

ORIGINAL ARTICLE

Surgical Management and Outcome of Depressed Skull Fracture

MUSHTAQ,¹ FAROOQ AZAM,² RIAZ-UR-REHMAN³Azmatullah Khattak,⁴ Waqar Alam,⁵ Anayatullah⁶^{1,2,3,4}Department of Neurosurgery, ⁶Institute of Kidney Diseases, Hayatabad Medical Complex and⁵Department of Orthopedic, Khyber Teaching Hospital, Peshawar

ABSTRACT

Objective: To know the surgical management and outcome of depressed skull fracture.

Materials and Methods: This descriptive study was conducted in Head injury unit Hayatabad Medical Complex, Peshawar from October 2006 to October 2009. Detail history regarding the cause of depressed skull fracture, duration since injury, clinical condition, and CT Scan picture were documented in a Performa. Depressed fracture of more than 5 mm, cosmetically disfiguring fractures and fracture over the sinuses were operated. All the patients were given prophylactic antibiotics and anticonvulsants. These patients were followed up for six months. History of fits, clinical examination of the wound, CSF leak and neurological assessment of patients were done on every visit. The data was analyzed in SPSS 16.

Results: This study includes 48 consecutive, surgically treated, depressed skull fractures patients. Male-to-female ratio was 2.2 : 1. The age range of the patients was 1-63 years with a mean age of 14.1 years. The pediatric population constituted the largest group 26 (54.1%) with the 16-30 year-old age group the next largest 12 (25.0%). 10 (20.8%) patients were older than 30 years. Etiological factors include fall from height in 26 (54.16%) cases, road traffic accident in 15 (31.25%), recreational activities injury in 1 (2.08%), physical violence in 3 (6.25%) and miscellaneous in 3 (6.25%) cases. 35 (72.91%) patients presented with mild head injury, 7 (14.58%) had moderate head injury and 6 (12.5%) with severe head injury. Closed depressed skull fracture was noted in 11 (22.91%) cases, while compound depressed skull fracture was in 37 (71.09%) cases. The incidence of depressed skull fracture was 8 (16.67%) in frontal bone, 8 (16.67%) in fronto-parietal, 10 (20.8%) in temporal, 13 (27.08%) in parietal, 5 (10.41%) in occipital, 2 (4.17%) on superior saggital sinus, 1 (2.08%) on confluence of sinuses and 1 (2.08%) on transverse sinus. Associated intracranial lesions were Extradural hematoma 16 (33.3%) Contusions 15 (31.25%), Dural tear 23 (47.92%) and in driven bone fragment 7 (14.58%). Postoperatively, 35 (72.9%) patients showed excellent recovery, 6 (12.5%) were hamiparetic, 4 (8.33%) were having seizures and 2 (4.17%) remained in vegetative state, and 3 (6.25%) developed meningitis. 2 (4.17%) patients had surgical site wound infections. 1 patient developed pseudomeningocele. One patient had CSF leak.

Conclusion: Depressed skull fractures are common in children. Anticonvulsants and antibiotics are effective in prevention of epilepsy and infection during perioperative period. Early surgical treatment is extremely desirable when fracture is more than 5 mm depressed and open depressed skull fractures. The outcome of depressed skull fracture depends on severity of injury and presence of other associated intracranial lesions.

Key Words: Depressed Skull Fracture Surgical management, Outcome.

INTRODUCTION

When a fragment of skull bone is displaced inward to a distance of equal or more than the width of the calvarium, a skull fracture is said to be depressed.¹

Most of causes of depressed skull fracture are falls, road traffic accidents and physical assaults².

A depressed fracture may be open or closed depend on presence or absence, respectively, of

overlying scalp laceration.³ Open fractures, by definition, have either a skin laceration over the fracture or the fracture runs through the paranasal sinuses and the middle ear structures, resulting in communication between the external environment and the cranial cavity. 75 to 90% of the depressed fractures are open fractures. Open fractures may be clean or contaminated.

Depressed fractures are frontoparietal (75%), temporal (10%), occipital (5%), and other (10%). Most of the depressed fractures are open fractures (75-90%).⁴

The presentation may vary depending on other associated intracranial injuries. In about 25% patients there is no loss of consciousness, and in equal number of patients, lose consciousness is present for less than an hour^{3,4}. Some patients may present with fits, other with discharging wound³. Depressed skull fracture can cause marked disfigurement especially if present in frontal and temporo-parietal region.²

CT scanning is the investigation of choice for the diagnoses of and skull fracture and associated intracranial lesions.^{3,5} Routine skull x-ray does not show full extent and depth of injury.³

It is vitally important that patients with depressed skull fractures are treated adequately so that complications, such as post-traumatic fits and infections are avoided.⁶

Depressed skull fracture can be treated surgically as well as conservatively.⁷

Depressed fracture of more than 5 mm, depressed fracture with evidence of dural tear and depressed fracture as a cause of raised intracranial pressure particularly over middle and posterior third of superior sagittal sinus should be surgically managed.² The outcome of depressed skull fracture is influenced by the presence or absence focal or global brain injuries and the severity of head injury.²

The aim of our study was to know the etiological factors of depressed skull fracture, Surgical management and treatment outcome in patients operated for depressed skull fracture in Neurosurgical Unit, Hayatabad Medical Complex, Peshawar.

MATERIALS AND METHODS

This descriptive study was conducted in Head injury unit Hayatabad Medical Complex, Peshawar from October 2006 to October 2009. Permission for this study was taken from the ethical committee Hayatabad Medical Complex, Peshawar. Written informed consent was taken from patients if possible. Detail history,

apart from age, sex and address, regarding the cause of depressed skull fracture, duration since injury, clinical condition and CT scan findings were documented. CT Scans were done in all cases.

Depressed fracture of more than 5 mm, cosmetically disfiguring fractures and fracture over the sinuses were surgically managed.

Surgical procedures include; S shaped, linear or horse shoe flap incisions according to type and site of depressed skull fractures, elevation of depressed bone fragment, removal of in driven bone fragment, repair of dural tear, evacuation of hematoma, homeostasis, debridement of wound margin and primary repair.

All the patients were given prophylactic antibiotics and anticonvulsants.

These patients were followed up at least up to 7th postoperative day in hospital and all the patients were advised to report to Neurosurgery OPD for follow up after one month, 3 months and six months. History of fits, clinical examination of the wound for infection and CSF leak and neurological assessment of patients were done on every visit.

All above preoperative and postoperative information were put in a semi structured Performa and stored in our computer database. The data was then entered into SPSS 16 and analyzed.

RESULTS

This study was conducted on 48 consecutive, surgically treated, depressed skull fractures. There was a predominance of male patients in this study i.e. 33 (68.75%) male and 15 (31.25%) female with a male-to-female ratio of 2.2 : 1.

The age range of the patients was 1-63 years with a mean age of 14.1 years. The pediatric population (below the age of 16 years) constituted the largest group 26 (54.1%) with the 16-23 year-old age group the next largest 12 (25.0%). Only 10 (20.8%) patients were older than 30 years.

Causes of depressed skull fracture were, falls from height in 26 (54.16%) cases, road traffic accident in 15 (31.25%) cases, recreational activities injury in 1 (2.08%) cases, physical violence in 3 (6.25%) cases and miscellaneous in 3 (6.25%) cases. These factors are shown in the graph below.

Of the study population, 35(72.91%) presented with mild head injury (GCS score of 13-15), 7 (14.58%) had moderate head injury (GCS score of 9-12) and 6 (12.5%) with severe head injury (GCS score of less than 8). Closed depressed skull fracture

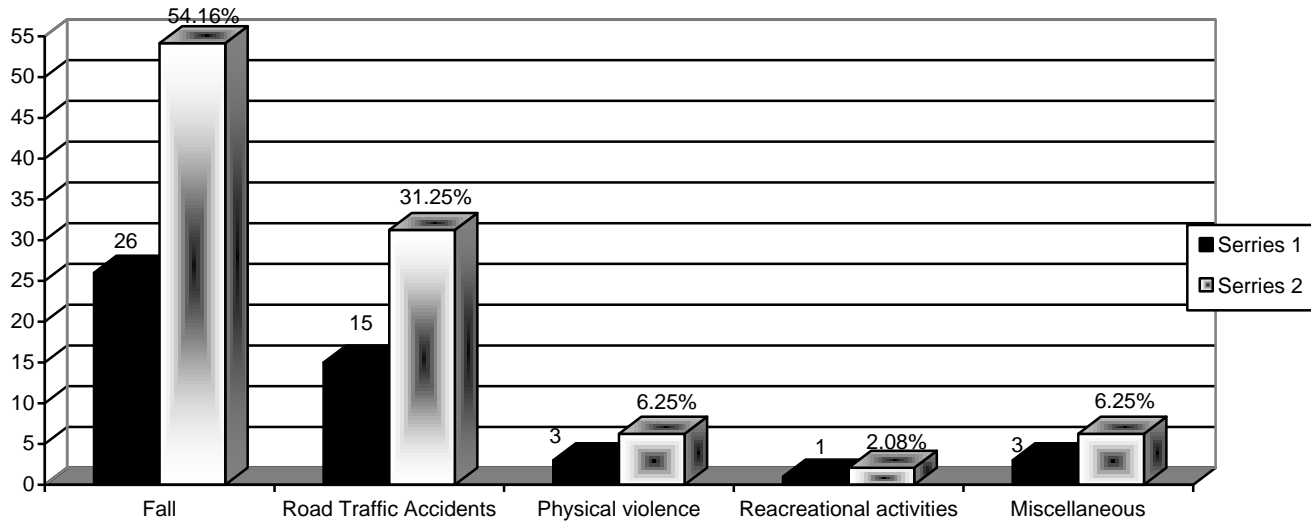


Fig. 1: Etiology of Depressed skull fracture.

was noted in 11 (22.91%) cases, while compound depressed skull fracture was in 37 (71.09%) cases.

The incidence of depressed skull fracture was 8 (16.67%) in frontal bone, 8 (16.67%) in fronto-parietal, 10 (20.8%) in temporal, 13 (27.08%) in parietal, 5 (10.41%) in occipital, 2 (4.17%) on superior sagittal sinus, 1 (2.08%) on confluence of sinuses and 1 (2.08%) on transverse sinus.

Associated intracranial lesions were extradural hematoma 16 (33.3%) Contusions 15 (31.25%) debridement and elevation of depressed fragments. The dura was found to be intact in 25(%), Dural tear 23 (47.92%) and in driven bone fragment 7 (14.58%).

All patients underwent wound (52.08%) and tom in 23 (47.92%) of cases. Of those who had undergone elevation of the depressed fragments, 42 (87.5%) patients had the bone fragments replaced onto the fracture site immediately. In the rest either the bone was lost or badly contaminated.

Postoperatively, 35 (72.9%) patients showed excellent recovery, 6 (12.5%) were hemiparetic, 4 (8.33%) were having seizures and 2 (4.17%) remained in vegetative state, and 3 (6.25%) developed meningitis. 2 (4.17%) patients had surgical site wound infections. 1 patient developed pseudomeningocele. One patient had CSF for which he was re operated.

Table 1: Associated lesions.

S. No.	Lesion	Number	Percentage
1.	Extradural hematoma	16	33.3%
2.	Contusions	15	31.25%
3.	Dural tear	23	47.92%
4.	In driven bone fragment	7	14.58%

Table 2: Surgical Outcome.

S. No.	Feature	No of Patients	Percentage
1.	Complete recovery	35	72.9%
2.	Hemiparesis	6	12.5%
4.	Seizures	4	8.33%
6.	vegetative state	2	4.17%
7.	Surgical site infections	2	4.17%
	Meningitis	3	6.25%
8.	CSF leak	1	2.08%
9.	Pseudomeningocele	1	2.08%

DISCUSSION

During the present study 48 patients with depressed skull fracture were analyzed. Male are the dominating population. Here the ratio of male to female is 2.2 : 1. Ali M, Ali L, Roghani IS found this ratio to be 1.8 : 1.²

The commonest age group (54.1%) in this study is the pediatric population i.e. age 16 years and below. In agreement with previous studies done by Al-Haddad SA, Kirolos R, we found that the pediatric population made up more than half of the study population (52%).⁶

Fall followed by RTA were the common cause of DSF i.e. 54.16% and 31.25% respectively. Fall from roof top was common in urban and from trees and mountains in the rural areas due to their habits of flying kites and climbing up. Children were at special risk to road traffic accident during school timing. Physical assault (6.25%) was though not a common cause, however most of the victims were from uneducated and far off areas. Previous workers have highlighted similar findings.²

In the present study it was noted that depressed skull fracture was located in 16.67% cases in frontal bone, 16.67% in fronto-parietal, 20.8% in temporal, 27.08% in parietal, 10.41% in occipital, 4.17% on superior sagittal sinus, 1 (2.08%) on confluence of sinuses and 1 (2.08%) on transverse sinus. These figures are not much different than those mentioned in the studies of Ali M,² Adelaye and Sayi.⁸ Robert F et al reported depressed skull fractures in 48% of frontal and 37% of parietal bones, 50% of frontal and 33.3% of parietal bones were the common sites for depressed skull fractures.⁹ A Adelaye and Sayi has reported 36.8%, 39.5% in frontal and parietal bones respectively. Occipital and temporal were uncommon locations.

Depressed skull fractures are commonly associated with intracranial injuries as well. These depend on severity and type of injury.³ In the present series associated intracranial lesions were extradural hematoma (33.3%) Contusions (31.25%), Dural tear (47.92%) and in driven bone fragment (14.58%). Study conducted by Hossain MZ noticed similar findings to our study.¹⁰

Although depressed skull fractures can be treated conservatively, Most of the cases need surgical management.^{2,3} We operated 48 cases because of clear surgical and cosmetic indications. Although controversial, still putting the patient's own bone pieces after washing has been largely acceptable.¹¹ Coleman, and Kriss et al are in favor of utilizing of bone pieces when the injury is not more than 24 hours.¹² Similarly some other workers have also reported good results of immediate replacement of depressed bone pieces.¹¹

The following picture was seen during three months follow up of patients. There was complete recovery

in 72% patients. Infections in 4.17 cases, meningitis in 6.25%, seizures in 8.33%. 4.17% patients remained in vegetative state. 12.6% were having hemiparesis. CSF leak and pseudomeningocele was seen rarely. Infection has been a matter of concern in depressed skull fractures which range from 2.5% to 10.6%.¹² Factors labeled responsible are longer duration since injury has occurred, improper wound care in the local hospital, Dural tear, replacing the bone fragments after elevation and not culturing the necrotic materials from the wound. In our study, the overall postoperative infection rate was 10.42% (surgical site infection + meningitis). This figure is comparable to the incidence quoted in the literature.^{2,6} Seizures are more common if there is concomitant brain contusions and intracranial hematoma or post traumatic amnesia of more than 24 hours.¹⁴ The incidence of seizures can be reduced by closing the Dura and elevating depressed bone pieces. Any patient who has had seizures, after a craniotomy or depressed fracture should advise not drive or operate dangerous machinery.¹⁴ The prevalence of 8.33% of epilepsy in our study is comparable with other series which quoted the prevalence around 10%.^{6,15}

CONCLUSION

Depressed skull fractures are common in children. Anticonvulsants and antibiotics are effective in prevention of epilepsy and infection during perioperative period. Early surgical treatment is extremely desirable when fracture is more than 5 mm depressed and open depressed skull fractures. The outcome of depressed skull fracture depends on severity of injury and presence of other associated intracranial lesions.

Address for Correspondence:

Dr. Riaz-ur-Rehman

Alnoor Drug Agency, Small Industrial Estate

Kohat Road, Peshawar

Email: Drriazurrehman@yahoo.com

Cell No: 03339250932

Land line: 091-2324601

REFERENCES

1. J. Robert Kirkwood, ed. Head trauma, in essential of neurosurgery, 1st ed. Churchill living Stone, New York 1990: 263.
2. Ali M, Ali L, Roghani IS. surgical management of depressed skull fracture: JPGMI 2003; (17) 1: 116-123.

3. Geisler F H, Manson PN. Traumatic skull and fascial fractures. In Rangachary SS, Elenbogen R G, editors. Principals of neurosurgery. Second edition. New York: Elsevier, Mosby; 2005: P. 329-380.
4. Qureshi NH. eMedicine specialities: Skull Fracture. eMedicine [from webMD on internet]. Nov 10, 2009. Available from: <http://emedicine.medscape.com/article/248108-overview>
5. Ringl H, Scherthaner R, Philipp MO, Metz-Schimmerl S, Czerny C, Weber M, et al. Three-dimensional fracture visualisation of multidetector CT of the skull base in trauma patients: comparison of three reconstruction algorithms. Eur Radiol 2009 Oct; 19 (10): 2416-24.
6. Al-Haddad Sa, Kirolos R. A 5-year study of the outcome of surgically treated depressed skull fractures: Ann R Coll Surg Engl 2002; 84 (3): 196-200.
7. Van den Heever HJ, Van der Mervve JJ. Management of depressed skull fractures. Selective conservative management of nonmissile injuries J neurosurgery 1985; 71: 186.
8. Mlay SM, Sayi EN. The management of depressed skull fractures in children at Muhimbili medical centre, Dar es Salam Tanzania, East Afr Med J 1993; 70 (5): 291.
9. Kriss et al 1969 cited by Robert F, et al. Non surgical treatment of compound depressed skull fracture. J. Trauma 199, 35 (3): 441.
10. Hossain MZ, Mondle M S, Hoque MM. Depressed Skull Fracture : Outcome of Surgical Treatment. TAJ 2008; 21 (2): 140-146.
11. Blankenship JB, Chadduck VM, Boop F. Repair of compound depressed skull fractures in children with replacement of bone fragments.
12. Kriss et al 1969 cited by Robert F, et al. Non surgical treatment of compound depressed skull fracture. J. Trauma 199, 35 (3): 441.
13. Wilberger J, and Chen DA. The skull and meninges, management of head injury. Neurosurgery clinical of north America 1991; 2 (2): 341.
14. Mlay SM. Head injury in children, A study of 120 cases. E. Afr. Med J 1985; 62: 877.
15. Pagni DA. Posttraumatic epilepsy, incidence and prophylaxis. Acta Neurochir 1990; 50: 38-47.