



## A PROSPECTIVE OBSERVATIONAL STUDY ON OUTCOME AND PRESENTATION OF DEPRESSED SKULL FRACTURE

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### ABSTRACT

**Background:** Depressed skull fractures are one of the common neurosurgical conditions. It could be simple type with overlying Scalp intact or could be compound with overlying Scalp laceration. The outcome of patients with depressed fracture varies and depends on multiple factors. This study aims to assess the outcome of the patients with depressed skull fracture. **Aims and Objectives:** To study the various associated intracranial injury with Depressed skull fracture (DSF) and effect on its outcome. **Materials and Methods:** This prospective study was done in 50 patients with depressed skull fracture in Government Kanyakumari medical college in department of Neurosurgery from March 2015-2017 for a period of two years. The patients selected for this study belonged to all age groups and had clinical depressed skull fracture. **Results:** In our study out of 50 patients, 64% were aged between 21 and 30 years; 74% were men and 26% were women. Vehicular accidents were the cause in most of cases followed by assault. Extradural hematoma was reported in two patients. Of 40 cases of mild head injury, 27 were managed conservatively and 13 were operated. Six cases had severe head injury; three were operated; and three were treated conservatively. **Conclusion:** Use of GCS in conjunction with the CT findings is most useful in early management of depressed skull fracture thereby decreasing mortality and morbidity. Mild head injury with better GCS and no associated injuries involvement has a better outcome.

**KEYWORDS:** Depressed Skull Fracture; Intracranial Injury; GCS.

### INTRODUCTION

Head injury is one of the most common public health problems today. With rapid urbanization and tremendous increase in high-speed traffic flow, incidence of trauma is increased both in developing and in developed countries. One of the varieties of serious head injuries is depressed skull fractures (DSF).<sup>[1]</sup> DSF is a common neurotraumatic disorder. A skull fracture is considered depressed when any portion of the outer table of the fracture line lies below the normal anatomical position of the inner table.<sup>[2]</sup> Skull fracture results from large energy forces applied to the head. The extent and type of skull fracture is determined by the kinetic energy of the striking object, the geometry of the striking object, the direction of the impact force, and the anatomic site of the impact.<sup>[3]</sup> This type of fracture carries a high risk of increasing pressure on the brain, crushing the delicate tissue. When DSF is associated with scalp laceration, it is called a compound DSF and otherwise a simple DSF. Compound depressed fractures are surgical emergencies, and unless treated promptly and properly, complications such as meningitis, cerebral abscess and osteomyelitis of Skull and epilepsy may supervene. The principles of management have undergone through a considerable

evaluation in the past few decades. Both conservative and surgical managements depend on the type of fracture. The outcome of patients with depressed fracture varies and depends on multiple factors. There has been no previous study on the significance of these factors on the outcome of depressed fracture of the skull and hence this study.

### MATERIALS AND METHODS

This prospective study was done in 50 patients with depressed skull fracture in Government Kanyakumari medical college in department of Neurosurgery from March 2015 to 17 for a period of two years. The patients selected for this study belonged to all age groups and had clinical depressed skull fracture. The CT scan showed the DSF. Patients excluded were female patient with pregnancy and head injury, patients having recurrent head injury, and patients with head injury associated with systemic disease such as diabetes and hypertension. All patients who had head injury with DSF, neurosurgical evaluation began during the primary survey and the scores were determined according to the Glasgow coma scale (GCS). Based on this was classified as mild head injury with GCS 13–15, moderate head injury with GCS

8–12, and severe head injury with GCS <8. A detailed history including age, sex, mode of injury, duration, loss of consciousness, and other symptoms were evaluated. In every case, central nervous system, abdomen, cardiovascular and respiratory organs were examined. In central nervous system, higher function, Glasgow coma scale (GCS), cranial nerve, pupil, reflexes, motor and sensory system, signs of irritation of the meninges, and Spine were examined. CT scans were performed. All patients were examined every half an hour for recording any changes in the vital parameters. Patients managed conservatively were the ones who had CT scan suggestive of DSF not more than 10 mm, not associated with underlying intracranial hematoma, mild head injury (GCS 13–15). Those patients were managed operatively whose CT scan was suggestive of DSF more than 10 mm with severe head injury, associated intracranial hematomas such as epidural and subdural with mid line shift and sign of neurological deficit. Follow-up of all patients was carried out after 1 month to study the

outcome of surgical management in terms of good recovery, morbidity, or mortality.

## RESULTS

Of 50 patients, 26% were aged below 20 years. The peak incidence was observed in 32 patients belonging to 21–30 age group; 74% of patients in our study group were men and rest 26% were women with a male/female ratio was 3.16:1. The age and sex distribution, various causes, and mode of presentation of DSF among the patients in our study group is given in below table. The most common cause of DSF in our study group was road traffic accidents, which were seen in 32 patients, whereas 9 patients had history of some kind of altercation or assault. Coming to presenting complaints when they were brought to hospital most of the patients, around 10(20%) of them presented with unconsciousness and 25 patients with altered consciousness. Some presented with single complaints and some with multiple complaints. In our study group 4% of patients had vomiting, 28% presented with convulsion, and 40% had ENT bleeding.

**Table 1: General characteristics of patients.**

| Characteristics      | No of Patients        | Percentage |     |
|----------------------|-----------------------|------------|-----|
| AGE IN YEARS         | < 20                  | 13         | 26% |
|                      | 21-30                 | 32         | 64% |
|                      | 31-40                 | 2          | 4%  |
|                      | 41-50                 | 2          | 4%  |
|                      | >40                   | 1          | 2%  |
| SEX                  | MALE                  | 37         | 74% |
|                      | FEMALE                | 13         | 26% |
| CAUSES               | RTA                   | 32         | 64% |
|                      | ASSAULT               | 9          | 18% |
|                      | FALL                  | 6          | 12% |
|                      | OTHER                 | 3          | 6%  |
| MODE OF PRESENTATION | UNCONSCIOUS           | 10         | 20% |
|                      | ALTERED CONSCIOUSNESS | 25         | 50% |
|                      | VOMITING              | 2          | 4%  |
|                      | CONVULSION            | 14         | 28% |
|                      | ENT BLEEDING          | 20         | 40% |

The most common site of depressed skull fracture in our study patients was frontal region seen in 29 patients. Compound fracture of skull was found in 35 patients, whereas closed fracture was found in 15 patients. On table we found duramater was found to be torn in 7 cases and intact in rest of 43 patients. Associated brain injuries were seen in our study group and most common being hematoma. We also looked for involvement of venous sinus, and brain contusions. Intracranial hematoma like extra dural hematoma was seen in 3 patients and sub dural hematoma was seen in 2 patients, contusion was reported in one patient; no involvement of venous sinuses was found in any patients. Management of depressed fracture of skull consists of conservative and operative modalities. Our patients were generally categorised as mild, moderate, and severe head injuries based on GCS. In our study among 50 patients 40 cases were of mild head injury, out of which 27 cases were

conservatively managed and rest 13 cases were operated. Four cases had moderate head injury and all of them were operated. Rest six cases had severe head injury, of which three patients were operated and three patients were treated conservatively because their general condition was not fit for surgical procedure.

Table 2: CT Findings and Severity.

| Characteristics         | No of Patients |    |
|-------------------------|----------------|----|
| SITE OF FRACTURE        | FRONTAL        | 29 |
|                         | TEMPORAL       | 7  |
|                         | PARIETAL       | 11 |
|                         | OCCIPITAL      | 3  |
| TYPE OF FRACTURE        | COMPOUND       | 35 |
|                         | CLOSED         | 15 |
| ASSOCIATED BRAIN INJURY | EDH            | 3  |
|                         | SDH            | 2  |
| SEVERITY OF HEAD INJURY | MILD GCS       | 40 |
|                         | MODERATE GCS   | 4  |
|                         | SEVERE GCS     | 6  |

Operative complication occurred in five patients, two patients had neurological deficit (hemiparesis), and three patients had wound infection. Good recovery was seen in all patients with minor head injury based on GCS and three cases among moderate head injury had good recovery while four patients with severe head injury had hemiplegia. Three patients died with one having moderate head injury based on GCS and rest 2 had severe head injury, out of these three patients, one patient had DSF associated with intracranial hematoma, and two patients had DSF associated with contusion. Coming to associated injuries seen in our study group, two patients had blunt chest injury and 12 patients had injury to extremities.

## DISCUSSION

Trauma is a huge problem in both developing and developed countries. Head injury largely contributes to the mortality and morbidity of trauma patients. The incidence of head injuries is steadily increasing, which has led to increased concerns on management and to improve outcome. The presence of a fracture implies an injury of a considerable force to the head. Fractures of the skull vault are influenced by a number of factors including thickness of a vault, the degree of mineralization, and force of impact. In view of the greater force required to cause depressed skull fractures, there is often underlying cerebral damage. The fracture occurs as a result of concentrated forces which indent the skull, for example when an object with a high kinetic energy such as golf club or cricket bat makes contact with a focal area of the skull. DSF s are common injuries, majority of them are sustained in road accidents. This prospective study was done in 50 patients with depressed skull fracture in Government Kanyakumari medical college in department of Neurosurgery from March 2015-2017 for a period of two years. The patients selected for this study belonged to all age groups and had clinical depressed skull fracture.

In our study, most of the patients (n=32) were belonged to 21–30 years age group; 74% patients were men and 26% were women. Thus, the male/female ratio was 3.16:1. This higher prevalence of DSF found among men was because majority of men are the breadwinners who used to travel a lot and have more chances of vehicle

related accidents whereas majority of women are housewives.

In studies done by Rolekar<sup>4</sup> and Ali *et al.*<sup>[5]</sup> there was a higher prevalence of head injury with DSF has been reported in 11–20 years age group. Whereas in a study by AI-Haddad<sup>6</sup> there was higher prevalence of head injury in 16–29 years age group, this was similar to our results where more cases was seen in 21-30. Vehicular accident was the main cause of injury in the present study, whereas in the study by Ali *et al.*<sup>[5]</sup> fall from height was the main cause of injury. But in a study done by Braakman<sup>[7]</sup> the results were similar to our study in which 51% of the patients had vehicular accident followed by fall from height which was seen in 26% patients. Fall from height was the most common mode of injury reported in studies by Mehdi *et al.*<sup>[8]</sup> Whereas assault was the most commonly cause found in studies done by Hossain *et al.*<sup>[9]</sup> where as in our study assault was second common cause.

Coming to clinical presentation the most common one in our study was either unconsciousness or altered consciousness followed by ENT bleeding. In previous study done by Ali *et al.*<sup>[5]</sup> and Hossain *et al.*<sup>[9]</sup> also it was unconsciousness which was the most common presentation similar to our study where either altered consciousness or LOC were common presentation.

Frontal region was the most common site of injury in our study group. In previous studies done by Braakman<sup>[7]</sup> and Mehdi *et al.*<sup>[8]</sup> frontal region was the most common site of fracture. This finding is consistent with our study. Similar findings were seen in many other studies done by many researchers, whereas in few studies done by researchers<sup>[5]</sup> parietal was the first and temporal was the second most common sites of injury. In the present study, 70% of the fractures were compound, many studies had different range of compound fracture with one study done by Ali *et al.*<sup>[5]</sup> had a similar result like our study. Of 50 patients in our study 20 patients required surgery. On surgery dural tear was seen in seven patients. This is less Compared to all studies done before. In the current study, five patients (10%) had intracranial hematoma like EDH and SDH whereas in a study by Rolekar<sup>[4]</sup> 19.7% patients had intracranial haemorrhage

(ICH) and In a study by Hossain *et al*<sup>[9]</sup> 22% patients had EDH and 31% had brain contusion. Our findings were similar to that of study by Ali *et al*<sup>[5]</sup> where 10.78% patients had ICH and 3.9% had involvement of venous sinus. Thus, the above findings suggest that patients of head injury with DSF most commonly present with a type of ICH or brain contusion.

Other injuries associated with DSF in were blunt chest injury, abdominal injury, injury to extremities, spinal injury, or pelvis injury. In our study, we encountered patients with blunt chest injury and injury to extremities similar to that of whereas in another study six patients had blunt chest injury and five had injury to extremities.

In the current study, majority of the patients were managed conservatively. The indications for conservative management were CT scan suggestive of DSF not more than 10 mm, not associated with underlying intracranial hematoma, and mild head injury (GCS 13–15). Of 50 cases in our study 30 patients were managed conservatively. It was suggested in cases where CT scan was suggestive of DSF >10 mm with severe head injury, associated intracranial hematomas, such as epidural and subdural, with mid line shift, and GCS of moderate or severe type surgical modalities can be followed.

Among our study patients mortality was seen in 4 patients among which one was of moderate GCS and rest three of severe GCS. These findings are constant with those of the studies conducted in the past. Similarly in the present study, postoperative wound infection was found in 3 cases, and two patients had hemiparesis whereas in the study by AI-Haddad and Kirollos<sup>[10]</sup> 12.3% patient had episodes of postoperative epilepsy as postoperative complication.

## CONCLUSION

Head injury with depressed skull fracture is frequently seen in frontal region and often associated with hematoma. Most commonly men are injured particularly in road traffic accidents. Use of GCS in conjunction with the CT findings is most useful in early management of depressed skull fracture thereby decreasing mortality and morbidity. Mild head injury with better GCS and no associated injuries involvement has a better outcome.

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