

Predictive Factors and Outcome Analysis of Traumatic Bilateral Intracranial Hematomas

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Abstract

Original Research Article

Aim: To study the outcome of bilateral intracranial hematomas in both surgical and conservative groups and also to study the factors influencing the morbidity and mortality in patients with bilateral intracranial hematomas. **Material and methods:** This is a prospective study conducted at our hospital from October 2013 to February 2016, including 34 patients who were managed either conservatively or surgically. **Results:** In this study, the age of the patients ranged between 9-70 years and the peak incidence was noted in the 31-50-year age group, comprising 52.94% of the cases, the mortality rate was more in this group contributing to 66.66% of the mortality. Male: female ratio in this study was 4.94:1 and the mortality was more in the males. Two-thirds of patients in this study were injured by road traffic accidents and mortality was higher (29.62%) compared to non-RTA group. 50% of the patients had focal neurological deficits and there was a significant difference in the mortality rate in patients with (50%) and without deficits (13.63%). There was a statistically significant difference in the mortality between the group of patients who were operated within and after 6hrs of injury. Mortality was more in the patients operated after 6 hours. Glasgow coma outcome scale was used to assess the outcome of the patients in this study, out of the 34 patients 14 had good recovery (more in the non-operative group), 6 had a moderate disability, 4 had a severe disability, and one is in a vegetative state. There were 9 deaths in this study. (8 in operative group and 1 in the non-operative group). **Conclusion:** The outcome of patients with traumatic bilateral intracranial hematomas was better in the conservative group compared to operative, though not statistically significant. The important factors affecting the patient's outcome were initial Glasgow coma scale, midline shift on initial CT scan, pupillary abnormalities and effacement of midline CSF spaces such as a 3rd ventricle, basal and quadrigeminal cistern on the initial brain CT scan. Identification of the risk factors, early diagnosis and proper management of such lesions play a key role in improving the prognosis of these patients.

Keywords: Posttraumatic, Bilateral, Intracranial, Hematomas, Outcomes, Predictive factors.

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INTRODUCTION

Traumatic bilateral intracranial hematomas occur rarely in about 2.5% to 3% of all the injured patients. In the case of evolution of new hematomas contralateral to the side of acute subdural hemorrhage, extradural hemorrhage or intracerebral hematoma, the immediate post-operative diagnosis and timely therapeutic intervention are of utmost importance.

Intraoperative brain swelling, postoperative neurological deterioration, pupillary dilatation contralateral to the hematoma, grand mal seizures, patient not improving after ipsilateral hematoma surgery and intractably elevated intracranial pressure have been proposed as some hints in the detection of contralateral hematoma. On presentation of these signs, an immediate CT scan of the brain recommended, as it may lead to an emergency evacuation procedure.

Surgical outcomes of the patients with traumatic bilateral intracranial hematomas are variable and depend on preoperative neurological status and effacement of midline spaces on the initial CT scan of the brain. In order to identify those patients at high risk for intracranial hematomas, various factors were studied prospectively which affect the surgical outcome. CT scan of the brain provides a rapid and accurate diagnosis of the intracerebral hematomas and plays a key role in the timely evacuation of the intracranial hematomas.

All the cases of traumatic intracranial hematomas presenting to the emergency department between August 2010 and February 2013 have been made a part of the study to study the outcomes and factors influencing the mortality and morbidity.

MATERIALS AND METHODS

Study design

This is a prospective study including 34 patients with bilateral traumatic intracranial hematomas who were managed conservatively or surgically, at our Hospital from October 2010 to February 2013.

Inclusion criteria

- Patients with all modalities of injury such as road traffic accident and fall from height were included in this study.
- Patients who sustained a head injury with radiological signs of bilateral intracranial hematomas were included in this study.

Exclusion criteria

- Patients with coagulation disorders or patients on anticoagulants were excluded from the study.
- Patients with life-threatening conditions other than the intracranial pathologies were excluded as they may influence the outcome of the patients.

All the patients included in the study were evaluated for the mode of injury, duration of loss of consciousness, post-traumatic seizures, focal neurological deficits and other clinical parameters such as alcohol intoxication, vomitings, and lucid interval. Patients who were diagnosed with bilateral intracranial hematomas on the initial CT scan were managed surgically/conservatively accordingly. Postoperatively a CT scan of the brain was done and followed up. At the time of discharge, Glasgow outcome scale was used to assess the outcome of the patients. They were classified into two groups, good outcome group (good recovery, moderate disability) and bad outcome group (severe disability, persistent vegetative state, and dead) based on the Glasgow outcome scale score at the time of discharge.

Decompressive craniotomy and evacuation of the hematomas were done in the operative group and those managed conservatively were placed on antiepileptics prophylactically and monitored regularly in intensive care unit. Informed consent was taken from all the participants at the time of inclusion in the study.

RESULTS

Age distribution

The age of patients varied from 9-70 years. The peak incidence was observed in the age group of 31-50 years comprising 52.94% of the cases. It was also observed that 17.64% belonged to the age group 21-30 years and 5.88% to the 11-20 years, 11.76% to the 51-60 years and 8.82% to the 61-70 years. Out of 9 patients who died 6 belonged to the age group of 31-50 years contributing to 66.66% of the mortality. Mortality was more in the operative group.

Sex distribution

In this study 82.35% of the patients were males and 17.64% were females and the mortality rate was 28.35% in males and 16.66% in females.

Other factors

Mode of Injury: 79.41% patients were injured in road traffic accident. Mortality in this group was (29.62%) was higher compared to the Non-RTA group (14.28%)

Alcohol Intoxication: Out of the 34 patients 11 were intoxicated at the time of injury. Mortality in this group was significantly high (27.27%) compared to the patients who were not intoxicated. (21.73%)

Post Traumatic seizures: 8 patients had a history of post-traumatic seizures, among them mortality rate was 62.5% in patients with seizures and 15.38% without seizures.

Focal neurological deficits: Mortality rate in the patients with neurological deficits was 50% and that without neurological deficits was 13.63%.

Good outcome was observed in the patients with GCS 9-15, equivocal in the patients with GCS 6-8 and bad in patients with GCS 3-5. This was found to be statistically significant. (p-value 0.06561)

Midline shift: Outcome was bad in the patients with midline shift greater than 15mm and comparatively better in patients with midline shift less than 15mm. This was found to be statistically significant (p-value- 0.01656)

CSF space Effacement: Outcome was good in the group of patients in whom there was only a mild effacement of midline spaces when compared to the patients with gross midline CSF space obliteration.

Pupillary abnormality: Mortality in the group with pupillary abnormalities at the time of presentation was significantly high (54.54%) compared to the patients without the pupillary abnormality. (13.04%)

In the present study, 32.35% were operated within 6 hours of injury. Mortality in these patients was 8.82% compared to the 14.7% in the patients who were operated after 6 hours of injury. And this was found to be statistically significant.

The Pattern of hematomas in the operative group includes EDH+SDH (7), SDH+SDH (5), EDH+EDH (4), EDH+ICH (2), ICH+ICH (1). The Outcome was good in the EDH+EDH pattern, equivocal in EDH+SDH pattern and bad in bilateral SDH.

The Pattern of hematomas in the conservatively managed group was EDH+SDH (9),

EDH+EDH (2), ICH+ICH (2), EDH+ICH (1). The Outcome was good in EDH+SDH and EDH+EDH pattern of hematomas.

On a whole, out of the 34 patients, 14 patients had a good recovery (41.17%), 6 had a moderate disability, 4 patients had a severe disability and 1 patient was in a vegetative state. There were 9 deaths, 8 in the operative group and 1 in the non-operative group.



Fig-1: Computed Tomography of Brain Shows left Fronto-parietal SDH, right parietal

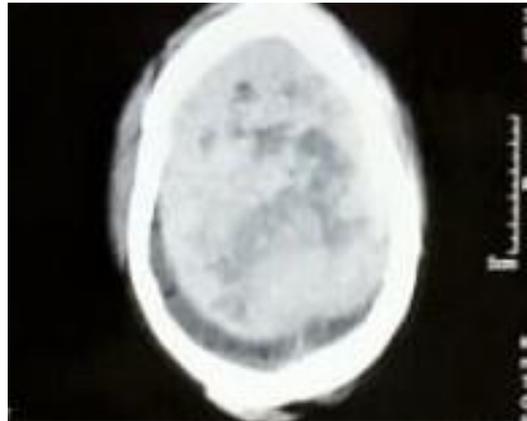


Fig-2: Computed Tomography of Brain shows bilateral vertex Epidural Hematoma



Fig-3: Intra- operative picture showing vertex epidural hematoma

Table-1: Mode of Injury

Mode of injury	NO of Cases	NO of Deaths	% of Mortality
RTA	27	8	29.62%
Non RTA	7	1	14.28%

Table-2: Alcoholic Intoxication

Alcoholic Intoxication	No of Cases	No of Deaths	% of Mortality
Present	11	3	27.27%
Absent	23	5	21.73%

Table-3: Post Traumatic Seizures

PostTraumatic Seizures	No of Cases	No of Deaths	% of Mortality
Present	8	5	62.5%
Absent	26	4	15.38%

Table-4: Relationship between pattern of hematoma and GOS in Operative patients

GOS	E+I	I+I	E+S	E+E	S+I	S+S	E+E+I
GOOD	1	0	4	3	0	1	0
BAD	1	1	3	1	0	4	1
TOTAL	2	1	7	4	0	5	1

E: EDH, S: SDH, I: Intra Cerebral Hematoma.

Table-5: Relationship between pattern of hematoma and GOS in Non-Operative patients.

GOS	E+I	I+I	E+S	E+E	S+I	E+E+I	S+S
GOOD	1	0	6	2	0	0	1
BAD	0	2	0	0	0	0	1
TOTAL	1	2	6	2	0	0	2

Table-6: Pupillary abnormalities

Pupillary abnormality	No of cases	No of Deaths	%
Present	11	6	54.54%
Absent	23	3	13.04%
Total	34		

Table-7: Glasgow Coma Outcome Scale

	No of Patients	Good Recovery	Moderate Disability	Severe Disability	Vegetative State	Death
Total	34	14	6	4	1	9
Operative	20	5	4	3	0	8
Non Operative	14	9	2	1	1	1

DISCUSSION

Bilateral traumatic intracranial hematomas are rare and even rarer are sequentially developed hematomas especially after removal of the first one. The studied concepts draw attention to the old concept that some of the intracranial hematomas may evolve gradually and may not appear in the early brain CT scans of the patients and underline the importance of continuous monitoring of the head-injured patients. Some of the possible implications in the development of such delayed hematomas are vascular necrosis due to leakage of enzymes, hypertension, hyperventilation and CSF leakage. These hematomas may occur even in the absence of skull fractures, particularly in the case of venous bleeding.

If the course of the patient cannot be completely explained with the brain CT findings, or after initial recovery, the patient deteriorates, further imaging is considered. Dharker *et al.* [1] reported a mortality rate of 20% in their series on bilateral epidural hematomas and Gorgulu *et al.* [2] reported a mortality rate of 15.7%. Our study shows a mortality rate of 40% in the operative group and 7.14% in the non-operative group of traumatic bilateral intracranial hematomas.

It is a well-known fact that early diagnosis and timely intervention is the key factor to the outcome. To assess those factors which affect the outcome various studies have been done before to correlate with the postoperative outcomes. This study showed that by preventing delay in admission and investigations mortality could be reduced.

Various studies show an increase in the mortality rates with the age but our study shows a bimodal distribution, larger peak comprising of young adults because of motor vehicle accidents and alcohol intoxication and a smaller peak comprising of elderly consequent to falls.

Two-thirds of the patients in this study were injured by road traffic accidents [3, 4]. Mortality in this group was higher compared to the non-RTA group and also 43% of these were in an intoxicated state. Alcohol consumption impairs the motor skills, reaction time and judgment hence responsible for a higher number of road traffic accidents.

The Duration between the time of injury and surgery plays an important role in the outcome of the patients as this factor alone turns the tide against recovery in a majority of the patients. In the present study, 32.35% were operated within 6 hours of injury. Mortality in these patients was 8.82% compared to the 14.7% in the patients who were operated after 6 hours of injury. And this was found to be statistically significant.

Midline shift on CT scan has an important correlation with the outcome of patients. In the present study midline shift greater than 15mm had a bad outcome. Status of the basal cistern and various CSF spaces play an important role in predicting the outcome of the patients. Compressed or absent basal cistern indicate a threefold increase in the intracranial pressure and also increases mortality two to three fold in the present study. Our study re-establishes the fact that patients with a severe CSF space effacement have a grave outcome. Yanaka *et al.* [5] in a retrospective study on 170 patients with acute subdural hemorrhages showed a positive predictive value of 77% to unfavorable outcomes in the presence of compressed basal cisterns.

Patterns of hematomas on both sides also have a say in the outcome of the patients. In our study patients with bilateral EDH and EDH+SDH pattern. Patients with bilateral SDH have the worst prognosis. Mortality was more in patients with bilateral SDH and bilateral ICH.

Based on the clinical status and pattern of hematomas surgery should be planned. EDH evacuation should be done on a priority basis because helps in improving the prognosis of the patients in bilateral intracranial hematomas. Barlow and Kohi [6] reported that dominant-sided epidural hematoma should predominantly be evacuated in order to prevent serious neurological sequels. Intraoperative brain swelling, postoperative neurological deterioration, pupillary dilatation contralateral to the hematoma, grand mal seizures, patient not improving after ipsilateral hematoma surgery and intractably elevated

intracranial pressure have been proposed as some hints in the detection of contralateral hematoma. In these patients an immediate CT scan of the brain is indicated and if it reveals any expansion of hematoma should be operated immediately.

CONCLUSION

The outcomes of traumatic bilateral intracranial hematomas in patients who were treated surgically were good (26.47%), bad (32.35%) and the mortality was 23.52%, whereas the outcome of patients treated conservatively was good (32.35%), bad (8.82%) and mortality was 2.94%.

The important factors affecting patient's outcome were GCS at the time of admission, effacement of midline CSF spaces on initial CT of the brain, pupillary abnormalities, midline shift and pattern of hematomas.

Identification of the risk factors, early diagnosis and proper management of such lesions play a key role in improving the prognosis of these patients.

Bilateral intracranial hematomas are not rare, must be considered in the management of intracranial hematomas. These patients underline the need for continuous monitoring after an operation and the need for an immediate CT scan if the patient does not improve after removal of the hematoma especially if the CT scan had been done in less than 6 hours after trauma. Unexplainable swelling of the brain during the operation and existence of the fracture line on the contralateral side can give a clue in this regard.

In a developing country like India, hindrances like poor patient economic status, delay in reaching the nearest medical facility plays a major role in governing the outcomes. Hence managing the bilateral intracranial hematomas is a big challenge, as immediate neurosurgical intervention is needed in such cases.

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