH.

REFERENCES:
AUTHORS:
1. S. N. Somashekhar
2. Vikram T. P.

PARTICULARS OF CONTRIBUTORS:
1. Professor, Department of General Surgery, J. J. M. Medical College, Davanagere.
2. Resident, Department of General Surgery, J. J. M. Medical College, Davangere.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:
Dr. S. N. Somashekhar,
# 4347, 5th Main,
S. S. Layout, 'B' Block,
Davangere-577004.
E-mail: drsoms91@yahoo.com

Date of Submission: 04/02/2015.
Date of Peer Review: 05/02/2015.
Date of Acceptance: 09/02/2015.
Date of Publishing: 19/02/2015.