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Comparative prospective study of outcome between burr hole evacuation and decomperssive craniectomy in spontaneous cerebellar hematoma at tertiary care centre

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Abstract

Introduction: Cerebellar hemorrhage is the least common type of intracranial hemorrhage and believed to result from rupture of micro aneurysms. These usually occur in the dentate nucleus. Due to limited ability to accommodate an expansion of its content, spontaneous cerebellar hemorrhage can lead to life threatening complications and associated with high mortality.

Various surgical techniques for evacuating the cerebellar hematoma are sub occipital craniectomy with or without external ventricular drainage, key hole craniotomy, endoscopic evacuation via burr hole, stereotactic burr hole aspiration and free hand burr hole aspiration.

Method: The present study was performed in the Department of Neurosurgery, Government General Hospital, Kakinada, Andhra Pradesh from November 2020 to January 2022 on 20 patients of spontaneous cerebellar bleed. Out of 20, 10 patients underwent sub occipital craniectomy and 10 patients burr hole evacuation.

Observations & Results: In this study, majority of the patients were from the age range 50-59 years and 60-69 years (60%) with mean age group of presentation is 56.7 years. (p value 0.246446)There is male dominance in the study (80%) with male to female ratio of 4:1.Most of our patients (90%) had co-morbidity. Large number of patients were presented with altered sensorium (60%), headache (35%) and vomiting (30%) with most of patients (70%) presenting to emergency department within 24 hours.

In 60% patient, volume of hematoma was found ≤15 ml and >15 ml in 40% of patients. Sub occipital craniectomy

associated with more complications as compared to burr hole aspiration. (p value 0.19076). Average duration of surgery for sub occipital craniectomy was 114.5 minutes and for burr hole evacuation was 31 minutes. In our study higher mortality (15%) was associated with burr hole evacuation as compared with sub occipital craniectomy (10%) (p value 0.6).

Discussion: Cerebellar hematomas represent approximately 10% of all ICH with a low annual incidence in all strokes. It occurs most frequently in the 5th through the 8th decades of life. Mostly spontaneous cerebellar hemorrhages occur in hypertensive patient. It is more frequent in males than in females. Timely and appropriate surgical intervention saves lives, and such patients can often make a very good functional recovery, especially if the intervention is done earlier. Patients with spontaneous cerebellar bleed benefit from surgical removal of hematoma, but there is still controversy regarding indication and optimal choice of surgical intervention. Sub-occipital craniectomy has several drawbacks such as greater degree of invasion, longer operating time, post-operative CSF leaks and meningitis. Therefore, stereotactic aspiration, endoscopic evacuation, free hand bed side catheter evacuation and mini craniectomy have been proposed. Burr hole aspiration is simple and shortens the interval from skin incision to hematoma evacuation.

Conclusions: In present study we concluded that with over all slight higher mortality in burr hole evacuation group as compared to sub occipital craniectomy group, Burr hole evacuation can be considered as an emergency procedure for patients with poor GCS and large hematoma in hospital with limited resources while sub occipital decompressive craniectomy is definite procedure.

Keywords: Craniectomy, Vomiting, Sensorium, Threatening.

Introduction

Cerebellar hemorrhage is the least common type of intracranial hemorrhage, and mostly caused by arterial hypertension and are not associated with trauma, vascular malformations, inflammatory diseases or tumors. Spontaneous cerebellar hematoma is believed to result from rupture of micro aneurysms, as first proposed by Charcot and Bouchard, and recently confirmed[1]. These usually occur in the dentate nucleus which is supplied by the superior cerebellar artery. There may be left predominance. A small number of hemorrhage originate in the vermis.

The posterior cranial fossa is the deepest and most confined space in the skull. Due to limited ability to accommodate an expansion of its content, spontaneous cerebellar hemorrhage can lead to life threatening complications such as obstructive hydrocephalus, brain stem compression or herniation resulting in high mortality.

Various surgical techniques for evacuating the cerebellar hematoma are sub occipital craniectomy with or without external ventricular drainage, key hole craniotomy, endoscopic evacuation via burr hole, stereotactic burr hole aspiration and free hand burr hole aspiration.

Method

The present study was performed in the Department of Neurosurgery, Government General Hospital, Kakinada, Andhra Pradesh from November 2020 to January 2022 on 20 patients of spontaneous cerebellar bleed. Out of 20, 10 patients underwent sub occipital craniectomy and 10 patients burr hole evacuation.

Inclusion criteria

Patients having spontaneous cerebellar hematoma on CT with any of the following indication of surgery-

1) volume >15 ml
2) Associated hydrocephalus
3) GCS <15
4) Any signs of raised ICP

Exclusion Criteria

1) Patients with history Traumatic Brain Injury
2) Tumor bleed
3) Associated hemorrhagic infraction
4) GCS – 3
5) Any bleeding disorders
6) Associated with any infection

Descriptive statistics for all data are presented as the mean and range for continuous variable and as frequency and percentage for categorical variable. For categorical variables, cross table were generated and chi square test was used to compare distribution. Statistical significance was a p <0.05.

Observations & Results

This study included the patients ranging from 40 years to above 70 years, however majority were from the age range 50-59 years and 60-69 years (60%) with mean age group of presentation is 56.7 years. (p value 0.246446).

Age Group (Years)	No. of Patients	Percentage
40-49	5	25%
50-59	6	30%
60-69	6	30%
≥70	3	15%

There is male dominance in the study (80%) with male to female ratio of 4:1.

Sex	No. of Patients	Percentage
Males	16	80%
Females	4	20%

Most of our patients (90%) had co-morbidity. These included hypertension, diabetes mellitus, asthma/COPD etc, out of which hypertension was found to be most common (55%) followed by hypertension with diabetes mellitus (30%) (p value0.864629).

Co Morbidity	No. of Patients	Percentage
HTN	11	55%
HTN+DM	6	30%
DM	1	5%
NO	2	10%

40% patients were on antiplatelet medication at the time of presentation.

Anti platelets / anticoagulants	No. of patients	Percentage
Yes	4	20%
No	16	80%

Large number of patients were presented with altered sensorium (60%), headache (35%) and vomiting (30%) with most of patients (70%) presenting to emergency department within 24 hours. (P value 0.19076)

Clinical Features	No. of Patient	Percentage
Altered Sensorium	12	60%
Headache	7	35%
Speech Problems	2	10%
Vomiting	6	30%
Vertigo	3	15%
Cranial Nerve Palsy	1	5%
Ataxia	4	20%

In our study, 40% patients presented with GCS 9-12, 35% patients with GCS 13-15 and 25% patients with GCS >3-8.

GCS	No. of Patients	Percentage
>3-8	5	25%
9-12	8	40%
13-15	7	35%

According to classification given by **kirollos et al.** [2]for compression of fourth ventricle, 25% patients belong to grade I, 55% patients grade II and 20% patients grade III.

Very poor outcome found in patients with grade III compression of fourth ventricle.

Grade	No. of Patients	Percentage
I	5	25%
II	11	55%
III	4	20%

In 60% patient, volume of hematoma was found ≤15 ml and >15 ml in 40% of patients. The mean hematoma volume was 13.9 ml, for sub occipital craniectomy 14.5 ml and for burr hole evacuation 13.3 ml (p value 0.639207).

Clot Volume	No. of Patients	Percentage
≤15ML	12	60%
>15ML	8	40%

The patients assessed with CT brain and hydrocephalus was noted as a finding in 8 (40%) patients. 12 (60%) patients had no hydrocephalus.

Hydrocephalus	No. of patients	Percentage
Yes	8	40%
No	12	60%

Taneda et al classified appearance of quadrigeminal cistern, pointing out hydrocephalus which was associated with poor outcome[3]. External ventricular drainage done in patient with hydrocephalus preoperatively.

Complications related to surgical procedure like CSF leak, meningitis, pseudo meningocele, were found in 30% of patients. Sub occipital craniectomy associated with more complications as compared to burr hole aspiration. (P value 0.19076).

Complications	No. of Patients	Percentage
Yes	6	30%
No	14	70%

Average duration of surgery for sub occipital craniectomy was 114.5 minutes and for burr hole evacuation was 31 minutes. In our study higher mortality (15%) was associated with burr hole evacuation as compared with sub occipital craniectomy (10%) (p value 0.6)

Survival and Mortality in Different Group

Parameters	Patients Survived	Patients Expired
AGE <50	3(75%)	1(25%)
AGE >50	12(75%)	4(25%)
HTN ONLY	9(81.8%)	2(18.2%)
HTN+DM	3 (50%)	3 (50%)
GCS (AD) >3-8	1(20%)	4(80%)
GCS(AD) 9-12	7(87.5%)	1(12.5%)
GCS(AD) 13-15	7(100%)	0(00%)
Hematoma Volume ≤15ML	9(75%)	3(25%)
Hematoma Volume >15ML	6(75%)	2(25%)
Fourth Venticle Compression Grade I	5(100%)	0(00%)
Fourth Venticle Compression Grade II	10(90.9%)	1(9.1%)
Fourth Venticle Compression Grade III	0(00%)	4(100%)
Presentation <24 Hours	12(85.7%)	2(14.3%)
Presentation >24 Hours	4(66.7%)	2 (33.3)

Discussion

Cerebellar hematomas represent approximately 10% of all ICH with a low annual incidence of 1% to 2% in all strokes. It occurs most frequently in the 5th through the 8th decades of life[2,4]. The incidence of ICH increases with age, doubling every 10 years after age 35[5,6].The rate is highest in the Asian population, lowest in whites, with Blacks having an intermediate occurrence rate[7]. Between 60% and 90% of all spontaneous cerebellar hemorrhages occur in hypertensive patient[8,9]. Anticoagulants and antiplatelet agents contributes to the incidence and severity of ICH in elderly patients.It is more frequent in males than in females[10]. Smoking, drug abuse, and heavy alcohol intake are also associated with a higher incidence of ICH[11].

Cerebellar hemorrhage, often presents with poorly lateralizing symptoms, and its diagnosis is often delayed as compared to supra tentorial hemorrhage patents with a cerebellar hemorrhage have indolent course and can abruptly decline, an early evaluation and close follow up

is a mainstay of management. Timely and appropriate surgical intervention saves lives, and such patients can often make a very good functional recovery, especially if the intervention is done earlier.

Patients with spontaneous cerebellar bleed with mass effect leading to hydrocephalus, brain stem compression and neurological deficits benefit from surgical removal of hematoma, but there is still controversy regarding indication and optimal choice of surgical intervention. Some authors emphasize on hematoma size threshold, above which they recommend surgical evacuation of the hemorrhage regardless of clinical status while others use the criteria of radiographic evidence of brainstem compression or cisternal effacement, which accounts for surrounding edema in addition to the size of the hematoma in determining overall mass effect.

It is widely accepted to evacuate cerebellar hematoma of more than 3 cm in diameter causing mass effect in posterior fossa [12,13,14]. The hematoma volume is measured using equation V = A × B × C/2, where A is the longest diameter of hemorrhage on the CT section with the largest area of hemorrhage, B is the diameter perpendicular (90°) to A, and C is the number of sections with hemorrhage multiplied by the section thickness[15].

The essence of the operation is to evacuate the hematoma. Sub-occipital craniectomy has several drawbacks such as greater degree of invasion, longer operating time, post-operative CSF leaks and meningiti[3,16,17,18]. Therefore, stereotactic aspiration [19,20], endoscopic evacuation[21], free hand bed side catheter evacuation [22] and mini craniectomy have been proposed. Mortality of ventriculostomy alone is the same as for the untreated patients: It does not relieve brainstem compression, and it carries a risk of upward herniation. Burr hole aspiration is simple and shortens the interval from skin incision to hematoma evacuation. In addition, the hematoma can be evacuated almost completely and bleeding vessels can be coagulated under the operating microscope[17].

Conclusions

In present study we concluded that with over all slight higher mortality in burr hole evacuation group as compared to sub occipital craniectomy group, Burr hole evacuation can be considered as an emergency procedure for patients with poor GCS and large hematoma in hospital with limited resources while sub occipital decompressive craniectomy is definite procedure.

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