

Surgical management and Outcomes of Depressed Skull Fractures

HAIDER ALI¹, MOHAMMAD MUSHTAQ², NAEEM UL HAQ³, MUHAMMAD ANWAR ULLAH⁴, SAQIB ALI⁵, ANWAR SHAH⁶

¹Registrar Neurosurgery Department, Lady Reading Hospital, Peshawar

²Assistant Professor Neurosurgery Department, Frontier Medical and Dental College, Abbottabad

³Assistant Professor Neurosurgery Department, Mardan Medical Complex/ Bacha Khan Medical College, Mardan

⁴Neurosurgeon, DHQ Teaching Hospital, Timergara

⁵Assistant Professor, Data Analyst, Department of Computer Science, University of Agriculture Faisalabad

⁶Associate Professor Neurosurgery, Khalifa Gul Nawaz Hospital Bannu

Corresponding author: Dr Naeem ul Haq, Email: brainsurgeon1978@yahoo.com, Cell No: +92 335 9192492

ABSTRACT

Objective: To determine the outcomes of surgical management in patients presented with depressed skull fractures.

Study Design: Prospective Study

Place and Duration of Study: Conducted at Neurosurgery department of Mardan Medical Complex/ Bacha Khan Medical College, Mardan during the period from 16th January 2019 to 15th January 2020.

Methodology: 65 patients of both genders with ages were 10 to 60 year were included in this study. Patients were aged between 12-70 years of age. After taking informed written consent from all patient's/parent/guardians, detailed demographics age, gender, body mass index cause of fracture, type of fracture and site of fracture were recorded. CT scan was performed on all patients. Depressed fracture of more than 5 mm, cosmetically disfiguring fractures and fracture over the sinuses were operated. Patients were held under examination for 12-weeks. Glasgow Coma Scale (GCS) was used for final outcome. Data was analyzed by SPSS 27.0.

Results: Out of all the patients, male patients were 45 (69.23%) and female patients were 20 (30.76%). 35 (53.85%) with ages <30, 20 (30.76%) with ages 30 to 50 and 10 (15.38%) with ages >50 were reoperated in study. Mean body mass index was 20.04±3.14 kg/m². The most common cause of the injury was road traffic accident 45 (69.23%) followed by fall from the height 20 (30.76%). 40 (61.53%) were compound fracture and 25 (38.46%) were closed fracture. 55 (87.5%) cases were treated surgically and 10 (12.5%) patients were treated conservatively. 45 (69.23%) patients were completely recovered, 10 (12.5%) were moderately disabled and 7 (10.77%) were severely disabled and 3 (4.61%) were died.

Conclusion: If treated promptly most of the cases of compound depressed skull fracture revealed good results but outcomes of the depressed skull fracture revealed contingent severity of injury and absence or presence of intracranial lesion.

Key words: Depressed skull fracture, Non-missile injuries, Compound skull fracture, conservative management

INTRODUCTION

A depressed skull fracture is a frequent neurotraumatic condition that occurs after an accident. When a piece of skull bone is pushed inward by a distance equal to or more than the width of the calvarium, a skull fracture is considered to be depressed [1]. The application of high-energy forces to the head leads in a fracture of the skull. The kinetic energy of the hitting item, the geometry of the striking object, the direction of the impact force, and the anatomic location of the impact all have a role in determining the degree and type of skull fracture [2].

Skull fractures may occur with or without brain injury as a result of an accident. Patients who are otherwise healthy and in whom the fracture may be the only clear evidence [2] are more likely to have conventional DSF symptoms than those who are not. When DSF is accompanied with scalp laceration, it is referred to as an open DSF; otherwise, it is referred to as a simple DSF [3]. The treatment of compound depressed fractures is a surgical emergency, and if they are not treated quickly and correctly, they may result in consequences such as meningitis and cerebral abscess after therapy, osteomyelitis of the skull after treatment, and epilepsy. Both conservative and surgical treatment options are available depending on the kind of fracture; however, complex fractures may be managed without the need for surgery [4].

The etiology is often post-traumatic, as in the case of falls or automobile accidents. The majority of patients with depressed skull fractures report a loss of consciousness lasting less than an hour, with a further 25% describing loose awareness [5] after the injury. C-T scan heads and X-rays of the skull are significant research methods that may be used to detect fractures of various types and positions, depression, and brain damage. The treatment of depressed skull fractures will be determined by the severity of the depression, the extent of external communication, and the presence of neurological abnormalities. Operating indications in depressed skull fractures include the following: complex depressed fractures, cerebrospinal fluid leaking, depression greater than the inner table of the non-depressed bone, local neurological deficits induced by pressure of a depressed fragment, related lesions other than the underlying blood pressure, and the presence of a depressed fracture on the head for cosmetic reasons [7, 8].

Patients who did not need traditional surgical therapy were handled with the same care as those who did, but in a more cautious manner, until an infection or other complications required further surgical intervention. Early diagnostic identification and treatment of skull fractures aid to reduce morbidity and mortality while also assisting in the achievement of maximum functional and cosmetic rehabilitation outcomes. The aim of this study was to

evaluate the outcomes of depressed skull fractures that were treated conservatively or surgically in the past.

MATERIAL AND METHODS

This prospective study was conducted at atNeurosurgery department of Mardan Medical Complex/ Bacha Khan Medical College, Mardanduring the period from 16th January 2019 to 15th January 2020. Total 65 patients of either gender with ages 10 to 60 years were enrolled in this study. Patient's detailed demographics were recorded after taking informed written consent. Patients who did not have depressed skull fracture, demised before examination and below than 10 years were excluded. Causes of depressed skull fracture, duration since injury, type of fracture, site of fracture, cause of fraction clinical condition and CT scan findings were recorded. CT Scans were performed on all patients. DSF 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. Antibiotics and anticonvulsants were given to the patients. Patients were followed for 12-Weeks. Outcomes were assessed by GCS. Categorical variables were assessed by frequency and percentage but descriptive variables were calculated by standard deviation. Complete data was analyzed by SPSS 27.00. version.

RESULTS

Male patients were 45(69.23%) and female patients were 20 (30.76%). 35(53.85%) with ages <30, 20(30.76%) with ages 30 to 50 and 10(15.38%) with ages >50 were reordered in study. Mean body mass index was 20.04±3.14 kg/m². The most common cause of the injury was road traffic accident 45(69.23%) followed by fall from the height 20 (30.76%). Table 1

Table 1 Demographical details on presented cases. (n=65).

Variable	Frequency	%age
Gender		
Male	45	69.23%
Female	20	30.76%
Age(years)		
Below 30	35	53.85%
30 to 50	20	30.76%
50 to 65	10	15.38%
Mean Age	18.21±7.32	
Mean BMI	20.04±3.14	
Cause of fracture		
Road Traffic Accident (RTA)	45	69.23%
Fall from height	20	30.77%

40(61.53%) patients had compound fracture and 25 (38.46%) had closed fracture. 35(58.46%) cases were temporal, 15(23.07%) cases were frontal, 9(13.84%) cases were parietal, 3(4.16%) cases were occipital and 3(4.16%) were other sites of fracture. Table 2

55 (87.5%) cases were treated surgically and 10 (12.5%) patients were treated conservatively (Table 3).

45(69.23%) patients were completely recovered, 10 (12.5%) were moderately disabled and 7(10.77%) were severely disabled and 3(4.61%) demised. (Figure1)

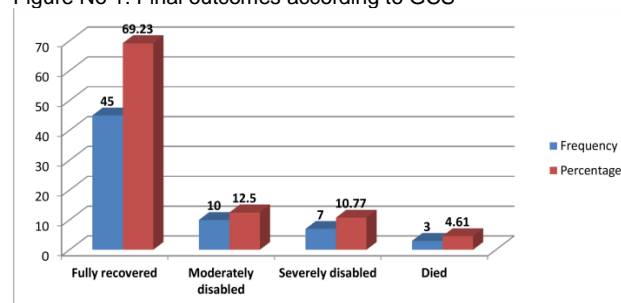
Table 2 : Types and sites of Depressed skull Fractures. (n=65).

Variable	Frequency	%age
Types of fracture		
Compound	38	58.46%
Closed	27	51.23%
Sites of fracture		
Temporal	35	53.84%
Frontal	15	23.07%
Parietal	9	13.84%
occipital	3	4.16%
other	3	4.16%

Table No 3: Mode of treatment. (n=65).

Variable	Frequency	%age
Mode of treatment		
Surgical management	55	87.50%
Conservative management	10	12.50%

Figure No 1: Final outcomes according to GCS



DISCUSSION

Globally, head injuries remain an important public health problem and contribute significantly to high morbidity, mortality and long term disability [11]. In present study 80 patients of both genders were presented. Patients were aged between 12-70 years. Majority of patients in our study were ages between 5 to 15 years. These results showed similarity to the study by Mushtaq et al [12], in their study most common age group was 5 to 16 years. In present study 45(69.23%) patients were males and female patients were 20 (30.76%). 35(53.85%) with ages <30, 20(30.76%) with ages 30 to 50 and 10(15.38%) with ages >50 were reordered in study. Mean body mass index was 20.04±3.14 kg/m². Many of previous studies reported male patients were predominant and road traffic accidents were the major cause of depressed skull fractures followed by fall from height [13, 14]. Two factors typically influence the pattern of skull fracture. The first element is the impact force. The other aspect is the impact ratio. The impact rate even if scattered in wide areas by high energy, as in the case of a head injury to an individual who is wearing a motorcycle helmet, sometimes does not produce a skull fracture.

Major head injury, in developing countries, is a major issue in the intracranial injury. In the young population, it can be fatal. [15, 16] The treatment of these patients can be carried out using both conservative and surgical approaches according to cosmetics and the practical In

our study 40(61.53%) patients had compound fracture and 25 (38.46%) had closed fracture. 55 (87.5%) cases were treated surgically and 10 (12.5%) patients were treated conservatively. Among these 45 (69.23%) patients were completely recovered. 10 (12.5%) were moderately disabled and 7(10.77%) were severely disabled and 3(4.61%) patients were died. The relationship between GCS arrival and last functional result was positive in our research. These results are similar to previous studies [16]. Studies have shown that GCS is a strong predictor of GOS performance [17-18]. These are also good tools for evaluating the original neurological condition and the eventual outcome.

A study conducted by Asif M et al [13] in which they operated 100 patients of depressed skull fractures and they reported 55% had GCS 13-15.

Ali M and Ali L [19] have confirmed focal deficit in 14 % and 9 % had CSF leaks, 7 % had extradural Haematoma, and 15 % of patients had gross Skull Deformation in a 7-year study of 98 cases of depressed fractures. The indications of emergence from surgical elevations of depressed skull fractures are also identified as the clinical and radiological features. In most cases, GCS patients have persistently increased ICP either because of a localized intracranial or parenchymal lesion or because they have diffuse brain oedema. Urgent exploration, debridement, and elevation of depressed fracturing can be desired due to a variety of reasons and these include surgical debridement of infected injury, uplifting depressed-kidney segment of the skull, removal or resection of an acute extradural or subdural haematoma, hard repair in cases where the dural tear is not present. In our study we found that CSF leak was the commonest complication followed by loss of consciousness, this rate of complication of DSF is comparable to many of previous studies in which CSF was documented in 25 to 40% patients followed by loss of consciousness [20-21].

CONCLUSION

Head injury with DSF is common in frontal region and often presented with EDH. Patients with mild head injury should be managed conservatively and those with moderate-to-severe head injury (when the fracture is larger than 5mm) should be managed operatively. The use of antibiotics and anticonvulsants had effective results during peri-operative periods to avoid infection and epilepsy. Early definitive diagnosis and management of skull fracture decrease morbidity and mortality as well as help achieving maximal functional and aesthetic rehabilitation. Use of GCS in conjunction with the CT findings is most helpful in early management of DSF.

REFERENCES

1. Ali M, Ali L, Roghani IS. Surgical management of depressed skull fracture. *JPMI* 2003;17:23.
2. Khan AH. Depressed skull fracture epidemiology and avoidance of its complication. Thesis, Punjab University, Lahore, 2004.
3. Parker R. Anatomy of head injury anatomy. *SurgInt* 2000;51:209.
4. Fitzsimmons-Francis C, Morris P. Prehospital care: Triage and trauma scoring. *SurgInt* 2001;52:25.
5. Mendelow AD, Campbell D, Tsementzis SA, Cowie RA, Harris P, et al. (1983) Prophylactic antimicrobial management of compound depressed skull fracture. *J R CollSurgEdinb* 28: 80-83.
6. Van den Heever CM, van der Merwe DJ (1989) Management of depressed skull fractures. Selective conservative management of nonmissile injuries. *J Neurosurg* 71: 186-190.
7. Nnadi MO, Bankole OB, Arigbabu SO. Outcome of surgically treated non-missile traumatic depressed skull fracture. *Niger Postgrad Med J*. 2014;21(4):311-4.
8. Rehman L, Ghani E, Hussain A, Shah A, Noman MA, Khaleeq Uz Z. Infection in compound depressed fracture of the skull. *J Coll PhysiciansSurg Pak*. 2007;17(3):140-3.
9. Blankenship JB, Chaddock WM, Boop FA. Repair of compound-depressed skull fractures in children with replacement of bone fragments. *PediatrNeurosurg*. 1990;16(6):297-300
10. Wylen EL, Willis BK, Nanda A. Infection rate with replacement of bone fragment in compound depressed skull fractures. *Surg Neurol*. 1999;51(4):452-7
11. Al-Derazi T, Das K, Gupta PK, Thajudeen BA, Ravindra J. Management strategy of depressed skull fractures. *Pan Arab J Neurosurg*. 2008;12:80-5.
12. Mushtaq, Muhammad Junaid, Mian Iftikhar-Ul-Haq. Spectrum of Head Trauma at Tertiary Care Military Hospital CMH Quetta, Pakistan. *Pak. J. of Neurol. Surg.* -Vol. 17, No. 1, Jan. -Jun., 2013.
13. Muhammad Asif, et al. Depressed Skull Fracture Management of 100 Cases at DHQ Teaching Hospital/Sahiwal Medical College Sahiwal. *Pak. J. of Neurol. Surg.* - Vol. 21, No. 3, Jul. - Sep., 2017.
14. Ahmad S, Afzal A, Rehman L, Javed F. Impact of depressed skull fracture surgery on outcome of head injury patients. *Pak J Med Sci*. 2018;34(1):130-134. doi:10.12669/pjms.341.13184
15. A. Tamimi, M. Abu-Elrub, A. Shudifat, Q. Saleh, K. Kharazi, I. Tamimi 'Superior Sagittal Sinus Thrombosis Associated with Raised Intracranial Pressure in Closed Head Injury with Depressed Skull Fracture' *Pediatric Neurosurgery* 2005; 41:237-40.
16. Nikita G Rolekar. Prospective study of outcome of depressed skull fractures and its management. *IJMHS* 2014 | Vol 3 | Issue 12. DOI: 10.5455/ijmsph.2014.271020141.
17. Satardey RS, Balasubramaniam S, Pandya JS, Mahey RC. Analysis of Factors Influencing Outcome of Depressed Fracture of Skull. *Asian J Neurosurg*. 2018;13(2):341-347. doi:10.4103/ajns.AJNS_117_16.
18. Jennett B, Snoek J, Bond MR, Brooks N. Disability after severe head injury: Observations on the use of the Glasgow Outcome Scale. *J Neurol Neurosurg Psychiatry*. 1981;44:285-93.
19. Ali L, Badar A. Management of Depressed Skull Fracture. *J Saidu Med Coll Swat* 2021;11(1):30-33.
20. Lihai Ren, Dangdang Wang, Xi Liu, Huili Yu, Chengyue Jiang, and Yuanzhi Hu . Influence of Skull Fracture on Traumatic Brain Injury Risk Induced by Blunt Impact *Int J Environ Res Public Health*. 2020 Apr; 17(7): 2392-99.
21. Ersahin Y, Mutluer S, Mirzai H, Palali I. Pediatric depressed skull fractures: analysis of 530 cases. *Child Nerv Sys*. 12 (6): 323-31.