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Clinical Outcome of Borderline Subdural Hematoma with 5-9 mm Thickness and/or Midline Shift 2-5 mm

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Abstract

Introduction: Patients with a subdural hematoma (SDH) and midline shift (MLS) of <10 mm on the computed tomography scans and with a Glasgow coma scale (GCS) score of 15 initially might be treated conservatively under close observation, reserving urgent craniotomy, and evacuation of the SDH for those with deteriorating neurological conditions.

Aim: The aim is to study the clinical outcome in management of borderline acute subdural hematoma with 5-9 mm thickness and/or MLS 2-5 mm.

Materials and Methods: Patients with head injury and acute SDH were screened. SDH thickness 5-9 mm, MLS 2-5 mm, GCS score >8, time since injury within 6 h of trauma, volume of contusion <20 ml, and loss of consciousness <1 h duration were included in the study.

Results: SDH thickness and outcome, it was observed that out of 17 cases with SDH thickness <5 mm, 15 were alive and 2 cases expired with a survival rate of 88%. In 83 patients with SDH thickness > 5 mm, survival rate was 76% with 63 survivors and 20 deaths. In the group with MLS 2-5 mm and SDH thickness <5 mm, there was only one death among 17 patients with 16 survivors. In the group with MLS 2-5 mm and SDH thickness 5-9 mm, there were 19 deaths with 9 survivors. The survival rate was 47%.

Conclusion: The mortality rate among those taken up for surgery after initial conservative management was significantly higher and thus emphasizing the need for close monitoring of conservatively managed patients and also to take up for primary surgery at the slightest degree of suspicion regarding conservative management in patients with associated contusion or subarachnoid hemorrhage.

Key words: Midline shift, Subdural hematoma, Trauma

INTRODUCTION

Patients with a subdural hematoma (SDH) and midline shift (MLS) of <10 mm on the computed tomography (CT) scans and with a Glasgow coma scale (GCS) score of 15 initially might be treated conservatively under close observation, reserving urgent craniotomy, and evacuation of the SDH for those with deteriorating neurological conditions.[1] A smaller degree of MLS was tolerated by patients with an GCS score of <15: A shift of more than 5 mm on the initial CT scans predicted an exhaustion of the cerebral compensatory mechanism within 3 days of injury Mathew *et al.* recommended conservative management with a MLS <10 mm in conscious patients, but Wong recommended it only on those patients with a GCS score of 15. Wong found that a MLS >5 mm in patients with a GCS score <15 was significantly related to conservative management failure due to exhaustion of the cerebral compensatory mechanisms within 3 days of injury. Therefore, he recommended that the minimal hospital stay for patients with small SDHs under conservative management should be 3 days. He also found that the thickness of the hematoma was non-predictive of the outcome.[2]

It is found that patients with a TICH volume of <15 ml, a MLS of <5 mm, an open perimesencephalic cistern on

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CT scans, a GCS score of 12 or more, and an absence of lateralizing signs may be treated conservatively and expected to make a good recovery.[1]

Dent *et al*. reviewed all patients with an acute SDH admitted over a 6-year period to a single trauma center and found that 61% of the patients received conservative management. The patients conservatively managed tended to fare better, but they also had better initial GCS scores, smaller hematomas, less shift of midline cerebral structures, less associated brain injuries, and less cerebrospinal fluid basal cistern effacement.[3]

Small subsets of patients fail with non-operative management and subsequently require surgical decompression for progression of a pre-existing lesion or delayed presentation of new lesions. Failure of nonoperative management has been associated with the timing of initial post-injury CT scans, hematoma location and volume, and the presence of edema around the hematoma, and physiologic variables such as hypotension, hypoxia, and coagulopathy of the variables investigated, and only anatomic location of injury was found to be predictive of early failure of nonoperative management. Frontal intraparenchymal hematomas are particularly prone to early failure. Clinical examination and intracranial pressure (ICP) monitoring are equally important in detecting failure and should be an integral part of non-operative management.[4]

Aim

The aim is to study the clinical outcome in management of borderline acute subdural hematoma with 5-9 mm thickness and/or MLS 2-5 mm.

MATERIALS AND METHODS

The study was conducted at Department of Neurosurgery at the Madras Institute of Neurology, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai. Institutional Ethics Committee approval and informed consent from patients' relatives were obtained. Patients who were admitted with head injury and acute SDH were screened. Inclusion criteria: Age-adults (13 years and above), SDH thickness 5-9 mm, MLS 2-5 mm, GCS score >8, time since injury within 6 h of trauma, volume of contusion <20 ml, and loss of consciousness <1 h duration. Exclusion criteria: GCS score <9, presence of bradycardia, pupillary asymmetry, presence of paucity of movements on one side or hemiplegia, chronic alcoholics, severe life-threatening musculoskeletal/spine/thoracoabdominal injuries, evidence of severe brain stem dysfunction, and patients who are unwilling to participate in the study.

Head injury patients who were admitted at our hospital with borderline SDH as per the inclusion and exclusion criteria were included in the study. Data regarding the various parameters such as age, sex, mode and time of injury, clinical examination pertaining to GCS, pupils, neurological deficit, pulse, blood pressure, respiration, and CT findings were recorded. Renal function tests, blood sugar, serum electrolytes, complete blood count, coagulation profile, and blood grouping was done. Patients were evaluated and treatment was done according to brain trauma foundation guidelines. Neurological status of the patient was monitored intensively. Treatment was altered according to changes in neurological status or CT scan.

RESULTS

In this study, 55 patients had SDH of thickness 5-9 mm, 17 had MLS 2-5 mm with SDH thickness <5 mm, and 28 patients had both SDH thickness 5-9 mm and MLS 2-5 mm. Thus, in the majority SDH, thickness was in the 5-9 mm range (83%). Significant MLS with a small SDH was present only in a minority (17%) (Figure 1).

The most common associated injury has been found to be an ipsilateral intraparenchymal contusion in 33 patients, and contralateral contusions were found in 12 patients. There was associated subarachnoid hemorrhage (SAH) in 15 patients.

Primary surgical intervention was done in 3 cases where contusions were the indication rather than the SDH itself with an anticipated worsening of the condition of the patient. The most common indication for surgical intervention was fall in GCS score after initial conservative therapy in this study among 12 cases. Increase in MLS was the second most common indication and occurred in 7 cases. The least common indication was increase in SDH thickness which occurred in only 4 patients (Figure 2).

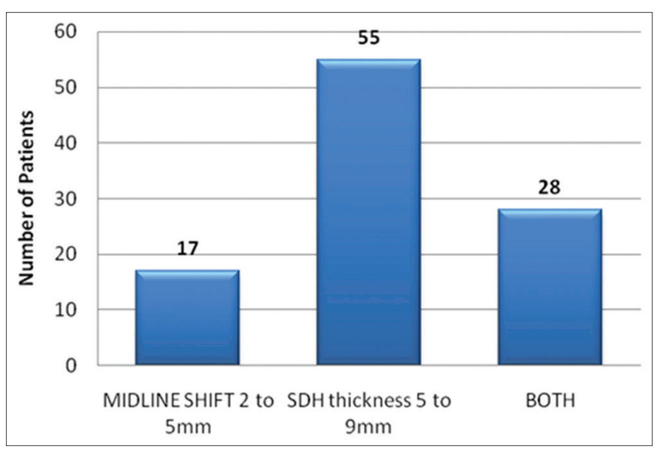

Figure 1: Distribution of computed tomography findings

In this study, among 100 patients, 97 were treated primarily conservatively. There was failure of non-operative treatment in 23 patients among the 97, requiring secondary surgical evacuation. Of these 23 patients, 9 patients were alive at 30 days and 14 patients had died. In the conservative group of 74 patients at 30 days, 66 were alive and 8 were expired. In the event of failure of conservative treatment, in those patients requiring surgery, 39% survived and 61% expired. In the group treated by primary surgery, all 3 patients survived with good outcome (Table 1).

In this study, among 41 patients with SDH only, death occurred in only 2 patients with 39 surviving patients at a survival rate of 95%. Of the 32 patients with SDH and ipsilateral contusions, 23 patients were alive and 9 patients expired with a survival rate of 72%. In 12 patients with SDH and contralateral contusion, there were 6 survivors and 6 deaths with a survival rate of 50%. In 15 patients with SDH and SAH, 10 patients survived and 5 expired with a survival rate of 67%. Of all the cases, patients with SDH alone had a good prognosis and those with SDH and contralateral contusion had a relatively poor prognosis (Table 2).

No deaths were observed among patients in the SDH only group who were operated. In the SDH with contusion group, of the 14 patients operated, there were 11 postoperative deaths with a survival rate of 21%. In the SDH with SAH group among the 4 patients, operated 3 expired with a survival rate of 25%. However, these statistics were not significant on applying the chi-square test (Table 3).

In the conservatively managed groups, the SDH only, SDH with contusion, and SDH with SAH had 2, 4, and 2 deaths, respectively. The mortality rates were 6% in SDH only group, 13% in SDH with contusion group, and 18% in SDH with SAH group. Thus, mortality rates were 2-3 times higher when SDH had an associated contusion or SAH.

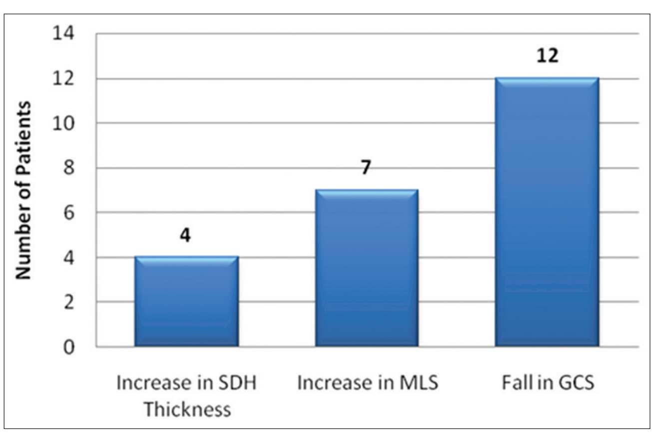

Figure 2: Distribution of indication of surgery

Comparing the SDH thickness and outcome, it was observed that out of 17 cases with SDH thickness <5 mm, 15 were alive and 2 cases expired with a survival rate of 88%. In 83 patients with SDH thickness >5 mm, survival rate was 76% with 63 survivors and 20 deaths (Table 4).

In the group with MLS 2-5 mm and SDH thickness <5 mm, there was only one death among 17 patients with 16 survivors. In the group with MLS 2-5 mm and SDH thickness 5-9 mm, there were 19 deaths with 9 survivors. The survival rate was 47% (Table 5).

On comparing the MLS, in the group with MLS and SDH <5 mm, the mortality was 6% while patients with MLS

Table 1: Distribution of treatment outcome

Treatment	Alive	Dead
Conservative	69	8
Conservative followed by surgery	9	14

Table 2: Distribution of CT findings and outcome

CT findings	Alive	Dead
SDH alone	39	2
SDH with ipsilateral contusion	23	9
SDH with contralateral contusion	6	6
SDH with SAH	10	5

CT: Computed tomography, SDH: Subdural hematoma, SAH: Subarachnoid hemorrhage

Table 3: Distribution of CT findings and surgery outcome

CT findings	Operated	Deaths conservative	Postoperative deaths
SDH only	5	2	0
SDH with contusion	14	4	11
SDH with SAH	4	2	3

CT: Computed tomography, SDH: Subdural hematoma, SAH: Subarachnoid hemorrhage

Table 4: Distribution of SDH thickness and outcome

SDH thickness	Alive	Dead
<5 mm	15	2
5-9 mm	63	20

SDH: Subdural hematoma

Table 5: Distribution of MLS and outcome

MLS type	Alive	Dead
MLS with <5 mm SDH	16	1
MLS with 5-9 mm SDH	9	19

SDH: Subdural hematoma, MLS: Midline shift

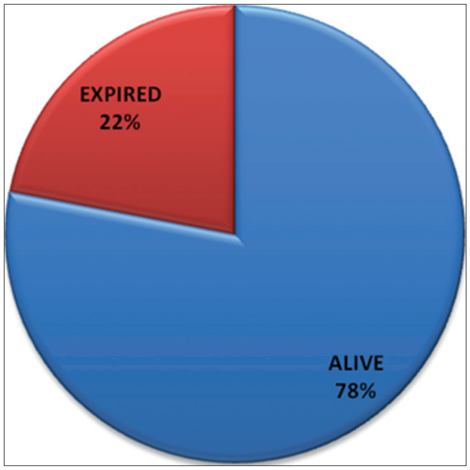

Figure 3: 30 days outcome

and SDH 5-9 mm had a mortality of 53%. On applying the Fischer's test, the $P < 0.0001$ is statistically significant.

On comparing MLS with isolated SDH, overall mortality was 5% in the group with MLS <2 mm. Mortality was significantly increased in the presence of MLS. On applying Fischer's test, this was statistically significant.

Of the 100 patients, majority (78%) were alive at 30 days whereas 22% expired (Figure 3).

DISCUSSION

Morbidity and mortality after an acute subdural hematoma are the highest of all traumatic mass lesions. This poor outcome results largely from associated parenchymal injuries and subsequent intracranial hypertension.[5,6]

In study done by Kotwica *et al.*, on analysis of operative timing and outcome, no benefit revealed when surgery was performed within first 4 h. However, the patients operated on later than 4 h after trauma had smaller MLS and less pronounced brain contusion. It should be taken into account that some patients who could benefit from early surgery - those with quickly developing hematomas and intracranial hypertension had no chance to arrive and died in peripheral hospitals. Despite our results, we advocate an urgent evacuation of hematoma, as early as possible after trauma. Significant correlation was found between MLS, cerebral contusion on CT scans, and results of surgery. Patients with bigger MLS or presence of focal cerebral contusion revealed higher mortality and worse outcome than patients with smaller shift and no cerebral contusion visible on CT pictures.[7]

In the study done by Wilberger *et al.*, the time from injury to operative evacuation of the acute SDH in regard to outcome morbidity and mortality was not statistically significant even when examined at hourly intervals although there were trends indicating that earlier surgery improved outcome. The findings of this study support the pathophysiological evidence that in acute SDH, the extent of primary underlying brain injury is more important than the subdural clot itself in dictating outcome; therefore, the ability to control ICP is more critical to outcome than the absolute timing of subdural blood removal.[8]

Other significant factors associated with poor outcome are interval between injury to surgery, hypoxia, hypotension, post-traumatic seizures, focal neurological deficit, obliteration of basal cisterns, thickness of hematoma, and MLS. Traumatic coma data bank cohort study showed hypoxia in 46% of patients and mortality in 40% of patients.[9]

CONCLUSION

Our study had mainly focused on borderline SDH. According to our study thickness of SDH alone, was not statistically significant in determining the outcome. SDH when associated with MLS had very significant influence on both mortality and functional outcome. Patients with greater MLS had worse outcome than those with a lesser MLS. SDH with associated contusion or SAH has a worse prognosis than SDH alone. Early surgery in these cases may improve the prognosis. The mortality rate among those taken up for surgery after initial conservative management was significantly higher and thus emphasizing the need for close monitoring of conservatively managed patients and also to take up for primary surgery at the slightest degree of suspicion regarding conservative management in patients with associated contusion or SAH. The threshold for decision-making toward primary surgical management should be lower for patients with moderate head injury as this group may benefit more from aggressive management. Furthermore, if the GCS scores fall further, the prognosis becomes dismal and the final outcome is bleak.

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