INTRODUCTION

Extradural hematoma is a collection of blood between the dura mater and skull, which usually occurs due to fracture of skull bone, causing rupture of underlying meningeal vessels, most commonly middle meningeal artery. It occurs in less than 2% of patients admitted with craniocerebral trauma. CT scan brain is the investigation of choice to diagnose and localize the extradural hematoma. Results are usually better in young patients, with high initial GCS and when there is minimal delay between trauma and surgery. Level of consciousness at the time of surgery is the single most important decisive factor in the outcome, hence early diagnosis and surgical intervention is essential. Better pre-operative GCS and conscious level are associated with better outcome. Extradural hematoma is a surgical emergency that can lead to death if it is not removed promptly. It requires urgent craniotomy or craniectomy and patient's outcome is good if surgery is not delayed. The purpose of this study was to find out neurological recovery and outcome of extradural hematoma after surgery in relation to the initial GCS.

METHODOLOGY

The study was conducted in the Neurosurgery Unit, Hayatabad Medical Complex, Peshawar, from January to October, 2006 over a period of 10 months. All patients admitted with acute extradural hematoma and operated were included. Patients were divided into 3 groups. Patients with severe injury comprised group I with GCS 3-8, group II with moderate head injury having GCS 9-12 and group III, who sustained mild head injury with GCS 13-15. Extradural hematoma not related to trauma e.g. postcraniotomy hematoma was excluded from the study. Patients' data was recorded with the help of a structured proforma, including age, gender, mode of trauma, examination findings, investigations and outcome were recorded. Glasgow coma scale was used for initial assessment and Glasgow outcome scale was applied to assess outcome in terms of neurological recovery in all patients. The follow-up period was 3 months.
of extradural hematoma and associated injuries were also noted. Outcome was measured in terms of mortality, recovery, occurrence of surgical complications and long-term disability. Recovery was assessed according to the Glasgow coma scale and physical examination in immediate postoperative period and in follow-up examination. Follow up period was 3 months. Attendants and relatives of all patients were counseled about the condition of their patients. Informed consent was taken from the relatives for surgical intervention. All of the patients were admitted through emergency.

The results were analyzed by using SPSS version 10. Frequency and pattern of different injuries, their mechanism, age and gender of the patients and level and extent of neurological injuries were determined. The outcome was analyzed by using Chi-square test by comparing three groups at variable GCS and p-value was calculated for the outcome measures. A p-value of less than 0.05 was indicated statistically significant.

**RESULTS**

During the 10 months period, 30 patients of acute traumatic extradural hematoma were admitted and operated. Out of 30, there were 22 (73.33%) male patients and 8 (26.66%) female patients, therefore, male to female ratio was 2.8:1. Seven (23.3%) patients were below 10 years of age, and 9 (30%) patients were in the age range of 20-30 years. Patients who had road traffic accidents were 15 (50%), patients with fall from height were 10 (33%), and patients of assault were 5 (17%). With reference to consciousness level, they were divided into three groups according to the initial GCS after resuscitation. The GCS was 3-8 in 6 patients (group I), 9-12 in 7 patients (group II), while 17 patients were in GCS 13-15 (group III) and the relationship between outcome and GCS was determined as shown in Table I. The outcome was significantly good between group I and III (p=0.01) and significant for death between group I and III (p=0.01). The results was not significant for vegetative state in either group (p=0.93 and 0.31 respectively).

According to the location of extradural hematoma, frontal (31%) were most frequent followed by temporoparietal (27%), temporal (23%), parietal (13%), occipital (3%) and posterior fossa (3%) extradural hematomas. Associated systemic injuries were found in only 2 patients with one tibia fracture and one forearm fracture, while 28 patients had isolated head injuries. Five cases had associated brain injuries in the form of small brain contusions. Mortality rate was 10% with 3 patients dying from the condition; all of them were in GCS 3-5 at the time of arrival.

All the patients were given broad-spectrum antibiotics. Two patients developed chest infections postoperatively. Surgical outcome was observed in terms of Glasgow Outcome Score (GOS). Twenty-four patients with Glasgow outcome score 5, showed complete recovery in terms of GCS and physical examination. Long-term disability was observed in one patient with persistently low level of consciousness, while one patient had weakness of the left side of the body. No surgical complication was recorded except superficial wound infection occurring in one case, which was controlled with antibiotics and dressings.

**DISCUSSION**

Traumatic Extradural Hematoma (EDH) complicates 1-4% of all head injuries and is a major factor contributing to morbidity and mortality. In many other studies, extradural hematomas are the most frequent surgical emergencies in head injuries. In the present study, it was found that 40% of all emergency surgeries were done for extradural hematomas.

Head injury is more common in males than females. According to Cheung et al., there were 78.7% male and 21.3% female patients. In a study by Knuckey et al., male to female ratio was 3.4:1 and age range was 1-71 years. In this study, male to female ratio was 2.8:1. Similar observations were found in other studies. The reason for this difference may be that males are more prone to trauma as they are more mobile and travel more for their day-to-day activities than females. Most common age group was found to be 20-30 years followed by 5-10 years. Elderly patients having adherent meninges are less prone to extradural hematomas. Other local and foreign studies have made the same observations regarding the age of patients.

The causes of extradural hematoma may be fall, road traffic accident or assault. According to Cheung et al., 56% patients sustained injuries because of road traffic accidents, 30% had history of fall and 11% of the patients had sustained direct head injury as a result of assault. In another study, 21 extradural hematomas

### Table I: Outcome of patients operated for extradural hematoma.

<table>
<thead>
<tr>
<th>Prognosis</th>
<th>GOS</th>
<th>Group I (n=6)</th>
<th>Group II (n=7)</th>
<th>Group III (n=17)</th>
<th>Group I vs. Group II</th>
<th>Group I vs. Group III</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>GCS 3-8</td>
<td>GCS 9-12</td>
<td>GCS 13-15</td>
<td>Chi-square value</td>
<td>p-value</td>
</tr>
<tr>
<td>5 Good</td>
<td></td>
<td>2 (66.66%)</td>
<td>6 (20%)</td>
<td>16 (53.33%)</td>
<td>1.86</td>
<td>0.17</td>
</tr>
<tr>
<td>4 Moderate disability</td>
<td>0</td>
<td>0</td>
<td>1 (3.33%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Severe disability</td>
<td>0</td>
<td>1 (3.33%)</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Vegetative State</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td></td>
<td>0.01</td>
<td>0.93</td>
</tr>
<tr>
<td>1 Death</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>2.17</td>
<td>0.14</td>
<td>5.86</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10%</td>
<td></td>
<td></td>
<td>0.01</td>
<td></td>
</tr>
</tbody>
</table>


resulted from fall, 12 from motor vehicle accident, and 6 from assault; one was of unknown cause.\textsuperscript{15} The causes of extradural hematomas in this study were found as road traffic accidents, fall from height and assaults in descending order of frequency. In other studies, either fall or accidents have been observed as most frequent causes.\textsuperscript{13,16,17}

Location of extradural hematoma is very important for both patient and the surgeon. It determines the prognosis as well as eases the surgeon to operate. Its location is more common in the distribution of middle meningeal artery and its branches. According to one study,\textsuperscript{15} the site of extradural hematoma was parieto-occipital in 24, posterior fossa in 11, frontal in 06, and temporal in 03 patients. Posterior fossa extradural hematomas are less common than supratentorial extradural hematomas. The incidence of posterior fossa extradural hematomas among intracranial extradural hematomas has been reported to be 4-7% and all cases had occipital fracture.\textsuperscript{18} Most frequent location of extradural hematoma was found to be frontal area in this study, consistent with some other studies. There was only one case with posterior fossa extradural hematoma comprising 3% of the patients. Some studies have shown temporal and temporoparietal areas to be common areas of extradural hematoma. Hence, location of extradural hematoma is not consistent to one specific region. However, posterior fossa EDH is less common.

The most widely used assessment of the outcome of patients after head injury is Glasgow outcome scale.\textsuperscript{19} There is a strong correlation between the outcome and GCS.\textsuperscript{20} Outcome is considered to be directly related to the patient’s pre-operative neurological status and the presence of associated intracranial lesions.\textsuperscript{21} According to Wester,\textsuperscript{22} the mortality rate was low (one patient died, 1.2%), 79 (95%) patients experienced good or moderate outcome (GOS scores of 4 or 5), while in 24 children, all experienced good outcome (GOS score of 5). On admission, 62 (70%) patients were in GCS 13-15, 9 (10%) patients were in GCS 9-12 and 18 (20%) patients had GCS 3-8. Sixty-six (74%) patients had skull fractures. Overall, 9 (10%) patients died; 8 patients were in GCS more than 8; 5 had bilateral fixed and dilated pupils and one had a single fixed and dilated pupil.\textsuperscript{11}

In a study by Ericson et al.,\textsuperscript{23} three patients died, constituting a mortality of 12.5%. There was a reduction in mortality among patients with isolated epidural hematoma (6.6%).\textsuperscript{24} The high mortality among patients with associated intracranial lesions (33.3%) or multiple traumas (32%) is still a cause of concern.\textsuperscript{24}

Although the ultimate goal is to achieve 0% mortality and 100% good functional outcome, the overall mortality in most series of patients with EDH ranges from 9.4-33%\textsuperscript{,8,16,17} averaging approximately 10%.\textsuperscript{8,16,17} Similar was the mortality rate (10%) observed in this study.

CONCLUSION

Extradural hematoma was the most frequent surgical emergency among head injuries, more commonly occurring in younger males. Common causes were road traffic accidents, fall from height and assaults, while mortality rate was 10%. Low GCS led to poor outcome and high GCS to good outcome with less neurological deficit and better prognosis.

REFERENCES


