



RETROSPECTIVE ANALYSIS OF PATTERN AND PREVALENCE OF MANDIBULAR FRACTURE : A CROSS-SECTIONAL OBSERVATIONAL STUDY.

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ABSTRACT

Introduction : The maxillofacial region is prone to injuries and fractures due to its protruding anatomical feature. The frequency of fracture around the mandibular region is higher than that of the other parts of the body.

Objective: This study was undertaken to study various aspects of mandibular fractures clinically and radiologically.

Materials and Methods: The study was conducted during the period from may 2016 to april 2018 on patients presented with facio-maxillary injury to the tertiary trauma care Ashwini Hospital, Cuttack, Odisha, India. Patients with mandibular fractures are included in the study.

Results : In this retrospective cross sectional study we analysed 95 patients presented with facio-maxillary injury with fracture mandible. Males sustained significantly more injuries as compared to females.

Conclusion: Use of seat belt, helmet and reduction in drunken driving has shown to reduce maxillofacial trauma.

KEYWORDS : Mandibular Fracture, road traffic accident, 3D face scan

Introduction

As the society gets urbanized, it affects the people's lifestyle leading to increased road traffic accidents, occupational hazards due to industrialization. Besides road traffic accident and violence, direct/indirect trauma may also occur due to sports activities, fall from height. Occasionally, it may also be secondary to certain disease like cystic lesion, neoplasms, and metabolic diseases. The maxillofacial region is prone to injuries and fractures due to its protruding anatomical feature. The fracture is defined as "breach in the continuity of bone".¹ The frequency of fracture around the mandibular region is higher than that of the other parts of the body.² Mandible is the second most commonly fractured bone after nasal bone, though it is the largest and strongest facial bone. Mandibular fractures can involve only one site or can often involve multiple anatomic sites simultaneously.³

Mandible is the only mobile bone of facial skeleton and there has been a significant increase in number of cases in recent years. It is embryologically a membrane bone and is more commonly fractured than the other bones of face. Mandibular fractures occur twice as often as midfacial fractures.⁴ The energy required to fracture it being of the order of 44.6–74.4 kg/m, which is about the same as the zygoma and about half that for the frontal bone.⁵ It is four times as much force is required to fracture maxilla. Bone fractures at site of tensile strain, since their resistance to compressive forces is greater.⁶ Areas that exhibit weakness include the area lateral to the mental protuberance, mental foramen, mandibular angle, and the condylar neck.⁷ The main causes of maxillofacial fractures worldwide are traffic accidents, assaults, fall, and sport-related injuries. Alcohol consumption is a well-known contributing factor to mandibular fractures derived from assault.

Hagan and Huelke in their survey showed a clean-cut pattern of mandibular fractures⁸ as follows.

- (1) The Condyle region is the most common site of fracture.
- (2) Angle is the second most common site of fracture.
- (3) But if only one fracture is there, then angle is the most common site of fracture than condyle.
- (4) Multiple fractures are more common than single (ratio, 2 : 1), 4.80% of the patients were dentate.

This study was undertaken to study various aspects of mandibular fractures clinically and radiologically with an aim to:

- (1) calculate the incidence of mandibular fractures;
- (2) study the pattern of fracture and the commonest site of fractures

Material and Method

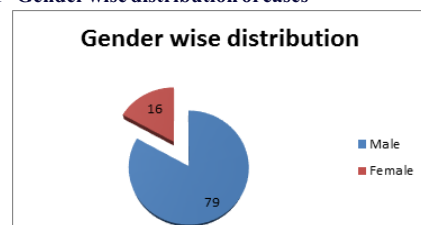
The study was conducted during the period from may 2016 to april 2018 on patients presented with facio-maxillary injury to the tertiary trauma care Ashwini Hospital, Cuttack, Odisha, India. Clinical examination was done using mouth mirror and probe. Patients with mandibular fractures were included in the study. The diagnosis of a

fracture was based on the history, signs and symptoms, visual finding, manual examination, and OPG radiographs. Exact determination of site and pattern of bony injury was determined by correlating it radiographically using three dimensional CT scan of face. In our study, based on the documented radiographic findings, the fracture sites were assigned to one of six anatomical subsites including symphyseal, parasymphyseal, body, angle, ramus, condyle and coronoid process and dentoalveolar regions. The etiological factors were classified as road traffic accidents (RTA), fall from height, interpersonal violence (IPV), sport injuries, occupational accidents, medical condition related and other causes. Age, gender, etiology, and pattern of mandibular fractures, associated injuries were recorded in clinical proforma.

Results

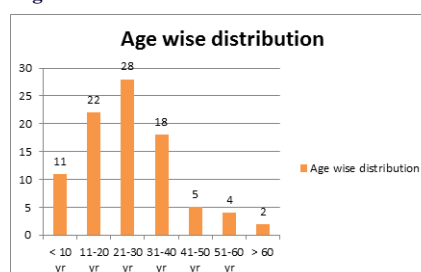
We conducted this study on 95 patients who presented with facio-maxillary injury and diagnosed radiologically to have some type of mandibular fracture. Out of 95 patients, 79 (83.2%) were males and 16 (16.8%) were females. Males sustained significantly more injuries as compared to females, with an overall ratio of 4.9:1. (Graph 1)

Graph 1 - Gender wise distribution of cases



Majority of fractures are seen in the age group of 21–30 years, 28 (29.5%) followed by 11-20 years, 22 (23.1%), 31-40 years, 18 (18.9%), of life, constituting a major proportion (71.5%). In patients aged above 61, there was less incidence of fractures that accounts for only 2.1%. (Graph 2)

Graph 2 - Age wise distribution of cases



Among 95 total fractures, 56 (58.9%) fractures are unilateral and 39 (41.1%) fractures are bilateral. Among 56 unilateral fractures, 32 (57.1%) fractures are present on right side and 24 (42.9%) fractures are present on left side. Mandibular fractures occurred most commonly in the parasymphyseal region, about 31 cases (32.6%), followed by body 20 (20.1%), subcondyle 18 (18.9%), angle 14 (14.7%), symphyseal 4 (4.2%). The less common sites are ramus, condyle, coronoid, dentoalveolar areas. (Table 1)

Table 1- Distribution of cases according to site of mandibular fracture

Site	n=95	%
Symphysis	4	4.2
Parasymphysis	31	32.6
Body	20	20.1
Angle	14	14.7
Ramus	2	2.1
Subcondyle	18	18.9
Condyle	1	1.1
Coronoid	1	1.1
Dentoalveolar	1	1.1
Communitied	3	3.2

Fractures due to RTAs is most common seen in 48 (50.5%) cases, followed by fall from height in 22 (23.1%), interpersonal violence 18 (18.9%), sports injury 3 (3.2%), occupational related 2 (2.1%) and illness related in 1 (1.1%) cases. (Table 2)

Table 2- Distribution of cases according to their etiology

Etiology	n=95	%
Road traffic accident	48	50.5
Fall from height	22	23.1
Interpersonal violence	18	18.9
Sports injury	3	3.2
Occupational related	2	2.1
Illness related	1	1.1
Non-identified	1	1.1

Mandibular fractures associated with other injuries in 69 (72.6%) cases and not associated in 26 (27.4%) cases. Among cases having multiple injuries (n = 45), fracture parasymphysis + subcondyle (Figure 4) was the commonest seen in 11 (24.4%) cases followed by fracture body + angle in 8 (17.8%), fracture parasymphysis + angle 6 (13.3%) (Figure 1), fracture body + subcondyle 5 (11.1%). (Table 3) and fracture parasymphyseal and body of mandible fracture 4 (8.9%) cases. (figure 3)

Figure 1 – Right Parasymphyseal and left angle of mandible fracture

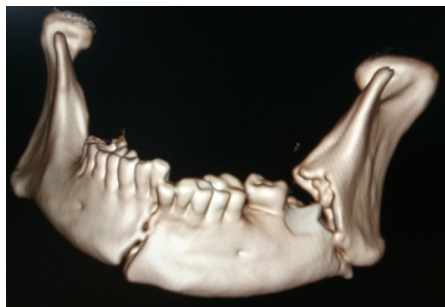


Figure 2 – Symphyseal and bilateral subcondylar fracture



Figure 3 –Left Parasymphyseal and right body of mandible fracture

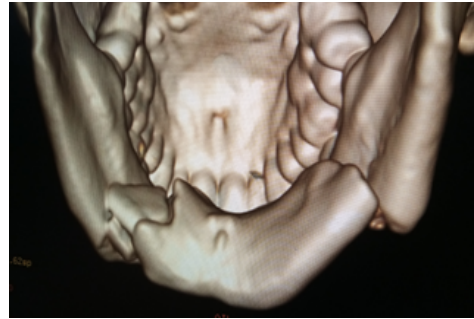


Table 3- Distribution of cases according to combination of fractures

Site	n=45	%
Symphysis + subcondyle	2	4.4
Parasymphysis + body	4	8.9
Parasymphysis + angle	6	13.3
Parasymphysis + subcondyle	11	24.4
Parasymphysis + condyle	1	2.2
Parasymphysis + Parasymphysis	2	4.4
Body + angle	8	17.8
Body + subcondyle	5	11.1
Body + Body	2	4.4
Subcondyle + subcondyle	1	2.2
Ramus + parasymphysis	2	4.4
Dentoalveolar + subcondyle	1	2.2

Discussion

we conducted this study on 95 diagnosed case of mandibular fracture. We studied that incidence of mandible fracture is more in males 79 (83.2%) in compare to females 16 (16.8%). Males sustained significantly more injuries as compared to females, with an overall ratio of 4.9:1. Similarly Subodh S. Natu et al⁹ have also observed mandibular fracture more common in males (81.8% vs 18.2%, 4.5 : 1). Ashwinirani Suragimath et al¹⁰ also recorded higher fracture rate in males compare to females (77.2% vs 22.8%, 3.3:1). Dhananjay Barde et al¹¹ also observed more commonly in men (79.1%) than women (20.9%), (3.7:1). Hai-Won Jung et al¹² in their study observed 84.5% were male, and 15.5% were female (5.45 : 1). Zix Juergen Andreasa et al¹³ also observed fracture mandible in favour of males in proportion of male-female ratio was 2.7 to 1.

We observed majority of fractures in the age group of 21–30 years, 28 (29.5%) followed by 11-20 years, 22 (23.1%), 31-40 years, 18 (18.9%), of life, constituting a major proportion (71.5%). In patients aged above 61, there was less incidence of fractures (2.1%). Similarly Subodh S. Natu et al⁹ studied maximum number of subjects in the age group 21–30 years (28.8%) followed by 11– 20 (25.8%), 31–40 (21.2%), <10 (13.6%), 41–50 (6.1%), and 60 years and above (4.5%). Around three-fourth (75.76%) of patients were in the age range 11 to 40 years. In accordance to us Ashwinirani Suragimath et al¹⁰ found majority of fractures in the age group of 21–30 (35.2%) years followed by 31–40 years (30.5%) of life, constituting a major proportion (65.7%). In patients aged above 61, they observed less incidence of fractures (4.1%). Dhananjay Barde et al¹¹ observed highest incidence of mandibular trauma in the age group of 21–30 years (37.5%), followed by the age group of 31–40 (22.4%). Hai-Won Jung et al¹² concluded that the most affected age group was the 20s (38.1%), followed by early adolescents and teenagers (20.7%), and patients in their 30s (18.5%). Zix Juergen Andreasa et al¹³ studied the mean age of fracture mandible was 37 years with a wide range from 16 to 97 years.

In this study we observed out of 95 cases, 56 (58.9%) have unilateral and 39 (41.1%) have bilateral fractures. Among 56 unilateral cases, in 32 (57.1%) fractures are present on right side and in 24 (42.9%) fractures are present on left side. Similar to us Subodh S. Natu et al⁹ seen 56.1% patients had a unilateral mandibular fracture while 43.9% patients had bilateral fractures. Ashwinirani Suragimath et al¹⁰ found 53.3% fractures on right side and 46.7% fractures on left side.

In this study we found mandibular fractures most commonly in the parasymphyseal region, about 31 cases (32.6%), followed by body 20

(20.1%), subcondyle 18 (18.9%), angle 14 (14.7%), symphyseal 4 (4.2%). The less common sites observed are ramus, condyle, coronoid, dentoalveolar regions. Similar incidence is observed by Subodh S. Natu et al⁹ such as, fracture parasymphysis (31.4%), body (24.5%), subcondyle (20.6%), and angle (13.7%) were the most common sites while fracture condyle (1%), coronoid (1.0%), dentoalveolar (1.0%), and ramus (1.0%). Similar to us Ashwinirani Suragimath et al¹⁰ studied mandibular fractures occurring most commonly in the parasymphyseal region (31.6%) but in contrast to us they observed the second and third most common regions being condylar region (24.3%) and angle (12.9%), and other sites were body (11.3%). They reported the least common fractures at coronoid fractures (2%) and ramus fractures (1.5%). Dhananjay Barde et al¹¹ also found the most common mandibular fracture is in the location of parasymphysis region (39.8%), and the next most preferred location was shared by condyle and angle with equal distribution of 18% for both. They seen dentoalveolar fractures in 6% of cases. In contrast to us Hai-Won Jung et al¹² studied Symphysis fractures as the most frequent in 36.8% cases, followed by angle fracture in 29.7%, condyle fracture in 23.8%, body fracture in 8.1%, ramus fracture in 1.5% and coronoid process fracture in 0.2% cases. In contrast to us Zix Juergen Andreasa et al¹³ studied most common site of fracture was at condylar/subcondylar region (43%), followed by the symphyseal region (34%), the angle (12%), the body (7%), the coronoid process (2%) and the ramus (2%).

In this study we observed that most common cause of fractures mandible is RTAs seen in 48 (50.5%) cases, followed by fall from height in 22 (23.1%), interpersonal violence 18 (18.9%), sports injury 3 (3.2%), occupational related 2 (2.1%) and illness related in 1 (1.1%) cases. Similarly Subodh S. Natu et al⁹ found road traffic accident (68.2%) as the most common etiologic factor, followed by fall from height is the second common etiologic factor accounting for 30.3% of the cases. Ashwinirani Suragimath et al¹⁰ also seen fractures due to RTAs were most common (62.6%), followed by assaults 16%, falls 13.9%, sport injuries and miscellaneous fractures constituted for low rates. Similarly Dhananjay Barde et al¹¹ observed RTA as the most common cause of fracture mandible (68%) followed by fall (17%), assault (11%) and miscellaneous (4%). Hai-Won Jung et al¹² observed highest cases were due to daily-life activity such as falling and collision (43.4%), followed by violence (33.9%), sport activity (10.5%), car accidents (10.1%), unknown factors (1.8%) and pathological causes (0.4%). Zix Juergen Andreasa et al¹³ seen road traffic accidents were most commonly associated with condylar and parasymphyseal fractures. Fractures of the mandibular angle were most often results of sports accidents.

We observed among cases having multiple injuries ($n = 45$), fracture parasymphysis + subcondyle was the commonest type seen in 11 (24.4%) cases followed by fracture body + angle in 8 (17.8%), and fracture parasymphysis + angle 6 (13.3%), fracture body + subcondyle 5 (11.1%), Similarly Subodh S. Natu et al⁹ studied most common type of combination fracture was parasymphysis + subcondyle (18.8%) followed by fracture body + angle (15.6%), fracture body + subcondyle (12.5%), and fracture parasymphysis + angle (12.5%). Dhananjay Barde et al¹¹ observed 49.5% had two fractures and 6% had three fractures. Hai-Won Jung et al¹² seen single fracture line in 47.5%, double fracture lines in 51.3% and 1.2% with three fracture lines.

We studied that mandibular fractures are associated with other injury in 69 (72.6%) cases and not associated in 26 (27.4%) cases. In contrast to us Subodh S. Natu et al⁹ have observed mandibular fractures associated with other injuries in 37.9% cases.

Conclusion

Developing nations, like India, still have large number of mandibular fractures attributed to RTAs and incidence of maxillofacial fractures can be significantly reduced by strict enforcement of traffic rules. Use of seat belt, helmet and reduction in drunken driving has shown to reduce maxillofacial trauma.

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