Original Article

Etiology, Patterns And Treatment Modalities For Mandibular Fractures

Muhammad Asif Shahzad, Momin Ayub Marath , Daud Mirza

ABSTRACT

Objective: The objective of current study was to evaluate the etiology, patterns of presentation, frequency and different treatment modalities for mandibular fractures in patients treated at Lahore Medical and Dental College/Ghurki Trust Teaching Hospital (LMDC/GTTH).

Methodology: This descriptive – cross sectional study was conducted at Lahore Medical and Dental College, Lahore/Ghurki Trust Teaching Hospital (LMDC/GTTH) from March 2015 to September 2017. The current study included one hundred and twelve (112) patients who were indentified having mandibular fractures. Data were collected regarding patient's age, gender, etiology, site of fracture, patterns and treatment modalities and analyzed using SPSS version 20.

Results: The patients' ages were between 3 to 55 years (24.87±10.867, mean/SD). The majority of fractures occurred amongst 21-30 years of age group having female to male ratio of 1:5.6. Road traffic accident (RTA) was the most frequent etiological factor for mandibular fractures in 89 (79.47%) of patients, followed by assaults 11(09.82%) and fall 07 (06.25%). A total of 189 fractures were recorded in 112 patients giving a mean of 1.7 fractures per patient. Out of 189 fractures, the parasymphysis was the most prominent site of mandibular fractures(43.39%), followed by condyle (22.75%) and angle (15.87%). The treatment modality of open reduction and internal fixation (ORIF/ORIF with IMF) was performed in 88(78.57%) of patients while closed reduction and indirect fixation (IMF with eyelet wiring/arch bar elastics & splint fixation) was done in 24 (21.43%) of patients.

Conclusion: As evidenced by the present study, road traffic accidents are the most common cause of mandibular fractures in young adults, mostly due to violation of traffic rules. These findings highlight the need to reinforce legislation for prevention of such injuries both in children and adults.

KEY WORDS: Mandibular fractures, Road traffic accidents, Open reduction and internal fixation, Etiology

INTRODUCTION:

The maxillofacial area is anatomically the most exposed part of the body, being more susceptible to injuries[1]. These injuries frequently result in varying degree of disfigurement, functional deficit and psychological problems[2]. The sheer pace of modern life with its high speed travels as well as an increasingly violent and intolerant society has made facial trauma a form of social disease to which no one is immune[3]. Mandibular fractures are amongst the common facial injuries treated in a trauma center, accounting for 36 to 59 % of all facial fractures[4]. Young men are more predisposed to trauma in the second and third decades of life owing to the fact that they frequently engage in outdoor and high risk activities[5]. The most favorable sites of fractures (in descending order) in the mandible are the parasymphysis, body, angle, condylar region, symphysis and coronoid process[6].

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Received: 14-03-2018
Revised: 04-05-2018
Accepted: 08-05-2018

The etiologies of mandibular fractures, incidence and patterns tend to vary with geographic region, socioeconomic status, culture, environmental and technologic factors. Therefore the main cause for mandibular fractures described in literature remains inconsistent[7]. Road traffic accident (RTA) has been reported as the leading etiology in the developing nations, while incidence due to personal violence is more in developed countries[8,9].

Since the last few decades, open reduction and internal fixation (ORIF) using titanium miniplates has become the treatment of choice whenever possible. This has resulted in improved oral hygiene, mouth opening, better speech and patient's earlier return to function and work. Also, a decreased preference and decline has been recorded in the use of wire osteosynthesis and closed reduction and indirect fixation (CRIF) techniques[10,11].

Over the years, the epidemiology of mandibular fractures keeps changing and new trends in etiology, pattern of presentation and management are constantly evolving[12]. This, therefore, necessitates a constant appraisal of these fractures injuries in order to keep abreast with recent developments and changing pattern of their management.

The objective of current study was to evaluate the etiological factors, patterns of presentation, frequency and different treatment modalities for mandibular fractures in patients treated at Lahore Medical and Dental College/Ghurki Trust Teaching Hospital (LMDC/GTTH). This study, in turn, will help the health care providers in a clearer understanding of

the different etiological factors involved and pattern of mandibular fractures while managing these injuries. The study may also provide circumstantial evidence for the recommendation of possible preventive measures and enforcement of seat belt legislation.

METHODOLOGY:

This study was conducted in the Department of Oral and Maxillofacial Surgery, Lahore Medical Dental College / Ghurki Trust Teaching Hospital, Lahore from March 2015 to September 2017.

The patients attending the Accident and Emergency Department as well as Outpatient Section/Department of Oral and Maxillofacial Surgery at Lahore Medical & Dental College / Ghurki Trust Teaching Hospital, Lahore were thoroughly assessed.

All the consecutive patients of any age and either gender having clinical and radiological evidence of mandibular fractures were included in the current study. Medically compromised, previously maltreated and untreated patients were excluded.

The patients were assessed with thorough history and clinical examination and information obtained was filled up in the patient's departmental records. Specific radiographs such as OPG (orthopentomogram) and PA (postero anterior) mandible were obtained to confirm the bony fractures. CT scan and intra-oral radiographs (periapical/occlusal) were prescribed if needed. Classification of fractures was done using standard nomenclature. An appropriated treatment plan was devised and executed after obtaining written informed consent of the patient. The pattern and management of mandibular fractures were compiled according to age, gender, etiology, anatomic site, relative frequency and methods of fixation.

Open reduction and internal fixation (ORIF) under GA (general anesthesia) was the preferred method of treatment for the mandibular fractures whenever possible (Fig 4 & 5). However, closed reduction and indirect fixation techniques were also used for mandibular fractures, with patients under local anesthesia (LA). IMF (intermaxillary fixation) with eyelet wiring was performed for patients who were unable to undergo GA, having financial issues and favourable mandibular fractures without significant displacement. While IMF (arch bar with elastics) was preferably used for condylar fractures. The patients below 12 years (in primary/mixed dentition) were treated under GA because of their uncooperative behavior. Splint fixation under GA was the method of choice for pediatric patients along with edentulous patients with atrophic mandible. A follow up of six weeks was done for all the patients.

The data collected from departmental records was analyzed using SPSS version 20. The qualitative variables like gender, etiology, pattern, anatomic site and treatment modalities were presented as frequency and percentages. While quantitative variable like age was presented by mean and standard deviation. A value of $p<0.05$ was considered significant with a confidence interval of 95%. We did not apply any inferential test as the study was descriptive in nature.

RESULTS:

During the period of March 2015 to September 2017, a total of 112 patients with 189 mandibular fractures were managed at Lahore Medical and Dental College/Ghurki Trust Teaching Hospital (LMDC/GTTH).

The patients' ages were between 3 to 55 years (24.87±10.867, mean/SD). The majority of fractures occurred amongst the 21-30 years of age group (n=49; 43.75%). There were 17 females and 95 males with female to male ratio of 1:5.6 (Figure 1).

Road traffic accident (RTA) was the most frequent etiology in 89 (79.46%) of patients, followed by assaults 11(09.82%), fall 09 (08.04%) and sports 02 (01.79%) (Figure 2).

The location and anatomical positions of fractures were determined in the mandible. 189 lines were detected in 112 patients with fractured mandibles, which were due to variations in mandibular fractures in each patient. It gave a mean of 1.7 fractures per patient.

Out of 189 fractures, the most prominent site of mandibular fractures was parasymphysis (n=82; 43.39%), followed by condyle (n=43;22.75%), angle (n=30;15.87%), body (n=20;10.58%), dentoalveolar (n=6;3.17%), symphysis (n=5;02.65%), ramus (n=2;01.06%), and coronoid (n=1;0.53%) (Table 1).

By excluding the symphysis and dentoalveolar fractures, out of 178 fractures, 98 (55.06%) were present on the right side and 80 (44.94%) on the left side. The mandible had a single fracture (unifocal) in 43(38.39%) of cases, 61(54.47%) had two fractures (bifocal) and 08(07.14%) with three fractures (trifocal) in mandible. The most common combinations in 112 patients were parasymphysis/condyle (n=27; 24.11%), followed by parasymphysis/angle (n=21; 18.75%), body/angle (n=04; 03.57%), parasymphysis/body (n=3; 02.68%) and (n=2; 1.79%) body/condyle.

The mandibular fractures were managed by using different treatment modalities of reduction and fixation (Figure 3). Out of the 112 patients, the technique of ORIF using miniplates was applied in 51(45.54%). 09(08.03%) were treated by ORIF with additional postoperative IMF using eyelet wiring, while ORIF with postoperative IMF using arch bar and elastics were used in 28(25.00%) of patients. The additional IMF was used in these patients due to multiple mandibular fractures usually in association with condylar region. Closed reduction and indirect fixation (CRIF) alone was the treatment of choice in 24(21.43%) of the patients, namely a non surgical approach of IMF. 06 (0.5.36%) of

them used IMF (with eyelet wiring) and 05 (04.47%) by IMF (with arch bar and elastics), mainly used to treat condylar fractures. Also 06 (05.36%) used wire composite splinting/or arch bar. In 07(06.25%) of pediatric patients, occlusal splint fixation with circum-mandibular wiring was used as the treatment of choice, while 02(01.79%) of the children were treated by ORIF with resorbable miniplates.

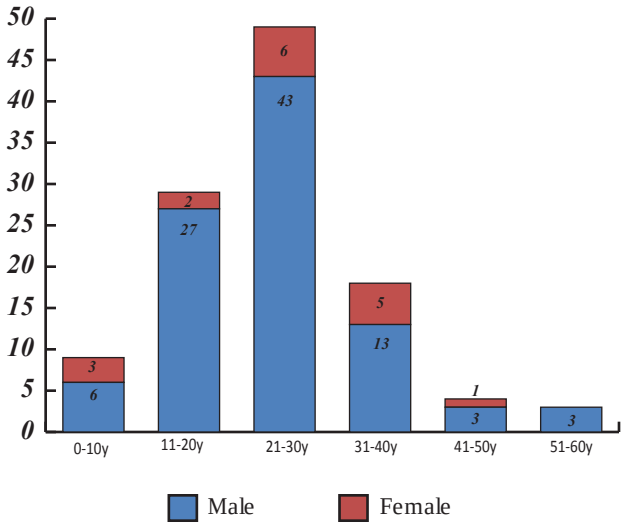

Figure 1: Age and Gender Distribution

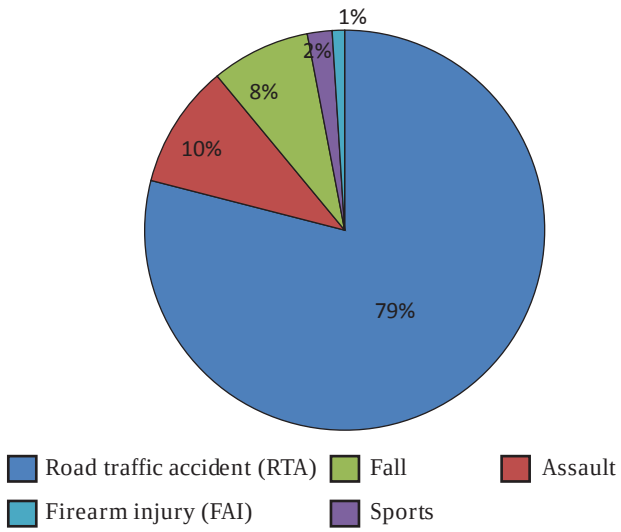

Figure 2: Etiology of Mandibular Fractures

Fracture Site	No of Fracture (n = 189)	%
Symphysis	05	02.65
Parasymphysis	82	43.39
Body	20	10.58
Angle	30	15.87
Condyle	43	22.75
Ramus	02	01.06
Dentoalveolar	06	03.17
Coronoid	01	00.53
Total	189	100.00

Table 1: Anatomical Location of Mandibular Fractures

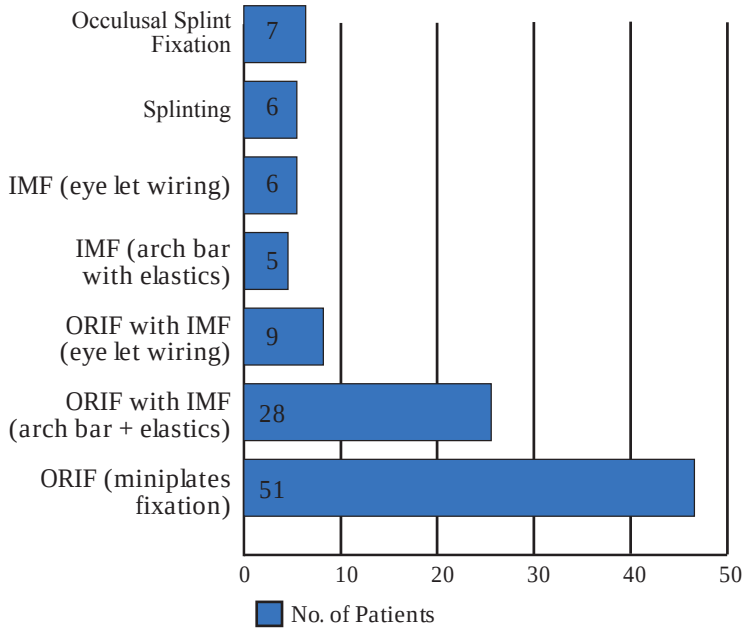

Figure 3: Treatment Modalities for Mandibular Fractures

Figure 4: Open reduction and internal fixation (ORIF) of parasymphyseal fracture (R) with titanium miniplates

Figure 5: (ORIF) of mandibular angle fracture (L)

DISCUSSION:

All over the world, maxillofacial injuries have continued to generate discussion among researchers, due to the functional and cosmetic deformities affecting the victims. The etiological factors, incidence and pattern of mandibular fractures tend to vary with geographic region, socioeconomic status, culture, religion and era[13]. Most of the literature confirms the predominance of mandibular trauma in 21-30 years of age group[9,14]. This assertion is supported by our study in which 49 (43.75%) of patients were between the ages of 21 to 30 years. The possible explanation can be attributed to the fact is that people in this age group take part in dangerous exercises and sports, careless driving of motor vehicles and are more likely to be involved in violence.

A higher frequency of mandibular fractures in males than females has been reported in most of the conducted studies[9,15]. In present study it remained 5.6:1, that is higher than reported by Boffano et al[13] (2.2:1). This finding is understandable and could be related to the fact that men are active and more exposed, due to their more frequent participation in outdoor and high risk activities such as driving vehicles, and sports that involve physical contact. Men are also more involved in violent interaction along with drugs and alcohol habits.

Our study highlights that road traffic accident (79.46%) was the most frequent etiology of mandibular, followed by assault (09.82%), fall (08.04%) and sports (01.79%),which is in agreement with other studies conducted in developing countries[14,16], while other studies have reported the assault as the most common cause of fracture[17]. Apart from RTA and assaults, other common cause of mandibular fractures include sporting injuries, falls, domestic accidents and industrial injuries[12]. These etiological variations reflect differences in the socio-economic factors, national infrastructure development(particularly roadways, traffic regulations and legislation) and other behavioral habits, such as alcohol consumption or criminal activities. The reasons for this higher rate of RTA in our region include poor road networks, improper licensing of drivers/riders, non usage of seatbelts, neglect of helmets by motorbike riders, addiction of drugs or alcohol and non compliance with traffic rules among others.

As revealed by the current study, the most prominent site of fracture in mandible was the parasymphysis region (43.39%), which is consistent with the findings of Sunita Malik *et al*[18]. However, the present study was not in agreement with the results of Nair[19] and Adebayo[20] who showed the body as the most common site, whereas Van Beek[21] observed the condyle and Chalya *et al*[22]. stated the angle region as the most frequent site of fracture. The parasymphysis/condyle (n=27; 24.11%), has been described as the most frequent combination in mandibular fractures, followed by parasymphysis/angle (n=21; 18.75%), These finding are consistent with the observations of Ogundare *et al*.[23] However, Abiose[24] reported bilateral body as the most frequent mandibular fracture combination. The particular reason for these variations is difficult to describe but one can assume that inter-population difference in the sites of maxillofacial fractures may be attributed to the diverse etiologic factors involved.

Over the last few decades, open reduction and internal fixation (ORIF) using titanium miniplates has become the treatment of choice whenever possible[10,11,25,26]. Open reduction and internal fixation (ORIF/ORIF with IMF) was performed in 88(78.57%) of patients while closed reduction and indirect fixation (IMF with eyelet wiring/arch bar elastics & splint fixation) was done in 24 (21.43%) of patients. All the treatment modalities were used without any device for external fixation achieving satisfactory results.

Al Moraissi et al[25] and Ellis E III[26] has also recommended

the use of ORIF, whenever possible. Whereas Chandra[27] and Kilasara[28] found that most of the mandibular fractures could be managed by closed reduction. The method of ORIF has been advocated to be the "gold standard" for the treatment of mandibular fractures. This has resulted in improved oral hygiene, mouth opening, better speech and patient's earlier return to function and work. However, this form of treatment has not become popular in our country due to lack of expertise (*i.e*. maxillofacial surgeons) and reduced facilities for open reduction and internal fixation; even when available, the cost of the treatment is usually prohibitive.

CONCLUSION/RECOMMENDATIONS:

This current study shows that the majority of fractures occurred amongst the 21-30 years of age group having female to male ratio of 1:5.6. Road traffic accident (RTA) was the most frequent etiological factor for mandibular fractures. Among the mandibular fractures, the most common site involved was the parasymphysis followed by condylar region. The most frequent technique used was ORIF/ORIF with IMF of patients.

As evidenced by the present study that the road traffic accidents are the leading cause of mandibular fractures in young adults, mostly due to traffic rules violations. These finding should alert the authorities to the need for the enforcement of existing traffic laws to control excessive speed on highways and careless driving; provision of better roads; and the use of safety belts is to be made compulsory. It is also recommended that there is need of cooperation and coordination among the various medical disciplines for a rapid management of maxillofacial injuries which might prevent functional as well as aesthetic morbidity.

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