

ORIGINAL ARTICLE

Types of Fractures in Cranial Vault Followed by a Head Injury: A Retrospective Cross Sectional Study

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ABSTRACT

Aim: To assess the types of fracture of cranial vault followed by head injury.

Study Design: Retrospective cross-sectional study

Place and duration: This study was conducted at Pakistan Institute of Medical Sciences Islamabad, Pakistan from June 2020 to June 2021.

Methodology: A total of 125 patients with head injury were considered in this study. Total 69 (55.2%) patients were from rural areas and 56 (44.8%) were from urban areas. Types of cranial vault fractures, their radiological findings and cause of injury were analyzed.

Result: Out of 125 patients, 102 were identified with severe head injuries. 53 (42.4%) had a fracture in the frontal bone. 49 (39.2%) patients had got injured due to violent assault.

Conclusion: Most of the patients who had received a head injury and frontal bone fracture were from rural areas. The most commonly fractured bone in these cases is the frontal bone. The commonest cause of injury in the head was a violent assault.

Keywords: Head injury, cranial vault fracture, frontal bone fracture, violent assault.

INTRODUCTION

Frontal bone fracture has been noticed as the most frequently fractured bone in incidences of head injury. It is the basic bone in the brow area. Its fracture affects the sinus floor. The fracture of the frontal bone most likely occurs in the center of the forehead because it is the weakest and thinnest part of the frontal bone. Its injury can cause its indentation. A considerable quantity of force is needed for the fracture of the frontal bone. Hence, the possibility of the presence of collateral damage including face and neurological trauma is also possible. Moreover, leakage of CSF fluid, damage to the ducts of the sinus, and eye injury can also present [1].

Frontal bone fracture alone comprises 37% of cranial bone fractures. Le Fort, I fracture out of maxillary fractures is associated with a frontal bone fracture. There are three parts of frontal bone; largest and most surface occupying is called a squamous part, superciliary arch and supraorbital margins. Nasal pyramids prominence protects frontal bone and naso-orbital region from traumas. The frontal bone has resistance against mechanical impacts. It can withstand up to 1600 pounds of intense force.

Sports-related trauma, violent assault and road traffic accidents are common etiological factors behind frontal bone fracture [2]. Workplace accidents, falls and domestic violence can also cause this fracture. The place from where the bone is weakest and fragile is the brow. The bone mostly breaks from that portion. Physical intervention can also make a dent in the bone rather than breaking it. Some studies suggest that if the site of the injury in the frontal bone is higher, then only an x-ray is not enough to diagnose it. Tomography would also be needed [3].

Frontal bone fractures are sometimes confined only to the face, however, sometimes it expands to the intracranial region. Restorative treatment is often required in this regard [4]. Fracture of the backplate of the skull vault is termed as a Calvary wound. It is not as dangerous and causes some intracranial diseases as a result of defilement of CSF fluid and intracranial drainage. In severe cases, the fractured part can extend backward and damage the cerebral tissue [5]. The present study is a retrospective cross sectional study giving a review of all the head injury cases of one year in in our hospital. The study aims to the investigation of etiology of injury of the cranial vault and to assess the types of fracture of cranial vault followed by head injury.

METHODOLOGY

This study was conducted at Pakistan Institute of Medical Sciences Islamabad, Pakistan from June 2020 to June 2021. The study was conducted on a total of 125 patients. 76 (60.8%) of them were male and 49 (39.2%) were female. Patients were selected after building inclusion and exclusion criteria. Written informed consent was signed by the patients or their attendants. According to inclusion criteria, patients that consented to the study had got a head injury and a fracture in the skull vault were considered in the present study. The ages of the individuals selected for the study ranged from 20 years to 55 years. A strong exclusion criterion was also set to refrain from any error in the final result. Pediatric patients with head trauma, patients who already had a neurological disorder such as epilepsy, stroke, dementia, etc., were not included in the study. Furthermore, the clinical ethics and moral committee

assessed and proved the process of research and examination.

The clinical records of all the patients who presented with a head injury in the department were collected. Radiological findings of the fractures in the skull were noticed according to X-ray and computed tomography. Out of all the head injuries reported, the frontal bone fracture was affirmed radiologically. Clinical examination of the patients was done according to the graphs built after the affirmation. Those graphs were assessed for relevant information regarding the injury.

Proforma for the clinical examination and other information was filled. Statistical analysis was done by IBM SPSS version 26. The mean along with the standard deviation of the quantitative variables was calculated and given.

RESULT

A total of 125 individuals were selected to participate in the study. Total 69 (55.2%) patients were from rural areas and 56 (44.8%) were from urban areas. This percentage depicts that most of the patients were from rural dwellers (As shown in table 1)

The causes of head injury identified in the participants of the present study are Road traffic accidents, violent assault, firearm injury, fall, industrial injury, and sports injury (As shown in table 2) As per the research results, the most significant and common reason behind head injury in the participants was violent assault (37.6%). The second frequent cause of head injury was firearm injury. Head injury from a fall was least frequent. Head injury from a fall only occurs when the fall is extremely severe.

According to these statistics, frontal bone fracture is the most frequently found fracture in head injury accounting for 42.4% of all the fractures. Temporal bone fracture is the second most common with a percentage of 25.6%. Then come occipital, nasal and parietal bone fractures accounting for 12%, 10.4% and 9.6%, respectively (As shown in table 3)

Table 1: Distribution of patients from Rural and Urban areas

Area of residence	Number	Percentages
Rural	69	55.2
Urban	56	44.8

Table 2: Frequency and percentages of the causes of the head injuries

Causes of head injury	Number	Percentage
Road traffic accident	15	12
Violent Assault	49	39.2
Firearm injury	35	28
Fall	5	4
Industrial injury	6	4.8
Sports injury	15	12

Table 3: Types of skull fractures and their prevalence in head injury

Bone fracture	Number	Percentage
Frontal Bone	53	42.4
Temporal Bone	32	25.6
Occipital Bone	15	12
Nasal Bone	13	10.4
Parietal Bone	12	9.6

DISCUSSION

The injuries of frontal bone are the commonest ones in maxillofacial injuries. They have higher occurrence as compared to other types of fractures of the skull including maxillofacial fractures [6]. The frontal bone is formed to be an unpaired bone. In the embryonic stages, this bone forms the prevalent part of the skull. A frontal suture isolates this bone at the start of life.

According to the research of Shakeel et al. timely management of moderate and severe head injuries is crucial because they can lead to fatality. Depressed fractures also need urgent management. If surgery is needed, it should be done on an early basis in these fractures because early management can be life-saving decreasing the rate of morbidity and rate of mortality [7]. Skull fractures followed by a blunt force can also present without a wound on the scalp as per the study of Rupani et al. who carried out his study on 100 dead bodies in King George's Medical University [8]. His studies showed 50% of fissured fractures, 30% of depressed fractures and 20% of comminuted fractures.

As stated by McIntosh et al. the trauma that causes frontal bone injury can also lead to gas in the parenchyma of the brain which is called intracerebral pneumocephalus. It is common in golf club injuries [9]. According to the research of Julie et al., the management of skull injuries is done according to two concepts. One is that a proper treatment of the acute injury should be done. The second is that proper preventive measures should be observed for secondary insult and treatment of the secondary injury should be done.

A number of complications occur followed by head trauma such as infections and psychiatric complications. It is important for the clinician to be able to identify and treat the complications to reduce the morbidity and mortality of the patients [10]. There are many preventive measures that can help in avoiding head injuries and frontal bone injuries. In an urban environment, a common reason for head injuries is road traffic accidents. It can be avoided by using helmets. The helmets appear to be highly protective in many intracranial and extracranial injuries [11].

CONCLUSION

The most common type of fracture of the skull vault is a fracture of the frontal bone. Fracture of frontal bone commonly results from road traffic accidents and violent assault. This type of injury is more prevalent in rural dwellers as compared to urban dwellers. Early diagnosis and management of fractures of the frontal bone are essential to save the patient from permanent brain damage and death.

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