CLINICAL STUDY OF ACUTE SUBDURAL HAEMATOMA

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ABSTRACT

BACKGROUND

Acute subdural haematoma is the most common type of traumatic intracranial haematoma accounting for 24% cases of severe head injuries and carries highest mortality. This study is designed to assess clinical characteristics of acute subdural haematoma and factors affecting its outcome.

MATERIALSAND METHODS

A prospective study was conducted from August 2010 to December 2012 in Osmania hospital, Osmania medical college, Hyderabad. 150 patients of traumatic acute subdural hematomas were enrolled in the study. A detailed clinical history, physical examination, CT scan was performed in all patients. Patients who were subjected to surgery, post-operative out-come were compared. Results are also compared with published literature.

RESULTS

Acute subdural haematoma constituted 21% of severe head injury cases. Majority of patients are between 20-40 years of age with male predominance (73%). Road traffic accidents (73%) are chief culprit for acute SDH. Majority of them are two wheeler accidents. Pupillary reaction, hypotension, CT scan findings i.e. thickness of hematoma >10mm and midline shift of >5mm, Basal cisterns obliteration, post traumatic seizure and delay in interval between the surgery had significantly affected the outcome of patients. Out of 150 cases, surgical approach was considered in 120 patients, while remaining 30 patients were managed conservatively.

CONCLUSION

We found that the time interval between injury and surgery, basal cistern obliteration, hypotension, post traumatic seizures have significant influence on the outcome of acute subdural haematoma in our study.

KEYWORDS

Subdural Hematoma, Glasgowcoma Scale, CT Scan, Midline Shift, Craniotomy.

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BACKGROUND

The mortality rates in acute subdural haematoma are seen to be ranging from 30% to 90%.[1,2,3,4] John abernethy, a pupil of Hunter described extradural and subdural hematomas.[5] Burrows and Jacobson also contributed to understanding of these lesions.[6]

Acute subdural haematoma occur in association with high rates of acceleration and deceleration of the head that takes place at the time of trauma. Because of viscoelastic mechanical behaviour of bridging veins and their lack of reinforcement by arachnoid trabeculae, they are prone to tear leading to acute subdural haematoma.[7] This is the reason why most of subdural haematomas are located over cerebral convexities in the frontal and temporal regions.[8]

A whiplash injury of cervical spine may cause subdural haematoma[9] also falls from height and landing on the feet or buttocks. Boxing injuries and battered baby syndrome also results in subdural haematoma.

The principle of treatment of acute subdural haematoma are-[3]

1. Early evacuation of clot by surgery.
2. Control of bleeding vessels where feasible.
3. Treatment of associated brain oedema and brain injuries.
4. Treatment of associated injuries elsewhere in the body.

Many factors influence prognosis. When symptoms of subdural haematoma appear slowly, the prognosis is better.[4,10,11,12] There is also a direct correlation between the level of consciousness and postoperative mortality.[11,13] With the onset of decerebrate rigidity, the mortality

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increases rapidly.[14] The prognosis is worse in patients with papillary abnormalities than those without. Kristiansen and Tandon observed 100% mortality when both pupils were dilated and fixed.

AIMS AND OBJECTIVES

1. To study clinical characteristics.
2. Factors affecting the outcome.
3. Surgical outcome.
4. Comparative analysis with other series.

MATERIALS AND METHODS

A prospective study was conducted from August 2010 to December 2012 in Osmania hospital, Osmania medical college, Hyderabad. 150 patients of traumatic acute subdural hematomas were enrolled in the study. All are analyzed with respect to age, sex, mode of injury, GCS at the time of presentation, post resuscitation GCS, papillary anisocoria, focal neurological deficit, hemodynamic status, imaging findings of thickness of hematoma, location of hematoma, extent of hematoma either focal or diffuse, midline shift, simple SDH or complicated SDH, status of basal cisterns, interval between injury to surgery, GOS at the time of discharge and at six months. Results are also compared with published literature.

One hundred and twenty patients underwent surgery. Criteria for surgical intervention are all cases of acute SDH with thickness of haematoma of >1cm, more than 5mm thickness with midline shift of >5 mm and GCS<8, pupillary dilatation and focal neurological deficit corresponding to the haematoma.

Standard front otemporoparietal craniotomy with question mark incision and flap was employed in all cases. Dura was wide opened and haematoma evacuated. Brain swelling occurred in 50 cases. Angioedema measures with mannitol and hyperventilation resulted in subsidence of brain swelling in 30 patients. Duraplasty was done with pericranium, temporalis fascia and bone flap replaced in 5 patients.

Glasgow outcome scale assessment was done at the time of discharge and again at 6 months.

RESULTS

Age	Number of Patients	Percentage
1-10	10	6.6%
11-20	20	13.3%
21-30	60	40.0%
31-40	35	23.3%
41-50	10	6.6%
51-60	10	6.6%
61-70	05	3.3%
Total	**150**	

Table 1. Age Distribution

Youngest patient was 8year old who fell down from second floor and oldest patient was 68 year old. Seventy five percent of patients were in second to fifth decade and majority were in 20-30 years age group.

SEX

Males constituted 73.33% of cases and females were 26.67% of cases.

Gender	No. of patients	Percentage (%)
Male	110	73.33%
Female	40	26.67%

Table 2: Sex Incidence

Mode of Injury

Majority of acute SDH were due to RTA, which constituted to 73.33% of cases followed by fall from height, which constituted 17.33% assaults, which constituted 9.33% of cases.

Mode of injury	No. of patients	Percentage (%)
RTA	110	73.33%
FALL FROM HEIGHT	26	17.33%
ASSUALTS	14	9.33%

Table 3. Mode of Injury

Glasgow Coma Scale at Presentation

At the time of presentation, 40% of cases were GCS<8, 26.67% of cases were in GCS 13-15, 33.33% of cases were in GCS 9-12.

GCS	No. of patients	Percentage (%)
< 8	60	40.00%
9-12	50	33.33%
13-15	40	26.67%

Table 4. Glasgow Coma Scale at Time of Presentation to Hospital

Post Resuscitation Glasgow Coma Scale

After resuscitation in patients, GCS 9-12 improved to 40% who were previously 33.33%, also in patients with GCS <8 improved.

GCS	No. of patients	Percentage (%)
< 8	60	40.00%
9- 12	50	33.33%
13-15	40	26.67%

Table 5. Post Resuscitation Glasgow Coma Scale

Pupillary Abnormalities

Normal pupil size was observed in 50 cases (33.33%), unilateral dilated pupils was observed in 90 cases (60%) and in 10 cases (6.7%) of cases pupils were bilaterally dilated. Mortality was 100% in cases of bilaterally dilated pupils, whereas mortality was 24.4% in cases with unilaterally dilated pupils, mortality was only 10% in cases of normal pupils.

Pupils	No. of Patients	Mortality	%	P Value	Pupils
Normal pupils	50	5	10%		Normal pupils
Unilateral dilated pupil (UD)	90	22	24.45%	<0.005	Unilateral dilated pupil (UD)
Bilateral dilated pupil (BD)	10	10	100%	<0.001	Bilateral dilated pupil (BD)

Table 6. Pupillary Abnormalities

Focal Neurological Deficit

Contralateral hemiparesis was present in 47.7% of cases with mortality of 28% of them. No neurological deficit was present in 33.33% of cases in whom mortality was 20%.

Neurological Deficit	No. of Patients	Mortality	(%)	P Value
No neurological deficit	50	10	20%	<0.05
Contralateral hemiparesis	70	20	28.57%	<0.01

Table 7. Focal Neurological Deficit

Haemodynamic Status

At the time of presentation in 26% of cases (40), systolic BP was less than 90 mmHg in whom mortality was 35% of them. In rest of 74% of cases (110), systolic BP was more than 90 mmHg in whom mortality was 21%.

BP	No. of Patients	Mortality	(%)	P Value
Systolic BP < 90mmhg	40	10	35%	<0.005
Systolic BP> 90mm hg	110	24	21.81%	<0.09

Table 8. Hemodynamic Status

CT Scan

Thickness of Haematoma

In 33.33% of cases (50 cases), thickness of haematoma was more than 10 mm in whom mortality was 30%, in 53% of cases (80 cases) thickness of haematoma was 5-10mm in whom mortality was 22.5% and in 14% of cases (20 cases) thickness of haematoma was less than 5 mm in whom mortality was 5%.

Thickness of Hematoma	No. of Patients	Mortality	%	P value
<5mm	20	01	5%	<0.01
5-10mm	80	18	22.5%	<0.005
>10mm	50	15	30%	<0.001

Table 9. CT Scan Thickness of Hematoma

Location of Haematoma

In 53.33% of cases (80 cases), haematoma was located in front otemporoparietal region in whom mortality was 25%. In the regions of frontal and temporal region, which constituted about 20%, each mortality was 13% in frontal region, 26% in temporal region. In posterior fossa, mortality was 20%.

Location	No. of Patients	Mortality	(%)	P Value
Frontal	30	04	13.33%	<0.001
Temporal	30	08	26.67%	<0.05
Fronto temporo parietal	80	20	25%	<0.05
Posterior fossa	10	02	20%	<0.05

Table 10. Location of Hematoma

Extent of Haematoma

In 53% of cases (80 cases), extent of haematoma was diffuse in whom mortality was 25%. In 47% of cases (70 cases) in whom extent of haematoma was focal in whom mortality was 20%.

Extent of Hematoma	No. of Patients	Mortality	Percentage (%)	P value
Focal	70	14	20%	<0.05
Diffuse	80	20	25%	<0.01

Table 11. Extent of Hematoma

Midline Shift

In 63.33% of cases (100 cases), midline shift was more than 5mm in whom mortality was 26%, in 33.6% of cases (50 cases) midline shift was less than 5 mm in whom mortality was 16%.

Midline shift	No. of patients	Mortality	Percentage (%)	P value
<5mm	50	08	16%	<0.05
>5mm	100	26	26%	<0.01

Table 12. Midline Shift

Associated Intracranial Injury

In 20% of cases (30 cases), SDH alone was present in whom mortality was 13.33%, in 47% of cases (70 cases) SDH with SAH was present in whom mortality was 28.57%. In 20% of cases (30cases), SDH with contusion was present in whom mortality was 20%, in 13% of cases (20 cases) SDH with EDH was present in whom mortality was 20%.

Associated Injury	No. of Patients	Mortality	Percentage (%)	P Value
Simple SDH	30	04	13.33%	<0.005
SDH with EDH	20	04	20%	<0.05
SDH with contusion	30	06	20%	<0.05
SDH with SAH	70	20	28.57%	<0.005

Table 13. Associated Intra Cranial Injury

Status of Basal Cisterns

Basal cisterns were obliterated in 27% of cases (40 cases) in whom mortality was 37.5%, whereas basal cisterns were patent in 73% of cases in whom mortality was 17.27%.

Basal Cisterns	No. of Patients	Mortality	Percentage (%)	P Value
Patent	110	19	17.27%	<0.05
Obliterated	40	15	37.5%	<0.001

Table 14. Status of Basal Cisterns

Time Interval between injury to Surgery

In 20% of cases (30 cases), time interval between injury to surgery was less than 4 hrs. in whom mortality was 13.33%, in 20% of cases (30 cases) time interval was more than 12 hrs.in whom mortality was 60%, in 40% of cases(60 cases) time interval was 5-12 hrs. and mortality was 20%.

Time	No. of Patients	Mortality	Percentage (%)	P Value
<4 hours	30	04	13.33%	<0.005
5-12 hours	60	12	20%	<0.05

Table 15. Time Interval between Injury and Surgery

Seizures-Outcome

Seizures were present in 26% of cases (40 cases) in whom mortality was 35%, in 74% of cases (110 cases) seizures were absent, mortality was 18%.

Seizures	No. of Patients	Mortality	Percentage (%)	P Value
Present	40	14	35%	<0.001
Absent	110	20	18.18%	<0.05

Table 16. Seizures - Outcome

Hyperglycaemia- Outcome

RBS was more than 150 mg/dL in 40% of cases (60 cases) in whom mortality was 23%, in 60% of cases (90 cases) RBS was less than 150 mg/dL in whom mortality was 22%.

RBS	No. of Patients	Mortality	Percentage (%)	P Value
>150 mg	60	14	23.33%	<0.05
<150 mg	90	20	22.22%	<0.05

Table 17. Hyperglycemia - Outcome

Oxygen Saturation- Outcome

Mortality was 33% in 40% of cases (60 cases) in whom oxygen saturation was <60%, mortality was 15% in 60% of cases (90 cases) in whom oxygen saturation was more than 60%.

Pao2	No. of Patients	Mortality	Percentage (%)	P Value
<60	60	20	33.33%	<0.005
>60	90	14	15.56%	<0.05

Table 18. Oxygen Saturation – Outcome

Grade	No. of patients	Percentage (%)
1	34	22.67%
2	05	3.33%
3	15	10%
4	46	30.67%
5	50	33.33%

Table 19. Glasgow Outcome Scale at 1 Week

Grade	No. of patients	Percentage (%)
1	37	24.67%
2	02	1.33%
3	10	6.67%
4	51	34%
5	50	33.33%

Table 20. Glasgow Outcome Scale at 6 Months

Comparative Study

Author	SDH/Total Patients	Percentage SDH of Total	Mortality	Percentage
Stone et al	128/712	18	59	46%
Haselberger et al	111/567	21	57	51.35%
Marshall et al	159/746	21	50	31.44%
Gennerelli et al	319/1107	29	61	19.12%
Present study	150/714	21	34	22.67%

Table 21

The present study was compared with four other studies, factors were compared with them.

RESULTS

One hundred and fifty cases of acute subdural haematoma out of 714 cases of severe head injury constituted 21% of severe head injury.

Majority of patients (63%) are between 20-40 years of age.

Male predominance is noted (73%).

Road traffic accidents (73%) are chief culprit for acute SDH. Majority of them are two-wheeler accidents.

40% of them are admitted with GCS <8.

Resuscitation brought it down to 33%.

Patients with normal size and reacting pupils, the mortality is10%. For those with unilateral dilated pupil, the

mortality rose to24.43% and it is 100%for bilateral dilated pupils.

Patients with no neurological deficit, the mortality is 20%, and with neurological deficit, it is 28.57%.

The mortality is 23.33%when the blood glucose levels are >150 mg% and it is 22.22% when the blood glucose levels are <150 mg%.

The mortality is 33.33% when the oxygen saturation is <60% and the mortality is 15.56% when the oxygen saturation is >60%.

Patients with hypotension (systolic BP <90 mmHg), the mortality is 35% and for those with BP >90 mmHg the mortality is 21%.

When the thickness of haematoma is <5mm, the mortality is 5%; when the thickness is 5-10 mm, the mortality is 22.5%; and when the thickness is >10mm the mortality is 30%.

When the haematoma is located in the frontal region, the mortality is 13.33%; when it is located in temporal fossa, the mortality is 26.67%; when it is in front otemporoparietal region, the mortality is 25%; and it is 20%, when it is located in the posterior fossa.

Patients with midline shift <5 mm, the mortality is 16% with midline shift >5 mm, the mortality is 26%.

Simple SDH, the mortality is 13.33%; SDH with EDH, the mortality is 20%; SDH with contusion, the mortality is 20%; and SDH with SAH, the mortality is 28.57%.

When the basal cisterns are patent, the mortality is 17.27%, and when they are obliterated, the mortality is 37.5%.

When the interval between the injury to surgery is <4 hours, the mortality is 13.33%; when interval is between 5-12 hours, the mortality is 35%; and when the interval is >12 hours, the mortality is 60%.

When posttraumatic seizures are present, the mortality is 35%, and when they are not present, the mortality is 18.18%.

Mortality in our series is 22.64%.

DISCUSSION

Morbidity and mortality after an acute subdural haematoma are the highest of all traumatic mass lesions.[3,4]

This poor outcome results largely from associated parenchymal injuries and subsequent intracranial hypertension.[3,4]

Approximately, 50% of the patients have associated lesions.[3,4] In our series, we found 68% of acute SDH patients are having associated lesions.

Majority of them are due to two-wheeler accidents. Most of them are not wearing helmets. We found a decreasing trend towards severe head injury with the enforcement of compulsory helmet wearing.

Prognosis is worse in patients with pupillary abnormalities than those without. In our study, we found 10% mortality in patients with normal size reacting pupil, 24%with unilateral dilated pupils and 100% with dilated fixed pupils.

Kristianson and Tandon[14] found 100% mortality when pupils are dilated and fixed, 19% when they are unequal and 14% when pupils are normal.

Other significant factors associated with poor outcome are interval between injury to surgery, hypoxia, hypotension, posttraumatic seizures, focal neurological deficit, obliteration of basal cisterns, thickness of haematoma and midline shift.

Traumatic coma data bank cohort study showed hypoxia in 46% patients and mortality in 40% of patients. In our study, we found hypoxia in 40% and mortality in 33.33%.

Hypotension is even more ominous predicting factor and the same study found it in 35% of patients and mortality in 60%. We found hypoxia in 25% of patients and mortality in 35% of patients.

Obliteration of basal cisterns was found in 26.66% of patients and mortality in 37.5%, whereas without basal cistern obliteration, the mortality is only 17.27%.

Seelig[15] and associates found that the time from injury to operative intervention is the critical determinant. The mortality, if operated within 4 hours is 30%, after, it rose to 90%. Our study also confirmed this.

Wilberger[16] and co-workers challenged this concept and they found that there is improved functional outcome if operated within 4 hours, but this difference did not reached statistical difference.

Gennereli[17] 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.

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%.

Sakas, Bullock and Teasdale GM found that fixed dilated pupils with basal cistern obliteration,>3 hours duration of dilated pupils are having 100% mortality. We also found 100% mortality with fixed dilated pupils irrespective of above factors.

Yanaka K, Kamazeki et al found patients with GCS <8, pupillary inequality, volume of haematoma>30 mL and midline shift >5 mm are having mortality to the range of 40%. We found it to the range of 30%.

The overall mortality in our series is 22.67%. In the study published by Stone[18] et al, it was 46%; in Haselbergers[19] series, it was 51.35%; in Marshall[20]et al series, it was 31.44%; and in Gennerelli[17] series, it was 19.12%.

Jamieson[3] reviewing autopsy material of extradural and subdural haematomas found a disturbing trend towards inoperable lesions and concluded that surgery cannot hope to repair those lesions and advised accident prevention would be the chief means of preventing such lesions.

As situation has not changed even after three decades of Jamiesons[3] observations, his advice continues to be the most relevant even now.

CONCLUSION

We found that the following factors are having significant influence on the outcome of acute subdural haematoma in our study.

1. Interval between injury to surgery with interval <4 hours having favourable outcome.
2. Basal cistern obliteration, which is an indirect indicator of increased intracranial pressure is the single most important factor responsible for unfavourable outcome.
3. Hypotension is another factor, which is having significant influence on the outcome after surgery for acute subdural haematoma.
4. Posttraumatic seizures influence the mortality to the extent of 35%, whereas without seizures, the mortality is 19% only.

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