Research Article

JRAD Journal of Research and Advancement in Dentistry

J Res Adv Dent 2024; 15:1:1-5.

Analysis of Mandibular Fractures

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ABSTRACT

Background: To evaluate and analyse mandibular fractures. A retrospective retrieval was conducted on 100 individuals with mandibular fractures. The statistical analysis involved both descriptive and analytical statistics, computed through SPSS software, incorporating Chi-square tests. In this study, the mandibular condyle emerged as the predominant site of fracture, observed in a substantial majority of trauma patients (43%). This was followed by fractures at the mandibular angle (20%), parasymphysis (11.5%), and dentoalveolar region (11.5%). This correlation can be instrumental in investigating the causes when dealing with cases where patients provide incomplete or inaccurate medical histories.

Keywords: Mandible, Patterns, Fractures.

INTRODUCTION

Facial fractures make up a comparatively small proportion of Emergency Department visits, but of these injuries, the most common are nasal and mandible fractures. While the vast majority of nasal fractures can be managed without surgery, operative intervention for mandible fractures is relatively common due to the complexity of the structure's anatomy and function. The mandible is a mobile, ring-like bone that frequently fractures in more than one location; these fractures are at risk for wound contamination with oral flora, may be complicated by teeth in the fracture line, and in some cases, can compromise the patient's airway. [1] Vehicular accidents and altercations are the primary causes of mandibular fractures in the United States and throughout the world. In an urban trauma setting, altercations account for most fractures (50%), and motor vehicle accidents are less likely (29%). Males suffer approximately three times as many mandible fractures as females, with the majority occurring in the third decade of life. [1,2]

Mandibular body fractures usually occur between the distal aspect of the canine and a hypothetical line that corresponds to the region of anterior attachment of the masseter muscle. They may be classified based on the anatomic location, the direction of the fracture line, the position of teeth relative to the fracture, and favorableness. [3,4] Based on the fracture line direction and the effect of muscle distraction on the fracture fragments, the body fractures can be classified into two types (favorable and unfavorable). In favorable fractures, the bony fragments are drawn together by the muscle distraction, whereas in unfavorable fractures, the bony segments become displaced by the muscle forces. Maxillofacial fractures are one of the most frequent and complicated problems of oral and maxillofacial surgery. Within these fractures, mandibula is one of the most affected bones. When all of the facial bone fractures are evaluated, incidence of the mandible fractures can be detected as ~38%. [5] If mandible fractures are not treated appropriately, they can cause morbidities at a high level. The most important aim of the treatment is to provide healing on both functional and cosmetic aspects. During the determination of treatment

Received: July. 17, 2023: **Accepted**: Aug. 18, 2023
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pISSN 2278-0076
eISSN 2321-9270

strategy, age of the patient, presence of additional injuries, comorbid diseases of the patient, trauma type, and localization of the fracture must be kept in mind. Mandibular fractures comprise most of the traumatic injuries, which are treated by an oral and maxillofacial surgeon. The facial area is one of the most commonly fractured site of the body, of which mandible is the most frequent. [6,7] Injuries of the maxillofacial area can be psychologically disturbing for patients with a functional impact. [8] According to several studies, they account for 15.5-59% of all facial fractures. [9,10] A fracture is defined as "breach in the continuity of the bone." [11] The occurrence of facial injuries tends to be high compared to injuries in other parts of the body because the face is without a protective covering, and the mandible the most prominent bone in this region of the body. [12]

The mandible is immaculate in design with varying strength of bone in different regions, in correlation with stress distribution on function. It is a tubular V-shaped bone that articulates with the skull via paired temporomandibular joints. It is the second most common maxillofacial bone prone to trauma second to nasal bones. [13] Maxillofacial trauma disrupts efficient form, function, and esthetics. The first description of mandibular fractures dates to the 17th century BC in the "Edwin Smith papyrus" brought by Smith in Luxor in 1862 and later translated by Breasted. [14] Management of the mandibular fractures has evolved with time. It has come a long way from the initial use of horse hair as interdental wiring tool, to the present-day use of resorbable hardware and custom-made titanium hardware. [15] Hence, this study was conducted to evaluate and analyse mandibular fractures.

MATERIALS & METHODS

A retrospective retrieval was conducted on 100 individuals with mandibular fractures. Data encompassing age, gender, etiology, fracture pattern, and treatment administered was gathered, organized into tables, and subjected to statistical analysis. Correlations were explored between variables such as age and gender, age and cause, gender and cause, site of fracture and cause, site of fracture and side, site of fracture and treatment administered, and site of fracture and gender. The statistical analysis involved both descriptive and analytical statistics, computed through SPSS software, incorporating Chi-square tests.

RESULTS

A total of 130 mandibular fractures were treated in 100 subjects. The mean number of fractures per subject was 1.3. In this study, the mandibular condyle emerged as the predominant site of fracture, observed in a substantial majority of trauma patients (43%). This was followed by fractures at the mandibular angle (20%), parasymphysis (11.5%), and dentoalveolar region (11.5%). Fractures at the body of the mandible constituted 7.8% of the cases as shown in Table 1. The primary cause of mandibular fractures was road traffic accidents (48 cases, 48%), followed by falls (29 cases, 29%), assault (22 cases, 22%), and sports-related incidents (1 case, 1%). Among patients aged 20–30 years, road traffic accidents emerged as the predominant etiology. This association between the age group of patients and the etiological factor was determined to be statistically significant (Chi-square value = 0.01, $P < 0.05$) as shown in Table 2.

Table 1: distribution of mandibular fractures according to location

Site	Number of fractures
Dentoalveolar	15 (11.5%)
Symphysis	3 (2.3%)
Parasymphysis	15 (11.5%)
Angle	26 (20%)
Body	10 (7.8%)
Condylar process	56 (43%)
Coronoid process	2 (1.6%)
Ramus	3 (2.3%)
Total	130

Table 2: Relation of age group and etiology of fractures.

Age group	Etiology				Total
	RTA	Assault	Fall	Sports	
20-30	22	14	15	1	52
31-40	12	3	9	0	25
41-50	10	2	4	0	16
51-60	4	3	1	0	7
Total	48	22	29	1	100

RTA – road traffic accidents

DISCUSSION

Various studies on the incidence of mandibular fractures in different countries have been studied. The sheer pace of modern life with high-speed travel as well as an increasingly violent and intolerant society has made facial trauma a form of social disease from which no one is immune. 16 Mandible fractures if remains undiagnosed or inappropriately treated may lead to severe consequences on the cosmetic, functional and psychological aspects of the patients. The epidemiology of mandibular fractures has changed dramatically with the advent of higher speed limits, new seat belt and helmet laws, and increased urban violence. 16 Hence, this study was conducted to evaluate and analyse mandibular fractures.

In the present study, the mandibular condyle emerged as the predominant site of fracture, observed in a substantial majority of trauma patients (43%). This was followed by fractures at the mandibular angle (20%), parasymphysis (11.5%), and dentoalveolar region (11.5%). Fractures at the body of the mandible constituted 7.8% of the cases. A study by Shah N et al, studied correlation between different factors associated with mandibular fractures. A database of 277 patients between July 2011 and October 2018 with mandibular fractures was retrospectively retrieved. Information on age, gender, etiology, pattern of fracture, and treatment done was obtained, tabulated, and analyzed statistically. In a total of 277 patients, a statistically significant correlation was found between age and the etiologic agent, site and side of fracture, and site of fracture and the treatment done with value of $P < 0.05$. [17]

In the present study, the primary cause of mandibular fractures was road traffic accidents (48 cases, 48%), followed by falls (29 cases, 29%), assault (22 cases, 22%), and sports-related incidents (1 case, 1%). Among patients aged 20–30 years, road traffic accidents emerged as the predominant etiology. This association between the age group of patients and the etiological factor was determined to be statistically significant (Chi-square value = 0.01, $P < 0.05$). Another study by Shrinivasan B et al, evaluated the age, gender distribution, side and site distribution, etiology, and common patterns of the mandibular fractures. Of 94 patients, 72 male and 22 female patients belong to the age group of 4–62 years (average 31.57 years). Among the various etiologies, i.e., assault, road traffic accident (RTA), self-fall, workplace injury, and sports-related injury, RTA accounts for 62.76% and self-fall for 18.08% of cases. Of the 100 fractures analyzed, 46% are unilateral fractures and 54% are bilateral. Sides affected among these are left (58%), right (39%), and symphysis or midline (3%). The site distribution is as follows: symphysis – 5; parasymphysis – 64; body – 13; angle – 43; and subcondylar – 37. The most common fracture pattern is the ipsilateral parasymphysis with contralateral angle (21 cases). Open reduction and internal fixation was the predominant modality of treatment. Complications were observed in 27.65% of patients. Surveys play a vital role in better understanding the biomechanics of the mandible fractures. Furthermore, analysis of the treatment modalities used and their respective outcomes are of paramount importance in guiding surgeons to evaluate their efficacy. [18] Vyas A et al, evaluated and compared with the existing literature on the etiology, pattern, gender, and anatomical distribution of mandibular fractures. The data of 225 cases were analyzed over a period of 5 years between March 2009 and November 2013. Of this 110 were unilateral, 23 bilateral, 18 symphysis and 74 multiple fractures. Males are more affected than females. The peak incidence rate is occurring in 30-35 years of age group. The most common fracture site is parasymphysis and least common site is ramus of mandible. The most common etiological factor is road traffic accident (RTA) (45.3%) followed by falls (42.6%), assaults (8.9%), sport injuries (2.2%), and gunshot wounds (0.89%). Thus, they concluded that RTA is the leading cause of mandibular fractures and males are more affected. The most common site is parasymphysis fracture in association with angle fracture. They observed that gender was significantly associated with body and angle fracture ($P = 0.04$) and significant relationship between etiology with multiple site fracture such as (parasymphysis-angle), (body-condyle), (body-angle), and (symphysis-condyle) was observed ($P \leq 0.05$). [19] Several variables are related to the study of mandibular fractures which have resulted in differences in demographic characteristics reported in the literature. Various countries across the globe have provided statistics of mandibular fractures, but information provided is distinct for the countries of origin and the people residing there. [20]

Increase in incidence of mandibular fractures is stated in long-term studies. Reported data show that mandibular fractures occur usually in the third decade of life with male predominance. [21] The socioeconomic trends, geographic locations, and local behavior have a considerable impact on the etiology of the injury which sequentially influences the distribution of fracture sites. [22] The key etiology for maxillofacial fractures may vary from road traffic accidents to assaults and from fall to sports injuries. Most mandibular fractures which occurred from assault have alcohol consumption as an eminent contributing factor. [16] Morris et al., in their retrospective analytical study of 4143 fractures in 2128 patients, found that the highest number of fractures occurred at the mandibular angle (1123), followed by the mandibular symphysis (882), condyle/subcondylar complex (761), body (695), and ramus (225). It is the opinion of these authors that a specific association between different locations of fractures is an important consideration when performing clinical assessment of a patient with a mandible fracture. Knowledge that one particular type of fracture may be more likely with a fracture at another location can aid in diagnosis. [23] On the basis of cause, the distribution of fractures may be linked to factors related to the mechanism of the injury. The direction and magnitude of impact force, the kind of object leading to impact, anatomy of the site, prominence and physical characteristics of the mandible, direction of the victim's head position, and status of occlusion are responsible for the wide-ranging clinical outcomes. [24,25]

CONCLUSION

This correlation can be instrumental in investigating the causes when dealing with cases where patients provide incomplete or inaccurate medical histories.

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