

## Posterior Fossa Haematomas outcome Following Surgical Evacuation: A Prospective Study

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### Abstract

**Objective:** To evaluate the various outcome variables in posterior fossa haematomas following surgical evacuation.

**Methods:** This is a prospective study done from August 2013 to February 2016 done on 68 patients with posterior fossa EDH, traumatic cerebellar haematomas, brainstem contusions, spontaneous cerebellar haematomas, sub dural haematomas were initially resuscitated, examined and graded according to GCS. The patient was thoroughly investigated and underwent conservative management and surgical evacuation and outcome parameters were measured.

**Results:** The patients admitted were evaluated with the preoperative GCS, of which the score of 8-12 with good outcome is present in 10 patients (66%) (P value- 0.0414), and the haematoma size and volume was measured showing a good outcome in 9 patients (69%) (P value- 0.0490) and 5 patients (83%) (P value- 0.0493) of haematoma size of < 4cm and volume of < 15ml. The patients outcome was also measured by effacement of 4<sup>th</sup> ventricle, as the good outcome was seen in 14 patients (73%) (P value- 0.0161). External ventricular drainage was performed in 14 cases of associated hydrocephalus. Significant no. of patients (17) had a GOS of 5 at discharge and followup. The mortality rate of the study was 14%.

**Conclusions:** The preoperative GCS, clot size, clot volume and configuration of the fourth ventricle on CT scans is a useful sign and valuable in measuring the outcome of the patient to apply the various and the best management protocol. These outcome variables can definitely change the mortality and morbidity in posterior fossa haematomas.

**Keywords:** Posterior Fossa Haematoma; GCS; GOS.

### Introduction

Posterior fossa is an uncommon site for intracranial haematomas, which includes traumatic and spontaneous haematomas – Extra dural haematomas, sub dural haematomas, cerebellar haematomas, brainstem haematomas. Cranial trauma is one of the most common serious causes of mortality and morbidity in developing countries. The common cause for cranial trauma encountered in general

population is motor vehicle accidents, falls, diving injuries, violence, assaults. Alcohol plays major role in trauma. Since the introduction of computerized tomographic (CT) scan number of cases reported were on rise when compared to pre CT era. Before the advent of CT most of the posterior fossa head injuries were diagnosed either clinically or on post-mortem pathology.

Posterior fossa haematomas constitutes about 3 - 5% of all intracranial haematomas [1]. In the emerging literature describing clinical research on head injuries, posterior fossa traumatic haematomas remain a clinico-pathological entity that has received relatively little attention. Posterior fossa haematomas are associated with high mortality, and present with low GCS.

Traumatic cerebellar contusions are indeed rare lesions, with a few reports being based on either single cases or small series of cases. Because of the rarity of

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these lesions individual surgeons or single institutions cannot gain considerable experience in their management. Spontaneous posterior fossa haematomas is an infrequent condition, may occur due to hypertension, patients on anti platelet treatment, anti coagulation treatment, blood dyscrasias and after cardiac surgery.

In the present study we evaluated the outcome of 68 patients of posterior fossa haematoma with regard to age, sex, clinically, radiologically, GCS at presentation, during and after treatment and GOS.

## Subjects & Methods

This is a prospective study done from August 2013 to February 2016 done on 68 patients with posterior fossa haematomas who underwent surgical evacuation, in department of neurosurgery, Osmania General Hospital. Patients with posterior fossa haematomas who underwent surgical evacuation were included in the study. Patients treated only with external ventricular drainage placement, associated supra tentorial injuries, brain tumours, vascular malformations and patients with systemic trauma were excluded from the study.

The patients were initially examined in emergency ward and graded according to Glasgow coma scale (GCS). Airway, Breathing, Circulation (ABC) of resuscitation attended to initially in some cases before the first CT scan was done at our institute. Endotracheal intubation followed by mechanical ventilation was carried out, if the patient had poor respiratory effort or low GCS. If there is doubtful lesion found in the initial CT scan then scan was repeated within 6 hrs. Criteria for ventilating the patient depends on GCS score, haemodynamical status and respiratory pattern. Neurological assessment was done once in two hours, if required more frequently. GCS was used to assess the severity of injury in all patients. Patients presented with posterior fossa extra dural haematoma (EDH), traumatic cerebellar haematomas, brainstem contusions, spontaneous cerebellar haematomas, sub dural haematomas. Emergency surgery - (Sub occipital craniectomy & evacuation of haematoma) was done in patients with significant size of haematomas. Outcome evaluated with GCS.

The patients underwent routine blood investigations, X-ray skull, X-ray cervical spine and also evaluated with CT brain as

1. Clot volume =  $(a \times b \times c) / 2$ ; a, b, c being the length, width and thickness of the clot.

2. Clot volume -Brown's formula  $4(S/2)^3 + S^2(L-S)/4L$  and S are the largest and smallest diameters of the clot respectively [2].
3. Tight posterior fossa of weisberg is a triad comprising of [3,4]:
  - Dilatation of 3rd ventricle.
  - Obliteration of quadrigeminal cistern.
  - Dilatation of temporal horns.
4. Status of fourth ventricle, whether it is normal or effaced partially (Figure 3) or completely (Figure 1).
5. Fracture of the skull bones and associated brain injury.

The patients were treated on the basis of duration between incident and surgery as conservatively or surgically by sub occipital craniectomy & evacuation of haematoma. The patient and the attendants are explained regarding the procedure of the surgery and the intraoperative and post operative complications in detail. A thorough consent is taken from the patient attendants and after the pre anesthetic checkup the patient is shifted to the theatre. After the anesthetic procedures a standard midline incision is given frominion to C2. The incision is deepened and suboccipital muscles and paraspinal muscles were retracted and a burr hole was made. A standard decompressive craniectomy was carried out extending superiorly to transverse sinus, laterally to mastoid air cells and below upto C2. Dura is opened in Y-shaped fashion and cerebellar corticotomy was done and the haematoma is evacuated (Figure 2 & 4). No suction drain is kept. After the discharge the patient was followed up at 15 days, 1, 3, 6 months.

*Outcome of posterior fossa haematomas depends on*

- Pre operative GCS score
- Haematoma volume
- Status of the fourth ventricle
- Duration between incident and surgery.

## Results

Total number of intracranial haematomas admitted from august 2013 to february 2016 in department of neurosurgery, Osmania General Hospital were 1284. Out of 1284 cases 452 cases were operated. Out of 1284 cases, total number of posterior fossa haematomas were 68. In that 29 cases (42%) were operated. These 29 cases were included in this study. Of the 29 cases of which 18 (62%) cases were male, 11 cases (28%) were female with ratio of 1.6 : 1. The mean

age of the study population was 41 years ranging from 10 to 74 years. There were 14 cases (48%) of spontaneous cerebellar haematomas, 9 cases (31%) of extradural haematomas, 6 cases (21%) of traumatic cerebellar haematomas.

Hypertension was the common cause of Spontaneous cerebellar haematomas. Road traffic accidents were the commonest cause of extradural and traumatic cerebellar haematomas. Altered sensorium was the commonest presenting complaint. Of the study population 26 patients (89%) presented

with altered sensorium, 15 patients (51%) with headache, 14 patients (48%) with vomiting, 8 patients (27%) with dysarthria and 7 patients (24%) with ataxia.

The outcome was measured as good outcome (GOS 4 or 5) and poor outcome (GOS <=3), when measured with GCS, 23 Patients presented with GCS 8-15 in that 18 patients had good outcome compared to 6 patients presented with GCS ≤ 7 in that 2 patients had good outcome as the P value (0.0414) is statistically significant (Table 1).

**Table 1:** Showing the outcome of patients with pre-op gcs

Pre op GCS	No. of patients	Good outcome	Poor outcome
≤ 7	6	2 (34%)	4 (66%)
8-12	15	10 (66%)	5 (34%)
13-15	8	8 (100%)	0

Out of 20 cases of cerebellar haematomas 13 patients presented with clot size of less than 4cm in that 9 patients had good outcome compared to 7 patients presented with clot size of greater than 4cm in that one patient had good outcome with P value of 0.0490. Out of 9 cases of extra dural haematomas 6 patients presented with clot volume of less than 15ml in that 5 patients had good outcome compared

to 3 patients presented with clot volume of greater than 15ml in that one patient had good outcome with a P value of 0.0493. 19 patients presented with partial effacement of 4th ventricle in that 14 patients had good outcome compared to 10 patients presented with complete effacement of 4th ventricle in that 2 patients had good outcome with a P value of 0.0161 (Table 2).

**Table 2:** Showing the outcome of patients with clot size, clot volume and effacement of 4<sup>th</sup> ventricle

Clot size/ clot volume/ effacement of 4 <sup>th</sup> ventricle	< 4 cm / < 15 ml/ partial effacement	> 4 cm / > 15 ml/ complete effacement
Number of patients	13 / 6 / 19	7 / 3 / 10
Good outcome	9 / 5 / 14	1 / 1 / 2
Poor outcome	4 / 1 / 5	6 / 2 / 8

All cases were operated by sub occipital craniectomy and evacuation of haematoma. Dilatation of supra ventricular system is seen in 14 cases, which are treated with EVD placement. 11 cases of spontaneous cerebellar haematomas required EVD placement. 3 cases of traumatic cerebellar haematomas required EVD placement. Patients who underwent surgical evacuation within 24 hrs had less mortality rate (4%) compared to the patients underwent surgery after 24-48 hrs and > 48 hrs i.e. 4% and 8% respectively.

Of the various complications encountered, 3 patients had postoperative wound infections. In 2 patients staphylococcus epidermidis was identified as a causative organism by doing culture and treated with sensitive antibiotic - Piperacilin-tazobactam. In one patient Methicillin - resistant staphylococcus

was identified as a causative organism treated with sensitive antibiotic linezolid. 2 patients developed meningitis.

Strepto coccus pneumoniae was identified as a causative organism by doing CSF culture and treated with sensitive antibiotic - vancomycin for 14 days, patients improved well. One patient developed pseudo meningocoele after 2 months of surgery treated with surgical repair. One patient with EDH developed re bleed on 1st postoperative day treated conservatively and improved well.

Patients outcome is defined by Glasgow outcome scale (GOS) score. Out of 29 cases, 14 patients improved with GOS score 5, 2 patients with GOS 4, 3 patients with GOS 3, 10 patients with GOS 1 (Table 3).

Table 3: Showing the gos of the patients

GOS score		Number of patients
5	( Resumption to normal life)	17
4	(Able to work in sheltered environment)	4
3	(Dependent for daily support)	4
2	(Unresponsive for months until death)	0
1	( Death)	4

Out of 29 cases 4 cases were expired, mortality rate in our study was 14%, of which the mortality rate of spontaneous cerebellar haematomas is 7%, extradural haematoma and traumatic cerebellar haematoma is 3% and 4% respectively.

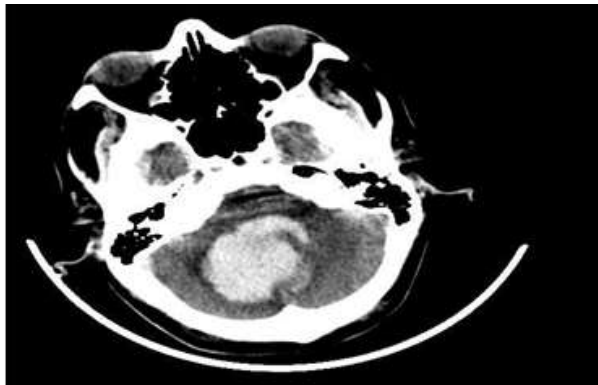


Fig. 1: Spontaneous cerebellar haematoma with complete effacement of 4<sup>th</sup> ventricle (Case 1)

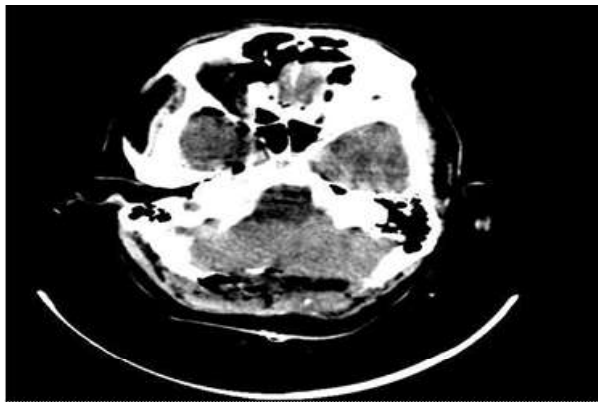


Fig. 2: Postoperative CT of Case 1

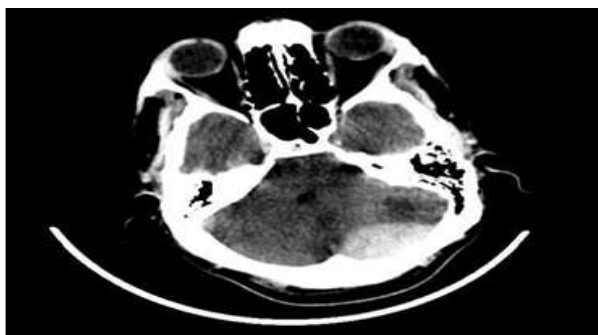


Fig. 3: Posterior fossa EDH with partial effacement of 4<sup>th</sup> ventricle (Case 2)

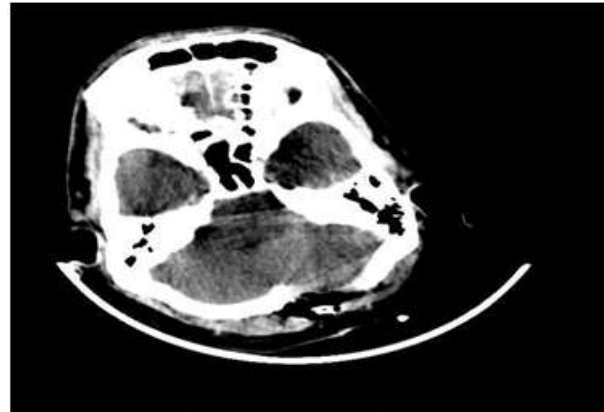


Fig. 4: Postoperative CT of case 2

### Discussion

The life saving nature of evacuation of the posterior fossa haematoma is accepted and recommended by the majority of authors. Most of them favored posterior fossa craniectomy as a life saving intervention when clinical cause is tending towards coma and decerebration. A high index of suspicion is needed for timely intervention to prevent death.

In the present study 14 cases of spontaneous cerebellar haematomas were operated. The commonest age group of presentation was 5th and 6th decade and the mean age was 58 years with range of 40-74 years. In other reported series in literature the mean ages were 58yrs [5], 61yrs [6], 63yrs [7]. The male to female ratio is 1.3:1, as in salvate et al series the reported ratio was 1.5:1 [4].

Hypertension was reported in 11 patients (78%). In a study by Lui, et al on 26 patients of spontaneous cerebellar heatomas, hypertension was noted in 16 patients (61%) which was reported with hypertension [8]. Gupta et. al. in his study on 18 cases of posterior fossa EDH reported male to female ratio of 3.5:1 is comparable with the present study male to female ratio of 2:1 [9].

In our study pre operative GCS score is a good prognostic indicator as 62% and 7% of patients with GCS of 8-15 and  $\leq 7$  had good outcome. Loon et. al. found a very significant correlation between the GCS

score on admission and outcome [10]. In another study by Mohanty et. al. also found GCS score had a significant bearing on the outcome [11]. Salazar et al found - whose haematoma size was larger than 4 cm, and these patients were associated with grave deterioration [8]. In our study 69% and 14% of the patients had favourable outcome with clot size <4 cm and >4 cm respectively. This was correlated with the outcome of the patients as in Zieger et. al. series [12].

In our study 83% and 33% of the patients had favourable prognosis with the clot volume <15 ml and >15 ml respectively. We found correlation between clot volume and prognosis as in series by Wong et. al. [13].

The appearance of 4th ventricle on CT scan was divided into normal, compressed or completely effaced. The degree of 4th ventricle compression was correlated with outcome. In the present study 73% and 20% of patients had good outcome with partial and complete effacement of 4<sup>th</sup> ventricle. This is consistent with the case series by Taneda et. al. [14] GCS at admission, clot size, status of 4th ventricle are good prognostic indicators in our study.

The mortality rate was comparable with the time interval of ictus to surgical evacuation i.e. 4%, 4% and 8% mortality rate for patients within 24hrs of ictus, 24-48 hrs and >48 hrs of ictus respectively. All cases operated by sub occipital craniectomy and evacuation of haematoma. EVD was placed in patients with dilatation of supra ventricular system

Out of total 29 patients of posterior fossa haematomas 4 patients were expired. Out of 14 patients of spontaneous cerebellar haematomas 2 patients (7%) were expired as these two patients were in hypertensive crisis with complete effacement of 4<sup>th</sup> ventricle and the patients had a preoperative GCS of 4. In salazar et al series on spontaneous cerebellar haematomas the mortality rate was 40% [8]. Mortality rate in extra dural haematomas was 3% (1 patient) as the patient presented 36 hrs after the initial insult and had complete infarction with brainstem herniation, the patient expired postoperatively after 24 hrs. In Traumatic cerebellar haematomas 4% (1 patient) expired due to sudden cardiac arrest. The overall mortality rate in our study was 14%.

## Conclusions

Decision-making in the management of posterior fossa hematomas requires careful consideration and interpretation of the various criteria. The preoperative GCS, clot size, clot volume and configuration of the fourth ventricle on CT scans is a useful sign and

valuable in measuring the outcome of the patient to apply the various and the best management protocol. These outcome variables can definitely change the mortality and morbidity in posterior fossa haematomas.

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