

Acute Extradural Hematoma in Pediatric Age Group: Factors Affecting The Outcome

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ABSTRACT

Objective: To identify the factors affecting the outcome of acute extradural haematoma in pediatric age group.

Subjects and Methods: This was a descriptive study carried out at the Department of neurosurgery, PGMI Lady Reading Hospital Peshawar from January 2007 to December 2007 on 50 consecutive patients of acute extradural hematoma operated and post-operative outcome including good recovery, moderate disability, severe disability, persistent vegetative state, and death recorded.

Results: Out of 50 cases, 80% were males and 20% females. Majority (48%) cases were in the age range of 6-10 years, 36% in age group of 11-15 years, 16% in the age range of 1-5 years. In 60% patients fall, in 26% road traffic accident (RTA) and in 14% physical assault was the mode of injury. Interval between injury and surgery of > 8 hours recorded in 78% cases, 4-8 hours in 20% patients, < 4 hour in 2% cases. On CT scan, parietal site was commonest in 40% cases, frontal site in 26% cases. In 80% cases craniotomy and in 20% cases craniectomy performed. Post-operative outcome, good recovery noted in 80% cases, moderate disability in 10% cases, death in 6% cases, and severe disability recorded in 4% cases.

Conclusion: Extradural hematoma is a common manifestation of head injury, affecting male children age range of 6-10 years and early surgical intervention is life saving.

Key Words: Epidural hematoma; Traumatic brain injury; Craniectomy; craniotomy.

INTRODUCTION

Head injury is the major cause of death in children,¹ between 20 to 30% of attendees at an average accident and emergency department in the UK are children. Nearly 10000 children every year in the UK become disabled because of trauma.²

Traumatic brain injury (TBI) is a non-degenerative, non-congenital insult to the brain from an external mechanical force, possibly leading to permanent or temporary impairment of cognitive, physical and psychosocial function with a diminished or altered state of consciousness. Among children aged 0-14 years, an estimated 475000 cases of TBI occur each year. Rates are higher among children aged 0-4 years.³

Epidural hematoma (EDH) is accumulation of blood between dura and bone in the potential space

intracranially, occurs in approximately 2% of patient with head injuries and 5 to 15% of patients with fatal head injuries. EDH is considered to be the most serious complication of head injury requiring immediate diagnosis and treatment.^{3,4}

The mortality rate associated with EDH has been estimated to be 5 to 50%. Almost half of patients to emergency department with head injury (1 million) are children.⁵

Time lapse between the occurrence of injury and management, age of the patient, Glasgow coma scale (GCS) at presentation and site of hematoma are the major determinants of the outcome of acute extradural hematoma.⁶

Acute extradural hematoma at the posterior fossa is associated with a mortality of 12.5 to 70%. Pre hospital delay, prolong emergency stay and

inappropriate head injury management are the major determinants of death. Epidural hematoma may affect any part of the skull, although mainly the temporal and temporoparietal regions are involved.⁶

With the advent of CT scan the management of head trauma has revolutionized, it is the investigation of choice for diagnosing extradural hematoma.⁷ The surgical treatment of EDH involves making a sufficient opening in the skull via a craniotomy or craniectomy, evacuating the clot and stopping the source of bleeding.⁸

MATERIAL AND METHODS

This was a descriptive study conducted at the Department of Neurosurgery Postgraduate Medical Institute, Lady Reading Hospital, Peshawar from January 2007 to December 2007 on 50 consecutive cases of acute extradural hematoma. All the consecutive 50 pediatric patients with extradural hematoma (on CT Scan diagnosis) referred through Accident and Emergency Department to Neurosurgery Department of Postgraduate Medical Institute, Lady Reading Hospital, Peshawar, were selected for the study. After taking informed consent, these patients were evaluated after neurosurgical assessment and initial resuscitation. They were further assessed through detailed history, from patient or from the attendants, including personal particulars, name, age, sex, address, time of incidence, mode of injury, and through clinical examination including vital signs i.e. blood pressure, pulse and temperature and evaluation of conscious level (GCS).

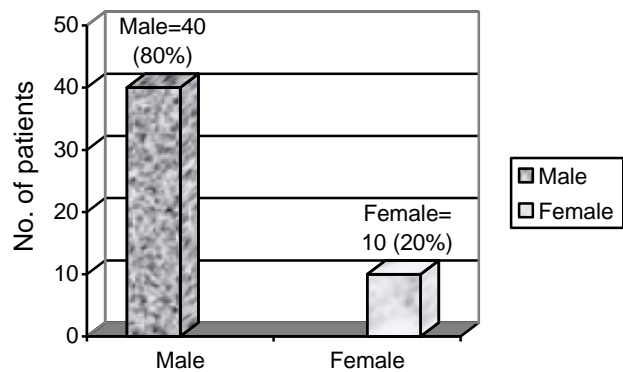
Patients were definitely diagnosed as case of acute extradural hematoma if found to have biconvex hyperdense lesion in extradural region on CT scan brain. Per-operative findings and post-operative findings regarding Glasgow coma scale and hospital stay noted. Post-operative outcome including good recovery, moderate disability, severe disability, persistent vegetative state, and death if any noted in proforma.

Other relevant data like mode of injury, interval between trauma and admission, arrival and surgery, presenting complaints, clinical findings, associated injuries, CT scan brain findings like size of hematoma, site of hematoma, overlying bone fracture entered into a proforma. For age, Glasgow coma scale on arrival and postoperative, interval between trauma and admission, arrival and surgery, hospital stay, mean and + standard deviation calculated. For sex distribution,

male to female ratio calculated. The results expressed/ presented through frequency tables, graphs and charts. All the data analyzed by using computer program SPSS version 12. Due to the nature of the study design (descriptive case series) no statistical test was applied to categorical data.

RESULTS

A total number of 50 patients with epidural hematoma were included in this study. Out of 50 patients presented with epidural hematoma, there were 40 (80%) males and 10 (20%) females patients (Graph 1).



Graph 1: Sex-Wise Distribution of Patients (n=50)

The age of patients ranged from 2 to 14 years. In this study the overall mean age was 9.16 years, + standard deviation was 3.46 years, minimum age was 2 years and maximum was 14 years. Majority of patients 24 (48%) were in the age range of 6-10 years, followed by 18 (36%) patients in age group of 11-15 years, eight (16%) patients were in the age range of 1-5 years (Table 1).

Table 1: Age-Wise Distribution of Patients (N = 50).

Age Ranges (In Years)	No. of Cases	Percentage
1 – 5 years	08	16%
6 – 10 years	24	48%
11 – 14 years	18	36%
Total	50	100%

In majority 30 (60%) patients fall was the mode of injury of epidural hematoma. In 13 (26%) patients

road traffic accident (RTA) was the mode of injury. In 7 (14%) physical assault was the mode of injury.

Delay between arrival to hospital and surgery of 1-4 hours was recorded in 24 (48%) cases, 4-8 hours delay between arrival to hospital and surgery was noted in 16 (32%) patients, < 1 hour delay between arrival to hospital and surgery was observed in 6 (12%) cases, > 8 hours delay between arrival to hospital and surgery was noted in 4 (8%) cases. Overall mean delay between arrival to hospital and surgery was 2.36 hours, + standard deviation was 0.80 hours.

Interval between injury and surgery of > 8 hours was recorded in 39 (78%) cases, 4-8 hours interval between injury and surgery was noted in 10 (20%) patients, < 4 hour interval between injury and surgery was observed in 1 (2%) cases. Overall mean interval between injury and surgery was 2.76 hours, + standard deviation was 0.48 hours.

Glasgow coma scale (GCS) at arrival on clinical examination was 13-15 in 22 (44%) cases, GCS of < 8 was noted in 17 (34%) cases, GCS of 9-12 was observed in 11 (22%) cases.

On clinical examination pupils equal and reactive to light were noted in 34 (68%) cases, ipsilateral dilated in 16 (32%) cases. Localizing signs including raccoon eye signs were present in 40 (80%) cases.

On CT scan parietal was the commonest site of the hematoma in 20 (40%) cases, frontal site of the hematoma was noted in 13 (26%) cases. Frontoparietal, temporoparietal and bifrontal sites of hematoma were present in 3 (6%) cases respectively. Temporal, occipital, and parieto-occipital site of hematoma was recorded in 2 (4%) cases respectively. Posterior-fossa and fronto-temporo-parietal site was observed in 1 (2%) case respectively.

On CT scan hematoma on right side of the brain was found in 29 (58%) cases, left side of the brain was involved in 18 (36%) cases, bilateral side was presented in 3 (6%) cases.

Approximate volume of hematoma on CT scan from 41-60 ml was found in 20 (40%) patients, from 20-40 cc in 19 (38%) cases and from 61-90 cc in 11 (22%) cases. Overall mean volume of hematoma was 51.04 + 15.74 cc. Minimum volume was 24 cc and maximum was 90 cc.

On CT scan overlying bone fracture was also present in 24 (48%) cases. While in remaining 26 (52%) cases no bone fracture was noted.

In majority 40 (80%) of cases presented with extradural hematoma craniotomy was performed. In remaining 10 (20%) cases craniectomy was performed.

Bleeding from dural vessels was noted in 20 (40%) cases, no active bleeding was observed in 17 (34%) cases, bleeding from fracture margins was observed in 9 (18%) patients, diffuse ooze was noted in 4 (8%) cases.

Post-operative Glasgow coma scale (GCS) of 13-15 was noted in 41 (82%) cases, GCS of 9-12 was noted in 6 (12%) cases, GCS of 3-8 was observed in 3 (6%) cases. Overall mean postoperative GCS was 13 (converted to round figure for convenience) + 2.70.

Post-operative hospital stay of 1-5 days was in noted in majority 42 (84%) cases, 6-10 days was noted in 6 (12%) cases, 11-15 days was observed in 2 (4%) cases. Overall mean hospital stay was 4.02 + 2.41 days. Minimum hospital stay was 1 day and maximum hospital stay was 14 days.

Post-operative outcome showed that good recovery was noted in majority 40 (80%) cases, moderate disability was observed in 5 (10%) cases, death occurred in 3 (6%) cases, severe disability was recorded in 2 (4%) cases, persistent vegetative state was not observed in any patient.

DISCUSSION

Head injury is a major cause of death and disability in children. Despite advances in resuscitation, emergency care, intensive care monitoring, and clinical practices, there are few data demonstrating the predictive value of certain physiological variables regarding outcome in pediatric population.⁹

Acute extradural haematoma is one of the known complications of head injuries. If not diagnosed and operated in time may lead to a high morbidity and mortality.¹⁰ Favorable outcome could be ensured only if the extradural haematoma is evacuated before the onset of brain dysfunction.¹¹ However a number of factors affect the ultimate outcome. Considering these factors, outcome of the surgical treatment can be significantly modified.

Factors that were found to considerably affect the outcome were age of patients, mode of injury, time interval between the trauma and operation, neurological status at the time of surgery, size of haematoma and postoperative condition of the brain. It was found that patients who were operated within 12 hours of trauma had better outcome as compared to the patients who were operated late.¹²

In one local study conducted by Ayub S et al,¹² favorable outcome was achieved in 69% patients, in terms of Glasgow coma score of 13-15. In 24% cases

there was moderate disability and 10.1% patients remained vegetative or died. While in contrast to this, in our study better outcomes that was good recovery achieved in 80% cases, moderate disability was observed in 10% cases, death was occurred in 6% cases and severe disability was noted in 4% cases, vegetative state was observed in no case. Glasgow coma score of 13-15 was achieved in 82% cases, GCS of 9-12 was achieved in 12% cases and GCS of 3-8 was achieved in 6% cases.

Glasgow coma scale, in a local study conducted by Akbar A,¹³ was 13-14 (9.72%), 9-12 (49.72%) and < 8.75 (40.54%). Good recovery occurred in 42.16% cases, moderately disabled were 15.13%, severely disabled were 9.72%, vegetative were 2.70% and death occurred in 30.27% cases.¹³

In another local study done by Hamid NA and Mian JM¹⁴ it was seen that the better pre-operative GCS and conscious level, were associated with better outcome.

Neurological condition before surgery and interval between trauma and surgery were found to be important factors in deciding the outcome.^{15,16} In one series¹² 26 patients with moderate disability were operated at interval of more than 12 hours. The reason was delay in transportation to the hospital. They probably developed complications like asphyxia and ischemic changes in brain due to prolonged compression and herniation.¹⁷ While in our series maximum pre-hospital delay was > 8 hours and > 8 hours delay between arrival and operation was noted in 8% and 78% cases respectively. Comparatively majority of patients arrived with mean time of 2.92 hours and they were operated within minimum mean time of 2.36 hours. So due to this reason we achieved better outcome in our series.

In a study by Munro PT and colleagues¹⁸ it is reported that age influenced neurosurgical transfer before other concomitant factors, such as size of haematoma, the incidence of serious extracranial injuries, and measures of physiological condition on arrival at hospital (including level of consciousness). In our study we have included pediatric age patients ranged from 2 to 14 years, majority was in the age range of 6-10 years.

Males were in predominance in our series as compared to females. The reason could be that males are exposed to external factors and other activities and are more prone to falls, road traffic accidents, assaults and other traumas. Females who are usually busy in their homes and schools are less prone to road traffic

accidents, falls, assaults and other traumas. Similar results have also reported in a local study done by Hamid NA and Mian JM¹⁴ in which males were 91% as compared to 80% in our study.

The majority of head injuries occur as a result of blunt trauma (falls, assault, motor vehicle collisions etc.¹⁹ In one study mechanisms of injury were falls (34%), assaults (28%), motor vehicle collisions (14%), pedestrian (11%), and other (12%).²⁰

In a local study the cause of head injuries were road traffic accident 42.16%, assaults 34%, fall from height 22.16% and sports injuries 1.62%.¹³ While in our study fall was the common mode of injury in pediatric population followed by road traffic accidents and physical assaults with the frequency of 60%, 26%, and 14% respectively. As in our study we selected pediatric population aged from 1 to 14 years, so this age group is more prone to fall as compared to other mode of injury.

In a study results showed that out of 1025 cases, 46 cases had 'double' EDH. There was bilateral EDH in 39 cases; multiple EDH in 3 cases and ipsilateral double EDH was present in 4 cases. The most common site was frontal (70%). The majority of the patients (80.3%) were in altered sensorium from the time of injury, similar situation was seen in 52.2% of cases with single EDH. The number of patients having a low GCS score was higher when first examined in the double EDH group and the mortality rate was 34.8% as compared to 9% in the single EDH group. Majority of the double EDH cases presented with a low GCS and there was a relatively quick neurological deterioration in these cases.²¹ In our series out of 50 cases of epidural hematoma, bilateral hematoma was found in 6% cases, right side was involved in 58% cases and left side of the brain was involved in 36% cases.

The mortality following the treatment of acute extradural haematoma varies from 9.6% to 45% in different studies.²²⁻²⁴ The mortality rate has been reduced considerably after the introduction of CT Scan, timely intervention and good postoperative care.²⁵ In our study there was 6% mortality out of 50 cases presented with epidural hematoma. It is very low mortality rate, than reported mortality rates in few studies. This may be due to early arrival of the patients to hospital and early intervention in these patients could save the lives of many patients. In one study the mortality rate was 34.8% as compared to 9% in the single EDH group.⁸⁰ In a local study death occurred in

30.27% cases.¹³ In another local study 10.1% patients remained vegetative or died.¹²

CONCLUSIONS

From the results of this study it is concluded that:

- Extradural hematoma is a common manifestation of head injury, affecting male children age range of 6-10 years.
- Fall from height was the commonest mode of injury in children rather than road traffic accidents.
- Good recovery was observed in children with GCS more than 12, shorter pre-operative delay, no active bleeding during the procedure (Craniotomy).

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