

Frontal Bone Fractures In Maxillofacial Injuries: A Retrospective Study In In A Regional Trauma Centre

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ABSTRACT

Objective: To evaluate and study the incidence and frontal bone fractures associated with maxillofacial trauma in a regional Trauma Centre.

Methodology: Data of 96 patients who reported with Maxillofacial injuries to Santosh Medical College and Hospital, Ghaziabad in a regional Trauma Centre in Ghaziabad was screened to assess the incidence with age, gender, mechanism of injury, alcohol consumption, degree of involvement and associated injuries.

Results: Out of 96 patients who presented with maxillofacial trauma, 13 patients had frontal bone fracture. The sample size depicted significant sex predilection, out of 13 patients, 12 patients were male and 1 patient was female. Majority of the patients were in second decade of life. The mean age distribution was 21-25 years (41.67%). RTA without the use of a helmet or seatbelt was the most common cause of injury (83%), due to the nature of impact caused by deceleration. Alcohol abuse was observed in 10 out of 13 patients. The most common maxillofacial injury associated is ZMC Fracture 41% & mandible fracture accounting for 29%. Anterior table fractures were observed in 5 patients and fractures involving both anterior and posterior table was observed in 8 patients. None of the cases has isolated posterior table fractures. One case involved anterior cranial fossa fracture.

Conclusion: Frontal bone injury are often associated with maxillofacial trauma although its incidence reported in literature appears to be on the decline. With stricter enforcement of traffic laws regarding the use of helmets and seatbelts, fortunately, the life-threatening complications have reduced significantly. A higher incidence of the fractures in our study can be attributable to blatant violations of these enforcements in conjunction with alcohol abuse.

Keywords: Frontal sinus injury, Frontal bone fracture

INTRODUCTION

Frontal bone fractures with associated involvement of the frontal sinus injuries are relatively uncommon injuries in maxillofacial trauma, comprising just around 2- 5% of all maxillofacial injuries.¹ The incidences of these fractures vary invariably depending upon the region and the population.² Frontal bone fractures are usually of high velocity impact such as motor vehicle

accident, interpersonal violence, industrial accident and sporting accidents. The frontal bone is an important component of the complex skeletal junction between the cranium and face.³ Injury to this area can occur in isolation or, more commonly, may be associated with other injuries to the cranium, brain and midfacial skeleton. These injuries can have significantly devastating sequelae if managed inadequately.⁴ This article aims to review the incidence of Frontal bone injury in Maxillofacial Trauma in a regional trauma centre. It also aims to review the mechanism of injury, age, sex, alcohol abuse, type of frontal sinus fracture.

Material and Methods

A retrospective study along with literature review to analyze the incidence of frontal bone fractures, mechanism of injury, age & gender predilection and the type of frontal bone fracture and in regional trauma center in Santosh Medical College and Hospital, Delhi NCR. A total of 96 patients with maxillofacial injuries were evaluated from July 2021 to July 2022. Only 13 patients diagnosed with frontal bone fractures were included in the study. Data such as age, gender, aetiology, alcohol abuse, fracture pattern was collected for analysis (Table 1).

Results:

In our study, a total of 96 patients diagnosed with maxillofacial injuries were analysed and frontal bone fractures were 13 with a frequency of 13.6%. Majority of patients were male 92% (n=11) and 8% of patient (n=1) were female (Graph 2). Majority of young adults between 21-25 years of age (41.67%) with a mean age of 22.5 in general. In extreme age groups, one case was seen in an infant 8.33% (n=1) one was seen and 8.33% above the age of 50 years (n=1) (Graph 3). Trauma from RTA was the most common cause for frontal bone fracture accounting for 83% of injuries, 9% was attributed to motor vehicle accidents without seatbelt and fall from height was 9%. No cases of sport injuries was reported in our cases. All fractures of the frontal bone occurred in conjunction with other maxillofacial fractures (n=13). None of the cases occurred in isolated nature (Graph 4). Associated fractures included ZMC 41%, mandible fracture 29%, orbit 18%, NOE 12%. Fractures involving the anterior table accounted for 50% of the cases and with involvement of both anterior and posterior table was 50%. No cases of isolated posterior table were found.

Discussion:

The incidence of frontal bone fractures is well reported in the literature however with a lower incidence rate between 5 and 15% (Table 2).⁵⁻¹³ Our study found a higher frequency of frontal sinus fractures 13.6%. This increase in frequency reported in our study was due to failure of implementation of stringent traffic laws pertaining to the use of helmets for both the rider and the pillion for motorcyclists/ cyclists, lack of use of seatbelts for motor vehicles, driving under the influence of alcohol, lack of automation of traffic lights (Graph 1). Road Traffic accidents can further be segregated into those involving car, bike, cyclists, pedestrians and constitute large fraction of maxillofacial injuries. Gadipatti et al reported 76.4% cases in

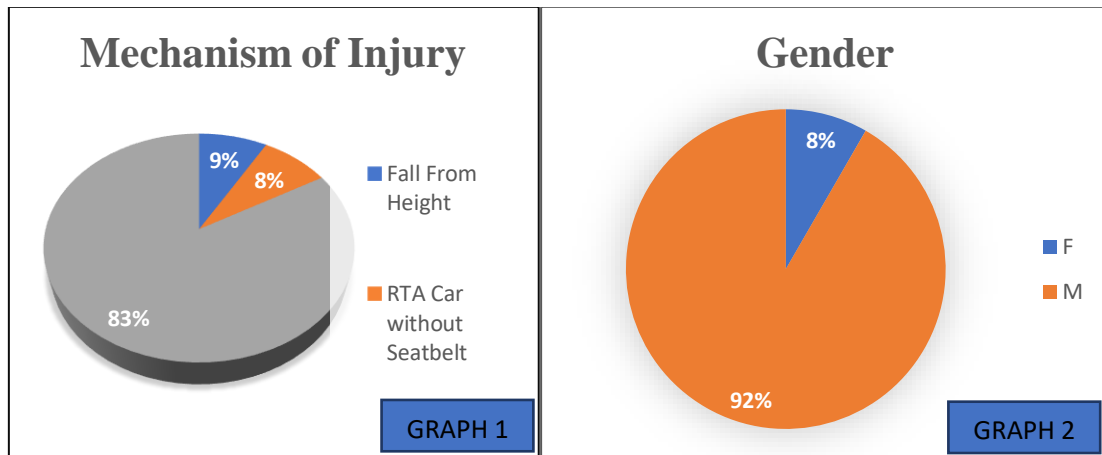
their study. Bonavolontà et al reported an association of 57.1% patients out of 1720 patients with maxillofacial fractures.¹⁴ This however, may vary according to a particular region or country where a study is carried out and is characteristic of patient data base in each of these areas.¹⁵⁻¹⁶ Use of seatbelts alone is considered to be more effective than the use of airbags to prevent fractures. However, in RTAs with speed greater than 55.7 km/hr the use of both seatbelts and air bags have been proven to be ineffective to protect against maxillofacial injuries.¹⁷

In our study, only one patient of motor vehicle accident was involved who was not wearing a seatbelt. This could also be a reflection of socioeconomic status of a particular region who use a vast number of 2 wheelers for commuting. Similarly, the use of helmets has proved to be effective in reducing morbidity and mortality with maxillofacial injuries.¹⁷ This study has reported the use of helmets. In our study, all the patients on 2 wheelers were not using helmets, disregarding their own safety. Rodruigues et al have reported the incidence of RTA associated fractures as 75.2%. Strong et al have reported the incidence of RTA associated fractures as 87.2%. Rodrigues found the greatest incidence of associated injuries with orbital fractures followed by mandible. Nogueria et al also reported that the highest associated injury was orbital fracture followed by orbitozygomatic and nasal bone fractures. Their analysis was coherent with the values reported by Schulz.¹⁸ In our study, we found the incidence of 79% associated fractures with 41% ZMC, 29% mandible, 18% orbit and 12% with NOE fractures. Isolated anterior wall fractures was found in 50% and a similar 50% was found involving the anterior and posterior table. No case of isolated of posterior table was found in our study. Montovani et al reported on 23 patients with anterior wall involvement out of 24 patients.¹⁹ Both anterior and posterior fractures in only 4 of their patients. Strong et al stated in their study 57% of fractures both anterior and posterior table. Out of these 57%, 27% were isolated anterior table fractures and 3% isolated posterior table fractures and the rest were frontal recess injury and through and through injuries to anterior cranial fossa.²⁰

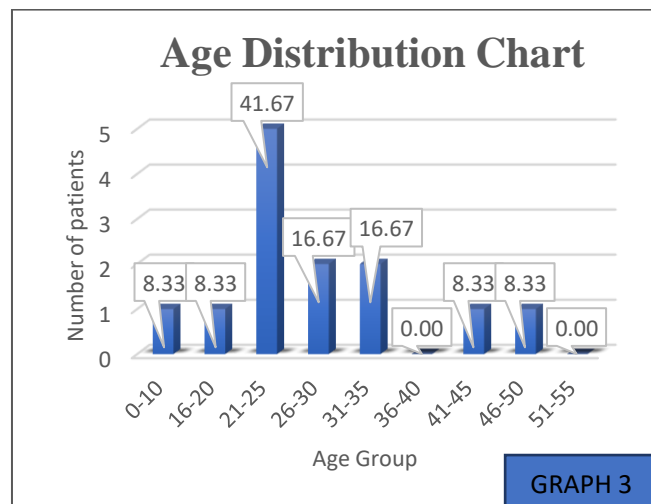
CONCLUSION:

Fractures of the frontal bone have been reported in decreasing incidence due to modernisation of laws and stringent. In this retrospective study in a trauma centre in Ghaziabad we have recognised as RTA to be common cause of frontal bone fractures even with the evolving era of technology. RTA still remains a major etiology for maxillofacial fractures with involvement of frontal bone, despite the evolution of safety laws and stringent norms.

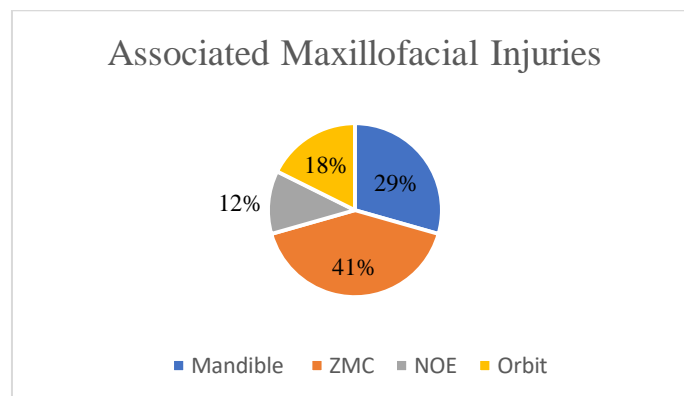
GRAPHS:



GRAPH 1 & GRAPH 2 SHOWING MECHANISM OF INJURY AND GENDER PREDILECTION



GRAPH 3 SHOWING AGE DISTRIBUTION PATTERN & GRAPH 4 SHOWING ASSOCIATED INJURIES



TABLES:

Frontal Bone Fractures in Maxillofacial Injuries

Sr No .	Patient Name	Age/ Sex	Mechanism of Injury	Alcohol Consumption	Degree of Involvement	Associated Maxillofacial Fractures
1.	Dharam veer	25/M	RTA Two Wheeler Without Helmet	No	Left Frontal Bone Fracture Anterior Table Fracture	Right ZMC Fracture Left Parasymphysis Fracture Right Subcondylar Fracture
2.	Sonu	47/M	RTA Two Wheeler Without Helmet	Yes	Frontal Bone Fracture Anterior And Posterior Table	Bilateral ZMC Fracture
3.	Ravi	25/M	RTA Two Wheeler Without Helmet	No	Left Frontal Bone Fracture Anterior Table Fracture	Left ZMC Fracture
4.	Bedram	2/M	Fall From Height 1 st Floor	No	Frontal Bone Anterior And Posterior Table Fracture	NOE Fracture
5.	Rinku	26/M	RTA Car without Seatbelt	Yes	Comminuted Frontal Bone Fracture Anterior & Posterior Table Fracture	Bilateral ZMC Fracture
6.	Gaurav	21/M	RTA Two Wheeler Without Helmet	Yes	Right Frontal Bone Anterior Table	Left Orbital Floor & Infraorbital Fracture
7.	Ruksar	45/F	RTA, Two Wheeler Without Helmet	No	Frontal Bone Fracture Anterior Table	-
8.	Ash	25/M	RTA,	Yes	Frontal Bone	NOE Fracture

	Mohd.		Two Wheeler Without Helmet		Fracture Involving Anterior And Posterior Table	
9.	Sumit	30/M	RTA, Two Wheeler Without Helmet	Yes	Frontal Bone Fracture Anterior Table	Left ZMC with palatal split and symphysis fracture, Bilateral Plane II Nasal Injury Neck laceration
10.	Vinay	20/M	RTA, Two Wheeler Without Helmet	Yes	Depressed Frontal Bone Fracture (Anterior And Posterior).	Frontal laceration, medial orbital wall fracture of right side
11.	Vishal	21/M	RTA, Two Wheeler Without Helmet	Yes	Frontal Bone Fracture Involving Anterior And Posterior Table,	Bilateral Le Fort II, Left Orbital Floor Fracture, Symphysis Fracture
12.	Nadeem	35/M	RTA, Two Wheeler Without Helmet	Yes	Frontal Bone Anterior And Posterior Fracture	Bilateral ZMC, Bilateral Le Fort II, Right Parasymphysis Fracture
13.	Ramshrestha	35/M	Fall From Height 2 nd Floor	Yes	Frontal Bone Fracture Involving Anterior And Posterior Table	Left ZMC, Left Mandibular Body Fracture

TABLE 1 SHOWING THE INCIDENCE OF FRONTAL BONE FRACTURES IN MAXILLOFACIAL INJURIES

Author	%
Ramos et al.	2.8%
Kyrgidis et al	2.9%
Bonavolontà et al.	1.8%
Povolotskiy et al.	0.5%
Ghosh and Gopalkrishnan	2.5%
Kanala et al.	1.3%
Goedecke et al.	2.1%
Roccia et al.	4.1%
Tiwari P et al	5-20%
Marinheiro et al	21.5%

TABLE 2 SHOWING INCIDENCE REPORTED IN OTHER STUDIES

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