

Analyzing the Incidence and Factors Responsible for Maxillofacial Trauma and Postoperative Malocclusion- A Retrospective Study

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ABSTRACT:

Introduction: The area that falls in maxillofacial specialty contains many vital and essential anatomical structures making treatment of maxillofacial trauma life-threatening demanding early and accurate treatment. Also, maxillofacial areas are the most prominent ones making it more susceptible to the various injuries with high mortality and morbidity.

Aims: Present retrospective clinical trial was aimed at establishing the incidence and associated etiological factors with maxillofacial trauma and also to identify various malocclusions seen post-operatively following the management of maxillofacial fractures.

Methods: The study included 76 subjects, both males (n=42) and females (n=34) with the age range of 19 years to 62 years and mean age of 42.7±7.53. The included subjects had the maxillofacial fractures determined by the appropriate radiographs (OPG/CT). The etiological factors considered were assault, road traffic accidents, falls from the height, sports injuries, and others (shot from the gun, animal bite, etc.). All the collected data were subjected to statistical evaluation to formulate the results.

Results: The results showed that the most common cause of maxillofacial fracture was road traffic accidents accounting for 72.36% (n=55) with the most common injury from two-wheelers by 67.10% (n=51), followed by fall from height (14.47%, n=11), assault (6.57%, n=5), and sports injury (3.94%, n=3). The least incidence was seen while walking on the road by 1.31% (n=1).

The Le Fort II fracture was most commonly seen in the maxillary fractures 11.84% (n=9). In the mandibular fractures most common fracture was parasymphysis fractures (30.26%, n=23) followed by condylar fracture (28.94%, n=22) and angle fracture (21.05%, n=16). The highest number of concomitant injuries were head injuries with 64.47% (n=49) followed by orthopedic injuries with 17.10% (n=13), and least associated were spine injuries shown by just one subject (1.31%). The highest incidence of malocclusion was seen as anterior open-bite in 12 subjects (15.78%), followed by 7.89% crossbite (n=6), and the least observed orthodontic complication was mandibular retrognathia in 1 subject (1.31%).

Conclusion: The present study concludes that the most common cause of maxillofacial trauma is road traffic accidents mainly by the two-wheelers with ZMC and mandibular parasymphysis being the most common fractures to be encountered with concomitant head injuries

Keywords: Incidence, Malocclusion Maxillofacial Fracture, Maxillofacial Injury, Retrospective, Road Traffic Accidents.

INTRODUCTION

Maxillofacial trauma accounts greatly for the injuries reported to the hospitals with varied etiology and prevalence in different places of the world owing to socioeconomic, cultural, environmental, and

ecosystem.¹ Maxillofacial trauma can either be concomitant with the other fractures of the pelvis, chest, extremities, spine and/or abdomen or it could be isolated and confined to only maxillofacial areas.² The extent, prevalence, and incidence of the maxillofacial injuries is largely determined by the age, fracture type, fracture cause, group, and geographical areas being considered.³ Mostly, the maxillofacial traumas are severe and complicated with airway obstructions resulting in complex treatments and outcomes.⁴

Awareness towards assessing and treating maxillofacial trauma is largely dependent on emergency care surgeons and clinicians. They also play a vital role in explaining the importance and treatment to the general population.⁵ It is of utmost importance to understand the etiology and incidence of maxillofacial fractures to formulate a treatment [plan and establish the preventive measures to reduce maxillofacial injuries in coming future].⁶

The most common etiology of maxillofacial trauma is attributed to road traffic accidents (RTA) especially motorbike accidents followed by physical assaults.⁷ These causes contributed to the increase in the incidence of maxillofacial traumas lately. Most of these traumas are complicated and require inter-disciplinary management by ENT, surgeon, ophthalmologist, maxillofacial surgeon, and/or plastic surgeon.⁸

Malocclusion following maxillofacial trauma is a common finding encountered mostly following the treatment of mandibular condyle fractures. This can be attributed to edema and the general physical state of the patient, where the approximation of the fracture segments is sometimes delayed to 1 week or more post-operatively.⁹ This time lag can result in malposition of fracture segments while repositioning, which further results in fracture healing to a non-favorable position and hence leading to various malocclusions. Treating these malocclusions depends on successful coordination of bone, teeth, muscles, neuromuscular compartments, and TMJ.¹⁰

The area that falls in maxillofacial specialty contains many vital and essential anatomical structures making treatment of maxillofacial trauma life-threatening demanding early and accurate treatment. Also, maxillofacial areas are the most prominent ones making it more susceptible to the various injuries.¹¹ These injuries are very commonly observed in the critical care units of the hospitals and with quite high mortality and morbidity rates leading to emergency care and also treating these injuries proves to be costly to many seeking treatment.

In the recent past, maxillofacial traumas including fractures and soft-tissue injuries are widely studied in the literature owing to the impact they cause on physical, emotional, functional, and aesthetic factors of the person suffered from these injuries.¹²

Hence, the present retrospective clinical trial was aimed at establishing the incidence and associated etiological factors with maxillofacial trauma and also to identify various malocclusions seen post-operatively following the management of maxillofacial fractures.

MATERIALS AND METHODS

The present retrospective clinical trial was carried out in Department of Dentistry, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar from the previous records of the patients presented with the maxillofacial fractures. The study included 76 subjects, both males (n=42) and females (n=34) with the age range of 19 years to 62 years and mean age of 42.7±7.53. The included subjects had the maxillofacial fractures determined by the appropriate radiographs (OPG/CT) depending on the advice by the surgeon. Also, only subjects with the post-operative photographs of the occlusion were included. The subjects with isolated nasal fractures, only soft-tissue injuries, dentoalveolar fractures, and pediatric subjects were excluded from the trial.

The following data was obtained from the hospital records as well as via questionnaire: Type and cause of the traumatic injury, concomitant injury, demographic details, post-operative malocclusion, and post-operative consequences. All the questions were to be answered by the subject itself. If this was not feasible relative/surgeon/attendants were made to answer the questionnaire. A thorough

examination concerning the number of fractures, sites of fracture, concomitant injury, and etiology was assessed.

The etiological factors considered were assault, road traffic accidents, falls from the height, sports injuries, and others (shot from the gun, animal bite, etc.). All the collected data were subjected to statistical evaluation to formulate the results.

RESULTS

The present retrospective clinical trial was aimed at establishing the incidence and associated etiological factors with the maxillofacial trauma and also to identify various malocclusions seen post-operatively following management of maxillofacial fractures and included 76 subjects, both males (n=42) and females (n=34) with the age range of 19 years to 62 years and mean age of 42.7 ± 7.53 were assessed for 1 year. The demographic data of the study subject are summarized in Table 1.

Etiology of the maxillofacial trauma was assessed and considered based on if the subject encountered assault, road traffic accidents, a sport associated injury, fall from a height, or others including animal bite or gun-shot injuries. The findings of the study are listed in Table 2. The results showed that the most common cause of maxillofacial fracture was road traffic accidents accounting for 72.36% (n=55) with the most common injury from two-wheelers by 67.10% (n=51), followed by fall from height (14.47%, n=11), assault (6.57%, n=5), and sports injury (3.94%, n=3). The least incidence was seen while walking on the road by 1.31% (n=1).

Concerning the fracture sites, they were divided into fractures of maxilla, mandible, ZMC fractures, orbital fractures, and frontal fractures. The Le Fort II fracture was most commonly seen in the maxillary fractures 11.84% (n=9). In the mandibular fractures most common fracture was parasymphysis fractures (30.26%, n=23) followed by condylar fracture (28.94%, n=22) and angle fracture (21.05%, n=16). In other associated fractures most commonly seen was zygomaticomaxillary complex fracture (65.78%, n=50). These findings are explained in Table 3.

Concomitant injuries associated with the maxillofacial fractures were also evaluated in the present retrospective clinical trials and the findings are summarized in Table 4. These findings showed that the highest number of concomitant injuries were head injuries with 64.47% (n=49) followed by orthopedic injuries with 17.10% (n=13), and least associated were spine injuries shown by just one subject (1.31%).

Malocclusions are commonly associated with maxillofacial trauma and fractures and also post-operatively after treating the trauma. In a total of 29 subjects (38.15%), malocclusion was seen after maxillofacial trauma. The highest incidence of malocclusion was seen as anterior open-bite in 12 subjects (15.78%), followed by 7.89% crossbite (n=6), and the least observed orthodontic complication was mandibular retrognathia in 1 subject (1.31%) as shown in Table 5.

Characteristic	Value
Total subjects	n=76
Mean Age (in Years)	42.7 ± 7.53
Age Range	19-62 years
Male	n=42
Female	n=34

Table 1: Demographic characteristics of the study subjects

Etiological Factors		%	n=76
Road Traffic	Total	72.36%	55
	Four-wheeler	3.94%	3

Accidents	Two-wheeler	67.10%	51
	Walking	1.31%	1
Fall from Height		14.47%	11
Assault		6.57%	5
Sport Injuries		3.94%	3
Others (Gunshot injuries and animal bite)		2.66%	2

Table 2: Etiological factors associated with the maxillofacial trauma

S. No	Fractures	%	n=76
Maxillary Fractures	Le Fort I	6.57%	5
	Le Fort II	11.84%	9
	Le Fort III	3.94%	3
Mandibular Fractures	Angle	21.05%	16
	Body	11.84%	9
	Parasymphysis	30.26%	23
	Condyle	28.94%	22
	Ramus	0.76%	1
	Symphysis	3.94%	3
	Coronoid	2.63%	2
	ZMC fractures	65.78%	50
	Frontal fractures	2.63%	2
	Orbital fractures	0.76%	1

Table 3: Sites associated with the maxillofacial trauma

Concomitant Injuries	%	n=76
Head Injuries	64.47%	49
Pelvis	2.63%	2
Chest	10.52%	8
Spine	1.31%	1
Orthopedic	17.10%	13
Abdomen	3.94%	3

Table 4: Concomitant injuries with the maxillofacial trauma

Orthodontic Complications	%	n=29
Cross-bite	7.89%	6
Open-Bite (Anterior)	15.78%	12
Open- Bite (Posterior)	6.57%	5
Open- Bite (Lateral)	3.94%	3
Maxillary Retrognathism	2.63%	2
Mandibular Retrognathism	1.31%	1

Table 5: Orthodontic Complications associated with the maxillofacial trauma

DISCUSSION

The present retrospective clinical trial was aimed at establishing the incidence and associated etiological factors with the maxillofacial trauma and also to identify various malocclusions seen post-operatively following management of maxillofacial fractures and included 76 subjects, both males (n=42) and females (n=34) with the age range of 19 years to 62 years and mean age of 42.7 ± 7.53 were assessed for 1 year. More male patients were seen to have suffered from maxillofacial trauma than female patients. These findings were in agreement with the studies by Boonkasem Set al¹³ in 2015 and Chalya PL et al¹⁴ in 2011 where authors have concluded the higher risk of maxillofacial trauma was in males.

Concerning the etiology of the maxillofacial trauma, the highest incidence was associated with the road traffic accident 72.36% (n=55) with the most common injury from two-wheelers by 67.10% (n=51), followed by fall from height (14.47%, n=11), assault (6.57%, n=5), and sports injury (3.94%, n=3). Similar findings were suggested by Zix ZA et al¹⁵ and Relly PL et al¹⁶ in 2016 where the main cause of maxillofacial trauma was listed as road traffic accident by two-wheelers. This can be attributed to the fact that two-wheelers are more economical and traffic friendly than four-wheelers in India.

Regarding the site of the maxillofacial fractures, Le Fort II fracture was most commonly seen in the maxillary fractures 11.84% (n=9). In the mandibular fractures most common fracture was parasymphysis fractures (30.26%, n=23) followed by condylar fracture (28.94%, n=22) and angle fracture (21.05%, n=16). In other associated fractures most commonly seen was zygomaticomaxillary complex fracture (65.78%, n=50). A higher incidence of ZMC fracture can be attributed to the most prominent location of the ZMC complex. These findings were consistent with the study of Manodh et al¹⁷ in 2016 where the mandibular fracture was seen commonly in subjects with maxillofacial trauma owing to the tendency of turning face to the side on blow out force application making mandible more prone to the fracture. The study by Manodh et al also confirms the findings of the present study that symphysis is a most common area to be fractured listing it as the weakest point due to long canine roots. These findings were also confirmed by Lee JH et al¹⁸ in 2010.

The highest number of concomitant injuries were head injuries with 64.47% (n=49) followed by orthopedic injuries with 17.10% (n=13). These findings were in agreement with the studies by Gadre et al¹⁹ in 2013 and by Chalya et al¹⁴ in 2011 where the most common concomitant injuries found were head injuries by 56 and 53% respectively. The least associated were spine injuries shown by just one subject (1.31%). These results were in contrast to the study by Mukherjee et al²⁰ in 2015 where the higher incidence of head injuries was seen (13%) along with maxillofacial fractures.

In the present study, in a total of 29 subjects (38.15%), malocclusion was seen after maxillofacial trauma. The highest incidence of malocclusion was seen was anterior open-bite in 12 subjects (15.78%), followed by 7.89% crossbite (n=6), and least observed orthodontic complication was mandibular retrognathia in 1 subject (1.31%). The similar findings were shown by Vega et al²¹ in 2011 who concluded that providing the delayed treatment or no treatment to maxillofacial fractures can lead to malocclusion. Also, Ellis et al²² in 2005 confirmed that even post-treatment malunion or inability of various anatomical structures to maintain harmony may lead to malocclusion.

CONCLUSION

The present study concludes that the most common cause of maxillofacial trauma is road traffic accidents mainly by the two-wheelers with ZMC and mandibular parasymphysis being the most common fractures to be encountered with concomitant head injuries. Hence, to decrease the incidence of maxillofacial trauma strict road traffic laws are need to be implemented with necessary education programs with traffic rules to be made compulsory especially to young individuals. Also, early management is warranted to decrease postoperative complications. The study had few limitations as a smaller sample size, short monitoring period, single institutional study, single

geographical area, and hence, this study could not depict the overall picture of the country. More prospective clinical trials with larger sample sizes and longer monitoring periods are required to reach the definitive conclusion.

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