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Traumatic isolated intracerebellar haematoma without any supratentorial lesion. A rare entity. Management strategy

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ABSTRACT

Purpose. Pure isolated cerebellar haematoma of traumatic aetiology, without associated posterior fossa sub- or epidural haematomas and without supratentorial bleed is a rare entity. We conducted this retrospective study to analyse the management strategy of isolated traumatic intracerebellar haematoma without supratentorial lesion in our institute.

Methods. We retrospectively reviewed records of more than 15000 head injury patients in our department of neurosurgery between January 2014 and November 2019. In this isolated intracerebellar hematoma patients are 60. Patients were divided into two groups assessed by the GCS score at the time of presentation – Group A (GCS>13) Group B (GCS lesser than or equal to 13). Group A treated conservatively and B surgically. Group A subdivided according to the size of hematoma into1st (> 3cm) and 2nd (<3 cm). Group B subdivided according to GCS into 1st (<8) and 2nd (8-13).

Results. Most Group B, subgroup 1st (GCS<8) patients found to be associated with poorer outcome (60 %) and subgroup 2nd (GCS 8-13) had only 10 %. Group A subgroup 1st (> 3 cm hematoma) has associated with poor outcome (28.57%) and Subgroup 2nd (< 3 cm) has 4.34%. GCS score at the time of admission, hematoma size, hematoma location, the timing of surgery were important factors for outcome.

Conclusion. We concluded that hematoma size is > 3 cm and GCS > 8 patient should operate within 12 hr. Patient of GCS < 8 results of surgery are poor (60%.). If the size of hematoma < 3 cm, lateral hematoma and GCS >13 should be treated conservatively. The factors which may be associated with the poor outcome are Low GCS score at the time of admission (<8), the large size of hematoma (>3cm), median location and delay time of surgery(>12hr).

Keywords
traumatic intracerebellar hematoma,
GCS,
hematoma size

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INTRODUCTION

Haematomas of the posterior fossa are by themselves uncommon and account for only 3.7% of all head injuries. (according to Liau)13. Approx 0.6-0.82 % cases have cerebellar hematoma without other posterior fossa lesion3,10,14. But isolated intracerebellar hematoma without supratentorial lesion is very rare (approx 40-50% of isolated cerebellar hematoma). As in 9/21-42.85% in bhardwaj et al5 and 8/18 -44.44% in devella et al6. In our study it is 60 (50%).

The clinical presentation of cerebellar haematoma may be readily apparent with classic signs including ataxia, nystagmus and signs of increased ICP like headache, lethargy and nausea and vomiting. Treatment options for this pathology are still evolving.

These hematomas may be totally asymptomatic, with a sudden increase in size can lead to rapid deterioration of neurological status[18].

Previously tested predictive factors in different studies include are size of hematoma, haematoma location (superficial vs. deep), haematoma volume, GCS of patient, degree of fourth ventricle and cistern deformation and assosiated hydrocephalus [9,15,21].

Previously there was difficulty in diagnose the posterior fossa ICH due to lack of CT but with the increasing use of computed tomography (CT) for screening of all head trauma patients, increasing number of cases have been reported to be diagnosed even before the appearance of symptoms and have thus been treated in a timely manner[14,22].

The cerebellum has four functionally important deep cerebellar nuclei (the dentate, emboliform, globose and fastigial nuclei) embedded in the white matter in its centre[8]. The locations of the deep cerebellar nuclei span the vermis and the innermost or medially approximately one third of each hemisphere. So it is devided into medial and lateral group / deep and superficial group.

We conducted this retrospective study to analyze the management statergy of isolated traumatic intracerebellar haematoma in our institute and study the factors which could be associated with the outcome. (like Mode of trauma,GCS,Hematoma size,Timing of surgery,Hematoma location etc).

Materials and methods

We retrospectively screened and (where required) reviewed records of more than 15000 head injury patients who were admitted in our Department of Neurosurgery between January 2014 and november 2019.In this approx 120 patients (0.8%) had intacerebellar hematoma without any other posterior fossa lesion, and in this isolated intracerebellar hematoma without supratentorial lesion are in 60 patients (approx 50 % of Cerebellar ICH without posterior lesion). Only these 60 patients are included.

Hematoma volume was assessed by using formula A*B*C/2, where A is maximum transverse diameter of hemorrhage on CT, B is anterioposterior diameter, and C is number of CT slices showing hematoma[12].

Patients were divided in to two groups based on their level of consciousness assessed by the GCS score at the time of presentation – Group A with GCS score greater than 13 and Group B with GCS lesser than or equal to 13. Group A patients were treated conservatively and group B treated surgically.

Data on patient age, gender, GCS score, mechanism of injury, timing of surgery, CT scan findings, management strategy and outcome were gathered and analyzed. These all factors detail given in **Table A**. The mode of injury were broadly categorized as road traffic accident (RTA), fall from height and assault.

Table 1. Demographics and factors associated with isolated traumatic intracerebellar hematoma

S.N	Factor Studied	Details Of Factor	Group A	Group B	Total
1	Number Of Patient		30	30	60
2	Age (Mean Age)		8-60(30)	8-60(36)	
3	Male/Female Ratio		3:1	3:1	
4	Mechanism of Injury	RTA	15	22	37
		Fall from height	12	7	19
		Assault	3	1	4
5	GCS	<8		10	10
		8-13		20	20
		>13	30		30
6	Time of Surgery	<12 hr		22	
		12-48 hr		5	
		>48 hr		3	
7	Cerebellar Hematoma Size	>3 cm	7	27	34
		2-3cm	10	3	13
		<2 cm	13	0	13
8	Hematoma Location	Medial or deep 1/3 and vermis	5	10	15
		Lateral or superficial 2/3	25	20	45
9	Status of Fourth Ventricle	Normal	27	6	33
		Compressed	3(mild)	24	27
10	Surgical treatment	Sub Occipital Craniectomy	4(after worsening)	27	31
		VP Shunt	4(after worsen	3	7

CT scan findings included clot location, size (largest transverse diameter of clot, categorized as > 3 cm or < 3 cm, or clot volume categorized as > 15 ml or < 15 ml), other associated findings and status of the fourth ventricle (normal vs. compressed)

According to all these criteria Group A devided into 2 subgroups according to size of hematoma . 1st has >3 cm and 2nd has < 3 cm size of hematoma. Group B also devided into 2 subgroups according to GCS . 1st has GCS< 8 and 2nd has GCS 8-13.

We also included timimg of surgery after injury in surgical group B and from time of worsen in Conservative group A. Timing devided into <12 hr, 12-48 hr and > 48 hr.

We also asses the location of hematoma and devided patients into medial 1/3rd /deep and superficial /lateral 2/3rd location in cerebellum.

Surgical treatment (sub-occipital craniectomy) and insertion of ventriculoperitoneal (VP) shunt was documented. Six month follow-up reports of all patients who turned in for the follow-up were also analyzed. Outcome was documented as favorable or poor based on the Glasgow Outcome Scale at the time of hospital discharge (GOS-HD). GOS 5 was counted as favorable whereas GOS 1-4 counted as poor response.

Results

There are 7 patients in group A subgroup 1st (~ > 3 cm size clot). 5 patients out of 7 (71.4%) , worsened and required surgical treatment (3 sub occipital craniectomy, 2 VP shunt). In these patients 1 expired due to sudden worsening . 1 patient has poor GOS and persist in severe disable stage. Both has delayed surgery and (between 12-48 hr) . Rest 3 patients has good outcome because of early diagnosis and early surgery . So poor outcome is 2/7- 28.57%.

In Group A subgroup 2nd has 23 patients(clot size <3 cm) . In which 3 patient of 2-3 cm clot size (30%) has worsened between 4-6 days , repeat scan suggesting of sudden increase in size in one patient and obstructive hydrocephalus in all 3. Urgent surgical intervention done (with in 12 hr) .VP shunt in 2 patient and suboccipital craniectomy in 1 patient. In this 1 patient expired 1 month after sub occipital craniectomy due to chest infection. Rest 20 patient has good recovery by conservative treatment. So poor outcome is only 1/23- 4.3%.

In group B(surgical group) , subgroup 1st(GCS < 8) has 10 patients , in which 8 patients has hematoma size more than 3 cm (even 5 patients has hematoma size 4-5cm) and 2 patient has size < 3 cm but in midline .In these 10 patients 3 expired and 3 has severe morbidity. Rest 4 patients survived with favourable results. So 6/10 -60 % has poor outcome inspite of surgery. This result included in **Table B**.

Table 2. Results

S.N	Factor Studied	Detail of factor	Outcome			Mortality
			Poor outcome (GOS 1-4)	Favourable Outcome (GOS 5)	Total	
1	Group A (GCS > 13) (Conservative treatment)	Subgroup 1st (size >3 cm)(5 /7patient worsens and operated)	2 (28.57%)	5	7	1
		Subgroup 2nd (size~,< 3 cm) Only 3/23 patient worsens and operated)	1(4.3 %)	22	23	1
2	Group B (GCS ~<13) (Surgical Treatment)	Subgroup 1st (GCS< 8)	6(60 %)	4	10	3
		Subgroup 2nd (GCS-8-13)	2(10 %)	18	20	1
3	Timing of surgery	<12 hr	3(12 %)	22	25	1
		12-48 hr	5(50 %)	5	10	2
		>48 hr	3(100 %)	0	3	3
4	Location of hematoma	Deep/medial 1/3rd	7(46.66%)	8	15	5
		Superficial/lateral 2/3rd	4(8.88%)	41	45	1

GCS 8-13 included 20 patients , in which 19 patients has hematoma size > 3cm and rest 1 has size 2-3 cm near midline. Only 1 patient expired and 1 has severe morbidity out of 20 patients .One who expired , operated after 12 hr and One patient who has severe morbidity has associated chest infection. So 2/20 – 10% has poor outcome after surgery .

Total 38 patient has undergone surgical procedure from which 8 operated in group A after worsening and all 30 operated in surgical group B.

Out of 3 patients who operated after 48 hr, all 3 patient expired.

(3/3 -100 %). Between 12 -48 hr 10 patient operated In which 2 expired and 3 patient has severe morbidity (5/10-50%). But all 25 patients which are operated before 12 hr had comparable favourable results(1 expired and two has severe morbidity).(3/25-12%). Patient expired in early surgery had chest infection.

VP shunt required only in 3 patients in group B which has hematoma size 2-3 cm, GCS(8-13) and has midline location. VP shunt also done in 2 patient in subgroup 2nd in group A. There is 5 patients in vermis or median ICH in group A and 10 patient in group B. rest all are located laterally.

The poor outcome in our series at the time of hospital discharge in GCS <8 was 6/10- 60%. . Domenico D'Avella[7] study shows 58.7% poor outcome in GCS<8 .

Poor outcome was higher, 60% (6/10) in GCS < 8 in Group B as against 10 % (2/20) in GCS 8-13 in Group B.

Mortality was 13.33% (4/30) in Group B and only 6.66% (2/30) in Group A. Poor outcome in group A is 3/30-10% and in group B is 8/30- 28.6 %. (in this <8 GCS is 60%, and GCS 8-13 has 10%) So it indicated that GCS is the most important predictor for prognosis in cerebellar ICH , either operate or not and second is size.

We have added pictures of preoperative cerebellar hematoma and postoperatively (after suboccipital craniectomy with hematoma evacuation). **Fig. 1, 2** (1st patient of 40 yr male), **Fig. 3, 4** (2nd patient of 42 yr male).

Figure 1. Pre-operative CT of a 40 yrs. male

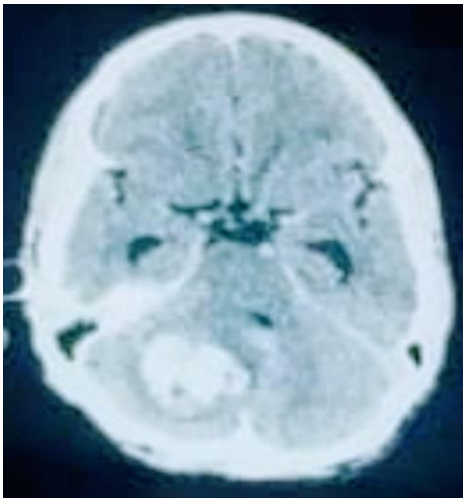


Figure 2. Postoperative CT after sub occipital craniectomy

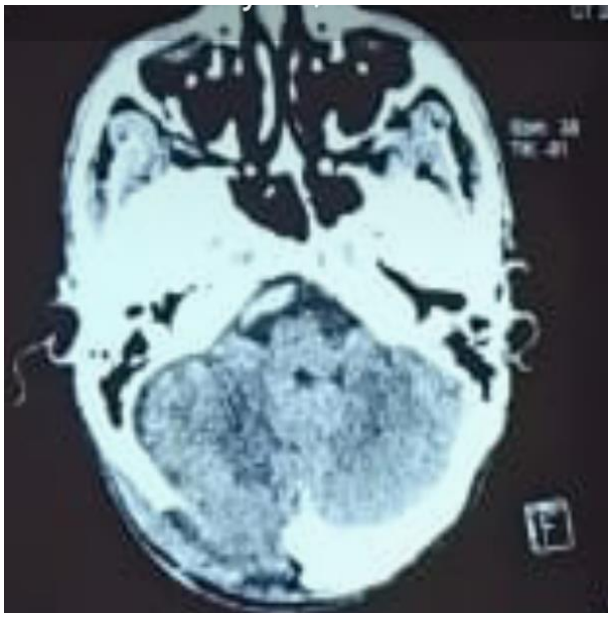


Figure 3. Preoperative CT of a 42 yrs. male

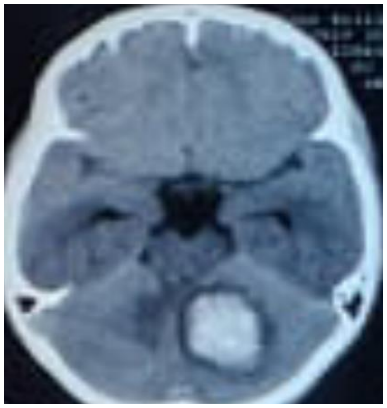
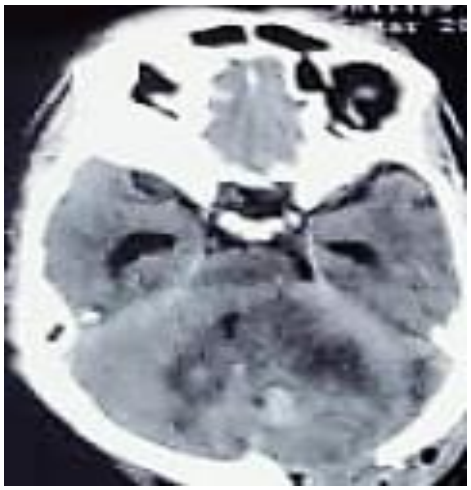


Figure 4. Post-operative scan after suboccipital craniectomy



Discussion

In our study, RTA was the most common 37/60(61.16%) and most damaging mechanism of injury. In this study fall from bike and pillan rider are the most common mechanism of injury. Bhardwaj et al has 15/21(71.14%)[5], Harsh et al has 15/23 (65.21%)[23].

Second most common is fall from tree in this tribal area which are more (19/60 -31.66%) in comparision to other studies. Bhardwaj et al has 6/21(28.57%), Harsh et al 5/23(21.73%).Last mode of injury are assault.

Fall from height was more common amongst children[1] while assault was more commonly associated with women and the elderly. But in our study , there are history of fall from tree and height in adult also[20].

Benign course of intracerebellar hematomas may be more frequent than appreciated so not all traumatic hematomas of the cerebellum require surgery[17]. So it is to be decided in which patient we should operate or not to operate.

In accordance with other studies on this topic, CT scan was extremely valuable in predicting patient outcomes[20].

Clots greater than or equal to 3 cm in diameter, GCS<8, deep/meadial 1/3rd hematoma location and timing of surgery were all shown by our study to predict a poor outcome.

Outcomes were worse for patients has GCS < 8 in subgroup 1st in Group B[7,15,25]. Such patients were critically injured and their brain function was already compromised at the time of admission.

In accordance with previous studies on this topic our data showed GCS at initial presentation to be the most predictive clinical tool [5,6,7,21,23,25]. Domenico d'Avella et al[7] suggest that A GCS score of less than 8 was the most powerful adverse prognostic factor (58.78% probability of poor outcome as sole covariate) . In our study poor outcome is 60% in GCS <8. With supratentorial lesion it is it is 84.61% in harsh et al and 88.78% in d'avella et al.

Mortility was 3/10 (30%) in which 2 patent has median cerebellar hematoma . all 3 had delayed surgery. .Rest 3 patient which has poor outcome in which 2 patient has median hematoma and 1 had delayed surgery.

Outcome is good for GCS 8-13 with surgical treatment. Only 1 patient expired in which hematoma was median and one patient has poor outcome had delayed surgery (12-48 hr).

Delayed surgery after 48 hr had worst outcome (100%), between 12-48 hr had poor outcome (50%). Early surgery within 12 hr had poor outcome only 12.0%. So Early surgery is good always . it indicated that timing of surgery is one of the most prognostic factor for outcome[5,7].

11 patients has poor outcome , in these 7 patient had medial hematoma. so 7/11 (63.63 %) of poor outcome had medial hematoma. Bhardwaj et al has (62.5%) and S. Takeuchi et al[21] has 9 patient has medial hematoma in 10 poor outcome patient(9/10-90%).So maximum poor outcome occurs in medial and deep hematoma lesion which are also in our study.

Total medial hematoma is 15 patients in which 7 patients had poor outcome (7/15-46.66%) and superficial hematoma in 45 patients in which only 4 patients has poor outcome (4/45-8.88%). It indicates that medial/deep hematoma has poor outcome[5,15,23]. In group A subgroup 1st 7 patients has hematoma size > 3 cm and 5 worsened (5/7- 71.42%) and then operated .. Subgroup 2nd has size < 3 cm only 3 patient worsened (3/23- 13.04%) , which is also due to midline position. So it is proven that size is important prognostic factor[4,5,7]. Hematoma of > 3 cm size should operate early whether GCS > 13.So size is important factor to take decision of surgery.

Poor outcome in patient of size> 3 cm in group A is 2/7 -28.57% due to sudden worsening and late surgery . But in < or equal to 3cm poor outcome is only 1/23- 4.3% which is also due to midline hematoma and chest infection. So size is most important factor and equal and less than 3 cm size can treated conservatively[4,5,7,15,23].

But in group B , all patient operated , so we can not compare size factor for decision of surgery.

Though trauma is the obvious cause, specific mechanism for this type of injury remains unclear. Takeuchi et al.[21] created a classification system for the types of trauma causing cerebellar haematomas. Their three classes included coup injuries, countercoup injuries and acceleration-deceleration injuries.

This classification system proved useful in predicting the site of haematoma, with coup injuries thought to be more common[19,24] causing only superficial bleeds while countercoup injuries resulted in deep cerebellar bleeds.

In all patients undergoing surgical intracerebellar

clot evacuation sub-occipital craniectomy was done , it is best procedure [2,16] and preferred over sub-occipital craniotomy as posterior fossa has less space for accommodation of any post-operative bleeding or post-operative edema.

Some may note our use of VP shunts over external ventricular drains (EVDs) for certain patients experiencing hydrocephalus resulting from cerebellar haematoma. VP shunt was chosen over EVD placement because in our clinical setting EVDs have allegedly been found to more frequently result in infections as ventriculitis and meningitis three to four days post-EVD placement. However, patients developing acute hydrocephalus need drainage of CSF usually for a period of more than two weeks during which the clot resolves and perilesional edema subsides[23].

HCP can be associated with traumatic intracerebellar clots but not always [17,22]. Karasawa et al[11] mentioned of acute HCP in 20% of intracerebellar hematomas, while in our series it was 16.6%.

Total poor outcome is in 11 patients so 11/60-18.33% which is very less in comparision of other studies because in this study only isolated intracerebellar hematoma taken without supratentorial lesion and 50 patients had GCS > 8[5,6,7,15,21,23]. It also indicates that GCS and associated lesion are important prognostic factor.

Conclusion

In an attempt to study the factors which may be associated with poor outcome in isolated intracerebellar haematoma cases we found that GCS score at the time of admission(<8), large size of hematoma(> 3cm), Hematoma location(deep/medial 1/3rd) and delay time of surgery (>12hr) has poor prognosis.

We also concluded that if hematoma size is > 3 cm and GCS > 8 patient should operate, and should operate early within 12 hr.

Median hematoma should be operated and operated early (whether size is 2-3 cm with ventricle compression) because chances of worsening more. But overall prognosis for deep hematoma was poor. Patient of GCS < 8 irrespective to size of ICH s results of surgery are poor(60%.)

We also concluded that if size of ICH >3 cm and has ataxia and other symptoms and whether the patient is conscious ,but should operate , because chance of worsening is present there or had close observation for 4-5 days and operated immediately after worsening .

If GCS > 13 and ICH < 3 cm size , patient should treated conservatively and at least 15 days follow up should needed. After 15days there is very less chance of worsening.

The overall prognosis is better than other studies because we exclude other supratentorial lesion and 50 patients has GCS > 8. It also conclude that if there is no associated lesion chances of low GCS is less.
But the most important thing is that it is the rare study in which only true intracerebellar hematoma without supratentorial lesion included.

Conflict of interest

There is no conflict of interest to disclose.

Informed consent

Informed consent was obtained from all individual participants included in this study.

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