ORIGINAL ARTICLE

ETIOLOGY, PATTERNS AND TREATMENT MODALITIES FOR MAXILLOFACIAL FRACTURES

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ABSTRACT

Background: Over the years, the epidemiology of maxillofacial fractures keeps changing and new trends in etiology, pattern of presentation and management are constantly evolving. 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 aim of this study was to determine the frequency, etiology, patterns and different treatment modalities for maxillofacial fractures in patients treated at Lahore Medical and Dental College/Ghurki Trust Teaching Hospital (LMDC/GTTH).

Methods: This cross sectional descriptive study was carried out at Lahore Medical and Dental College/Ghurki Trust Teaching Hospital (LMDC/GTTH) from February 2014 to October 2017.A total of 161 patients having maxillofacial fractures were included in the current study. Data on patients, including age, gender, cause of injury, fracture site, pattern and treatment modalities were collected and analyzed using SPSS version 20.

Results: The age range was 3 to 62 (mean/SD, 26.42±11.24) with peak frequency occurring in age group 21-30 years. The male to female ratio was 5.2:1. The most common cause of maxillofacial fractures was road traffic accident (RTA) in 134 (83.23%) of patients, followed by in fall 12 (07.46%) and assault in 09 (05.59%) patients. The most frequent bone fractured was the mandible, which accounted for 117 (72.67%) cases and parasymphysis (43.22%) was the most frequent site affected, followed by 67 (41.61%) cases of zygomatic complex fracture and 56 (34.78%) cases of maxillary fractures. Open reduction and internal fixation (ORIF/ORIF with IMF) was performed in 127(78.88%) of patients while closed reduction and indirect fixation (IMF with eyelet wiring/arch bar elastics & splint fixation) was done in 34 (21.12%) of patients.

Conclusion: As evidenced by the present study, majority of fractures were caused by RTA in 21-30 age group with male predominance. Mandible was the predominant fractured bone followed by the zygomatic complex area. ORIF was treatment of choice in the current study. According to present study, it seems reasonable to recommend that road traffic legislation enforcement and continuous public education towards the use of restraining devices and helmets should be encouraged by relevant authorities.

KEYWORDS: Maxillofacial fractures, Road traffic accidents, Open reduction& internal fixation, Intermaxillary fixation.

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INTRODUCTION

Maxillofacial injuries remain a common health problem representing 20-60% of traumatized population and are a major cause of morbidity and mortality worldwide. [1,2] These injuries of maxillofacial skeleton frequently result in varying degree of disfigurement, functional deficit and psychological problems along with high cost of treatment. [3] This can diminish both the quality of life and productivity of affected individuals resulting in significant social and economic burden. 1 Maxillofacial trauma is a

frequent occurrence in Pakistan and is presented in Accident and Emergency department of hospital as isolated or part of polytrauma..[2] Road traffic accident (RTA) remains the major cause of maxillofacial fractures in the developing countries, whereas assault leads the pack of etiologies in the developed world. [4,5] According to anatomic site of distribution, mandibular and zygomatic complex fractures account for majority of facial fractures and their occurrence varies with the mechanism of injuries and demographic factors. [6] The pattern of maxillofacial fractures varies in type, severity, cause and incidence depending on the population studied, socio economic, cultural and environmental factors. [1,7] Young men in the age group 20-40 years of life are the worst afflicted owing to the fact that they engage frequently in activities that can predispose them to trauma. [8]

The age long principle of fracture management: reduction and immobilization also applies to maxillofacial fractures; however, the pathway to achieving this principle is influenced by many other factors. Treatment of maxillofacial fractures has changed over the last 20 years, namely a decrease was recorded in the use of wire osteosynthesis and intermaxillary fixation (IMF), along with increased preference for open reduction and internal fixation (ORIF) with mini plates. [9] It should be noted that the treatment outcome of maxillofacial fractures is mainly dependent among other thing on the degree of injury, type of fracture, the expertise of surgeon and the available technology. [10] Over the years, the epidemiology of maxillofacial fractures keeps changing and new trends in etiology, pattern of presentation and management are constantly evolving. This, therefore, necessitates a constant appraisal of these injuries in order to keep abreast with recent developments and changing pattern of their management.

The aim of this study is to determine the relative frequency of various etiological factors, patterns and the best possible treatment modality done for management of maxillofacial fractures in the department of OMFS, LMDC, Lahore. This in turn will help us to establish clinical priorities for the effective treatment and preventive strategies of these injuries.

METHODS

This study was carried out in the Department of Oral and Maxillofacial Surgery, Lahore Medical & Dental College, Lahore from February 2014 to October 2017.

Patients were reviewed after initial management, if needed, by general trauma specialist and neurosurgeon. According to the departmental protocol, the patients who were attended in the Accident & Emergency department by on call resident or presented in outdoor unit of Oral and Maxillofacial Surgery, Lahore Medical & Dental College were properly assessed.

Patients of all ages and either gender having clinical and radiological evidence of maxillofacial fracture were included in the study. Patients having only soft tissue lacerations, previously maltreated and malunited fractures were excluded.

A detailed history and thorough clinical examination was carried out and information obtained was filled up in a specially designed proforma. Specific radiographs such as OPG (orthopentomogram) and PA (postero-anterior) mandible, OM (occipitomental 100 and 300) and submentovertex (SMV) were obtained to confirm the bony fractures. CT/C-BCT scan and intra-oral radiographs (periapical/occlusal) were prescribed if needed. The fractures were classified according to standard nomenclature. An appropriated treatment plan was devised and executed after obtaining written informed consent of the patient. The pattern and management of maxillofacial fractures were compiled according to age, gender, etiology, anatomic site, relative frequency and methods of fixation.

Open reduction and internal fixation (ORIF) with miniplates under GA (general anesthesia) was the preferred method of treatment for the mandibular and midfacial/zygomatico-maxillary complex fractures whenever possible (Fig 1-4). The elevation of zygomatico-complex fractures was performed, with patients under GA.

However, simple methods of closed reduction and immobilization were also used for mandibular fractures, with patients under LA (local anesthesia). 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. Patients were allowed to take liquid/semisolid diet along with dietary supplements. Suitable antibiotics, analgesics and oral rinses were also prescribed. NG intubation was done for 48-72 hours post-operatively in some patients having panfacial fractures for feeding purposes. The patients were followed up for six weeks.

The data collected was analyzed using SPSS 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 calculated as mean and standard deviation. Level of significance was set at $p<0.05$ with a confidence interval of 95%. No inferential test was applied due to descriptive nature of the study.

RESULTS

A total of 161patients were treated during February 2014 to October 2017. Patient's age at the time of injury ranges from 3 to 62 (mean/SD, 26.42±11.24). The majority of fractures occurred amongst the 21-30 years of age group (n=74; 45.96%). In virtually all age groups, more men than women were affected, the overall ratio being 5.2:1 (Table 1).

The most common cause of maxillofacial fractures was road traffic accident (RTA) in 134 (83.23%) of patients, followed by in fall 12 (07.46%), assault in 09 (05.59%), sports in 04 (02.48%) and FAIs in 02 (01.24%) patients. (Table 2)

The most frequent bone fractured was the mandible, which accounted for 117 (72.67%) cases, followed by 67 (41.61%) cases of zygomatic complex fracture and 56 (34.78%) cases of maxillary fractures. The midface fractures alone were found in 44 (27.33%) cases and the combined mandible-midface fractures were found in 82 (50.93%) cases. (Table 3)

A total of 199 mandibular fractures were recorded in 117 patients. Out of 199 fractures, the most prominent site of mandibular fractures was parasymphysis (n=86; 43.22%), followed by condyle (n=47; 23.62%), angle (n=30;15.08%), body (n=22;11.05%), dentoalveolar (n=6;3.01%), symphysis (n=5;02.51%), ramus (n=2;01.01%), and coronoid (n=1;0.50%) (Table 4).

The distribution of maxillary fractures (n=56) was Lefort I in 13 cases (23.11%), Lefort II in 19 (33.93%), Lefort I+II in 12 (21.43%), dentoaveolar in 10 (17.86%) and Lefort III in 2 (03.57%) of patients. (Table 5)..

Of zygomatic complex fractures (n=67), the zygomatic bone was involved in 59 cases (88.06%) and zygomatic bone plus arch were fractured in 08 cases (11.94%). (Table 6).Naso-orbito-ethmoidal (NOE) fractures were present in 05 cases.

For treatment of maxillofacial fractures, open reduction and internal fixation (ORIF/ORIF with IMF) was performed in 127(78.88%) of patients. ORIF was used in 86 (53.42%) cases and ORIF with IMF (arch bar elastic/eyelet wiring) in 41(25.46%) cases. While simple methods of closed reduction and indirect fixation (CRIF) using(IMF (arch bar elastic/eyelet wiring& splint fixation) in34 (21.12%) cases were the main modalities of treatment. (Table 7)

Table 1: Age and Gender Distribution

Age group (years)	Gender		Total	Percentage
	Male	Female		
01-10	06	03	09	05.59
11-20	34	04	38	23.60
21-30	63	11	74	45.96
31-40	14	05	19	11.80
41-50	14	02	16	09.94
51-60	03	01	04	02.49
61-70	01	00	01	00.62
Total	135	26	161	100.00

Table 2: Aetiology of Maxillofacial Fractures

Causes	No. of patients (n=161)	Percentage
Road traffic accident (RTA)	134	83.23
Assault	12	07.46
Fall	09	05.59
Sports	04	02.48
Firearm injury(FAI)	02	01.24
Total	161	100.00

Table 3: Anatomical Location of Maxillofacial Fractures

Fractured site/bone	No. of patients (n=161)	Percentage
Mandible alone	73	45.34
Maxilla alone	02	01.24
Zygoma alone	04	02.49
Mandible + Maxilla	03	01.86
Mandible + Zygoma	22	13.67
Maxilla + Zygoma	25	15.53
Mandible + Maxilla + Zygoma	11	06.83
Maxilla + Zygoma + NOE	03	01.86
Mandible + Maxilla +Zygoma + NOE + Frontal bone (Panfacial)	02	01.24
Dentoalveoler (Upper)	10	06.21
Dentoalveolar (Lower)	06	03.73
Total	161	100.00

Table 4: Treatment Modalities for Maxillofacial Fractures

Modalities	No. of patients (n=161)	Percentage
ORIF (miniplates fixation)	86	53.42
ORIF with IMF (arch bar elastics)	32	19.87
ORIF with IMF (eyelet wiring)	09	05.59
IMF (arch bar with elastics)	05	03.11
IMF (eyelet wiring)	06	03.72
Occlusal splint fixation (circumandibular wiring)	07	04.35
Splinting (Plain arch bar/or wire composite)	16	09.94
Total	161	100.00

Figure1: Open reduction and internal fixation (ORIF) of mandibular body fracture (R) with titanium miniplate

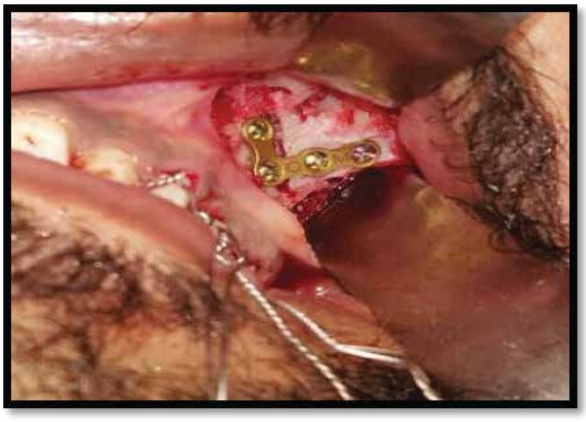

Figure 2: ORIFof maxillary fracture (L)

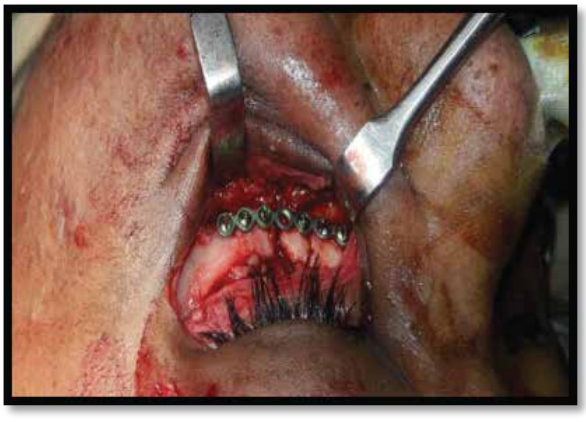

Figure 3: ORIF of infraorbital margin fracture (L)

Figure 4: ORIFof frontozygomatic fracture (L)

DISCUSSION

Maxillofacial trauma is usually caused by a known and relatively constant set of etiological factors. Recent studies and surveys show that the pattern of maxillofacial fractures varies in type, severity and cause depending on the population studied, socio-economic, cultural and environmental factors.[1,11] Fractures of the maxillofacial skeleton are commonplace following trauma and therefore form a major part of the overall duty of an Oral and Maxillofacial Surgeon.

Most of the studies agree on the predominance of maxillofacial trauma in the age group 21-40 years and on rarity of facial fractures at the extremes of life. [5,12,13] This assertion is supported by our study in which 93 (57.76%) of patients were between the ages of 21 to 40 years. The possible explanation for the high frequency is that people in this age group take part in dangerous exercises and sports, drive motor vehicles carelessly and are more likely to be involved in violence.

Similarly the significant male preponderance in all injury types as noted in this study has been reported in other similar studies. [14] In this study, it remained 5.2:1 that is higher than reported by Boffano et al (2.2:1). [15] This finding is understandable as men are active and mostly involved in outdoor activities and also exposed to violent interaction. Male drivers are more as compared to female.

This study shows that the most common cause of facial fractures was road traffic accident (RTA) in

134 (83.23%) patients, especially by motor bike and chingchi rickshaws. This finding is consistent with other studies carried out in Pakistan and also in other countries. [11,16]The reasons for this high rate of RTA in Pakistan include poor road networks, improper licensing of drivers/riders, nonusage of seatbelts, neglect of helmets by motorbike riders and non compliancewith traffic rules among others. It is instructive to note that assault related cases have been on the increase in developed countries, [14,17] a finding not demonstrated by this study (n=09; 05.59%).

The constant improvement in the quality of individual life and growing interest in sporting activities have resulted in an increased use of sport in free time at the amateur level. As a result, sports related injuries have steadily increased. [18] Maxillofacial trauma due to firearm and blast injuries has been on increase during the past decade. [19] This might eventually turn out in the near future to be the most significant etiological factor in our nation if the current wave of terrorism and gun violence is not checked. Future studies may help determine this.

Our observation that mandible as the most common fractured bone of facial skeleton (n=117; 72.67%) agrees with published studies from Pakistan [11,20] and different parts of the world. [14,17] The predominance of parasymphysis involvement (43.22%) has been seen in this study is in accordance with other studies, [21] but is inconsistent with others which have shown condyle and angleas the commonest site of fracture. [22]

In the midface region, the zygomatic complex (n=67; 41.61%) was the most susceptible area. This coincides with the views of Baylan JM et al, [23] who reported that zygoma was the most common site of fractures in the middle third of the face. Low prevalence of orbital, naso-ethmoidal as observed in this study have been reported by some local studies [24] but contrast with others, where relatively higher prevalence was reported. [14] One can speculate that inter population difference in the sites of maxillofacial fractures is partly related to the diverse etiologic factors involved.

The place of open reduction and internal fixation (ORIF) with miniplateosteosynthesis in the surgical management of maxillofacial fractures cannot be over emphasized as it promises a shortened period of intermaxillary fixation (IMF), bony union with minimal callus formation, rapid recovery of normal jaw functions and maintenance of normal body weight among others. [25]

In the past two decades, changes in maxillofacial trauma management have been strongly influenced by innovations in materials and technology. [26] In our study, open reduction and internal fixation (ORIF/ORIF with IMF) was performed in 127(78.88%) of patients.Gali R, Devireddy SK et al [27] also advocated that miniplatesosteosynthesis has become the standard procedure in their department. Closed reduction and immobilization (IMF with eyelet wiring/arch bar elastics & splint fixation) was done in 34 (21.12%) patients. Reports from Pakistan and other developing countries confirmed this practice and stated that ORIF of facial fractures has not become popular in many developing countries mostly because of cost and lack of expertise. [6,24] Due to lack and inefficiency of national health insurance scheme, the patients have to directly pay for their treatments and only a limited number of patients can afford the use of miniplateosteosynthesis for their fracture management. This is virtually the situation with many maxillofacial surgical centers in our country. Nevertheless, satisfactory results have been obtained using simple methods of CRIF comparable with treatment outcomes of ORIF with miniplates to a very large extent.

CONCLUSION

This study provides related data on pattern and outcome of maxillofacial fractures presenting to our hospital. Majority of fractures were caused by RTAin 21-30 age group with male predominance (5.2:1). Mandible was the predominant fractured bone and parasymphysis was the most frequent site followed by condyle region. In the mid face, the zygomatic complex was the most susceptible area. Open reduction and internal fixation (ORIF/ORIF with IMF) was treatment of choice in the current study.

RECOMMENDATION

According to present study, it seems reasonable to recommend that road traffic legislation enforcement and continuous public education towards the use of restraining devices and helmets should be encouraged by relevant authorities. It is also recommended that titanium miniplates manufactured for low income countries like ours should be subsidized so that all categories of patients may benefit from their usage.

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