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ORIGINAL RESEARCH

Surgical Management of Depressed Skull Bone Fracture

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ABSTRACT

Background: Depressed skull bone fractures constitute a common condition following head trauma. A skull fracture is considered depressed when a portion of the outer table lies below anatomical position of inner table. The outcome of the patient with depressed fracture depends on multiple factors.

Objective: To assess outcomes in surgically managed patients with depressed skull fractures and associated head injuries.

Materials and Methods: This study was conducted from January 2024 to March 2024, in Department of Neurosurgery G.G.Hospital, Jamnagar. A total of 30 patients of all age groups with clinically palpable depressed skull bone fracture, treated surgically were included in this study. Details regarding the causes, duration and clinical conditions were documented. Ct scans were done in all cases. After surgery patients were followed up at 1, 2 and 3 months. Clinical examination of the wound for sepsis, CSF leak, check up CT scan and neurological assessment of patients was done on every visit. Outcome was assessed by Glassgow coma scale.

Results: Factors associated with outcome were duration of injury, mode of injury, glassgow coma scale and associate brain injuries.

Conclusion: Depressed skull bone fractures is common neurosurgical issue. Timely surgical management gives excellent results by decreasing morbidity and mortality. Most of the causes can be prevented by taking some safety measures.

Keywords: Depressed Skull Fracture, Surgical Management, Glassgow Coma Scale.

INTRODUCTION:

The skull consists of three layers: the inner table, diploe and the outer table. A skull bone fracture is said to be depressed when a fragment of skull bone is displaced inward in a distance equals to or greater than the width of calvarium. Skull fractures are classified in three ways – by pattern (linear, comminuted, depressed), by anatomic location (vault convexity, base), and by skin integrity (open, closed). Complex depressed fractures are those in which the dura mater is torn (1).

Skull fractures are influenced by number of factors including the thickness of the vault, mineralization of the bone, the force along with the mechanism of the impact. When depressed skull fracture is associated with scalp laceration, it is called on open depressed skull fracture and if not then simple depressed skull fracture. The brain can be either directly damaged to neurological tissue and its vasculature or it can be affected indirectly by subdural and/or extradural hematoma which compress the underlying brain parenchyma.(2) Signs and symptoms of depressed skull fracture include pain at the site of injury, visible deformity or depression of the skull, bruising or swelling, bleeding from the ears or nose, and neurological symptoms such as loss of consciousness, confusion, or weakness.

Prompt medical attention is crucial in case of depressed skull fractures. The arrival of computed tomography (CT) scans and magnetic resonance imaging (MRI) in the late 2 century paves the path for significant advancement in the understanding of brain injuries and surgical techniques(2).

In this study, we aimed at:

1. To report our experience regarding the surgical management of depressed skull fractures;
2. To report the outcome of patients after surgery, at G. G. hospital, Jamnagar.

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Exclusion criteria:
Patients have other medical comorbidities.
Gun shot wounds and linear fractures.

MATERIALS AND METHODS

A retrospective study of 30 patients of depressed skull fractures who were admitted to the Neurosurgery department of G. G. hospital, Jamnagar and underwent surgical intervention. We collected data of patients with depressed skull bone fracture with relation to age groups, sex ratio, mode of injury, sites of injury, Glasgow coma scale. The study was self-funded. The post operative evaluation includes plain CT scan of brain.

Surgical procedures include burr hole and elevation of depressed skull fractures, dural repair with fascia lata/pericardium and drainage of extradural hematoma or decompressive craniotomy in cases of associated diffuse brain injuries.

In cases of dural injury, the dural defect was repaired using various techniques depending on the size and location of the injury like primary closure of small dural tears or use of dural substitutes (e.g., artificial dura or allografts) for larger defects. Outcome was measured by Glassgow coma score. The patients were discharged after 5-10 days depending on neurological assessment. Follow up was done at 1, 2 and 3 months interval. The post operative evaluation includes plain CT scan of brain, wound examination and neurological assessment.

RESULTS

A total of 30 patients of Depressed Skull fracture were included in the study. Males comprised the majority of the study population, accounting for 83% (25 out of the total). Age group ranging from 5 to 85 with mean age of years 39.03 ± 21.76. The highest proportion (37%) was found among patients in the 40-59 year age group. The commonest cause of depressed skull fracture was road traffic accident, seen in 18 (60%) patients, whereas in 9 (30%), mode of injury was Accidental fall and in 3 (10%) cases Assaulted trauma as shown in Table 1. The commonest fracture site was seen in Parietal region 12 (40%) cases. Dura was intact in 20 (67%) cases but was breached in 10 (33%) Cases. Among the 30 cases, dural breach occurred in 10 (33.3%) patients, while the dura remained intact in the other 20(66.7%) patients as Shown in Table 2.

Table 3 shows the associated brain injuries, the most common brain injury was subdural hematoma (SDH, 30%), followed by subarachnoid haemorrhage (SAH, 27%), contusion (23%), and extradural hematoma (EDH, 17%). Notably, 27% of cases had no associated brain injuries. Preoperatively, there were 14 patients (47%) with moderate head injury (GCS:8-12) and 4 patients (13%) with severe head injury (GCS<8) as shown in Figure 1. Duration of hospital stay cases was median of 7 (ranging from 4-20) days. Majority 25 (83%) patients were discharged, whereas total 4(14%) deaths were observed, and 1(3%) patient were referred to another hospital as shown in Table 4.

Table 1: Age and sex distribution, mode of injury and mode of presentation.

	Characteristic	Frequency	Percentage	Mean ± SD
Age groups (in years)	**0 to 19**	6	20	**39.03 ± 21.76**
	20 to 39	8	27	
	40 to 59	11	37	
	60 to 79	4	13	
	>= 80	1	3	
Sex	**Male**	25	83	
	Female	5	17	
Mode of injury	**Accidental fall**	9	30	
	Assaulted trauma	3	10	
	Road Traffic Accidents	18	60	

Table 2: Site of Fracture distribution

	Characteristic	Frequency	Percentage	P value
Site of fracture	**Frontal**	10	33	0.05
	Occipital	2	7	
	Parietal	12	40	
	Temporal	6	20	
Type of Fracture	**Open**	10	33.33	0.067
	Closed	20	66.67	

Table 3: Associated Brain Injuries

Brain injury*	Frequency	Percentage	P value
EDH	5	17%	0.05
SAH	8	27%	
SDH	9	30%	
Contusion	7	23%	

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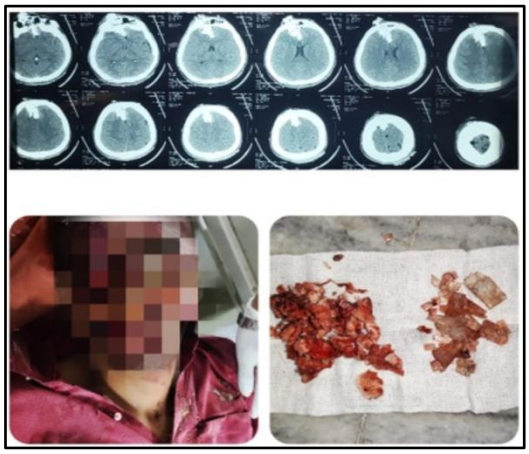
Vasogenic oedema	1	3%	
Not associated	8	27%	

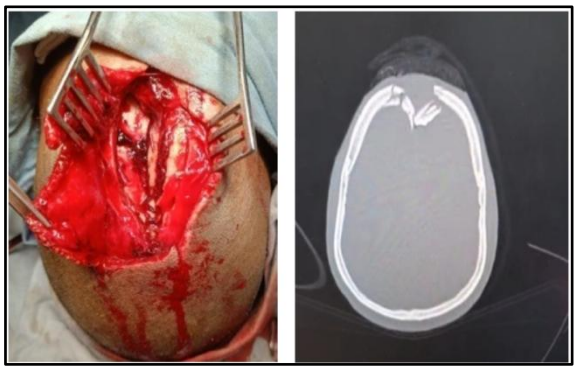
*****Multiple associated brain injury present among patients

Table 4: Outcome of treatment among patients

Outcome	Frequency	Percentage	P value
Discharge/DAMA	25	83	<0.001
Refer	1	3	
Expired	4	14	



CASE 1: (A) Figure depicting NCCT right frontal bone comminuted displaced fracture. (B) Figure depicting right frontal bone comminuted displaced fracture. (C) Figure depicting post-op bone fragments of a depressed skull fracture



CASE 2: (A) Figure Depicting Intra-Op Depressed Skull Fracture. (B) Figure Depicting NCCT - Frontal Bone Communited Displaced Fracture

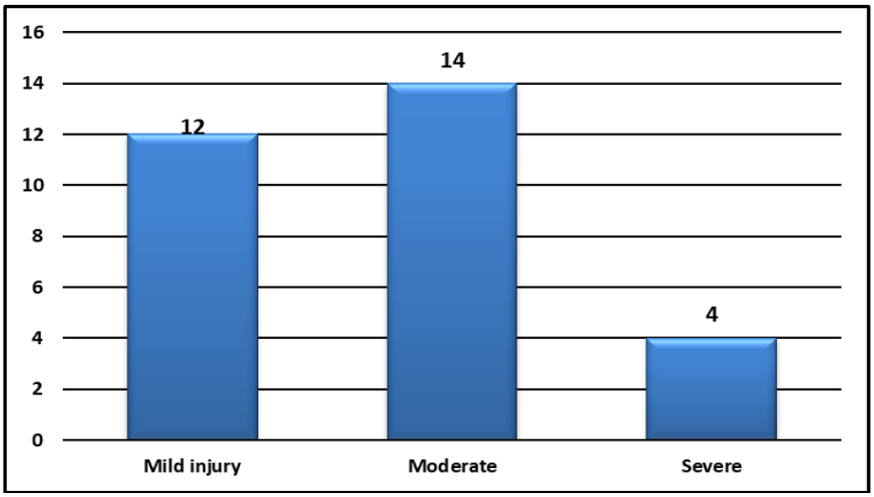


Figure 1: Assessment of Glassgow Coma scale of patients preoperatively

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DISCUSSION

Head injury is a major contributor to the mortality and morbidity in patients sustaining trauma. Non-helmeted riding on two-wheelers is a deep- rooted practice in Indian public scenario in spite of many rules and regulations prohibiting the same. The number of RTAs is increasing each year. Driving under the influence of alcohol is a major factor contributing to this rise in incidence. DSFs is one of the commonly seen head injuries. Patients give a classical history of trauma to the head, RTAs being the most common followed by accidental falls, assaults, and railway accidents among others. Various coexisting scenarios arise along with DSFs, namely, underlying bleeds such as EDHs, SDHs, dural tears, and contusions. Computed tomography (CT) scan is helpful in the diagnosis of skull fracture and associated intracranial lesion. CT is more useful in demonstrating depressed fractures except when they are at the vertex. The rationale behind aggressive treatment of depressed cranial fractures stems from their association with infection and late epilepsy.

In the study by Ali et al. fall from height was the main cause of injury (51.94%) (3). In Rolekar et al. study, road traffic accident was the main cause of injury (60%) (4). In our study, the commonest cause was road traffic accidents seen in 18 patients (60%), whereas fall from height in 9 patients (27%) and fall of heavy object or assaults in 3 patients (10%).

Skull fractures can occur at any part of the skull. In Rolekar et al. study, the most common site was frontal bone (52%). In the study by Ali et al, the most common region was the parietal bone. In our study, parietal region was the most common site of injury (50%) followed by frontal bone (33.67%), occipital bone (10%).

In Rolekar et al. study, the most common way of presentation was loss of consciousness (56%) followed by ENT bleeding (34%). In our study, the most common mode of presentation was loss of consciousness (50%) followed by vomiting (30%) and seizures (30%).

In Ali et al. study, compound fractures were found in 73.5% of patients, while in Rolekar et al. study it was 68%. In our study, compound fractures were seen in 83.3% and close fractures in 16.6% cases.

Dura injury has been reported by different studies. In Braakman study,44% had dura injury.[5] In Hossain et al. study, 25% had dura injury. In our study, it was found in 10 patients (33.67%).[6]

Depressed skull fractures are associated with underlying brain injuries frequently. In Hossain et al. study, 22% patients had EDH and 31% had brain contusions. In Ali et al. study,10.78% patients had ICH and 3.9% had involvement of venous sinus. In our study, extradural hematoma was found in 12 patients (40%), brain contusions and subdural hematoma in 5 patients (16.67%). Venous sinus involvement in 2 patients(6.67%).

The postoperative incidence of wound infection was observed to be significantly associated with a significantly higher incidence of persistent neurological deficit, epilepsy and death. In Rolekar et al. study post operative infection was found in 16.66% patients,8% had neurological deficits. In study by Al-Haddad and Kirollos 12.3 % patients had epilepsy.[7] In our study, complications developed in 9 patients (30%), 3 patients (10%) had neurological deficit,4 patients (13.33%) had wound infection with CSF leakage in which 1 patient (3.33%) had developed meningitis, 2 patients (6.67%) had mortality due to diffuse brain injuries.

CONCLUSION

Surgery for depressed fractures should be done because early diagnosis and management of depressed skull fracture decreases morbidity and mortality. There was a positive correlation between GCS at presentation and discharge. The underlying brain trauma had poor outcomes in general and a statistically significant association was also found. Other factors such as sex, age, pneumocephalus were not related to outcomes in our study. Hence, from this study, it can be concluded that depressed fractures with good GCS score at presentation and at discharge with no underlying brain injuries had good outcomes.

REFERENCES

1. Vishwanath Sidram, PC Chandra Kumar, Bellara Raghavendra. A Prospective Study of Spectrum of Depressed Fractures of Skull and its Surgical Outcome. 10.5005/jp-journals-10001-1242.
2. Anand Prakash, Viraat Harsh, Utkarsh Gupta, Jayendra Kumar, Anil Kumar. Depressed Fractures of Skull: An Institutional Series of 453 Patients and Brief Review of Literature. Asian J Neurosurg. 2018 Apr-Jun; 13(2): 222–226. doi: 10.4103/ajns.AJNS_168_16
3. Haider Ali, Mohammad Mushtaq, Naeem Ul Haq, Muhammad Anwar Ullah, Saqib Ali, Anwar Shah. Surgical management and Outcomes of Depressed Skull Fractures. https://doi.org/10.53350/pjmhs211572327
4. Nikita G Rolekar. Prospective study of outcome of depressed skull. DOI: 10.5455/ijmsph.2014.271020141
5. R Braakman. Depressed skull fracture: data, treatment, and follow-up in 225 consecutive cases. J Neurol Neurosurg Psychiatry.1972 Jun.
6. Abdulaziz Abdellah Hussein et al. Clinical Outcomes and Prognostic Determinants of Surgically Treated Depressed Skull Fracture in Addis Ababa University Neurosurgical Teaching Hospitals: A Prospective Multicenter Observational Study. World Neurosurg. 2022 Feb.
7. Al-Haddad SA, Kirollos R. A 5-year study of the outcome of surgically treated depressed skull fractures. Ann R Coll Surg Engl. 2002;84(3):196-200.