

Midface Fracture Pattern in a Tertiary Care Hospital – A Prospective Study

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ABSTRACT

Introduction: The midface with multiple bones and cavities is vulnerable to fractures more commonly. Mid face is one of the most frequently injured areas of the body, accounting for 23-97% of all facial fractures.

The classic LeFort type of fractures are uncommon now a days and a more common picture is more severe forms primarily due to the high speed vehicles that are a major cause of these fractures. It therefore has become imperative to determine the commonly occurring patterns of fractures in this area in the present time for a better insight into diagnosis and treatment plans.

The aim of this article was to determine fracture patterns in midface trauma to ease the treatment planning in such a scenario.

Materials & Method: This prospective study included 62 patients who reported to a tertiary hospital during a 2-year period and were diagnosed with suspected mid face fractures. The etiology and pattern of fractures of mid face was assessed based on history, clinical examination and imaging data. The diagnosis of a fracture was based on the clinical history, signs and symptoms, manual examination and correct interpretation of radiographs and CT. Mid-face fractures were recorded as Le Fort I, II, III, dentoalveolar, palatal, zygomatic complex fracture, nasal bones, naso-orbital-ethmoidal complex, orbital and zygomatic arch fractures. Etiological factors were classified as road traffic accidents, fall, and assault and sports injuries.

Results: During the 2-year period, a total of 62 patient were included. Patients' ages ranged from 17 to 65 years, with 60 males and 2 females. The most common fracture in this study was found to be zygomatic complex fractures (50%) and road traffic accident (RTA) was identified as the main cause of fracture in this study (75.8%).

Discussion: The mid face fractures are more common in males due to the propensity of males to use two wheelers more than females. The prominence of the zygoma makes it more vulnerable to fractures than rest of the bones in the midface. Increased speed of vehicles and lack of discipline in following traffic rules has resulted in RTA being the biggest etiological factor in mid face injuries

Keywords: Maxillofacial injuries; Zygomatic complex; RTA

Introduction

Middle third of the facial skeleton that gives facial form is primarily made of the maxilla and zygomatic bone. The elasticity of the maxilla and the crumpling effect of the midface helps to minimize the impact to the brain. Mid face is one of the most frequently injured areas of the body, accounting for 23-97% of all facial fractures [1].

The high speed motor vehicles and changed environment with increased violence and contact sports has led to a drastic change from the conventional picture of classic LeFort type midface fractures to a more varied severe type of pattern in recent times. Therefore, epidemiological assessment of maxillofacial fractures is paramount to help the surgeon in aiding early diagnosis and plan treatment measures in a better way. The epidemiology of facial fractures varies in type, severity and cause, depending on the population studied. The etiology of maxillofacial fractures have changed with time and the primary causes are traffic accidents, assaults, falls, sport-related injuries and warfare [2].

Thorough knowledge of the biomechanics of the region and the mechanical environment after a fracture allows the surgeon to select and place the osteosynthesis material appropriately for adequate treatment with a low complication rate [3].

The successful treatment and rehabilitation of patients with fractures of the midface requires a profound knowledge of the anatomy and pattern of the fracture. The goal of treatment should be the restoration of function and appearance. The pre-morbid form and function should be re-established as much as possible. The knowledge in the pattern of the fracture, are most helpful to establish the pretraumatic appearance [4].

This study determined the pattern of injuries associated with trauma to the midface to emphasize diagnosis and plan the management of the patient. The aim of this study was to assess the incidence and pattern of maxillofacial injuries resulting from various etiological factors. This would help in gaining knowledge of the standard pattern of fractures one would be expected to encounter in a developing country in the present scenario.

Materials and Method

With the approval of ethical committee of the institution, the prospective study was conducted on patients suspected with mid face fractures who reported to the tertiary care hospital in Bangalore, India during this period. The etiology was determined based on the case records elicited from the patients / attenders. The pattern of fractures of mid face was assessed by clinical examination and imaging records which included radiographs/CT. Data was collected regarding etiology of injury and pattern of fracture of mid-face. The diagnosis of a fracture is based on the clinical history, signs and symptoms, manual examination and correct interpretation of radiographs and CT. They were then classified as Le Fort I, II, III, dentoalveolar, palatal, zygomatic complex fracture, nasal bones, naso-orbital-ethmoidal complex, orbital, zygomatic arch fractures and combinations. Etiological factors were classified as road traffic accidents, fall, assault and sports injuries. Soft tissue lacerations were not recorded as associated injuries. All patients satisfying the inclusion criteria were included in this study and informed consent was obtained from all individual participants included in the study. The surgical procedures were performed in accordance with the relevant guidelines and regulations laid out by the ethical committee of the institution and Helsinki guidelines and standard surgical practice. During this period, 62 patients fulfilled the inclusion criteria and were part of the study.

The only consistent parameter in the study was the fracture location while the others were variables. The variables included the age, sex, presence of concomitant fractures elsewhere and etiology. These were not part of the specific parameter in the study.

Statistical Analysis

Descriptive statistics

It includes expression of different study variables terms of Frequency and Proportions.

Inferential statistics

Chi square test was used to compare the distribution of mid – face fractures based on the age group and aetiology of the fracture among study patients

Selection criteria

Inclusion criteria

- I. All clinically and radiographically confirmed mid-face fracture patients including those with concomitant injuries to other parts of the craniofacial region.
- II. All age groups.
- III. Both genders

Exclusion criteria

- I. Subjects who had already undergone treatment for the midface fractures.
- II. Malunited fractures.
- III. Injuries only restricted to soft tissues of the region

Results

During a 2-year period, a total of 62 patient with midface fractures reported to the institution. Patients’ age ranged from 17 to 65 years (Figure 1 and Table 1). The age group 21 – 40 constituted the biggest group of patients (40 patients) representing 64.5% of total population. There were 13 patients (21 %) in the 41-60-year group, 8 (12.9 %) in the below 20-year age group and only 1 in the above 60 age group (1.61 %). There were 60 males (96.8%) and 2 females (3.2%). 13 out of the 62 patients (20.9 %) had more than one fracture.

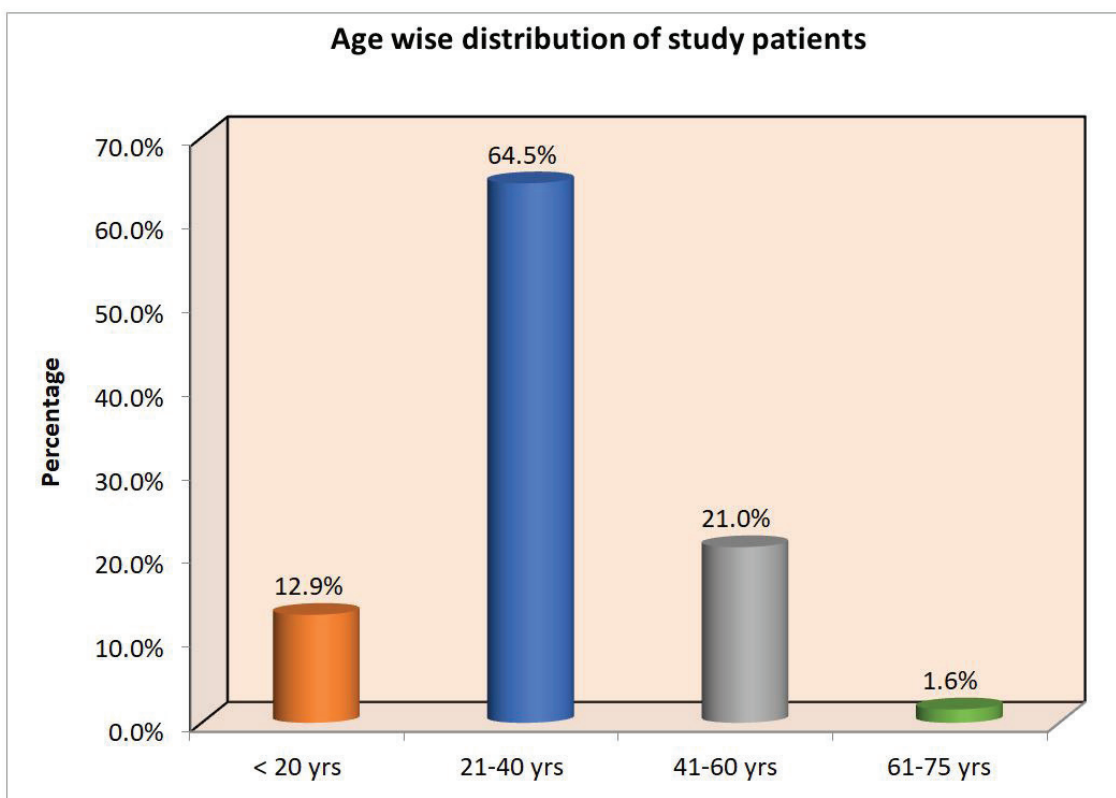


Figure 1: Distributions of patients according to age

Mid Facial Fractures	< 20 yrs		21-40 yrs		41-60 yrs		61-75 yrs		Total	
	n	%	n	%	n	%	n	%	n	%
Lat. Wall of Orbit	0	0.0%	1	2.5%	0	0.0%	0	0.0%	1	1.6%
Lefort I	0	0.0%	1	2.5%	2	15.4%	0	0.0%	3	4.8%
Lefort I + Nasal	0	0.0%	2	5.0%	0	0.0%	0	0.0%	2	3.2%
Lefort I + Orbit	0	0.0%	1	2.5%	1	7.7%	0	0.0%	2	3.2%
Lefort 2	0	0.0%	2	5.0%	0	0.0%	0	0.0%	2	3.2%
Lefort II + NOE	0	0.0%	1	2.5%	0	0.0%	0	0.0%	1	1.6%
NOE fracture	0	0.0%	4	10.0%	1	7.7%	0	0.0%	5	8.1%
Orbit	0	0.0%	1	2.5%	0	0.0%	0	0.0%	1	1.6%
Palate	1	12.5%	0	0.0%	0	0.0%	0	0.0%	1	1.6%
Palate + Zyg. complex	0	0.0%	1	2.5%	0	0.0%	0	0.0%	1	1.6%
Zyg. complex + Dentoalv.	2	25.0%	0	0.0%	0	0.0%	0	0.0%	2	3.2%
Zyg. Complex	4	50.0%	19	47.5%	7	53.8%	1	100.0%	31	50.0%
Zyg. complex + Nasal	1	12.5%	2	5.0%	1	7.7%	0	0.0%	4	6.5%
Zyg. Arch	0	0.0%	5	12.5%	1	7.7%	0	0.0%	6	9.7%

Chi Square Value : 33.121; P-Value = 0.73

Table 1: Comparison of distribution of Mid facial Fractures based on the age group

Patterns of Midface fractures

Zygomatic complex fractures constituted the largest number (50%) (31 cases) in terms of site of fracture. This was followed by 6 cases of isolated zygomatic arch fractures (9.7%), 5 cases of NOE (naso orbito ethmoidal) fractures (8.1%), 3 cases of Lefort I (4.8%), 2 cases of LeFort II & 1 case each of orbital floor & palate fracture (1.6% each). The other 13 cases (20.9 %) were fractures involving more than one bones: LeFort I with orbital floor, LeFort I with nasal, LeFort II with NOE, Lateral wall of orbit, Zygomatic complex with palate, Zygomatic complex with dentoalveolar & Zygomatic complex with nasal bone (Figure 2).

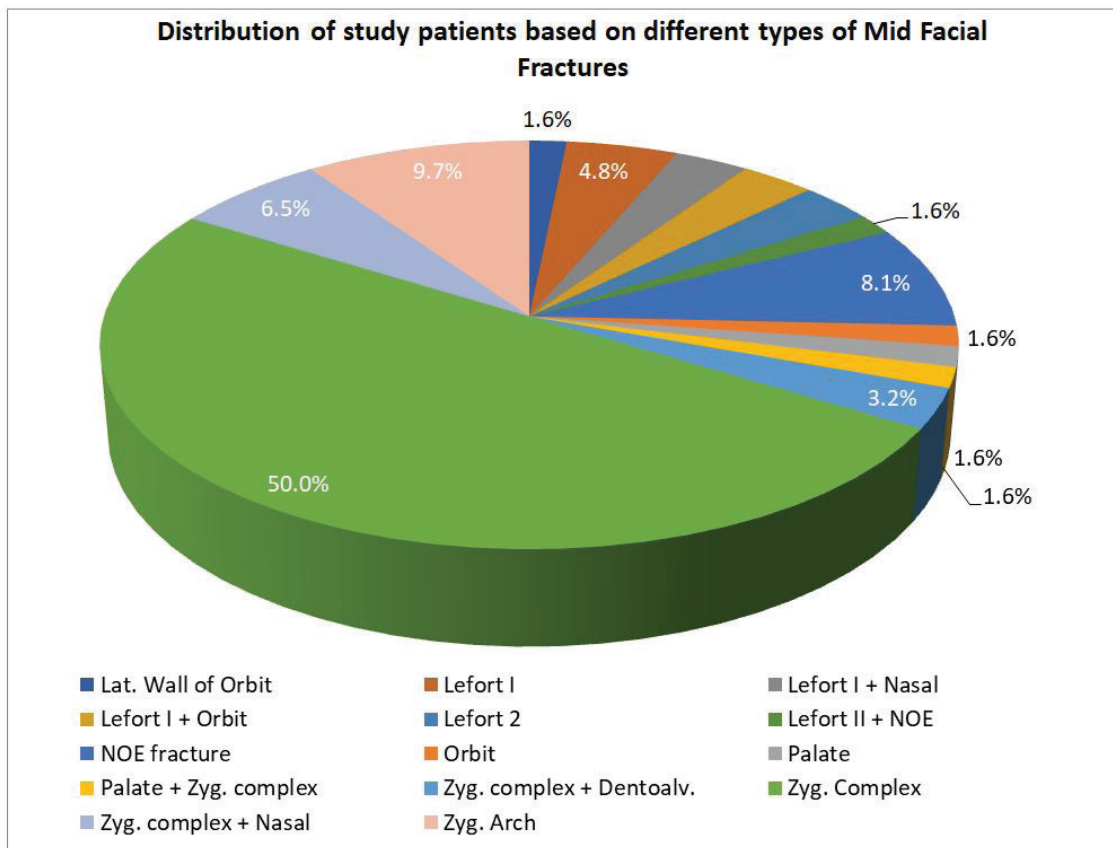


Figure 2: Distribution of study patients based on different types of Mid Facial Fractures

Etiology of Mid – Face fractures

Road traffic accidents (RTA) was identified as the main cause of fracture in this study (75.8%) (47 cases). The second most common cause was fall incidents, affecting 8 cases (12.9%). This was followed by assault (8.1%) (5 cases). In addition, fracture caused by sports injury and work accidents were (1.6%) (1 case each) as shown in Figure 3 and Table 2.

Mid Facial Fractures	Assault		RTA		Self Fall		Sports Injury		Work Place Injury	
	n	%	n	%	n	%	n	%	n	%
Lat. Wall of Orbit	0	0.0%	1	2.1%	0	0.0%	0	0.0%	0	0.0%
Lefort I	0	0.0%	3	6.4%	0	0.0%	0	0.0%	0	0.0%
Lefort I + Nasal	0	0.0%	2	4.3%	0	0.0%	0	0.0%	0	0.0%
Lefort I + Orbit	0	0.0%	2	4.3%	0	0.0%	0	0.0%	0	0.0%
Lefort 2	0	0.0%	2	4.3%	0	0.0%	0	0.0%	0	0.0%
Lefort II + NOE	0	0.0%	1	2.1%	0	0.0%	0	0.0%	0	0.0%
NOE fracture	1	20.0%	1	2.1%	3	37.5%	0	0.0%	0	0.0%
Orbit	0	0.0%	0	0.0%	1	12.5%	0	0.0%	0	0.0%
Palate	0	0.0%	1	2.1%	0	0.0%	0	0.0%	0	0.0%
Palate + Zyg. complex	0	0.0%	1	2.1%	0	0.0%	0	0.0%	0	0.0%
Zyg. complex + Dentoalv.	0	0.0%	2	4.3%	0	0.0%	0	0.0%	0	0.0%
Zyg. Complex	3	60.0%	22	46.8%	4	50.0%	1	100.0%	1	100.0%
Zyg. complex + Nasal	0	0.0%	4	8.5%	0	0.0%	0	0.0%	0	0.0%
Zyg. Arch	1	20.0%	5	10.6%	0	0.0%	0	0.0%	0	0.0%

Chi Square Value : 27.267; P-Value = 0.99

Table 2: Comparison of distribution of Mid facial Fractures based on the etiology

Using Chi Square test, the age group of the study patients and the etiology of the fractures were cross tabulated against the type of Mid facial fractures and it was identified that the distribution of the Mid facial fractures was not found to be statistically significant with the age of the participants ($p=0.73$) and the etiology of fractures ($p=0.99$). However, In this study, it was identified that Zygomatic complex fractures were more common in middle aged patients (21-40 years) ($n=19$)(30.6 %). The most common cause for this type were road traffic accidents ($n=22$) (35.4%).

Discussion

Maxillofacial fractures are one of the most common injuries and can be challenging to diagnose and treat. The pattern of fractures have drastically changed from the classic LeFort pattern to comminuted varieties due to the high speed road traffic accidents. The cause of facial injuries depends on a variety of contributing factors, including environmental, cultural and socioeconomic factors. Fractures of the midfacial region occurs most often because of automobile collision, workplace injuries and assaults resulting in trauma of maxilla, nose, zygoma and mandible. These fractures may involve important adjacent structures like nasal cavity, maxillary antrum, orbit, cranial nerves, major blood vessels and the brain, with disastrous consequences.

These epidemiological studies are regularly required to address the needs of the local population, thus helping the specialists to get a better understanding of the type of injury to be expected. Accumulating long-term data on maxillofacial trauma provides valuable information about the dynamics of accidents thus helping the authorities to formulate, develop and evaluate preventive measures.

Trauma is the leading cause of death in the first four decades of life and also contributes to a large extent to lost productivity, causing more loss of man hours than cardiac diseases and cancer combined [5,6]. The large percent of the cases were in the 2nd and 3rd decades of life because this group are the most mobile and tend to use motorcycles and scooters more than cars making them vulnerable to injuries. This is similar to those in the study by Mohammed Al Bokhamseen and workers [7], Mabrouk A et al [8] and Ziyad AlHammad et al. [9].

The overwhelming number of males (60 out of 62) in the study can be explained by the fact that they are more involved in physical activities like driving, etc and more prone to be involved in interpersonal violence. This is a common finding in Asian countries as mentioned in the study by Mohammed Al Bokhamseen and workers [7].

In our study, highest rate of incidence of fractures was caused by road traffic accidents which was very similar to other studies [7,9]. Lack of road safety awareness, bad road conditions without expansion of the motorway network, violation of speed limit, old vehicles which lack safety features, not adhering to safety measures like wearing seat belts or helmets, violation of highway code and use of alcohol or other intoxicating agents have all contributed to RTA being the most common cause.

In contrast EU countries have seen a drop in fractures due to RTA due to strict compliance of preventive measures, such as the obligatory wearing helmets & seat belts and the more aggressive enforcement of the law regarding drinking under influence. A contrasting evidence has been given in the study by Sam Thomas Kuriadom and co workers who found maximum incidence of fractures in RTAs in Dubai in pedestrians and the mandible was the most involved bone [10].

The high prevalence of zygomatic complex fractures in our study can be explained by the prominent position of the zygomatic bone on the face and therefore being more vulnerable to trauma followed by LeFort fractures. The significant number of cases showing multiple bone involvement can be attributed to the predominant etiology, RTA where high speeds have led to more severe injury. This is similar to studies by Mohammed Al Bokhamseen and workers⁷ & Mesgarzadeh, A.H et al. [11]. This is in contrast to midface fractures amongst military casualties where mandible was more commonly involved and in the midface, nasal fractures were predominant [12].

Conclusion

In conclusion, the mid face fractures were more common in males with the highest percentage in 21 – 40 years age group. It was observed that zygomatic complex was the most common site. RTAs was the biggest etiological factor of mid face injuries. Considering the large number of cases with RTA as the cause, there is a need to reinforce legislation regarding safety traffic rules strictly to minimize the injuries. Preventive programs, strict enforcement of rules regarding protective gear and punitive punishment for law breakers can result in a substantial reduction in incidence of these fractures.

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