

# DEPRESSED SKULL FRACTURE: SURGICAL MANAGEMENT AND OUTCOME

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## ABSTRACT

**Objective:** To study the characteristics, associated intracranial injury, indication of surgery and outcome in patients with depressed skull fracture.

**Material and Methods:** This descriptive (cross sectional) study was conducted at Neurosurgery Department of Naseer Teaching Hospital, Peshawar, Pakistan from January 2014 to December 2015. 83 patients underwent surgical procedure were studied. Clinical data regarding age, sex, occupation, mode and time of injury, loss of consciousness, seizures, vomiting, ENT bleed, site of fracture and type of fracture were documented. Post-operative complications were noted. Outcome was measured by Glasgow coma scale. All the patients were followed at 5th postoperative day.

**Result:** A total of 83 patients were taken into account, comprising of 69 male and 14 female with male to female ratio of 6:1. The age ranged from 1 to 60 years. 40(48%) patients were in age group of 0 to 15 years followed by 19(23%) in 16 -30 years age range, 17(21%) in 31-45 years and 7(8%) were in age group of 46-60 years. The most common region was the parietal 25 (30%), followed by temporal 16(19%). Frontal region was effected in 11(14%) and occipital in 10(12%) subjects. 7 patient developed wound infection, 2 patients developed meningitis, 1 patient with chronic infection of scalp developed osteomyelitis of skull. Neurological deficit was seen in 3 while pseudomeningocele in 1 patient. 69(83%) had a very good outcome.

**Conclusion:** DFS is a very common neurosurgical emergency. Surgery is a good option and should be done whenever indicated as the results are favorable in most of cases.

**Key Words:** depressed skull fracture, surgical intervention, outcome.

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## INTRODUCTION

Trauma is a serious problem worldwide<sup>1</sup>. Depressed fracture of skull (DFS) is a common traumatic condition in which the depressed fragment is pushed inside for a distance equivalent or more than the thickness of skull bone.<sup>1-3</sup> Depressed fracture of skull (DFS) accounts for significant morbidity and mortality as it complicates the head injury in up to 6% subjects<sup>4</sup>. Compound fracture account up to 90% and the associated infection rate of DFS is 1.9 to 10.6% and 11% neurological deficit.<sup>5</sup>

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A depressed fracture may be closed or open type. In closed type, laceration of skin may or may not be present but the dura is intact while in open or compound type, skull fractures has direct communication between the scalp laceration and the cerebral surface because the dura is torn.<sup>6</sup> X-ray skull will delineate the type, severity and place of depression. CT is the gold standard as it not only demonstrate the depress fracture but also show intracranial lesion<sup>5,7</sup>.

A depressed fracture (DFS) can be managed either surgically or conservatively.<sup>8</sup> Surgical treatment include elevation of depressed fragment, evacuation of hematoma, wound debridement and repair of dura and dural venous sinuses. The indications for surgery are neurological deficit, cerebrospinal fluid leakage, depression greater than inner table of bone of skull, cosmetic purpose and associated intracranial hematoma.<sup>2,9,10</sup> DFS should be treated properly and timely to prevent complications such as infection, seizures, progression of neurological deficit, and post traumatic

## Depressed skull fracture: surgical management and outcome

Hydrocephalus<sup>11</sup>. Midline depressed skull fractures (MDFs) deserve a special mention among skull fractures and should always be treated with caution<sup>12</sup>.

The aim of our study is to investigate the characteristics, associated intracranial injuries, indication for surgery and outcome of those patient in which surgery was needed for DFS. Our study will provide data for health care professionals so that this serious condition can be dealt with a more appropriate manner.

### MATERIAL AND METHODS

This descriptive (cross sectional) study was done at Neurosurgery Department of Naseer Teaching Hospital, Peshawar, Pakistan from January 2014 to December 2015. Sample size was 83 and sampling technique was consecutive (non-probability) sampling. Approval was obtained from hospital ethical committee. Inclusion criteria were all patients more than two years age admitted via OPD or Emergency department having DSF clinically and who needed surgical treatment. All those patients who were not willing for surgery were excluded.

All patients in accordance with the inclusion criteria were taken into account and admitted through OPD or Emergency. Written informed consent was taken from patients. After admission, detailed history including age, gender, profession, mode and time of injury, loss of consciousness, seizures, vomiting, nasal and ear bleed, site and type of fracture were documented. General physical examination and detailed neurological examination was done. Preoperative GCS was documented at the time of arrival and one hour before surgery. CT scan brain was done in all patients. Those showing depressed fragment more than 10mm, midline shift, associated intracranial injuries like extradural hematoma, subdural hematoma, contusion and neurological deficit were operated. All patients were given prophylactic antibiotic and anticonvulsant. Surgery was performed under general anesthesia, lifting up of depressed bone fragment, indriven and free bone fragment removal, water tight closure of dura, evacuation of any hematoma if present, debridement of wound margin was done in all cases.

Postoperative complications like wound infection, meningitis, osteomyelitis, CSF leak, pseudomeningocele and neurological deficit were documented. Outcome was measured by Glasgow coma scale. All the patients were followed at 5th postoperative day. Data was analyzed by using SPSS 20.0 and descriptive analysis was done. Categorical data was analyzed in form of percentages and presented in form of tables.

### RESULTS

A total of 83 patients were taken into account, comprising of 69 male and 14 female with male to female ratio of 6:1. The age ranged from 2 to 60 years. 40(48%) patients were in age group of 2 to 15 years followed by 19(23%) subjects of 16 -30 years, 17(21%) in age range 31-45 years and 7(8%) were in age group of 46-60 years.

Table 1: Age distribution

Age	Frequency	Percentage
2-15 years	40	48%
16-30 years	19	23%
31-45 years	17	21%
46-60 years	7	8%

Table 2: Etiology of depress skull fracture

Etiology	Frequency	Percentage
Road Traffic Accident (RTA)	45	55%
Assault	16	19%
Fall	15	18%
Fall of object on Head	7	08%

Table 3: Preoperative GCS (one hour before surgery)

GCS	Frequency	Percentage
Mild (GCS 14-15)	44	53%
Moderate (GCS 9-13)	30	36%
Severe (GCS 3-8)	9	11%
Total	83	100%

Table 4: Postoperative GCS

GCS	1st post op day	5th post op day
14-15	56	70
9-13	22	13
≤ 8	5	00
Total	83	83

Table 5: Postoperative complications

Complication	Frequency
Wound infection	7
Meningitis	2
Osteomyelitis	1
Pseudomeningocele	1
Neurological deficit	3

Road traffic accident was the most common etiology noticed in 45(55%) followed by assault in 16(19%), fall in 15(18%) and object on head in 7(08%) subjects. Compound DFS was observed in 56(68%) while simple type in 27(32%) patients.

The most common region was the parietal in 25 (30%), followed by temporal in 16(19%) patients. Frontal region was effected in 11(14%) and occipital in 10(12%). Associated injuries with DFS were observed in which the most common was extradural hematoma 24(29%) followed by brain contusion 15(19%). Subdural hematoma and in driven bone fragment were also observed.

In this study 44(55%) patients presented with mild head injury (GCS 14-15), 30(36%) had moderate head injury (GCS 9-13) and 9(11%) with severe head injury (<8). Post-operative GCS was recorded at 1st and 5th post op day. At 5th post op day, 70 patients presented with GCS 14-15, 13 patients presented with GCS 9-13 and no patient had GCS < 8 as shown in table III & IV.

Seven patients develop wound infection, among them 5 were treated with oral antibiotic while 2 needed debridement and drainage of pus, 2 patient developed meningitis and 1 patient with chronic infection of scalp developed osteomyelitis of skull. Neurological deficit was seen in 3 while pseudomeningocele in 1 patient. Sixty-nine (83%) patients had a very good outcome.

### DISCUSSION

Depressed skull fracture (DFS) occurs as result of direct blow to a small surface area of the skull with a blunt object. Generally it is thought that DFS is a very serious head injury having very bad prognosis. But the reality is that, it become serious only when it directly or indirectly involve the brain.<sup>6,13,14</sup> In compound DFS not only the function of brain is effected but there is an epileptogenic focus and neurodeficit, therefore treatment needs to be started as soon as possible. Elevation of depressed bone fragment is gold standard procedure performed in order to prevent complications like infection, meningitis, CSF leak and post traumatic seizures.<sup>15-17</sup>

In our study, DFS was common in males with male to female ratio was 6:1 which is close to the studies done by other authors where this ratio was observed to be 9:1,4:1.<sup>9,18</sup> Mean age of DFS in our study was peak incidence at school going age i.e; 2 to 15 years (48%) which is similar to the study done by Rehman Z in which peak incidence was 46.4%.<sup>17</sup> Studies done by Al-Haddad SA and Mehdi SA reported 52% and 44% respectively and majority of patients were in school going age.<sup>9,19</sup>

DFS is either simple (close) type or compound (open) type. In our study, 68% were compound while 32% were open type. Similar study was done by Hossain MZ showing 64% compound while 36% simple DFS.<sup>6</sup>

In our study, the most common etiology for DFS is Road Traffic Accident (55%) followed by assault in 19% and fall in 18%. According to Rolekar NG, 51% of patient had road traffic accident followed by 26% of cases of fall.<sup>20</sup> Ozer FD in his study concluded motor vehicle accident as the most common cause followed by assault.<sup>21</sup>

In our study, the most common region was the parietal region (30%) followed by temporal in (19%). Frontal region was affected in 14% and occipital in 12% cases. Similar study was done by Ali M in which parietal region was mostly involved (36.1%) followed by frontal (31.3%) and temporal regions (17.64%).<sup>2</sup>

In a study conducted by Hossain MZ the most common associated injury was contusion (31%) followed by dural tear (25%), EDH in ( 22%), and in 13% there is in driven bone fragment, this study is similar to our study in which brain contusion , EDH and in driven bone fragment was seen in 29%,19% and 7% cases respectively.<sup>6</sup>

In our study, 7 patients developed wound infection, amongst them 5 were treated with oral antibiotic while 2 needed debridement and drainage of pus, 2 patients developed meningitis and 1 patient developed osteomyelitis of skull. Neurological deficit was seen in 3 while pseudomeningocele in 1 patient. Almost similar findings were documented by Bonfield CM.<sup>22</sup> No death was recorded in our study. Similar study was done by Hossain MZ in which 8 patients developed wound infection, 1 presented with meningitis and 1 with cerebral abscess.<sup>6</sup> No post operative seizures and pseudomeningocele were observed. In our study, 83% had a very good outcome similar to the study done by Al-Haddad SA which showed 80% had a good outcome<sup>9</sup>. Nandi MO recruited 17 patients and reported 88.8% of patients had good functional outcome.<sup>23</sup>

There are few limitations in our study, first the sample size was small and secondly very short term follow up, and so randomized controlled trials are needed for generalization of this study.

### CONCLUSION

DFS is a very common neurosurgical emergency. Surgery is a good option and should be done whenever indicated as the results are good in most of cases. Majority of the patients enjoy healthy life. Early diagnosis and prompt treatment will definitely decrease the mortality and morbidity.

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