



Original Article

Assessment of Modes of Injury and Outcome in Patients with Traumatic Posterior Fossa Extradural Hematomas: A Study of a Tertiary Care Hospital

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ABSTRACT

Objective: The aim of study to assess the prevalence of divergent modes of injuries in traumatic posterior fossa extradural hematomas (PFEDH) along with the description of surgical and clinical management.

Material and Methods: A descriptive study was performed at the Jinnah Postgraduate Medical Centre (JPMC), Karachi from May 2014 to October 2020. Total 37 patients who presented with posterior hematoma of any age and gender were included. CT scan Brain plain with the bone window was performed for a basic diagnosis to assess the volume, and any associated fracture, or any injury in the posterior fossa. The outcome was calculated from the scores of the Glasgow Coma Scale (GCS).

Results: 70% were male and around 30% were female patients. The mean calculated age was 32 ± 5.33 years. A road traffic trauma was the major cause of brain injury in 25 (67.56%) cases. The majority (56.75%) of patients reported headache, nausea and vomiting. 35% of patients were conservatively managed, with an average hematoma size of 3 cm on CT scan and GCS > 12 while 64.86% patients were operated, with the average size of hematoma > 3 cm and GCS < 10 while 61% of the patient had an occipital fracture. The majority of patients (8.1%) reported complications such as brain contusions and post-traumatic hydrocephalus.

Conclusion: Post fossa EDH should be managed aggressively, especially those with low GCS (< 8), and volume > 3 cm. Patients who are to be managed conservatively also require close observation.

Keywords: Glasgow Coma Scale (GCS), Extradural Hematoma, Posterior Cranial Fossa, Occipital Fracture.

Abbreviations: GCS: Glasgow Coma Scale. EDH: Extradural Hematoma.

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INTRODUCTION

An extradural hematoma (EDH) is most frequently observed in the supratentorial region of the brain while posterior fossa extradural hematoma is the rare entity to present with, having a prevalence for only 1.2% to 12.9% of all EDH presentations¹ and posterior fossa hematomas due to trauma

are responsible for < 1% of all the head injury in the patients, as due to less volume of the posterior fossa, an increase in volume due to any reason may lead to brain herniation, raised intracranial pressure and fall in Glasgow coma scale (GCS).² The most common cause of epidural hematoma of the posterior fossa may be due to rupture of a venous blood vessel or arterial rupture. The main source of the bleed is considered either from middle meningeal artery branches, occipital bone fracture, or injury to the transverse sinus.^{3,8} The patient may present with loss of consciousness, headache, vomiting apart of this patients may deteriorate in no time because of compression on vital structures fourth ventricle, the brain stem, cerebellum.⁴ CT scan is diagnostic for traumatic injuries of the brain and extradural either supratentorial or infratentorial can be diagnosed and can be decisive of surgery.⁵ based on an assessment of status, asymptomatic patient with good GCS, can be managed conservatively is one of the options, but such a decision should be followed by intensive care unit protocol and kept under neuro-monitoring, while all the measures should be taken for emergency surgery at any time for evacuation of the hematoma.⁶ Standard Sub-occipital craniectomy surgery or craniotomy should be done based on the clinical status or size of the hematoma while the final decision and management are difficult.⁷ The current study was aimed to assess the prevalent causes of Traumatic Posterior Fossa Extradural Hematomas (PFEDH) in patients admitted in our department. The PFEDH requires urgent management especially in our region where head trauma is a major issue and may lead to morbidity and mortality. We presented the detail on the clinical as well as the surgical management.

MATERIAL AND METHODS

Study Design & Setting

A descriptive study was conducted after obtaining

an ethical approval from the hospital ethical review board. Total 37 patients with Traumatic Posterior Fossa Extradural Hematoma (PFEDH) were included from the Department of Neurosurgery, Jinnah Postgraduate Medical Centre (JPMC), Karachi – Pakistan from May 2014 to October 2020. The informed and written consents were taken from all patients or their attendants.

Sample Size

The sample size was calculated with the prevalence of 2.5%, confidential interval 95%, sample was calculated as 37.

Inclusion Criteria

Patients of any age from both genders, who presented with traumatic posterior fossa bleeds over 10 ml in volume causing mass effect and compression on brainstem or fourth ventricle, were included in the study.

Exclusion Criteria

Those who had a recurrence of bleeds or had previous operations for posterior fossa bleeds were not included in the study.

Data Collection

The information of age, gender, mode of injury, hematoma sizes, GCS scores and symptoms were collected for all patients.

Clinical Management

All the patients were admitted through the emergency department. CT scan Brain plain with the bone window was performed for a basic diagnosis of all patients, in order to assess the volume and any associated fracture, or any injury in the posterior fossa.

Patients with low GCS below 10 and those

with posterior fossa EDH more than 3 cm were transferred to operation room for suboccipital craniectomy for evacuation of the hematoma.

Data Analysis

All the analysis related to qualitative as well as quantitative parameters were evaluated and reported through IBM SPSS version 24.

RESULTS

Patients' Demographics

Among 37 patients, 26 (70.27%) patients were males and 11 (29.73%) females. The age range was between 9 years to 57 years while the mean calculated age was 32 ± 6.33 years.

Prevalence of Injuries

A road trauma was the major mode of injury to brain in 25 (67.56%) patients. The cause fall from high point was found in 7 (18.91%) patients, and assault was the reason in 5 (13.51%) patients (**Table 1**). The occipital fracture was observed in 61% of cases.

Table 1: Distribution of Injuries in Patients with Posterior Fossa Extradural Hemorrhage -PFEDH (n = 37).

| Mode of Injury | n = 37 | Percentage (%) |
|-------------------------|--------|----------------|
| Road accident | 25 | 67.56% |
| Fall Over from a height | 7 | 18.91% |
| Assault | 5 | 13.51% |

Admission GCS Scores and Symptoms

At the admission time, the GCS scores were between 13 – 15 in 13 (35.13%) patients, 9 – 12 in 17 (45.94%) patients and GCS 3 – 8 in 7 (18.91%) patients. As for the symptomatology, headache, nausea, and vomiting were observed in 21

(56.75%) cases, drowsiness in 9 (24.32%), localized swelling in 13 (35.13%) patients (**Table 2**).

Table 2: Prevalence of Symptoms (Preoperative).

| Symptoms | Prevalence in Patients (n) | Percentage (%) |
|--------------------|----------------------------|----------------|
| Headache | 21 | 56.75% |
| Vomiting | 21 | 56.75% |
| Nausea | 21 | 56.75% |
| Drowsiness | 9 | 24.32% |
| Localized Swelling | 13 | 35.1% |
| Ventilator support | 3 | 8% |

Surgical & Conservative Management

13 (35%) patients were conservatively managed, with an average hematoma size of < 3 cm on CT scan and GCS > 12. 24 (64.86%) patients were operated on, with the average size of hematoma > 3 cm and GCS < 10. average 61% of the patient had an occipital fracture. Three (8.1%) patients had a history of spontaneous bleed, they were on anticoagulants.

The patients who were managed conservatively had improved GCS (> 13) with minimal neurological deficit; the patients were kept in ICU for observation. Chest physiotherapy, antibiotics, and analgesics were continued and an initial CT scan of the Brain was repeated once after 6 hours and they were under treatment for 7 days and they were discharged with instructions to the family, with follow-up in OPD.

Craniotomy for Traumatic Posterior Fossa Extradural Hematomas (PFEDH)

The craniotomy done was done in 24(64.86%) patients. **Figures 1** showing EDH in the posterior fossa. After general anesthesia, the patient was kept in the lateral position. The head was kept on the head ring. The neck preservation was done by keeping it sufficiently flexed; a distance of one or two-finger breadths must be maintained between the chest and the chin. Straight paramedian

incision, down to the level of C-2. Skin and muscles were retracted in a sub-periosteal fashion and dissection is extended laterally along the occipital bone. Burr hole was made on occipital area of involved side. A craniotomy was performed EDH was removed and fascia muscle and skin was closed layer by layer.



Figure 1: Right sided extradural hematoma in posterior fossa.

Complications & Outcome

Complications related to the trauma were seen as cerebellar contusions in 2 (5.4%), brain contusions in 3 (8.1%) and posttraumatic hydrocephalus in 3 (8.1%) patients, 2 (5.4%) patients had ventilator support, while 03 (8.1%) patients had chest pneumonia. 31 (84%) patients had improved GCS with only minor issues and 6 (16%) had moderate morbidity.

| Complication | Prevalence in Patients (n) | Percentage (%) |
|-----------------------------|----------------------------|----------------|
| Cerebellar Contusions | 2 | 5.4 |
| Brain Contusions | 3 | 8.1 |
| Posttraumatic Hydrocephalus | 3 | 8.1 |
| Ventilator Support | 2 | 5.4 |
| Chest Pneumonia | 3 | 8.1 |

DISCUSSION

The current study assessed the prevalence of different modes of injuries in traumatic posterior fossa extradural hematomas (PFEDH) along with the description of surgical and clinical management. Among 37 patients, 26 (70.27%) were males and 11 (29.73%) were females. A road trauma was the major mode of injury observed in 67.56% of cases. The cause 'fall from height' was found in 18.91% of patients, and assault was the reason in 13.51% patients. Chaoguo et al had 24 males and 24 female patients, the ratio of 1:1, and the most common mode of the injury was fall followed by trauma, similar to our study they reporting time was around 72 hours.⁹ The headache, nausea, and vomiting were observed in most of the patients (56.75%), drowsiness in 24.32% of patients and, localized swelling in 35.13% patients. The 35% of patients were conservatively managed, with average hematoma size of 3 cm on CT scan brain and GCS > 12. The 64.86% of patients were operated, with the average size of hematoma > 3 cm and GCS < 10 while 61% of the patient had an occipital fracture. Our majority of the patients (8.1%) reported complications such as brain contusions and posttraumatic hydrocephalus. 84% of patients had improved GCS with only minor issues and 16% had moderate morbidity. Kumar et al¹⁰ stated that the hematoma size more than 3 cm and GCS less than 8 should operate within 12 hours while the poor outcome was observed in patients with GCS less than 8 while further study stated that posterior fossa hematoma GCS more than 13 and size less than 3 cm should be treated conservatively while GCS was the main factor for the poor outcome while compared to our study all the patient with GCS 8 were operated and 3.5 cm volume in the posterior fossa causing shift were operated within hours at our center. Anurag et al¹¹ observed skull fracture in 71% of cases. In this comparative study, the GCS was the main factor associated with survival and mortality in

extradural bleed of posterior fossa along with extradural bleed in posterior fossa. Similarly, in our study GCS was considered as an important score as it played the main role in morbidity and mortality of the patient. We reported 61% occipital fracture cases. In another prospective study by Sobti et al¹² had 25 patients, among other factors survival, GCS, a mode was injury were kept under consideration, follow-up duration was 6 months and mostly injury to occipital was related to posterior fossa extradural hematoma.

In our study, we had 37 patients with the most history of trauma. Kircelli et al¹³ fracture was observed in 68% of PFEDHs. Incidence of posterior fossa extradural hematoma associated with the clinical deterioration can result in fatal consequences, early diagnosis minimizes the modality and can be lifesaving while non-operative cases should also be kept under close observation. Another study by de Amorim et al¹⁴ showed that the incidence of subdural hematoma of posterior fossa was prevailed in 1.2% cases. Whereas, the patients with subdural hematoma of posterior fossa had a poor prognosis. A patient who showed ischemic lesions in postoperative CT scans, had an affected fourth ventricle. Overall, a poor outcome was seen in 63% of patients. In the study by Asif et al¹⁵ the male to female ratio was 1.6:1, while the age of the patient ranged between 5 – 45 years. They had all the hematoma cases of traumatic origin. The road trauma was the mode of injury in 40% patients. Whereas, only three patients presented with the bleed from the ear and developed CSF leakage. The rate of mortality was 4%. Takeuchi et al¹⁶ had 41 patients with traumatic hematomas of the posterior fossa. Among these patients, they had 18 patients of extradural hematoma, 10 patients had subdural hematoma, and intracerebellar hematomas were seen in 17 patients. A poor outcome was observed in posterior fossa subdural hematoma and intracerebellar hematomas, whereas, in our study we did not had any subdural hematoma nor

did we had any intracerebral bleed. We had cerebellar contusions in 2 (5.4%) patients. The outcome, maybe depends more on the mechanism of injury.

In another study, Sencer et al¹⁷ 29 patient underwent surgery for posterior fossa and eleven patients were kept on conservative management. They did not report any morbidity and mortality; they showed that excellent outcome can be given in children with experience and surgery can be avoided whenever it is indicated. Jang et al¹⁸ stated that the GCS score was a prognostic factor of a great value. Among the twenty-eight patients, in surgically treated patients, two patients had moderate disability, one patient died (overall mortality 2.9%) and two patients were in a vegetative state. An occipital fracture was diagnosed in 28 patients. The associated intracranial injuries had a poor outcome such as a contrecoup injury, while, in our study, the brain contusions were reported in 3 (8.1%) patients and posttraumatic hydrocephalus was treated in 3 (8.1%) patients. These patients had a longer duration of stay.

CONCLUSION

Post fossa EDH should be managed aggressively, especially those with low GCS (< 8), and volume > 3 cm. Patients who are to be managed conservatively also require close observation.

REFERENCES

1. Parashar VS, Kankane VK, Jaiswal G, Gupta TK. Traumatic posterior fossa extradural hematoma: A comprehensive analysis of cases from a tertiary care centre in Southwestern Rajasthan. *Romanian Neurosurgery*, 2019; 15: 160-5.
2. Bhardwaj S, Sharma V, Sharma S, Purohit D, Chopra S. Traumatic Posterior Fossa Hematoma, A Rare Entity: Study of 21 Cases. *Journal of Neurosciences in Rural Practice*, 2019; 10 (4): 675.
3. Muhammed GT, Aboud SH. Patterns and outcomes of posterior fossa extradural hematoma-six years

- study in emergency hospitals of Erbil city. *Journal of Kurdistan Board of Medical Specialties*, 2019; 5 (2): 36-41.
4. Verma SK, Borkar SA, Singh PK, Tandon V, Gurjar HK, Sinha S, Satyarthee GD, Gupta D, Agarwal D, Sharma BS. Traumatic posterior fossa extradural hematoma: Experience at level I trauma center. *Asian Journal of Neurosurgery*, 2018; 13 (2): 227.
 5. Moussa AA, Mahmoud ME, Yousef HA. Conservative management of significant epidural haematomas. *Egyptian Journal of Neurosurgery*, 2018; 33 (1): 1-3.
 6. Kang SH, Chung YG, Lee HK. Rapid Disappearance of Acute Posterior Fossa Epidural Hematoma—Case Report—. *Neurologia Medico-chirurgica*, 2005; 45 (9): 462-3.
 7. Aji YK, Apriawan T, Bajamal AH. Traumatic supra- and infra-tentorial extradural hematoma: case series and literature review. *Asian Journal of Neurosurgery*, 2018; 13 (2): 453.
 8. Haq NU, Azam F, Ishfaq M, Khan BZ, Jalal A. Clinical presentation and outcome of traumatic epidural hematomas in posterior fossa: study of 34 cases. *Journal of Postgraduate Medical Institute (Peshawar-Pakistan)*, 2016; 30 (3).
 9. Chaoguo Y, Xiu L, Liuxun H, Hansong S, Nu Z. Traumatic posterior fossa epidural hematomas in children: experience with 48 cases and a review of the literature. *Journal of Korean Neurosurgical Society*, 2019; 62 (2): 225.
 10. Kumar JS, Kumar GT, Gaurav J, Kumar LV, Patel P. Traumatic isolated intracerebellar haematoma without any supratentorial lesion. A rare entity. Management strategy. *Romanian Neurosurgery*, 2020 Dec 1; 34 (4).
 11. Anurag P, Rajeev B, Radheyshyam M. Factors affecting outcome in posterior fossa EDH: an analytical study at the tertiary referral hospital. *Romanian Neurosurgery*, 2016; 30 (2): 267-71.
 12. Sobti S, Bansal S, Choudhary A, Gupta LN. Clinico-radiologic Predictors of Outcome of Posterior Fossa Extradural Hematoma: An Institutional Experience. *Indian Journal of Neurotrauma*, 2017; 14 (02/03): 142-4.
 13. Kircelli A, Ozel O, Can H, Sari R, Cansever T, Elmaci I. Is the presence of linear fracture a predictor of delayed posterior fossa epidural hematoma? 2016; 22 (4): 355-360.
 14. de Amorim RL, Stiver SI, Paiva WS, Bor-Seng-Shu E, Serman-Neto H, de Andrade AF, Teixeira MJ. Treatment of traumatic acute posterior fossa subdural hematoma: report of four cases with systematic review and management algorithm. *Actaneurochirurgica*, 2014; 156 (1): 199-206.
 15. Asif M, Younus H. Early Diagnosis and Intervention in Epidural Hematoma of the Posterior Cranial Fossa. *Pakistan Journal of Neurological Surgery*, 2016; 20 (4): 214-8.
 16. Takeuchi S, Wada K, Takasato Y, Masaoka H, Hayakawa T, Yatsushige H, Shigeta K, Momose T, Otani N, Nawashiro H, Shima K. Traumatic hematoma of the posterior fossa. In *Brain Edema XV 2013* (pp. 135-138). Springer, Vienna.
 17. Sencer A, Aras Y, AkcAkAyA MO, Goker B, Kiris T, Canbolat AT. Posterior fossa epidural hematomas in children: clinical experience with 40 cases. *Journal of Neurosurgery: Pediatrics*, 2012; 9 (2): 139-43.
 18. Jang JW, Lee JK, Seo BR, Kim SH. Traumatic epidural haematoma of the posterior cranial fossa. *British Journal of Neurosurgery*, 2011; 25 (1): 55-61.

Additional Information

Disclosures: Authors report no conflict of interest.

Ethical Review Board Approval: The study was conformed to the ethical review board requirements.

Human Subjects: Consent was obtained by all patients/participants in this study.

Conflicts of Interest:

In compliance with the ICMJE uniform disclosure form, all authors declare the following:

Financial Relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.

Other Relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

AUTHORS CONTRIBUTIONS

| Sr.# | Author's Full Name | Intellectual Contribution to Paper in Terms of: |
|-------------|---------------------------|--|
| 1. | Aurangzeb Kalhoro | Study design and methodology. Data collection and statistical analysis. |
| 2. | Lal Rehman | Referencing, data calculations, manuscript writing, analysis of data and interpretation of results. |
| 3. | Sher Hassan | Analysis of data and literature review. |