



Original Article

Clinical Outcome Following Surgical Evacuation of Spontaneous Cerebellar Hematomas

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ABSTRACT

Objective: The role of surgical intervention in the management of spontaneous cerebellar hematoma remains controversial and whether it leads to improved outcomes is still debated. The present study was designed to analyze the clinical outcome of patients operated in our department for spontaneous cerebellar hematoma evacuation.

Material and Methods: The medical data of all the patients in whom spontaneous cerebellar hematoma had been surgically evacuated were retrospectively analyzed. The parameters of age, preoperative Glasgow coma scales (GCS), and the volume of the hematoma was studied and their relationship with clinical outcome based on the Glasgow outcome scale (GOS) was analyzed.

Results: The study included twenty-four patients. Fourteen (58.3%) patients survived and ten (41.7%) patients expired. The mean age of the surviving patients was 57 years and the mean age of the expired patients was 57.2 years. The difference wasn't statistically significant ($p = 0.9612$). The mean hematoma volume in the surviving patients was 23 cm³ and in the expired patients was 26.2 cm³. The difference didn't reach statistical significance ($p = 0.1614$). The mean preoperative GCS of the surviving patients was 12.4 and of the expired patients were 8.3. This difference was statistically significant ($p = 0.0004$). All the surviving patients had a favorable outcome based on the GOS score.

Conclusion: Surgical evacuation of cerebellar hematomas leads to a good clinical outcome. Preoperative GCS is significantly associated with the clinical outcome. The age of the patient and the volume of the hematoma were not found to be significantly associated with the clinical outcome.

Keywords: Cerebellar hematoma, clinical outcome, preoperative GCS, the volume of hematoma.

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INTRODUCTION

Intracerebral hematoma (ICH) is the most deadly type of stroke.^{1,2} Spontaneous cerebellar

hematoma constitutes about 10% of the intracerebral hematomas.^{3, 4, 5} They have a worse prognosis than their supratentorial counterpart.⁴⁻⁸ The mortality is very high and reaches 30 – 50%.^{4,9,10} Historically, surgical evacuation of cerebellar hematomas has been considered the preferred mode of treatment.^{4,5,9} However, the evidence favoring surgical evacuation of cerebellar hematomas has been based on observational and retrospective studies with a small sample size.^{5,9} Whether surgical evacuation actually leads to improved outcome remains controversial and a debated topic.^{4,7,9} Studies addressing the topic have shown contrasting results with some studies³ reporting that surgical evacuation led to a good outcome,^{7,11} whereas others finding surgical evacuation to be no better than conservative management^{9,10} or even leading to a worse outcome compared to the conservative treatment.^{5,12} Even the surgical indications based on the hematoma size and preoperative clinical status vary, and the opinions diverge from carrying out the surgical evacuation of all hematomas to managing all the hematomas conservatively.⁵ No consensus exists even in the international guidelines on the management of cerebellar hematomas and contrasting recommendations have been put forward.^{5,9} The present study had been designed to analyze the clinical outcome in patients that had undergone surgical evacuation of cerebellar hematomas in our setup, and to determine the relationship of the parameters of age, preoperative GCS and the volume of the hematoma with the clinical outcome in the operated patients.

MATERIAL AND METHODS

Study Design and Setting

Ours was a retrospective observational study. The medical data of all the patients in whom surgical evacuation of cerebellar hematomas had been carried out from 7th March 2013 to 17th July 2014 in the department of neurosurgery Lahore

General Hospital were retrospectively analyzed. We studied the parameters of age, sex, the preoperative GCS of the operated patients, the volume of the hematoma, the complications following surgery, and the clinical outcome based on the GOS score.

Inclusion Criteria

The study included all the patients in whom surgical evacuation of a cerebellar hematoma had been carried out with a sub-occipital craniectomy.

All the cases of cerebellar hematomas had been diagnosed with a CT brain.

The volume of the operated hematoma was $\geq 15\text{cm}^3$ in all the cases.

Patients in whom in addition to cerebellar hematoma evacuation an external ventricular drain (EVD) had to be placed because of the development of hydrocephalus secondary to 4th ventricular obstruction were also included in the study.

Exclusion Criteria

Patients with a preoperative GCS of ≤ 4 were excluded from the study. Patients with a brainstem hematoma or were treated conservatively were also excluded. Patients in whom the presenting hematoma volume was $\leq 15\text{cm}^3$ were also excluded from the study.

Operative Technique and Patient Management

The surgical intervention in all the patients was a sub-occipital craniectomy carried out in either a prone position or in a lateral position wherein the side of the operated cerebellar hemisphere was up. The volume of the hematoma was calculated with the application of the formula $(a \times b \times c) / 2$, where a, b and c denoted the diameter of the hematoma. An EVD was passed in patients that developed hydrocephalus secondary to 4th

ventricular obstruction. All the patients had been followed for more than 2 months.

Data Analysis

The statistical analysis was carried out by comparing the surviving and the non-surviving patients for age, preoperative GCS, and the volume of the hematoma using a two-sample independent t-test. A p-value of < 0.05 was considered statistically significant.

Table 1: A comparison of age, preoperative GCS, and volume of the hematoma between the survivors and non-survivors.

	Survivor	Non-survivor	P-value
Age Mean \pm SD (Years)	57 \pm 10.47	57.2 \pm 8.79	0.9612
Preoperative GCS Mean \pm SD	12.43 \pm 2.19	8.3 \pm 2.69	0.0004265 (significant association)
Volume of hematoma Mean \pm SD (cm ³)	23 \pm 3.55	26.2 \pm 7.12	0.1614

0.1614).

An EVD was passed in two patients that had already developed hydrocephalus. In two patients there was residual/recurrent hematoma and repeat surgery was carried out in both of these patients. Unfortunately, all these four patients expired later on. All the surviving patients had a good clinical outcome (GOS 4-5) based on the GOS scale.

RESULTS

Gender Distribution

Our study included twenty-four patients. There were 17 males and 7 females.

Age Distribution

Fourteen patients in our study survived while ten expired. The mean age of the surviving patients was 57 years. The mean age of the expired patients was 57.2 years. The difference between the surviving and expired patients didn't reach statistical significance ($p = 0.9612$) as has been depicted in table 1.

Clinical Outcome

The survival rate was 58.3% and the overall mortality was 41.7%. The mean preoperative GCS of the surviving patients was 12.4, while the mean GCS of the expired patients was 8.3. Preoperative GCS was found to be significantly associated ($p = 0.0004265$) with survival as shown in table 1. The mean hematoma volume in the surviving patients was 23 cm³, while the mean volume of the hematoma in the expired patients was 26.2 cm³. The volume of the hematoma was not significantly associated with the outcome ($p =$

DISCUSSION

Spontaneous cerebellar hematoma carries a grave prognosis. The mortality reaches up to 50%,^{10,13} with a morbidity rate of more than 60% in the surviving patients.¹³ Cerebellar hematoma has generally been considered as an entity requiring surgical evacuation in the neurosurgical community.^{5,7,9,14,15} The generally accepted indication was a hematoma ≥ 3 cm (13.5 cm³) in width.^{7,9,15,16} The other accepted indications included a patient with deteriorating conscious level or developing hydrocephalus secondary to 4th ventricular obstruction.^{7,15,16} But whether the surgical intervention improves clinical outcome remains controversial.^{4,7,9,10,15} Satopää et al⁵ and Kuramatsu et al,⁹ in their study found that surgical evacuation of cerebellar hematoma did not lead to improved outcome. Dolderer et al,¹² in their study concluded that surgical evacuation of cerebellar hematoma worsened the outcome. The role of surgical intervention in the management of cerebellar hematomas thus remains a

controversial and debated topic.^{5,7,9,10,14,15} Even the surgical indications recommended for surgical intervention are not agreed upon.^{5,7} Different hematoma values and clinical scenarios have been proposed as indications for surgical intervention.⁵ The clinical practice regarding the management of cerebellar hematomas thus varies widely amongst the neurosurgical community and institutional variations abound in this regard.¹⁰

In our study, we noted a mortality of 41.7% which was within the range of 30 – 50% mortality mentioned in the literature. The survival rate was 58.3% and all the surviving patients had a favorable outcome (GOS 4 – 5) on follow-up. We thus found that surgical evacuation of cerebellar hematoma led to a good outcome. Our findings are similar to the findings of Han J et al⁷ and Dahdaleh et al,¹¹ who also found that surgical intervention in cerebellar hematomas was associated with a good clinical outcome. In cerebellar hematoma patients, the size of the hematoma and the preoperative GCS have been stated as important determinants of clinical outcomes.⁷ Although multiple studies have found a significant association between the volume of the hematoma and the clinical outcome in the operated patients,^{5,7} in our study this relationship was not borne out and the volume of the hematoma in the surviving and the expired patients was not significantly different ($p = 0.1614$). Our findings are thus similar to the findings of Dammann et al,¹⁷ who also concluded that hematoma size was not predictive of clinical outcome. We found the preoperative GCS to be significantly associated with clinical outcome ($p = 0.0004265$) in our study which was following the findings of Satopää et al⁵ and Han J et al⁷. With a survival rate of 58.3% and all the surviving patients having a favorable outcome on follow-up, we conclude that surgical evacuation of cerebellar hematomas leads to a good outcome. We also conclude that preoperative GCS is significantly associated with the clinical outcome

while the age of the patient and volume of the hematoma are not.

LIMITATIONS

Our study is a retrospective study. It was confined to a single institution and the sample size was also small. A prospective study involving multiple neurosurgical centers and a larger sample size is required for a clear definition of the role that surgery plays in managing spontaneous cerebellar hematomas.

CONCLUSION

We conclude that surgical evacuation of cerebellar hematomas leads to a good clinical outcome. Preoperative GCS has a significant association with the clinical outcome. The age of the patient and the volume of the hematoma were found not to have a significant association with the outcome.

RECOMMENDATIONS

Strong consideration should be given to surgical evacuation of cerebellar hematomas $\geq 15 \text{ cm}^3$ in volume as it leads to a good clinical outcome.

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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.

AUTHOR CONTRIBUTION

Author's Name	Intellectual Contribution to Paper in Terms of:
Imran Altaf, Muhammad Rizwan Sarwar	Study design, methodology, data collection, data analysis and literature review.
Muhammad Rizwan Sarwar	Editing and quality insurer