

Original Research Article

A study on pattern of skull fractures due to head injury

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ABSTRACT

Background: Skull fractures are very serious type of trauma occurring in 15% of severe head injuries, and there is a consistent association between the presence of cranial fracture and a higher incidence of intracranial lesions, neurological deficit, and poor outcome. Objectives were to study the various patterns of skull fractures and associated intracranial injuries.

Methods: A prospective case series study of 50 patients with skull fractures due to head injury was selected from December 2021 to December 2022 at Srinivas Institute of Medical Sciences & Hospital, Mangalore. Out of the 50 cases, the majority were found to be co-existing with intracranial injuries, but few cases showed the presence of skull fractures alone. Among the selected patients, the clinical profile, and radiological profile was undertaken. Appropriate descriptive statistics were used to analyze the findings and to draw inferences.

Results: There were 34 males and 16 females. Maximum cases were found in the age group of 31-40 years. The common cause of fracture was road traffic accident (70%) followed by assault (22%); Of the various skull fractures, linear fracture (66%) was the commonest type followed by comminuted fracture and then by depressed fracture. Common associated injuries were extradural hematoma (42%) EDH followed by intracerebral contusion (32%).

Conclusions: Common causes of skull fractures are Road Traffic Accidents, assault by blunt weapons and falls from height. The commonest age group affected is 31-40 years. Skull fractures may or may not be associated with intracranial injuries.

Keywords: Skull fractures, Head injury, EDH

INTRODUCTION

"National advisory neurological diseases and stroke council, USA (1969), defined "head injury" as a morbid condition caused by obvious or subtle structural changes to the scalp, skull, and/or contents of the skull as a result of mechanical pressures with high rates of death and morbidity.¹ Head injuries are a serious public health concern. Although a skull fracture is typically accompanied by some degree of brain damage, brain injury on its own is not rare. The study of the pattern of skull fractures in these cases is important as the head being the most exposed and prominent part of the body

becomes most susceptible to injuries. The skull fractures, especially by blunt force offer varying diagnostic and medico-legal problems to the forensic experts and to the clinicians.²

Head injury occurrences are currently rising alarmingly, especially in more densely populated locations with heavy traffic and quick industrialization expansion. No head injury is too little to be disregarded or too significant to cause despair. These head injuries are typically brought on by car accidents, height falls, forceful assaults, etc. Just a few papers from emerging nations describe the distribution of skull fractures.

The goal of the current study is to categorize skull fractures by age, sex, mode of injury, site, kind of fracture, and concomitant cerebral injuries.³

Aims and objectives

The aim of the study is to describe various patterns of skull fracture and associated intracranial injuries.

METHODS

Source of data

Study conducted at a tertiary care hospital at SIMS RC Mangalore from (December 2021 to December 2022).

Type of study/study design

It was prospective study.

Duration of study was of 1 year.

In this prospective study, 50 cases of skull fractures caused by head injury were selected from December 2021 to December 2022 at Srinivas institute of medical sciences hospital. Only those cases were selected which had a definite history of head injury by blunt force e.g., road traffic accidents, fall from height, assault by blunt weapons etc are included in this study.

Present study did not include head injury cases in which skull and brain had been completely obliterated. Moreover, cases with cerebral damage without any fractures of the skull were not chosen for the research. The reason and method of the accident, the time and location of the incident, duration of survival after head injury, and approximate age of individual were all noted down in a brief account of the injury from family and eyewitnesses. With CT, head injuries were thoroughly evaluated. The scalp was inspected for any signs of hematomas or contusions. The pattern of skull fractures (depressed, linear, sutural, comminuted), extension, and location of each skull fracture was carefully investigated. Blood vessel damage of brain parenchyma and concomitant intracranial haemorrhages were seen.

Equipment used

Patients are scanned using SIEMENS Healthineers SOMATOM go. Up 64 slice machine. It is a modified fifth generation scanner. Slice Thickness-1 mm, 2 mm, 5 mm and 10 mm available gantry tilt ± 20 degree, matrix size of 512x512, KVp-80 to 130 MAS-60 to 200

Analysis statistical

Every piece of information was gathered and, if appropriate, transformed into percentages. For comparing CT results of various variables, the chi-square test and Spearman's correlation coefficient were utilized. and

parameters, p calculated using DATAtab programme.

Sample size

$$(n) = Z^2 p(q) / d^2$$

Confidence interval= 96%

Z score=2.05

p=Prevalence 3.2 %, d=error rate=4%, q=(p-1)

RESULTS

Out of the 50 cases, the maximum cases (38 %) were noted in the age group of 31-40 years. The number of male subjects affected was significantly higher than the female counterparts. Out of 50 cases, 34 were males (68%) (Table 1).

Table 1: Age and sex distribution.

Variables	N	Percentage (%)
Age group (in years)		
<15	4	8
15-30	12	24
30-40	19	38
40-50	10	20
>50	5	10
Total	50	100
Sex		
Male	34	68
Female	16	32

Table 2: Clinical profile of the patients with head injury.

Variables	N	Percentage (%)
Aetiology		
RTA	11	22
Assault	4	8
Fall		
Type of fracture		
Linear	33	66
Depressed	5	10
Comminuted	12	24
Location		
Frontal	19	38
Temporal	14	28
Parietal	10	20
Occipital	7	14
Associated injuries		
EDH	21	42
Subdural hematoma (SDH)	5	10
Intracerebral contusion (ICH)	16	32
Sub-arachnoid haemorrhage (SAH)	8	16

The most common cause of fractures is road traffic accidents (70%) followed by assault (22%) and falls (4%).

In the present study, out of various types of skull fractures, 33 cases (66%) sustained linear fractures, 12 cases (24%) sustained comminuted fractures, and 5 cases (10%) showed the presence of depressed fractures.

The frontal bone was most involved in 19 (38%) cases followed by the temporal and parietal bone. In our study, fracture was most associated with extradural hematoma (42%) followed by intracerebral contusions and subarachnoid hemorrhage (Table 2).

DISCUSSION

A skull fracture is a break in one or more of the skull's bones brought on by a blow to the head. Only when these skull fractures directly or indirectly impact the brain are they considered dangerous. Nonetheless, skull fractures are associated with serious injuries and a poor prognosis.⁴ A force powerful enough to shatter the skull may also cause brain injury if it spreads beyond the skull. Shattered pieces of the skull might lacerate, bruise, or harm blood vessels in the brain.⁵

The skull can sustain comminuted, depressed, linear, or diastatic fractures. Comminuted skull fractures, in which the bone is broken up into several fragments, can cause the brain to be cut by shards of bone.⁶ When a blunt item strikes a small section of the skull directly with great force, depressed skull fractures occur. Fragment comminution begins at the point of greatest impact and spreads centrifugally. Due to the thin bone and vulnerability of the frontoparietal area to an attacker's onslaught, most depressed fractures occur there.⁷

An open or closed depressed fracture is possible. By definition, open skull fractures have a skin laceration above the fracture that passes through the middle ear structures and paranasal sinuses, allowing connection between the cranial cavity and the outside world. A clean open fracture might also be infected.⁷

The majority of patients in Thangaraj research on blunt-force craniocerebral injuries were caused by falls from heights (34%) and auto accidents (32%). Yet, in this research, falls from height accounted for just 8% of occurrences, with road traffic accidents accounting for 70%.⁸ Most people were found to be in the 31-40 age range (38%). External injuries may or may not be present in all cases of head injury. Wounds of the scalp due to blunt force must be looked upon as potentially serious no matter how they are produced.⁹ These statements hold good in the present study also. In 16 % of cases of trauma to the head by blunt force, there were no external injuries on the head but these had severe cranial or intracranial lesions which proved fatal.

Research done by Pathak and Manish et al concluded that linear fractures accounted for 66% of all skull fractures, with comminuted and depressed fractures coming in second and third. It is consistent with the current study that linear fractures (38.8%) are the most frequent fractures, followed by comminuted fractures (27.7%), and depressed fractures (11.1%).^{10,11}

In our study, skull fractures were seen in 41 (92%) of the fracture patients. Most EDH participants (41%) were between the ages of 20 and 40, which is a little older than earlier research. Adults between the ages of 21 and 40 are most affected by head injuries, with a mean age of 35.7 years, according to Chiewvit et al research. Kraus also revealed that head injuries are more frequent in adults between the ages of 20 and 40.^{12,13}

On the other hand, investigations on SDHs infrequently include information on the existence of contemporaneous cranial fractures, 16% of the patients in our research also had a fracture. In the elderly, 8% of SDH cases were linked to cranial fractures, according to Kuhn et al in the general population, the incidence was 26.3%.¹⁴

Limitations

The limitations of this study are the small number of patients. The number of patients in paediatric and adolescent age group also has been very small to study the outcome in that age group.

CONCLUSION

Common causes of skull fractures are road traffic accidents, fall from height and assault by blunt weapons. The commonest age group affected is 31-40 years. Skull fractures may or may not be associated with intracranial injuries. The commonest type of skull fracture is the linear fracture followed by comminuted fracture. EDH is the most common intracranial lesion associated with skull fracture followed by SDH.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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