SURGICAL MANAGEMENT AND OUTCOME OF DEPRESSED SKULL FRACTURE

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Abstract

Aim and Objective: Surgery for depressed fracture of skull is often performed as an emergency. This entity accounts for significant morbidity and mortality as it complicates the head injury. The study is designed with an objective to investigate the factors accompanying with depressed skull fractures (DSF) in patients who experienced surgery and their association to the outcomes.

Method: The cross sectional study was conducted on 50 patients with depressed skull fracture who needed surgical treatment. The study carried out over 18 month's period from December 2007 to July 2009 in the Neurosurgery ward of Superspeciality Hospital Government Medical College (GMC), Nagpur. Demographic data, mode and time of injury, seizures, vomiting, ENT bleed, loss of consciousness, site and type of fracture were documented. Outcome was measured by Glasgow coma scale. Post-operative complications were noted. All the patients were followed at 5th postoperative day.

Result: A total of 50 patients comprising of 39 male and 11 female age ranged from 10 to 55 years underwent surgical intervention for depressed skull fracture during the study period. It was found that 38(76%) patients had compound or open fracture and 12(24%) patients were found to have simple or closed fracture. The most common etiology was noticed as road traffic accident in 30(60%) followed by assault in 10(20%), fall in 7(14%) and fall of object on head in 3(06%) subjects. The common region affected was parietal region in 23(46%) and the most common associated injury was brain contusion in 20(40%) patients.GCS (Glasgow Coma Scale) score ranged from 5-15. The GCS score improvement was found from before surgery 50% to postoperative 5th day 88% which represents the good outcome of the study.

Conclusion: DFS is a very common neurosurgical emergency. Surgery is a great choice and therefore should be done whenever indicated, since the outcomes are favourable in most cases.

Keywords: DFS, Depressed skull fractures, Neurosurgery, GCS, Glasgow Coma Scale.

1. Introduction

The skull provides good protection for the brain and its fractures may occur with head injuries. However, a severe impact or blow on head can cause the skull to fracture or break. It may be accompanied by concussion or other traumatic brain injury. Depressed skull fractures, a most severe form of trauma that occurs in 11 per cent of serious head injuries, are comminuted fractures that displace fractured bones internally. This kind of fracture carries a high risk of increased brain pressure, smashing the sensitive tissue. Complex depressed fractures are the ones that rupture the dura mater. Depressed skull fractures may require surgery if they cause pressure on the brain to raise the bones off[1]. The head injury is thus a significant contributing factor to mortality and morbidity in trauma-bearing patients. The deep-rooted practice in the Indian public context despite many laws and restrictions is non helmeted riding on two-wheelers which contribute one of the major reason for head injury.

The fracture of the skull may be categorized as closed, open, depressed, and basal. Closed type fracture also referred to as simple fracture, cutting of the skin may or may not occur, but the dura is intact while in open or compound type, skull fractures have direct contact between the laceration of the scalp and the cerebral surface because the dura is torn[1]. In depressed skull fracture, the bone/skull indented or extended into the cavity of the brain. In the skull floor a basal fracture occurs such as the areas around the eyes, the ears, the nose, or at the top of the neck, along the spine. There are a number of associated injuries with depressed skull fractures such as cerebral contusion, subarachnoid hemorrhage,

subdural hematoma, extradural hematoma, CSF leak, pneumocephalus etc. The type, extent and position of depression can be identified by radiographic examination of the skull. Non-enhanced Computer tomography (CT) with bone windows is the preferred method since it not only shows the fracture of the depression but it also shows intracranial lesion[2].

The advances in CT scan and MRI help in detailed understanding of brain injuries and better planning of surgical techniques. Additionally, after introduction of Advanced Trauma Life Support training, the management of head injury in trauma patients has undergone significant changes[3,4]. However, so far there have been a few notable studies that examine the overall results and associate early complications with skull fractures. In present study, we have attempted to see the patterns of incidence of depressed skull fractures and to evaluate the influence that may be attributed with the surgical outcome of depressed skull fractures.

2. Materials and Methods

The present cross sectional study was carried out at Neurosurgery Department, Superspeciality Hospital, Government Medical College, Nagpur, Maharashtra, India. Prior to the beginning of the study, approval was obtained from the hospital ethical committee. All the 50 patients were admitted with depressed skull fracture and underwent operative treatment were involved in this study. A written informed consent was obtained from all the patients. The patients who were not willing to get operated were excluded from the study. Operation decision was made in accordance with the standard indication that was published in books and articles.

After admission, detailed history including sex, age, profession, side and site of fracture, mode and time of injury, loss of consciousness, vomiting, seizures, nasal and ear bleed, type of depressed fracture were noted. General physical examination and detailed neurological examination was done. The outcome was studied by the Glasgow outcome scale.

At the arrival time and one hour prior to surgery, preoperative GCS was registered. CT scan of brain was done in all the patients. The patient who showed midline shift, 10 mm or more of depressed fragment, associated intracranial injuries like subdural hematoma, extradural hematoma, neurological deficit, and contusion were operated. All patients were given anticonvulsant and antibiotic prophylactically. Surgery was performed on patients under general anaesthesia, elevation of depressed bone fragments, removal of in-driven and free bone fragments, dural tear repair, debridement of wound margin and evacuation of hematoma if present was done in all cases. Postoperative complications of all patients were reported, and at least up to the 7th postoperative day were followed. All the patients were recommended to return for follow-up after one month to Neurosurgery OPD. Data were analysed using SPSS, and descriptive analysis was performed. Categorical data were analysed in percentage form and presented in table format.

3. Observations and Results

A total of 50 patients comprising of 39 male and 11 female underwent surgical intervention for depressed skull fracture during the study period. The age ranged from 10 to 55 years with an average age 32.84±13.56. 10(20%) patients were in age group of 10 to 18 years followed by 10(20%) subjects of 19-30 years, 20(40%) in age range 31-45 years and 10(20%) were in age group of 46-55 years (figure 1).

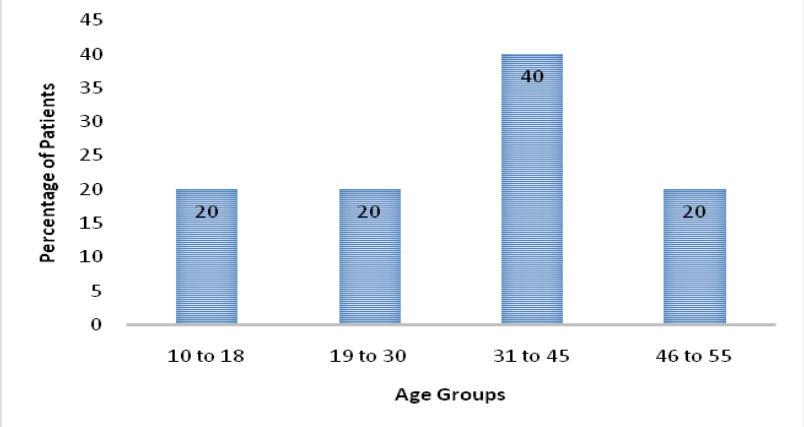

Figure 1: Distribution patients according to age group

It was found that 38 (76%) patients had compound or open fracture and 12 (24%) patients had simple or closed fracture. The most common etiology was noticed as road traffic accident in 30(60%) followed by assault in 10(20%), fall in 7(14%) and fall of object on head in 3(06%) subjects. The common region affected was parietal region in 23 (46%) followed by temporal region in 12 (24%) patients. While 9 (18%) patients were affected in frontal and 6(12%) patients were affected in occipital region. The most common associated injury was brain contusion in 20 (40%) patients followed by dural tear in 15 (30%) patients. Extradural hematoma and in-driven bone fragments was found in 10(20%) and 5(10%) patients respectively.

Preoperative GCS was performed and it was found that 25 (50%) patients presented with mild head injury who had GCS score 14-15, 17 (34%) patients presented with moderate head injury with GCS score 9-13 and 8 (16%) patients recorded severe head injury with GCS score 3-8. None of the patient was below GCS 7. Post-operative GCS were recorded at 1st day and 5th day of surgery and we found that GCS score had improved at 5th day of surgery. At post-operative day 1 GCS score was found 14-15 associated with mild and some moderate head injury to 35 (70%) patients and it improved further at day 5 to 44(88%) patients. Four patient (8%) patients develop wound infection, among them 3 were treated with oral antibiotic while 1 needed debridement and drainage of pus, 3 patients developed meningitis and 1 patient with chronic infection of scalp developed osteomyelitis of skull. Neurological deficit was seen in 2 while pseudomeningocele in 1 patient. Forty one (82%) patients had a very good outcome.

Table 1: Distribution of study population according to their clinical profile

Parameter		Frequency	Percentage
Age Groups	10 to 18	10	20
	19 to 30	10	20
	31 to 45	20	40
	46 to 55	10	20
Type of Depressed Skull fracture	Simple Fracture	12	24
	Compound Fracture	38	76
Etiology	Road Traffic Accident (RTA)	30	60
	Assault	10	20
	Fall	7	14
	Fall of object on Head	3	6
Preoperative GCS	Mild (GCS 14-15)	25	50
	Moderate (GCS 9-13)	17	34
	Severe (GCS 3-8)	8	16
1st day Postoperative GCS	Mild (GCS 14-15)	35	70
	Moderate (GCS 9-13)	11	22
	Severe (GCS 3-8)	4	8
5th day Postoperative GCS	Mild (GCS 14-15)	44	88
	Moderate (GCS 9-13)	6	12
	Severe (GCS 3-8)	0	0
Associated Injuries	Extradural hematoma	10	20
	Dural Tear	15	30
	Brain Contusion	20	40
	In driven Bone fragments	5	10
Postoperative complications	Wound infection	4	8
	Meningitis	3	6
	Osteomyelitis	1	2
	Pseudomeningocele	1	2
	Neurological deficit	2	4
	Cerebral abscess	0	0
	Post-operative seizures	0	0

Data presented in percentage. GCS: Glasgow Coma Scale

4. Discussion

Major contributor to the mortality and morbidity in patients sustaining trauma is head injury. DFS is a commonly seen head injury and considered to be a very serious injury to the brain with very poor prognosis. However the actual fact is, it only gets serious when it includes the brain directly or indirectly[1,5]. Therapy needs to begin as quickly and efficiently as possible in case of compound DFS because it not only affects the function of brain but also leads to epileptogenic focus and neurodeficit. Depressed bone fragment elevation is a gold standard procedure executed to prevent complications such as meningitis, CSF leakage, infection, and post-traumatic seizures[6].

The Mean age of DFS in our study was 32.84±13.56 years. Maximum patients (40.0%) were in the age group of 31–45 years. In contrast to our study, the study done by Al-Haddad and Kirollos[7] and Mehdi *et al*[8] reported school going students having aged 2 to 15 years presented as DFS. Al-Haddad[7] also reported that there was a male majority of 9:1 which is similar to our study and alleged assault was the most common cause of depressed skull fractures followed by road traffic accidents. RTA is one of the major contributors for DFS in most of the patients. The present study reported the same that maximum patients DFS was associated with RTA. While Heary *et al*[9] reported that assault and RTAs associated injuries were equal.

A skull depressed fracture is either simple (close) type or compound (open) type. An open fracture can have skin laceration over the fracture or through the para-nasal sinuses and the middle ear structures, resulting in communication between the external environment and the cranial cavity. Open fractures may be clean or contaminated/ dirty. Hence the compound depressed skull fractures are surgical emergencies, and unless treated promptly and properly, can have serious morbidity and mortality. In our study, 76% were compound while 24% were simple type of DFS. Similar study was done by Hossain[1] showing 64% compound while 36% simple DFS. Also the study by Al-Derazi *et al*[10] found 72% patients had compound DSF. In present study, the most common region affected by DFS was the parietal region (46%) followed by temporal in (24%). Frontal region was affected in 18% and occipital in 12% cases. Similar study was done by Ali[11] in which parietal region was mostly involved (36.1%) followed by frontal (31.3%) and temporal regions (17.64%).

GCS scores were studied before 1 hour of surgery and at discharge which can affect the outcome of DSF patients. Higher GCS score that is 14-15 represents the patient have mild head injury. GCS score 9-13 represents the moderate head injury while GCS score 3 to 8 represents the severe head injury. Hence the GCS score should be improved when the DFS treated surgically so that the good outcome of the study can be achieved. In present study GCS was monitored before surgery and postoperatively on 1st day and 5th day. The GCS score improvement was found from before surgery 50% to postoperative 5th day 88%. In a similar study by Hossain *et al*., patients with preoperative GCS in the range of 13–15 were 50%, 9–12 were 31%, and those who presented with GCS of 8 or lower were 19%.

Accompanying brain injuries are additional significant factor in envisaging the outcome in patients with DSFs. Also in a study conducted by Hossain[1] 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 exactly similar to our present study in which brain contusion, Dural tear, EDH and in driven bone fragment was seen in 40%, 30%, 20% and 10% cases respectively.

5. Conclusion

DFS is a very common emergency in neurosurgery which can lead to mortality and morbidity unless early diagnosis and prompt treatment are given. The use of prophylactic antibiotics decreases post-operative / post-traumatic infection risk and perioperative use of anticonvulsant effectively reduces the possibility of post traumatic seizure. The GCS score at discharge of patients represents the good outcome of the present study. Surgery is a great choice and therefore should be done whenever suggested, since the outcomes are favourable in most cases.

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