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A clinicoradiological scoring for management of acute subdural hematoma: a prospective study

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Abstract: *Background*: Acute subdural hematoma is the most common type of traumatic intra cranial hematoma accounting for 24% cases of severe head injuries and caries highest mortality. The aim of this study is to analyze the prognostic factors and to propose Neuro-clinical and radiological prognostic scoring system on the clinical spectrum and to evaluate the postoperative outcome and validate the same. *Methods*: This is a prospective Study which included 100 patients admitted in Government Medical College, Kota, Rajasthan from 01st Jan 2016 to 30 June 2017 with head injury and were diagnosed to have Traumatic Subdural Hemorrhage. A detailed clinical history, Physical examination, Computerized Tomography scan was performed in all patients and were divided into 2 groups; that is conservative or surgical interventional as per Neuro-clinical and radiological prognostic scoring system. *Results*: The maximum patients suffering from Subdural Hematoma were in the age group of 11-60 years with male predominance 72%. The most common mode of injury was RTA with 68 % of incidence. 36 out of 100 cases presented to hospital with GCS <8 while 44 patients showed improvement of GCS after resuscitation. Out of 100 cases, surgical approach was considered in 34 patients while remaining patients were managed conservatively. Pupillary reaction, Hypotension, CT scan findings that is, thickness of hematoma >10mm and midline shift of >5mm, delay in interval between the surgery had greatly affected on outcome of patients. *Conclusions*: According to the results, use of Neuro-clinical and radiological prognostic scoring system is very useful in determining early intervention and also avoids unnecessary surgical intervention.
Key words: Clinicoradiological score, Neuro intervention, Subdural hematoma

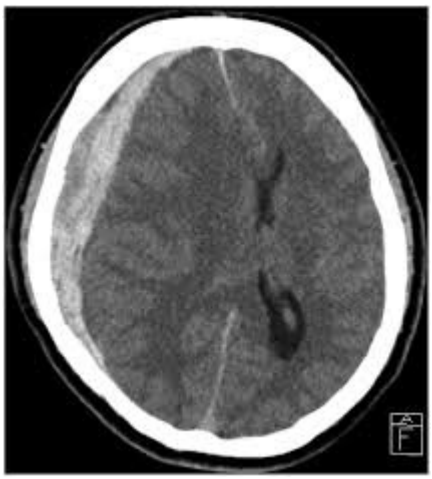
Introduction

Since the first attempts at aggressive neurosurgical intervention for traumatic acute subdural hematoma in the 1930's and 1940's, the rate of mortality from this injury has ranged from 76% to 90%. [7] Despite new technology and advent of new neuroradiological techniques and neurointensive monitoring and treatment, traumatic acute subdural hematoma remains one of the most lethal of all head injuries. Acute subdural post-traumatic haematoma's (SDH) continue to have a distressingly high morbidity and mortality. Clinical factors like presenting GCS, Pupils, Time to operative interval, Hemodynamics and co-morbidities plays a critical factor in overall outcome from acute subdural hematoma.

Clinical Material and Methods

This is a prospective observational study which included 100 patients admitted in government Medical College, Kota, Rajasthan from 01st Jan 2016 to 30 June 2017 with head injury, diagnosed to have Traumatic subdural Hemorrhage. All cases were analyzed with respect to Age, sex, mode of injury, GCS at the time of presentation, post resuscitation GCS, pupillary anisocoria, focal neurological deficit, hemodynamic status, imaging findings of thickness of hematoma, midline shift, simple SDH or complicated SDH, Finding on repeat CT after 6 hrs, GCS at the time of discharge and at four weeks.

Patients were evaluates according to Neuro-clinical and radiological prognostic scoring system and were divided into two groups; conservative and operative.



Criteria for surgical intervention were – 1.Neuro-clinical and radiological prognostic score of 1-5 with hemodynamic stable patient and duration of arrival in hospital after trauma of less than 6 hrs with no co-morbid conditions. 2. Neuro-clinical and radiological prognostic score of 6-10 with hemodynamic stable patient and duration of arrival in hospital after trauma of less than 6 hrs with no co-morbid conditions and hematoma thickness more than 10 mm.

Results

One hundred cases of acute subdural hematoma out of 854 cases of head injury constituted 11.7%. Youngest patient was 4 months old and oldest patient was 88 year old. 82% of patients were in second to sixth decade. This study showed that males are predominant as compared to females. Out of 100 cases, Males constituted 72% whereas 28% were female (Table 1).

Table 1 - Age and sex distribution

Age	No. of patients	Male	Female
1-10	10	8	1
11-60	82	44	18
>61	8	20	9
TOTAL	100	72	28

The most common mode of head injury was found to be road traffic accidents accounting for 68% of total and Fall from height and physical assaults being subsequent with 18% and 14% incidence respectively. (Table 2)

Table 2 - Mode of injury

Mode of injury	No. of patients	%
RTA	68	68
Fall from height	18	18
Assualts	14	14

Looking at the data, Glasgow coma scale at time of presentation to hospital was equal in distribution in < 8 and 9-13 groups with 36 patients in each group. Patients with GCS range of 9-13 showed significant improvement after post resuscitation (Table 3).

Table 3 - Glasgow coma scale at the time of presentation to hospital and Post resuscitation

GCS	No. of patients at the Time of Arrival	Post Resuscitation
< 8	36	34
9- 13	36	44
14-15	28	22

Comparing others factors like pupillary abnormality, there was a significant (100%) death among patients presented with bilateral pupil dilatation corresponding to 13 patients. Patients with normal pupil on presentation were 34 in numbers and out of which only 3 patients had mortality having a 9% distribution (Table 4).

Table 4 - Pupillary abnormalities

Pupils	No. of patients	Mortality	%
Normal pupils	34	3	9
Unilateral dilated pupil	53	18	34
Bilateral dilated pupil	13	13	100

Comparing Table 5, out of 42 patients who presented with contralateral Hemiparesis, 24 patients (57%) had mortality, whereas only 10 patients of 58 died who presented with no neurological deficit. When Comparing hemodynamic status, patient had significant mortality when presenting with systolic BP of less than 90 mmHg as compare to more than 90mmHg having 71.42% and 17% mortality in each (Table 6).

Table 5 - Focal neurological deficit

Neurological deficit	No. of patients	Mortality	%
No neurological deficit	58	10	17
Contralateral hemiparesis	42	24	57

Table 6 - Hemodynamic status

Bp	No of patients	Mortality	%
Systolic BP <90mmhg	28	20	71.42
Systolic BP >90mmhg	78	14	17.95

Table 7 and 8 shows incidence and mortality of patients as per neuroimaging that is CT scan, while table 7 illustrates mortality on the basis of hematoma thickness on the other hand Table 8 explains mortality on the basis of midline shift. Majority of patients came with a hematoma thickness of 5-10 mm corresponding to 40 in number with 14% mortality and the highest mortality rate was in patients presenting with more than 10 mm thickness with 19% mortality. Looking at Table 8, 66 patients of the total cases presented with midline shift of more than 5 mm with a significant mortality rate of 45.45%.

Table 7 - CT scan thickness of hematoma

Thickness of hematoma	No of patients	Mortality	%
<5mm	28	01	3.6
5-10mm	40	14	35
>10mm	32	19	59

Table 8 - Midline shift

Midline shift	No. of patients	Mortality	%age
<5mm	34	04	11.76
>5mm	66	30	45.45

Our study population showed other associated intracranial injury which highest incidence of 32 patients having SDH with SAH corresponding to 53.13% on mortality scale on the other hand simple SDH corresponded to 26 cases with a 7.69% of mortality (Table 9).

Table 9 - Associated intra cranial injury

Associated Injury	No of patients	Mortality	%
Simple SDH	26	02	7.69
SDH with EDH	08	01	12.5
SDH with Contusion	34	14	41.18
SDH with SAH	32	17	53.13

Looking at Glasglow Outcome Score at 4 weeks (Table 10), patients were divided into 5 grades from 1-5. There was equal distribution among grade 1(34%), grade 5(34%) and between grade 2(8%), grade 3(8%) patients with grade 4 having 16% patients.

Table 10 - Glasgow outcome scale at 4 week

Grade	No. of patients	%
1	34	34
2	08	08
3	08	08
4	16	16
5	34	34

Prognostic criteria was evaluated in all patients using Table 11 and patients were given score for each factor from 0 to 1.Sum of total score (0 to 10) was calculated and patients were divided into 3 groups with score 1-5 in group 1, 6-8 in group 2 and 9-10 in group 3. Out of 42 patients in group 1, 22 patients were kept for conservative management and 20 were operated with 90.9% and 55% mortality in each. In group 2 with score of 6-8 there were total 24 patients out of which 15 patients were kept in conservative group with only 6.66% mortality and 9 patients out of 24 were operated with

22.2% mortality rate. When comparing group 3 with 9-10, both conservative and operative patients had zero mortality rate having 30 and 4 patients in each.

Table 11 - Gautam and Sharma Clinicoradiological Prognostic Score (0 To 10)

Prognostic Factors	0	1
GCS On Arrival in Hospital	< /= 8	>9
Hematoma Thickness (In mm)in NCCT head on arrival	>5	<5
Presence And/ Or Degree Of Midline Brain Shift (In mm) in NCCT head on arrival	>5	<5
Increase in midline shift and thickness of hematoma in repeat NCCT head after 6 hrs	Yes	No
Pupil Abnormality	Yes	No
Age	> 60	< 60
Availability Of OT, Neurointensive Care,CT and Other Facilities	No	Yes
Co-Morbidity And Associated Trauma	Yes	No
Time To Arrival In Tertiary Centre (In Hours)	> 6	< 6
Drop Of GCS In Subsequent Examination	> 2	<2

Table 12 - Management Of Acute subdural hematoma according to prognostic score

Score	Total no of patients	Conservative			Operative		
		Total	Mortality	% Mortality	Total	Mortality	% Mortality
Score 9-10	34	30	0	0	4	0	0
Score 6-8	24	15	1	6.67	9	2	22.2
Score 1-5	42	22	20	90.9	20	11	55

Discussion

Morbidity and mortality after an acute subdural haematoma are the highest of all traumatic mass lesions. This poor outcome results largely from associated parenchymal injuries and subsequent intracranial hypertension. [10] Of the many variables that have been found to significantly correlate either positively or negatively (Age, sex, GCS at the time of presentation, post resuscitation GCS, pupillary anisocoria, focal neurological deficit, hemodynamic status, imaging findings of thickness of hematoma, midline shift, simple SDH or complicated SDH, Finding on repeat CT after 6 hrs, GCS at the time of discharge and at four weeks) with morbidity or mortality from acute subdural hematoma, [1,3] only two can potentially be affected by neurosurgical intervention: the time from injury to operative intervention for evacuation of hematoma and the control of ICP. Prompt surgical intervention for evacuation of traumatic intracranial hematomas has been emphasized in the literature but little hard evidence is available to support its efficacy. As advocated by us we believe that surgery should be performed as early as possible, especially in patients with Neuro-clinical and radiological prognostic

score of 1-5 with hemodynamic stable patient and duration of arrival in hospital after trauma of less than 6 hrs with no co-morbid conditions and in patients with Neuro-clinical and radiological prognostic score of 6-10 with hemodynamic stable patient and duration of arrival in hospital after trauma of less than 6 hrs with no co-morbid conditions and hematoma thickness more than 10 mm.

Isolated ASDH, acting as a compressive lesion, is an uncommon clinicopathological entity. Majority of patients with ASDH have associated focal (contusion / laceration / intracerebral haematoma) or global (diffuse axonal injury, subarachnoid haemorrhage) involvement of the brain or both of these. In addition, ischaemia underlying the haematoma and ipsilateral hemispherical brain swelling (? hyperaemic, ? oedematous), which may be self perpetuating, are consistent findings in most patients with surgically significant haematoma. [8,9]

Kristianson and Tandon found 100% mortality when pupils are dilated and fixed, 19% when they are unequal and 14% when pupils are normal3 which is comparable to our study.

The factors affecting the prognosis of the patients with ASDH were assessed by ZhAO Hong as follows (1) Mechanism of injury. The primary causes of ASDH were fall (53%), motor vehicle accidents (37%), blunt impact injuries (4%), and other factors (7%). There was no significant difference in mortality and functional recovery rate regardless of injury mechanism. (2) Age, significant higher mortality is found in the patients over 65 years old. (3) Sex. In spite of a 3-to-1 male predominance, there was no significant difference in the prognosis between males and females. (4) Pupillary reflex. Bilateral absence of pupillary reflexs was associated with an 88% mortality and a 7% functional recovery rate. And (5) time from injury to operation which is comparable to our study. [11]

Age is a strong factor influencing both mortality and morbidity, as several authors have identified in their works. In our study confirms this result: there is a significant statistical correlation between age and patient's outcome. Despite some contradictions, most literature supports children faring better than adults who have severe brain injury. Gennereli et al found that interval between injury to surgery, hypotension and basal cistern obliteration are the three important factors, which have significant impact on outcome. Our study also found these three factors together have significant impact to the extent of 90% mortality. [4]

Heissler and Dietz et al found thickness of haematoma, midline shift are having significant impact on outcome. They found haematoma thickness of >10 mm with midline shift >5mm are having 30% increased mortality than those without. Our study showed similar trend with mortality reaching 30%. [4] In 1989, Howard, et al [5]., reported extremely favorable results in the management of acute subdural hematoma with the primary discriminating variables being age and clot size. In their patients aged 18 to 40 years, the mortality rate was only 18% with functional survival in 66% as

compared to rates of 74% and 5%, respectively, in those aged over 65 years. Even in young patients with low GCS scores the results were similarly encouraging: 25% mortality and 67% functional recovery which is comparable to our data [6].

Conclusions

We found that, the following factors are having significant influence on the outcome of acute sub dural hematoma in our study:

Gautam and Sharma Clinicoradiological Prognostic Score of 9-10 have favorable outcome and score 6-8 have good outcome with early intervention if required

Hypotension and associated intracranial or other injury are another factor which is having significant influence on the outcome after surgery for acute subdural hematoma.

This proposed Clinicoradiological Prognostic Score is useful in peripheral neurosurgery centre having limited resources. According to the results, use of Neuro-clinical and radiological prognostic scoring system is very useful in determining early intervention and also avoids unnecessary surgical intervention.

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