

## Factors affecting outcome in posterior fossa EDH: an analytical study at tertiary referral hospital

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**Abstract:** *Introduction.* Posterior fossa extradural hematomas (PFEDHs) are uncommon as compared to supratentorial EDH and these patients can deteriorate very rapidly due to compression over brainstem. Thus early identification and intervention can save the lives of these patients. *Methods.* We prospectively studied 114 patients of posterior fossa injury for mode of injury, neurological status during admission, radiological findings, management, and outcomes of patients suffered posterior fossa extradural hematoma. All statistical analyses were determined using the SPSS 22.0.0.0 version. Statistical analysis was conducted utilizing Chi-square test. *Results.* Out of 114 posterior fossa trauma patients 28 patients (24.56%) having posterior fossa EDH. GCS on admission (p value=0.002), volume of posterior fossa EDH (p value= 0.000) were significant factors for the outcome of posterior fossa EDHs. On comparing the data patients who survived and those who did not survive, the GCS on admission (p value=0.004) and brain stem compression (p value=0.000) were two factors found to affect the mortality significantly. *Conclusion.* Early detection with high degree of suspicion and immediate evacuation of PFEDHs should be done if causing fourth ventricle, basal cistern or brain stem compression.

**Key words:** Posterior fossa extradural hematomas (PFEDHs), Glasgow coma scale (GCS), Brainstem compression

### Introduction

Posterior fossa injury is rare, it accounts for less than 0.3 % of all head injuries. In comparison to supratentorial epidural hematomas are much less common and constitutes nearly 1.2 -15 % of all intra cranial epidural hematomas. (1, 3) The stable looking

patient deteriorates very rapidly due to compression over the brainstem usually without any prior warning sign. Thus early intervention before progression to herniation is lifesaving. We prospectively studied mode of injury, neurological status during admission, radiological findings,

management, and outcomes of patients suffered posterior fossa extradural hematoma.

## Material and methods

### Study design

From August 2013 to July 2014, total one hundred fourteen posterior fossa injury patients admitted in department of neurosurgery at our institution. Out of them 28 (25%) patients were suffered by posterior fossa EDH. All patients were divided in two groups. Group A were those who had mass effect on fourth ventricle (n=14) and decompression surgery was performed as an emergency procedure. In group B were those patients without fourth ventricle shift and hence treated conservatively by continuous watching of patients neurological status, there vital parameters and serial CT scans as and when indicated. Patients were evaluated age, gender, mode of injury neurological status cranial CT findings were noted at the time of admission and follow up to find outcome. We assessed the prognosis of posterior fossa EDH depending on the compression over the fourth ventricle, basal cistern and brain stem.

### Clinical data

For each patient, the clinical data, mechanism of head injury, neurological findings, treatment, and outcome were noted carefully.

#### Radiological data

Radiological data including volume of hematoma, its mass effect, associated skull fractures and other intracranial lesions were noted. Volume was measured by empirical formula of volume =  $(0.5 \times \text{length} \times \text{depth} \times$

height) and the mass effect over fourth ventricle, basal cisterns were noted carefully.

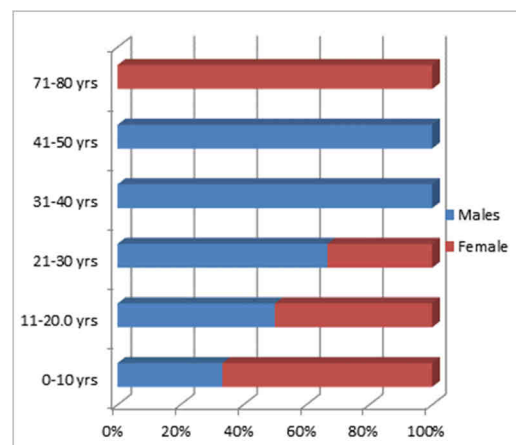
### Statistical analysis

All statistical analyses were determined using the SPSS 22.0.0.0 version. Factors like GCS on admission, volume of posterior fossa EDH, mortality and time of hospital stay were compared between group with mass effect over fourth ventricle and group without mass effect and there statistical significance was evaluated and analyzed by chi square test.

## Results

### Patient characteristics

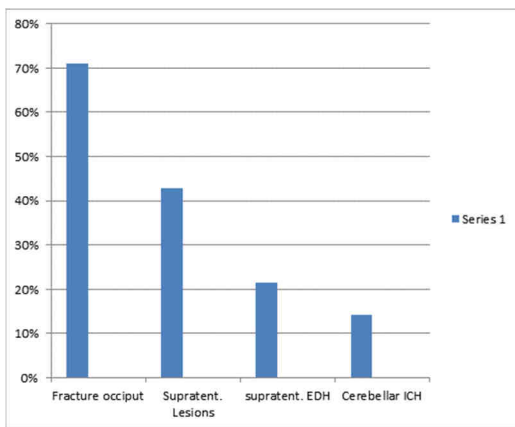
Out of total posterior fossa trauma patients 28 patients (24.56%) having posterior fossa EDH. Age of the patients ranged from 4yrs to 80 yrs with average age of 25yrs. There were eighteen males (64.29%) with ten female (35.71%) (Figure 1). The cause of injury were vehicular accidents in 24 patients and fall from height in four patients.



**Figure 1** - Bar diagram showing age and sex wise distribution of patient population

**Radiographic findings**

Among all the total number of post traumatic posterior fossa EDHs, skull fractures was seen in 71% cases, supratentorial contusions in 43%, associated supratentorial EDHs in 21.45% cases, and cerebellar ICH found in 14.28 % patients (Figure 2) and fifty percent patients were in group A (mass effect over fourth ventricle and basal cisterns).



**Figure 2** - Bar diagram showing intracranial injuries associated with posterior fossa EDHs

**Statistical analysis**

Comparisons of clinical features, neurological findings and neuroimaging findings between patients with mass effect over fourth ventricle and without mass effect during hospitalization are listed in Table I. Statistical analysis of GCS at admission, average time of stay at hospital, mortality and neuroimaging findings between two groups revealed that GCS on admission (p value=0.002), volume of posterior fossa EDH (p value= 0.000) were significant factors for the outcome of posterior fossa EDHs.

On comparing the data patients who survived and those who did not survive, the GCS on admission (p value=0.004) and brain stem compression (p value=0.000) were two factors found to affect the mortality significantly.

**TABLE I**

**Comparison of variables in patients with mass effect and without mass effect group and their significance**

	Patient with mass effect (mean)	Patient without mass effect (mean)	P value	Correlation
GCS on admission	7.89±3.48	14.2±1.09	0.002	-0.747
Volume of PFEDH in cubic cms	17.22±5.54	5.2±2.1	0.000	0.798
Average time of hospital stay	7.57±0.787	4.4±0.548	0.000	0.925
Mortality	28.57%	none	0.29	0.304

**TABLE II**

**Statistical analysis of various variables and their significance**

	Survivors	Non survivors	P value	Correlation
Age	24.83±13.05	46.5±15.46	0.152	- 0.404
GCS	11.33±3.17	3	0.004	0.72
Volume of PFEDH	11.92±7.63	19±1.41	0.229	
4 <sup>th</sup> ventricle compression	14	4	0.290	- 0.304
Basal cistern effacement	10	4	0.147	- 0.408
Brain stem compression	none	4	0.000	- 1

## Discussion

Post traumatic posterior fossa hematoma is the most commonly encountered after posterior fossa injury. In this study posterior fossa EDHs accounted for 25% of total cases of posterior fossa injuries. Overall mortality of posterior fossa EDHs was 14.28%. The outcome of PFEDHs was mainly influenced by GCS on admission and the mass effect over brain stem.

Bor seng shu et al reported that radiologic findings precedes clinical findings so patients suspected of having posterior fossa EDH should be monitored thoroughly and patients with external injuries in occipital region should be followed with regular CT scans (4, 5). We advocate early surgical intervention as the size of EDH increases rapidly and thus patients deteriorates quickly and may not be able to decompress by surgical intervention during such a short time.

The outcome of posterior fossa EDH depends on the volume of hematoma, or the mass effect over 4th ventricle, but Van den Brink et al postulated that hematoma volume is not the sole criteria for surgical intervention. (7) We suggest that the decision for surgery should be based on the GCS of the patient on admission, any further deterioration in neurological status, mass effect on 4th ventricle, effacement of basal cisterns and the compression over brain stem.

In the literature the mortality in posterior fossa EDH ranges from 4% to 26.5% (5, 6, 7) and lesser the GCS more is the mortality, in our study we found mortality rate of 14.28%. Along with the GCS, age of the patient,

duration from injury to operation also affects mortality. We found that the mortality along with the GCS on admission, the mass effect over 4th ventricle, effacement of basal cisterns and the compression over brain stem should also be considered as the potential factors suggesting poor prognosis, the later was associated with the poorest outcome (p value=0.000).

Therefore we recommend early detection with high degree of suspicion and immediate evacuation of PFEDHs if causing fourth ventricle, basal cistern or brain stem compression. Bozbuga (3) and colleagues also postulated that the obliteration of perimesencephalic cisterns and compression of fourth ventricle were evidences of brain stem compression in cases of PFEDHs.

In cases of posterior fossa EDHs there are associated supratentorial injuries in greater than 55 % of cases. In one study by Zucarello et al, he reported 87.5% of these associated intra cranial post traumatic lesions (8). We documented 78.57% of other intracranial lesions like contusions in frontal and temporal region, supra tentorial EDHs.

## Conclusion

This study concludes that the patients with mass effect over fourth ventricle, perimesencephalic cistern and brain stem should undergo evacuation of hematoma as early as possible. GCS on admission and mass effect over above mentioned structures are the factors of statistical significance for the outcome.

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