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RESEARCH ARTICLE

TRAUMATIC ACUTE SUBDURAL HEMATOMAS AND PARENCHYMAL CONTUSION: ANALYSIS OF OUTCOMES AFTER SURGERY AT A SINGLE CENTER

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ABSTRACT

Acute subdural hematoma (Acute SDH) and cerebral contusion that occurs following trauma carries higher morbidity and mortality in spite of recent developments in neurosurgery. Emergency surgical interventions without delay and proper ICU care are necessary for favourable clinical outcome. **Aim:** In the present study, we evaluated the patients admitted with head injury and analysed the outcome of the patient who diagnosed and operated for Cerebral Contusion and Acute Sub Dural Hematoma at various locations of brain. **Materials and methods:** This study was performed on 54 patients who were operated for traumatic acute subdural hematoma and Cerebral Contusion without any systemic injuries at a single centre. Gender of the patients, mechanism of trauma, Glasgow Coma Scale (GCS) score at the time of admission and on discharge, procedures such as Fronto Temporo Parietal (FTP) Decompression, Uni Frontal Decompression and Bi Frontal Decompression were studied in detail and outcomes are compared. **Conclusion:** Acute SDH, Temporo Parietal contusion and Frontal contusion following trauma was associated with high morbidity. FTP Decompressive Craniectomy done for Acute SDH or Contusion in Temporo Parietal region has better prognosis when compared to Unifrontal/Bifrontal Decompression done for contusion or Acute SDH in Frontal region.

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INTRODUCTION

Acute subdural hematoma: The Acute SDH is an extra axial collection of blood classically associated with head injury following rapid acceleration/deceleration force that produces tearing of the bridging veins as they cross from brain to dural sinus. It can be associated with high morbidity and mortality, depending upon the size of the hematoma, the mass effect it produces, and the presence of associated brain injuries. Even though it is a potentially a devastating problem, early and accurate diagnosis with timely decompressive craniectomy and evacuation of Acute SDH reduces the mortality of the patient (Ly *et al*., 2006).

Clinical features: Symptoms of subdural hematomas are relatively nonspecific, often presenting as rapid decline in mental status with or without focal neurological deficits. Headache is the major complaints in 80% of cases. Other nonspecific symptoms include memory impairment, confusion, lethargy, weakness, nausea, vomiting, seizure activity, visual changes, coma and death.

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Investigation: CT Brain is fast, highly accurate, should always be the first investigation of choice for the patients suffering from acute head injury. On imaging, Subdural hematoma has characteristic crescentic morphology that can extend across the suture lines and into midline interhemispheric space. The density of the subdural collection can vary based on the age of the traumatic injury. Acute hematomas usually have high attenuation, unless the patient is anemic or has a clotting disorder, in which case the density of the blood may be low. Acute SDH may progress to subacute and chronic types if not addressed immediately following trauma (Ly *et al*., 2006). MR imaging is useful for confirming smaller suspected chronic subdural hematomas that may have a CT density that is similar to the cerebrospinal fluid. MR imaging also allows assessment of the size and extent of the lesion in multiple planes (the coronal plane is very useful) and is superior for the evaluation of associated parenchymal brain injuries and in determining the age of collected blood depending upon the changes that take place in haemoglobin (Marshall *et al*., 2012). Acute blood appears isointense on T1W and hypointense on T2W images. Hyperintense collection on T1W and hypo- or hyperintense collection on T2W images suggests subacute blood. Chronic blood may be hypointense on both T1W- and T2W MR imaging sequences (Ly *et al*., 2006).

Management: Alarge SDH with thickness more than 10mm and midline shift more than 5mm leads to high intracranial pressure due to significant mass effect, do not tend to do well with conservative management. Hence most of the patients with significant mass effect needs liberal Decompressive craniectomy and Evacuation of Acute SDH as early as possible. FrontoTemporo parietal decompression or frontal decompression can be planned depending upon the location of Acute SDH (Phan *et al*., 2017).

Cerebral Contusion: Following head trauma, Cerebral parenchymal injuries occurs in significant percentage of patients. Parenchymal injuries such as laceration, Contusion, and Hematoma, along with surrounding edema due to ischemic and inflammatory phenomena results in significant mass effect leads to rapid deterioration of the clinical condition of the patients (Alvis-Miranda *et al*., 2013). Although cerebral contusions may occur at any site, most common locations are frontal and temporal lobes near the bony prominence. Coup contusions are the parenchymal injury that occurs at the site of impact. But Contrecoup contusion occurs diametrically opposite to the point of impact (Alvis-Miranda *et al*., 2013).

Investigation: As discussed previously, Computed Tomography is the first and foremost investigation of choice. CT brain shows, a heterogeneous area of haemorrhage, brain necrosis, infarction and surrounding edema as mixed-density lesions. MRI imaging is highly specific in identifying associated brain injuries like diffuse axonal injury which determines the prognosis of the patients (van den Brink, 2000).

Management: Patients with Cerebral Contusion are at significant risk for development of seizures, which can rapidly aggravate its neurological deficit within 24 hours after injury. Hence patients with Cerebral Contusion should be treated with appropriate anti epileptics and anti edema measures. Cerebral Contusion can be managed conservatively if it is smaller in size without mass effect. Because cerebral contusion has the tendency to enlarge over time to produce significant space occupying lesions, it should be addressed as early as possible. Surgery is indicated if the volume of contusion is more than 50cc, midline shift of more than 5mm, effacement of basal cisterns and GCS is poor. As a tool for the reduction of ICP, Decompressive Craniectomy (DC) and evacuation of ICH or Contusion is the recommended procedure. The procedure aims at negating the pressure volume relationship of the closed cranial cavity. FTP decompression is ideal for contusion involving Temporo Parietal region and Unifrontal or Bifrontal decompression is the procedure of choice for contusion involving the frontal region unilaterally or bilaterally (Marshall *et al*., 2012).

Aim: To analyse the various factors that influence the outcome of patients admitted with acute subdural hematoma and cerebral contusion following head injury.

MATERIAL AND METHODS

This study was performed on 54 patients who were operated for traumatic Acute SDH, Cerebral Contusion at the Institute of Neurosurgery, Madras Medical College, Chennai between

RESULTS

Table 1. Distribution of Patients according to Gender, Mode of Injury, and Additional head injury

		N	Percentage
Gender	Male	43	80%
	Female	11	20%
Mode of injury	Motor vehicle accident	31	57%
	Fall from height	13	24%
	Fall of heavy object over head	7	13%
	Others	3	6%
Additional head injury	EDH	13	24%
	SAH	10	18.5%
	IVH	4	7%
	Brainstem contusion	2	4%
	Skull fracture	10	18.5%
	Without any associated injury	15	28%

Table 2. Distribution of Patients according to Size of SDH

Size of SDH		N	Thickness in mm	Percentage
	Expired	6	15	19%
	Alive	26	8	81%

Table 3. Distribution of Patients according to Volume of Contusion

Volume of contusion		N	Volume in cc	Percentage
	Expired	9	38	41%
	Alive	13	25	59%

Table 4. Distribution of Patients according to GCS Score

GCS	Score	Expired	Alive	Percentage of expired	Percentage of alive
	8 – 12	10	20	33%	67%
	13 – 15	5	19	21%	79%

Table 5. Distribution of Patients according to Location of the Injury

	Expired	Alive	Percentage of expired	Percentage of alive
FTP decompression for Acute SDH	7	25	22%	78%
FTP Decompression for Temperoparietal Contusion	3	7	30%	70%
Unifrontal decompression	2	4	33%	67%
Bifrontal decompression	4	2	67%	33%

August 2016 and July 2018. FTP decompressive craniectomy was the procedure done for Acute SDH and Contusion involving Temporo parietal region and unifrontal or bifrontal decompressive craniectomy was the procedure done for the patients depending upon Acute SDH or Contusion involving unilateral or bilateral frontal region. Gender, mechanism of trauma, time interval between the onset of trauma and admission, additional Head injuries, thickness of hematoma, effect of procedures such as Fronto Temporo Parietal (FTP) Decompression, Uni Frontal Decompression and Bi Frontal Decompression and GCS score at admission, before surgery and discharge were investigated. Factors that affected the mortality rate, GCS score and the size of Acute SDH and volume of Cerebral Contusion were analyzed.

Following patients were excluded from the study.

- Head injury patients with associated other system injury such as abdominal, thorax or spinal cord injuries that might affect prognosis of traumatic subdural hematoma and cerebral contusion.
- Patients with spontaneous acute SDH/cerebral ICH due to anticoagulant use.
- Patient with GCS less than 8 before surgery.

Data were collected from previously prepared patient information sheet. Statistical analyses were performed.

DISCUSSION

This study showed that males were predominant as compared to females. Details were shown in (Table 1). Out of 54 cases, Males were 43 (80%) whereas 11 cases were Females (20%). RTA was the most common mode of injury in the study group constitutes about 57%, following that, fall from height 24% and other mode of injuries constitutes about 19%. Fifty four patients were operated for Acute SDH and Cerebral Contusion. Of which, 32 patients was with Acute SDH and 22 patients with Cerebral Contusion. Of the 22 patients with Cerebral Contusion, 10 patients with Temporo Parietal Contusion, 6 patients with Unifrontal Contusion and 6 patients with Bifrontal Contusion. Mean time interval between entering the casualty department and surgery was 21/2 hours. According to Table 2 & 3, mean thickness of SDH was about 11.5+/- 7.5 mm and mean volume of Cerebral Contusion was about 33.5cc +/- 5.5cc. Among the patient population 71% had additional pathology such as skull bone fracture (18.5%), EDH (24%), SAH (18.5%), IVH (7%) and brain stem contusion (4%). GCS is an important classification method that directly reflects brain damage, clinical status, and provides information about patients' survival and mortality rates. The study found that, 30 patients with GCS score between 8 and 12 had a survival rate of 67% (Table 4). In addition, 24 patients with GCS scores between 13 and 15 had a survival rate of 79%. One of the main reasons for this improvement i.e., higher GCS score which results in higher survival rate because of spontaneous hematoma resolution, surgical decompression, and regression of edema (Alagoz *et al*., 2017).

In this study (Table 5), FTP decompression for Acute SDH was observed in most patients (32 patients) with severe brain injury and survival rate of 78% with only 22% of mortality. The mortality rate of Acute SDH has begun to decrease because of the recent developments in medicine (Ryan *et al*., 2012). Followed by FTP Decompression for Temporo parietal Contusion where survival rate was 70% and mortality of 30%. Total patients with Unifrontal decompression were six, with the survival rate of 67% and 33% of mortality. On the other hand, mortality rate of Bifrontal decompression was on the higher end (67%) whereas survival rate was just 33%.

Conclusion

Road traffic accidents are the most common cause for head injury. Although patients admitted with head injury have high morbidity, mortality rate increases if the admission GCS is very low, thickness of SDH and volume of Cerebral contusion is very high. Fronto Temporo Parietal decompression done for Acute SDH/contusion in Temporo Parital region has better survival rate compared to Frontal decompression done for Acute SDH/contusion in frontal region. Mortality of the patients cannot be determined by gender of the patient, mode of injury and time interval between injury and surgery.

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