

Pattern of Palatine Bone Fracture in Le-Fort Maxillary Fractures

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Abstract

Background and Objectives: Palatal fractures occur rarely in isolation and are usually found in patients with Le-Fort 1 maxillary fractures. The objective of our study is to determine the palatine bone fractures in Le-fort maxillary fractures.

Methodology: This cross-sectional study was carried out in the Department of Oral & Maxillofacial Surgery, KCD, Peshawar from 02 Nov 2016 to 02 Apr 2017. Patients with Leforte 1 fractures fulfilling inclusion criteria were invited to participate in the study. A detailed history followed by clinical and radiographic examination including Orthopantomogram (OPG), Occipitontal View (OMV) of the patient was performed. Computed tomography (CT scan and 3D scan) was advised. The data was collected using a customized Performa.

Results: As per patterns of fractures 53(30.99%) patients were recorded with Transverse, 59(34.50%) patients were recorded with sagittal, 38(22.22%) patients were recorded. With parasagittal and 21 (12.72%) patients were recorded with comminuted

Conclusion: In this study, we came to the conclusion that it is crucial to collect data on the epidemiology of maxillofacial fractures over the long term because it would help medical professionals create and assess preventive strategies for lowering the occurrence of facial injuries. Additionally, this will aid in the development of a clinical and research procedure for the efficient treatment of maxillofacial trauma patients in our community.

Keywords: Maxillofacial injuries, Ocular injuries, Mid-face fractures, Road traffic accidents

Introduction:

Maxillofacial injuries most commonly occur after trauma and have a great impact on psychological and functional activity of the patient. This is due to the centrality of the midface region playing as a key factor in human esthetics, general well-being and identity^{1,2,12}. The causes of maxillofacial fractures vary around the world and include things like sports injuries, firearm injuries, assaults, falls, and road traffic accidents.³ Majority of trauma including palatal fractures occur in third decade of life according to study done internationally.^{4,13}

Various acute insults to the face frequently result in facial fractures, which can happen on their own or simultaneously with other injuries. Diagnosis

and treatment of facial fractures continue to be difficult issues that frequently call for a multidisciplinary team approach.¹⁴ Le Fort I, II and III fractures are the three most prevalent forms of midface fractures, with Le Fort I the least severe and Le Fort III being the worst. The palatine bone, horizontal bone and the palatine process of the maxilla combine to form the palate, which is a portion of the midface. It gives support to buttresses and determines facial architecture and width. Eight percent of mid face fractures are accompanied by palatal fractures.⁵ Approximately 8% of Le Fort fractures had palatal fractures. Rarely do they experience an isolated fracture. Based on the fracture's proximity to the maxillary alveolus, teeth, and palatal midline, some have suggested categorizing these fractures into different groups.¹⁵ Several techniques are used in the literature to describe the pattern of palatal bone fracture.

Fractures of the palate can be classified according to simple classification as 1) sagittal 2) parasagittal 3) transverse 4) comminuted.⁶ CT based classification system done by Hendrickson et al included six classes which are; 1) Anterior and Postero-lateral alveolar 2) Sagittal 3) Parasagittal 4) Paraalveolar 5) Complex 6) Transverse fractures.

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Palatal fractures hardly ever occur alone, but less than 10% of individuals with midface fractures have them as well. Even though certain small studies suggest a substantially greater incidence. A local investigation on fracture patterns found that 54% of maxillary Le Fort fractures were sagittal fractures, 32% were para-sagittal fractures, and 65% were sagittal fractures.⁴In one of such studies majority of palatal fractures are le fort II fractures associated.⁸

The objective of this study was to determine the frequency of palatine bone fractures in Le-fort maxillary fractures.

Materials and methods:

This Cross-sectional study was carried out in the department of Oral and Maxillofacial Surgery, Khyber College of Dentistry, Peshawar, Khyber Pakhtunkhwa from 02 Nov,2016 to 02 Apr, 2017. As per WHO sample size calculator, sample size was 171 with 95% confidence interval, 7% margin of error keeping 32% as prevalence.⁴ Sample selection: Inclusion Criteria: 1) All patients of Le-fort maxillary fractures with palatine bone fracture reporting to oral and maxillofacial surgery Khyber College of Dentistry, Peshawar. 2) Age:18-60years 3) Both genders

Exclusion Criteria: 1) Those cases of le fort injuries previously treated in other centers was excluded from the study 2) Pathological fractures 3) Blast injuries.

The hospital's ethical review committee gave its approval. Participants in the study were invited to be patients referred from different Outdoor Patient Departments and other departments who met the inclusion criteria. A thorough history was taken before the patient underwent a clinical and radiographic examination that included orthopantomogram (OPG) and para-nasal sinus (PNS) images. In cases of pan facial trauma and comminuted fractures, computed tomography (CT Scan and 3D scan) was indicated. The information was gathered using a customized Performa, which also recorded study characteristics like the type of palatal bone fracture and the pattern of Le-Fort fractures. To prevent confounding factors and bias in the study's outcomes, an exclusion criterion was closely adhered to. All the data was entered in Statistical package for social sciences (SPSS) version 21.

For each variable, a descriptive statistic was generated. Age was a quantitative variable for which mean + SD was determined. For categorical characteristics like gender and the pattern of the

palatine bone fracture in the le fort fracture, frequencies and percentages were determined. By using a chi square test, the pattern of palatine bone fracture was stratified according to age and gender to determine how the effect changed. P-values below 0.05 were considered significant.

Results:

This study has been carried out at the Department of Oral & Maxillofacial Surgery, Khyber College of Dentistry Peshawar. As per our sample size, 171 patients were included in this study. Results are appended below:-

As per descriptive statistics, mean and SDs for age was recorded as 51+13.93. (TableNo.1).As per gender wise distribution,153(89.47%) patients were recorded as male patients while 18 (10.52%) patients were recorded as female patients.(Table No. 2). As per age wise distribution, 76 (53.10%) patients were recorded in 18-30years' age group while 97 (46.89%) patients were recorded in 31-60 years' age group.(TableNo.3).As per patterns of fractures,53(30.99%)patients were recorded with Transverse,59(34.50%) patients were recorded with sagittal, 38 (22.22%) patients were recorded with parasagittal and 21 (12.72%) patients were recorded with comminuted. (Table No. 4).Stratification of patterns of fracture with age and gender are recorded at TableNo.5and6

Table no1: Descriptive statistics (n=171)

Numerical Variables	Mean and SDs
Age	51+13.93

Table No2:Gender Distribution

Gender	Frequency	Percentages
Male	153	89.47%
Female	18	10.52%
Total	171	100%

Table No 3: Age Distribution (n=171)

Age	Frequency	Percentage
18-30Years	76	53.10%
31-60Years	97	46.89%

Table No 4: Patterns of Fractures (n=171)

Patterns of Fractures	Frequency	Percentage
Transverse	53	30.99%
Sagittal	59	34.50%
Parasagittal	38	22.22%
Comminuted	21	12.72%
Total	171	100%

Table no 5: Stratification of patterns of Fractures with Age

Patterns of Fractures		Age		P Value
		18-30Years	31-60Years	
Transverse	Yes	23 (13.4%)	60 (35.08%)	0.000019
	No	53 (30.9%)	35 (20.46%)	
Sagittal	Yes	30 (17.5%)	29 (16.95%)	0.221
	No	46 (26.9%)	66 (38.59%)	
Parasagittal	Yes	17 (9.94%)	21 (12.28%)	0.967
	No	59 (34.5%)	74 (43.27%)	
Comminuted	Yes	06 (3.50%)	15 (8.77%)	0.1180
	No	70 (40.9%)	80 (46.78%)	

Table No.6: Stratification Patterns of Fracture with Gender (n=171)

Patterns of Fractures		Age		P Value
		Male	Female	
Transverse	Yes	51 (29.82%)	02 (1.16%)	0.053
	No	102 (59.64%)	16 (9.35%)	
Sagittal	Yes	49 (28.65%)	10 (5.84%)	0.469
	No	104 (60.81%)	08 (4.67%)	
Parasagittal	Yes	32 (18.71%)	06 (3.50%)	0.230
	No	121 (70.76%)	12 (7.01%)	
Comminuted	Yes	32 (18.71%)	0	0.118
	No	121 (70.76%)	18 (10.52%)	

Discussion:

Maxillofacial injuries most commonly occur after trauma and have a great impact on psychological and functional activities of the patient. This is due to the centrality of facial region as a key factor in human esthetics, identity, and general well-being.^{1,2} Maxilla facial fractures across the world have different etiological factors such as Road traffic accident, falls, assaults, firearm injury, sports, and industrial accidents.³Majority of trauma including palatal fractures occur in third decade of life according to study done internationally.

Le Fort I, II and III fractures are the three most prevalent forms of mid face fractures, with Le Fort I being the least severe and Le Fort III being the most.

The palate, which is a portion of the mid face, is made up of the horizontal plate of the palatine bone and the palatine process of the maxilla; it supports the buttresses and establishes the width and architecture of the face. Palatal fractures accompany midface fractures in 8% of cases.⁵Literature has used a variety of techniques to describe the palatal bone fracture pattern. Fractures of the palate can be classified according to simple classification as 1)sagittal 2) transverse 3) comminuted.⁶ CT based classification system done by Hendrickson et al included six classes which are; 1) anterior and postero-lateral alveolar

2) sagittal 3)parasagittal 4)paraalveolar
5)complex 6)transversefractures.^{6,5}

Palatal fractures almost never occur in isolation; they are however found in less than 10% of patients with mid face fractures. Although some isolated studies report a much higher incidence. According to a local study regarding the pattern of fracture 65% were sagittal fractures and 32% para-sagittal fractures, (54%) occurred with maxillary Le Fort fractures.⁴

In one of such studies majority of palatal fractures are associated with le fort II fractures.⁴In our study, as per patterns of fractures 53 (30.99%) patients were recorded with Transverse, 59(34.50%) patients were recorded with sagittal, 38 (22.22%) patients were recorded with parasagittal and 21 (12.72%) patients were recorded with comminuted. (Table No. 4). Maxillofacial fracture frequency varies by geographic location, socioeconomic level, culture, and religion. 3 Maxillofacial injuries affect men more frequently than women. The male to female ratio in the current study was 18:1, which is typical of most investigations.

The age range most frequently affected was between 31 and 60 years old, which is consistent with the findings of other studies. Because their facial skeleton is more elastic and less brittle than that of adults, the age range between 18 and 30 was the least affected. According to age-wise distribution, 76 patients (53.10%) were in the 18-30 age range, while 97 patients (46.89%) were in the 31-60 age range. (Table Number 3) As people age, their physical and social traits change, making them more vulnerable to facial injuries.³

According to several research and reports, assault and daily activities are the main causes of maxillofacial trauma in developed nations. The declines in traffic accidents in developed nations are largely attributable to a variety of road safety initiatives, including using seat belts, calming traffic, and enforcing traffic laws. In case reports, alcohol is typically acknowledged as a significant contributing element to conflicts and traffic accidents.³

The mandible is the bone that is most frequently impacted in isolated fractures, according to numerous studies. This preponderance may be explained by the fact that the mandible, which is the most visible and the only moving facial bone, is more likely to fracture than the well-articulated mid-facial bones.³

The mandible has consistently been identified as the maxillofacial region's most often fractured bone in surveys conducted across the nation, including our own. Road traffic accidents were the primary etiologic cause in several nations where the incidence of mandibular fractures was higher. In contrast, one study found that mid-face fractures were more common, and another found that mandibular fractures

were substantially less common. These studies' primary etiologic factors were everyday falls and activities, which account for the distribution variation of maxillofacial fractures aetiology based.⁶

The most frequent location for mandibular fractures was the region of parasymphysis, followed by the condylar region. With the exception of one study where sub condylar fractures were more frequent, this is comparable to other Indian studies. The parasymphysis and condyle are the most often fractured sites, according to studies involving traffic accidents as the primary cause of maxillofacial fractures. After an assault, fractures of the mandibular body and angles are frequent. The most frequent fracture in the category of bilateral fractures was the bilateral condylar fracture. Symphysis with condyle and angle fractures were the two most common fracture combinations.²

Mandibular fractures were more common than mid-face fractures. The mandible and the skull, which provide protection by absorbing most of the traumatic impact, as well as the fact that the mid-facial bones are quite elastic, are both responsible for this low occurrence. Due to a greater degree of paranasal sinus pneumatization in elderly patients, the maxilla has been associated to be the most prevalent site for mid-facial fractures. However, due to its prominent location in the face, some studies have indicated that the zygoma is the most frequent site of mid-facial fractures.¹

Zygomatic complex fractures and Le Fort II fractures were the most prevalent types of mid-facial fractures. Except for one study, where zygomatic complex fractures were more frequent than nasal bone fractures, this finding is consistent with other investigations conducted in the subcontinent.^{9,10}

Palatal fractures are very rare and occur usually in combination with midface fractures. However, it is an important bone in a sense that it maintains the symmetry and horizontal width of the face ¹⁶.the approach to manage palatal fractures vary from simpler solutions such as splints and wiring to open reduction and internal fixation ¹⁷

In an Indian study, 317 fractures that involved both the maxilla and the mandible made up 12% of all fractures. Another study conducted in India found that 4.7% of patients involved pan facial fractures. In our study, 59 (34.50%) patients had sagittal fractures, 59 (30.99%) patients had parasagittal fractures, 38 (22.22%) patients had transverse fractures, and 21 (12.72%) patients had comminuted fractures. In table No. 6, 7 Road traffic accidents are on the rise in part because of increased outdoor recreation in tourist areas and reduced visibility during the monsoon season. In terms of management Trans palatal screw has been

used for stabilization of these fractures¹⁸. Traditionally palatal fractures are managed via wiring techniques or plate stabilization¹⁹.

A study has also described the use of three-dimensional plate for stabilizing palatal fractures.²

Conclusion:

In this study, we suggest that long-term, continuous data collecting on the epidemiology of maxillofacial fractures is crucial because it will help healthcare professionals create and assess preventive strategies for lowering the frequency of facial injuries. Additionally, this will aid in the development of a clinical and research procedure for the efficient treatment of maxillofacial trauma patients in our community. Our study indicates that male population is more affected than female coinciding with the cultural background of the region. Also majority of the patients are adults. We recommend awareness of the general population regarding road safety measures and precautions.

CONFLICT OF INTEREST: None

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1. HinaAfsar- Data Analysis
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5. Yasir Rehman Khattak -Data Analysis
6. Muslim Khan - Proofreading