

Clinical Evaluation and Management Outcome of Extradural Haematoma

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Abstract

Aims and Objective: The purpose of this study was to evaluate the clinical presentation of patient with extradural hematoma secondary to head injury and to decide upon the mode of management and also to study the results of the management and the outcome and the factors affecting morbidity and mortality. **Materials and Methods:** Data was collected through a prescribed proforma from the patients admitted in Surgery Department, Dr. Vasant Rao Pawar Medical College and Hospital, Adgaon with extradural hematoma during the period of November 2014 to October 2016. The sample size of the study was 30 patients who completed the inclusion and exclusion criteria. 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 surgical intervention. The patients were followed for the results during the period of stay in hospital. **Results:** 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 CT scan variables. Lower GCS was very significantly associated with unfavorable outcome along with CT scan variables irrespective of mode of management. **Conclusion:** From this study we concluded that neurological status of patient on presentation and the volumetric details of EDH are the most important factors in management and outcome of EDH. EDH patients were managed surgically and carried high number of unfavorable outcome previously. With early detection and treatment due to better connectivity of 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: Conservative Management, CT Scan, Extradural Hematoma, GOS, GCS, Surgical Management

1. Introduction

Head injury is one of the most important public health problem and challenge due to high morbidity and mortality particularly in young and productive age group.

Over 5.56 million accidents occur worldwide per year with 1.2 million deaths annually and 3400 deaths per day, in which India has highest rate of head injury worldwide¹.

Extradural hematomas occur in approximately 2% of all patients of head injuries and 5-15% of fatal head injuries. EDH is considered to be one of the most serious complications of head injury requiring immediate diagnosis and surgical intervention².

Extradural hematoma is abnormal collection of blood between dura and calvarium usually due to torn middle meningeal artery, but it can be from torn venous sinus or bleeding from fracture lines. It is most exclusively caused

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by trauma³. Overall incidence of EDH in Traumatic Brain Injury (TBI) patients has been reported to be in the range of 2.7 to 4%. Traffic related accidents, falls, and Assaults accounts for 53% (range 30-73%), 30% (range 7-52%), 8% (range 1-19%), respectively of all EDH. Among all these patients around 9% require craniotomy⁴⁻⁶. Peak incidences of EDH are seen in 2nd decade of life and mean age of EDH patients is between 20-30 years. Extradural hematoma is rare in extremes of ages. Mortality rate vary from 10-40% and is an index of efficiency and alertness of healthcare system in country.

Widespread availability of CT scans has increased diagnosis of EDH. CT scan also help determining of severity of it by letting us know site, size, shape and mass effect along with associated lesions. Earlier mortality rate of EDH was 86%^{3,7} which has reduced to 5-12%³ due to introduction of CT scan.

Commonly used predictors of outcome include Age, Glasgow Coma Scale (GCS), pupillary reaction, brainstem reflexes and CT findings^{8,9}. Neurological status at the time of admission is most important factor for prediction of outcome of patient. Considering all these factors mode of management is decided whether patient requires surgical or conservative management.

We analyzed 30 presented cases from November 2014-November 2017 to study on the factors determining the outcome of patient and their favorable role in deciding upon mode of management that is conservative management or surgical intervention.

2. Methodology

The study will be conducted in department of surgery of medical college and tertiary health care center from November 2014 to November 2016. A total of 30 subjects will be included in present study after they satisfy inclusion and exclusion criteria. The cases were selected at random and were admitted in surgical emergencies. Written and informed consent will be taken from all the subjects for participation in study.

For present study subject head injury were assessed clinically i.e., nausea/vomiting, loss of consciousness, lucid interval, convulsions, ENT bleed and diagnosed on CT scan conducted in all study subjects as a primary diagnostic investigation tool with providing site, size, clot thickness, clot volume, midline shift, brain herniation and other pathological or anatomical specifications.

2.1 Source of Data

Data will be collected through a prescribed proforma from among the patients admitted in Department of surgery, medical college and hospital and tertiary health care center with extradural hematoma during the period November 2014-November 2017.

2.2 Method of Collection of Data

In the study, 30 patients presenting exclusively with extradural hematoma are subjected to study by:

- Thorough history taking and clinical examination of the patients presenting to casualty, according to head injury proforma.
- CT scanning of the patients who met the criteria for the same.
- Selectively choosing the patients who had extradural hematoma keeping exclusion criteria in mind.
- Initial resuscitation of all patients admitted to ICU.
- Continuous monitoring using observational chart. Intracranial Pressure (ICP) could not be measured as facility is not available.
- Selected patients among all patients with EDH were taken for surgery by judging their clinical parameters along with relevant CT findings.
- Informed consent was taken from all patients before examination, investigation and from the patients who underwent surgery.
- Resuscitation of post-operative patients and monitoring.
- Outcome of the patients were categorized by assessing clinical and neurological status of patient using Glasgow Outcome Scale (GOS).
- Follow up of the patients were done and their neurological status were regularly assessed.
- The results were analyzed.

3. Results

3.1 Incidence of Age

In the present study, largest number of patients having head injury belong to age group of 21-30 years (n = 15, 50%), followed by 41-50 years age group (n = 5, 16.66%), least common age group involved age group being popu-

lation more than 60 years (n = 1, 3.3%) (Table 1). Out of 30 patients, 24 patients (80%) were males and 6 patients (20%) were females. Male to female ratio is 4:1.

Table 1. Age distribution

| Age (in years) | Number of patients | % |
|----------------|--------------------|-------|
| <=20 | 2 | 6.66 |
| 21-30 | 15 | 50 |
| 31-40 | 4 | 13.33 |
| 41-50 | 5 | 16.66 |
| 51-60 | 3 | 10 |
| 61+ | 1 | 3.33 |
| Total | 30 | 99.98 |

3.2 Mode of Injury

Mode of injury in majority of patients in this study was due to road traffic accidents accounting 18 patients (60%), 9 patients (30%) were due to self fall and 3 patients (10%) were due to assault (Table 2).

Table 2. Mode of injury

| Mode of Injury | Number of patients | % |
|-----------------------|--------------------|--------|
| Road traffic accident | 18 | 60.0% |
| Self fall | 9 | 30.0% |
| Assault | 3 | 10.0% |
| Total | 30 | 100.0% |

3.3 Glasgow Coma Scale

In terms of severity of head injury which is expressed in terms of Glasgow Coma Score, majority of patients (n=15, 50%) had GCS of 14-15 having mild head injury. 10 patients (33.33%) with GCS of 9-13 having moderate head injury and 5 patients (16.66%) had GCS of 3-8 having severe head injury (Table 3).

Table 3. Glasgow Coma Scale

| GCS | Number of patients | % |
|-----------------|--------------------|--------|
| Mild(14-15) | 15 | 50% |
| Moderate (9-13) | 10 | 33.33% |
| Severe (3-9) | 5 | 16.66% |
| Total | 30 | 100% |

3.4 Clinical Presentation

In this study, most of the patients presented with lucid interval (n = 11, 36.66%), other clinical presentation were Anisocoria in 7 patients (23.33%), Battle's sign in 4 patients (13.33%), Hemotympanum in 3 patients (10%), Black eye in 3 patients (10%), and Hypoxia or Hypotension in 2 patients (6.66%) (Table 4).

Table 4. Clinical presentation

| Clinical Sign | Number of Patients | % |
|----------------|--------------------|-------|
| Lucid interval | 11 | 36.66 |
| Anisocoria | 7 | 23.33 |
| Battle sign | 4 | 13.33 |
| Black eye | 3 | 10 |
| Hemotympanum | 10 | 10 |

3.5 Site of EDH

In the present study, most common site of EDH was Temporal (n = 6, 20%), and temporo-parital (n = 6, 20%) regions, followed by parital (n = 5, 16.66%) and frontal (n = 4, 13.33%) regions. 3 patients (10%) had fronto-temporal region. 2 patients in (6.66%) had EDH each in occipital and parieto-occipital subgroups. 1 patient (3.33%) had EDH each in fronto-parital and temporo-parieto-occipital subgroups (Table 5).

Table 5. Site of EDH

| Region | Number of Patients | % |
|---------------------------|--------------------|--------|
| Temporal | 6 | 20% |
| Temporo-parietal | 6 | 20% |
| Frontal | 4 | 13.33% |
| Parietal | 5 | 16.66% |
| Fronto-temporal | 3 | 10% |
| Occipital | 2 | 6.6% |
| Parieto-occipital | 2 | 6.6% |
| Temporo-parieto-occipital | 1 | 3.33% |
| Fronto-parietal | 1 | 3.33% |
| Total | 30 | 100% |

3.6 Side of EDH

In our study, out of 30 patients 17 patients (56.6%) had EDH on right side, 11 patients (36.66%) on left side and 2 patients (6.66%) had Bilateral EDH.

3.7 CT Findings

CT Brain findings of EDH and its effects are as follows. Clot volume more than 30ml was found in 14 patients (46.66%) and less than 30ml in 16 patients (53.33%). Midline shift was noted in 12 patients (40%) and was absent in 18 patients (60%). Brain herniation was present in 2 patients (6.66%) and herniation was absent in 28 patients (93.33%) (Table 6).

Table 6. CT findings

| CT findings | Number of patients | % |
|-----------------------|--------------------|--------|
| Clot volume>30ml | 14 | 46.66% |
| Clot volume<30ml | 16 | 53.33% |
| Midline shift present | 12 | 40% |
| MIDLINE SHIFT ABSENT | 18 | 60% |
| HERNIATION PRESENT | 2 | 6.66% |
| HERNIATION ABSENT | 28 | 93.33% |

3.8 Mode of Management

Table 7. Mode of management

| Mode of Management | Number of patients | % |
|--------------------|--------------------|--------|
| Conservative | 19 | 63.3% |
| Surgery | 11 | 36.7% |
| Total | 30 | 100.0% |

Among 30 patients with EDH, 19 patients (63.33%) were conservatively managed and 11 patients (36.7%) were managed by surgery (Table 7).

3.9 Glasgow Outcome Score (GOS)

In the present study, 21 patients (70%) recovery well with GOS of 5 (good recovery), 4 patients (20%) had moderate disability with GOS = 4, 3 patients (3.33%) had severe disability with GOS = 3, 1 patients (3.33%) was in persistent vegetative state GOS = 2, and 1 patient (3.33%) was dead with GOS = 1 (Table 8).

4. Discussion

Head injury is the leading cause of death in the age group of 16 to 40 years. Extradural Hematoma, (EDH) a collection of blood between the skull and the dura matter due to bleeding from extra cerebral vessels is a common compli-

cation if head injury, often fatal if not treated in time. The availability of Computed Tomography (CT) has increased the diagnosis of extradural hematomas. The early mortality rate was 86%, which has reduced now by introduction of CT and proper resuscitative measures and timely surgical intervention to 5 to 12%^{4,10}.

Table 8. Glasgow outcome score

| Glasgow outcome score | Number of patients | % |
|---------------------------------|--------------------|-------|
| Good recovery (5) | 21 | 70% |
| Moderate disability (4) | 6 | 20% |
| Severe disability (3) | 1 | 3.33% |
| Persistent vegetative state (2) | 1 | 3.33% |
| Dead (1) | 1 | 3.33% |
| Total | 30 | 100% |

This prospective study includes both surgically and conservatively managed cases of EDH. The study provided opportunity to observe the various aspects of EDH and evaluate our ongoing management procedure.

Patients were aged ranging from 19 to 65 years. In the present study patients in the age group 21-30 years formed the bulk of study (50%), successively followed by age group of 41-50 years (16.66%). Patients of age group more than 60 years are the least (3.33%). Studies done by Babu et al.¹¹, Vishwanath et al.,¹² and others. Also shows that the younger age group was 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.

In elderly patients EDH is less frequent because of strong adhesion of dura to the skull, hampering the detachment and accumulation of blood. In children, as the osseous groove that houses the middle meningeal artery is not yet fully formed, injury of this artery is less frequent.

Males were most common victims as compared to females. The male-female ratio in the present study is 4:1. This was also seen and comparable with the other studies of Chowdhury et al.,¹² and R.J. Cook et al.¹³. This may be due to reflection of our social culture where most females are housewives and are not exposed to external work.

Road traffic accident was the most common mode of injury noted in this study, followed by self-fall and assault. R. J. Cook¹³, Chowdhury Noman SM et al.,⁶ have also mentioned road traffic accidents as the most common cause of injury. But in contrast João Luiz Vitorino Araujo et al.,¹⁴ and John M.

Tallon et al.,¹⁵ reported fall due to unspecified causes as the most common mode of injury.

On admission, most patients (50%) had GCS between 13 and 15, demonstrating that the epidural hematoma was often a consequence of low energy trauma, with little effect on the brain parenchyma. Study mentioned in chart considers GCS on presentation is the strong predictor of outcome. Lower GCS at admission had higher incidence of intradural hemorrhage with EDH.

The classic "lucid interval", described as loss of consciousness followed by a lucid period and the quick deterioration into coma, was observed in 36.66% of patients in this study. Jamieson et al reported only 20 from 167 (12%) of patients, Bricolo⁷ 21% and Keet¹⁶ 22%. A lucid period in EDH, therefore, probably occurs in 1-30% of patients; furthermore, it is not specific for extradural hemorrhage, being observed in other head injuries.

Other significant clinical findings noted were anisocoria which was present in 23.33% of our patients. This can be compared with other authors who have noted anisocoria in 18.5% by João Luiz Vitorino Araujo et al.,¹⁴ and 20%-30% by Bricolo et al.,⁷ and Kuday et al.¹⁰. Other clinical findings seen in the study were Battle sign in 13.33%, Black eye in 10% patients and hyoxia/hypotension in 6.66% of patients. However no neurological deficit or lateralizing signs noted in this study at the time of presentation.

CT scan was done in patients with history of loss of consciousness or deterioration of consciousness, 2 or more episodes of vomiting, pupillary abnormalities, persistent headache and in patients with hemotympanum, Battle sign and Black eyes.

According to this study temporo-parietal and temporal region was most common location of EDH. It was present in 20% each of our patients. Next common location was parital and frontal which were in 16.66% and 13.33% patients respectively. R.J. Cook et al.,¹³ also shows temporo-parietal region as the most common site but followed temporal and frontal region as the common site. But Chowdhary et al.,⁶ shows temporal region is the most common location followed by temporo-parietal region.

5. Management

The most significant clinical variable which influence surgical mode of management were higher age group and lower GCS.

The significant CT scan variable which indicates surgical management was greater clot volume, greater clot thickness and midline shift. Hematomas in temporo-pari-

etal region indicates surgical mode of management when compared to hematomas at other regions, since hematoma in this region is highly associated with unfavorable outcome due proximity to the brainstem structures.

According to Bejjani et al.,¹⁷ mass effect, temporal location of blood clot, midline shift, thickness of clot and clot volume were independently related to surgery and other clinical factors such as age, GCS were not associated.

Hamilton and Wallace et al.,¹⁸ said patients with lower GCS score, pupillary abnormalities, larger EDH and greater midline underwent surgical management.

But according to Servadei et al.,¹⁹ only thickness of hematoma and midline shift were related to decide to operate of all factors they analyzed.

Chen et al.,²⁰ reported that supratentorial EDH with volume more than 30ml, a thickness of more than 15mm and a midline shift more than 5mm tended to require surgery.

Dubey A et al.,²¹ identified GCS, EDH volume and location of EDH as the factor that influence the management.

6. Outcome

The significant clinical factor associated with unfavorable outcome in this study was GCS of the patient at the time of presentation.

The significant CT scan factors associated with unfavourable outcome in the present study were greater clot volume, greater clot thickness, midline shift and herniation irrespective of mode of management, i.e., conservative or surgical. Hematomas in temporo-parietal region were associated with favorable outcome if operated early.

According to Bricolo A et al.⁷, Kuday C et al.¹⁰, Gennarelli T et al.,²² and various authors, admission GCS or GCS before the surgery is the single most important predictor of outcome in patients with EDH undergoing surgery.

Lee et al.,²⁰ and Servadei et al.,¹⁹ have reported that outcome was influenced by GCS and EDH volume among other factors.

Dubey et al.,²¹ reported GCS as the single most significant factor. The other significant factors in their study were age, clot volume and site of EDH.

It is found the pupillary abnormality and lower GCS score (less than 9) was associated with poor outcome.

It is observed that the outcome was better in patients with an EDH volume less than 30ml compared to those with more than 30ml. this finding corresponds the finding of Sevadei et al.,¹⁹ that patients with 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 of trauma.

7. Conclusion

- EDH commonly affects male patients of age group 21-30 years.
- Road traffic accidents are the commonest mode of injury presenting with lucid interval as the most common clinical finding followed by anisocoria.
- CT scan features are very suggestive of management of EDH.
- In patients with EDH, surgical mode of management is preferred if patient is having low GCS and large hematoma.
- Early diagnosis and treatment with good hospital care improves the outcome of EDH.

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