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Research Article

Etiology and Clinical Evaluation of Patients with Zygomatic Fractures Referring to Imam Reza Hospital in a 2-year Period

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Abstract: The Purpose of this study To document the etiology and clinical data of patients with fractures of the zygomatic complex and to compare the findings with other studies in the literature Patients and Methods: This cross-sectional study was performed from January 2011 to December 2012, One hundred and sixty patients with zygomatic fracture were admitted to Oral & maxillofacial department of Imam Reza hospital , Tabriz , Iran. Results: Results: 80.6% were males and 19.4% females. Most (38.1%) patients were aged 21-30 years and road traffic accidents (66.8%) caused the most injures. Regarding the site of fracture, 56.8% of the patients had fractures of the zygomatic bone, 6% had fractures of the arch, and 36.2% had fractures of both the zygomatic bone and arch. The most frequently associated maxillofacial fracture was mandibular fracture (23.1%). The most common clinical feature was Infraorbital nerve paresthesia (64.3%). Conclusion: The findings, compared with similar studies reported in the literature, support the view that the highest prevalence is in young male patients and, concerning cause, traffic accidents is the most frequent.
Keywords: Zygomatic fractures, Classification, Etiology

INTRODUCTION

Maxillofacial fractures account for a substantial proportion of traumatic injuries [5]. Several authors have noted that the zygomatic complex and maxilla are the most common maxillofacial fracture sites [4]. The zygomatic bone has a prominent and important position in the facial skeleton [21]. The zygomatico-maxillary complex (ZMC) contributes to the formation of the lateral wall and floor of the orbit as well as walls of the temporal and infratemporal fossa because of its articulations with the frontal, temporal and maxillary bones and the greater wing of the sphenoid [20]. Due to the anterior location of facial bones, they are exposed to trauma and the zygomatic complex injuries are very common in trauma patients. They might be isolated or associated with other serious body injuries.

The architectural pattern of zygomatic bone allows it to withstand blows of great forces without fracturing. Because of such heavy forces zygomatic bone gets separated from adjacent bones at or near the suture lines. It may be separated from its four articulations, resulting in a zygomatico-maxillary complex, zygomatic complex or orbito-zygomatic fracture. Fractures of this complex are one of the most common types of maxillofacial injuries to treat. They are seen as isolated or in association with other facial fractures due to the complex midface anatomy [6,8.12]. The fracture of the zygomatic bone can result in restricted mouth opening due to impingement on the coronoid process. Disruption of the malar bone position also carries psychological, esthetic and functional significance, causing impairment of ocular and mandibular function. Therefore, for both cosmetic and functional reasons, it is mandatory that zygomatic bone injury be properly diagnosed and adequately managed [13].

In recent years, the incidence of injuries and its related mortality has increased dramatically in Iran. In fact, injuries are the second most common cause of death after cardiovascular diseases and the first cause of years of life lost (YLL) in Iran [1]. The high burden of injuries in Iran necessitates the establishment of periodic epidemiologic reviews to reaffirm previously established trends or identifying new patterns of disease frequency.

The present research study was carried out to determine the etiologic factors, symptoms and signs, associated injuries and fracture patterns of zygomatic complex in patients referring to Imam Reza Hospital (a level 1 center for trauma in the north-west of Iran).

PATIENTS AND METHODS

This cross-sectional study was performed from January 2011 to December 2012 in the Department of

Oral and Maxillofacial Surgery of Imam Reza Hospital, Tabriz, Iran. The study was approved by the local Ethics Committee at Tabriz University of Medical Sciences. During this period, 160 patients with zygomatic complex fractures with or without other facial, rib or extremity fractures were included in the study. Patients with Lefort fractures were excluded from the study. All the participants or their relatives signed an informed consent form. Based on the prepared checklist during the first clinical examination, following the registration of personal particulars and obtaining the history of trauma, etiologic factors such as causes of trauma, symptoms and signs of fractures, and accompanying injuries were recorded. If surgical intervention was inevitable because of functional or esthetic impairment based on the systemic situation and the type of fracture, the best standard surgical approach was determined and performed thereafter. For radiological examination, computed tomography (CT) was performed in the majority of the patients. Axial and coronal CT scans with 2-mm cross-sections were obtained. Based on Fuji and Yamashiro classification system, zygomaticomaxillary complex fractures were divided into 4 types as follows:

Type I: green stick fracture of zygoma

Type II: pure zygomatic arch fracture

Type III: fracture of zygomatic buttress with minimal displacement in the antero-posterior direction

Type IV: fracture of zygomatic buttress with great displacement in the antero-posterior direction. Patients with displacement in the lateral direction were also included in type IV group.

Infraorbital nerve (ION) paresthesia in the affected ION dermatome was diagnosed based on patients' complaints. Ophthalmology consultation was requested for all the patients.

RESULTS

Of 160 patients with zygomatic fractures seen during the 2-year period of the study, 129 (80.6%) were male and 31 (19.4%) were female. The male-to-female ratio was approximately 4:1. The age of the patients at presentation ranged from 12 to 90 years (Figure 1), with a mean age of 32.81 years (SD=12.85)

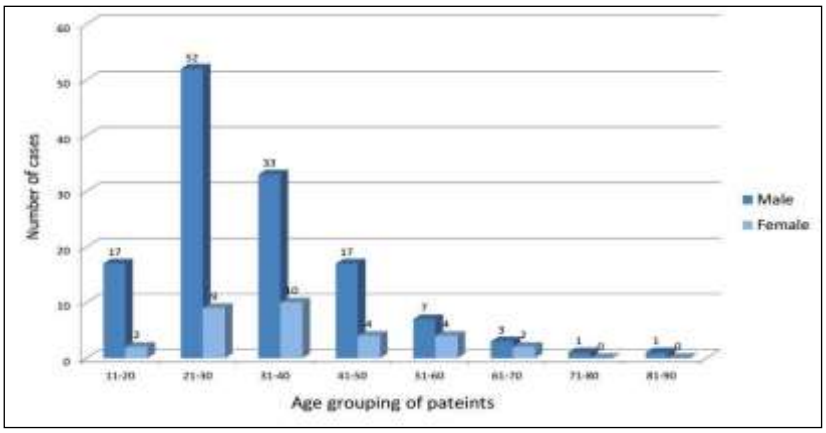

Fig-1: Distribution of age groups.

About 12 patients (7.5%) were alcoholic, 10 (6.2%) were addicted to opioids and 50 (31.2%) were smokers. The leading cause of zygomatic fractures was motor vehicle accident, accounting for 66.8% of all the injuries (107 patients); 55 were drivers or passengers of cars (34.3%); 40 were motor cyclists (25%) and 12 were pedestrians (7.5%). Other causes of ZMC fracture were as follows: falls with 30 patients (18.7%), assaults with 16 patients (10%) and sport accidents with 7 patients (4.3%).

None of the patients reported traumas inflicted by their husbands, child abuse and occupational accidents as reasons for zygomatic fractures.

Among 160 cases of zygomatic fractures, zygomatic buttress fractures were seen in 91 patients (56.8%), isolated arch fractures were seen in 10 patients (6%) and 58 patients (36.2%) had both buttress and arch fractures. One patient had a pure blown-out fracture. Table 1 presents fracture patterns based on Fuji and Yamashiro classification.

Table-1. Anatomic distribution of ZMC fractures

Type I	8 (5%)
Type II	8 (5%)
Type III	59 (36.8%)
Type IV	85 (53.1%)

For 111 cases (69/3%) of the present study, surgical intervention was carried out while others (30/6%) were just followed. Table 2 presents clinical symptoms and signs.

Table-2: Frequencies of concomitant symptoms and signs

Infraorbital nerve paresthesia	103 (64.3%)
Inferior orbital rim step	90 (56.2%)
Subconjunctival hemorrhage	84 (52.5%)
Facial asymmetry	83 (51.8%)
Malar depression	82 (51.2%)
Periorbital ecchymosis	69 (43.1%)
Periorbital swelling	24 (15%)
Arch depression	21 (13.1%)
Positive Marcus Gunn test	19 (11.8%)
Blurred vision	19 (11.8%)
Binocular diplopia	14 (8.7%)
Enophthalmous	14 (8.7%)
Anisocoria	11 (6.8%)
Limitation of globe movements	8 (5%)
Monocular diplopia	2 (1.2%)
Blindness	2 (1.2%)

Infra orbital nerve paresthesia was the most common symptom (64.3%) followed by Inferior orbital rim step (56.2%) and Subconjunctival hemorrhage (52.5%) respectively. None of the patients had emphysema and ectropion after zygomatic complex fracture. Table 3 presents the frequencies of concomitant fractures of facial and body skeleton in descending order.

Table-3: Frequencies of other facial and skeletal fractures

Mandible	37 (23.1%)
Nasal	20 (12.5%)
Frontal	7 (4.3%)
Iliac	5 (3.1%)
Rib	5 (3.1%)
Radius	5 (3.1%)
Tibia	3 (1.8%)
Femur	1 (0.006%)
Fibula	1 (0.006%)
Temporal	1 (0.006%)

The time intervals between trauma and first visit were ranged from 0 to 128 days with the mean day of 9.6 days (SD=18.31), also the same criteria for time intervals between first visit to hospitalization were 1 to 139 days, 14 days SD=25/02 and for time intervals between hospitalization to discharge were 2 to 11 days, 6.14 days SD=2.86 respectively.

DISCUSSION

A total of 160 patients with ZMC fractures, referring to the Imam Reza Hospital, were included in the present study.Imam Reza Hospital is a level I referral center for traumatic patients in the north-west of Iran. Every year a large number of maxillofacial trauma patients are referred to this center.

An expected finding of the present study was the difference in the prevalence of zygomatic complex fractures between men and women: zygomatic fractures occurred in men 4 times more frequently than that in women, consistent with many previous studies [15,19,20].

It is obvious that violent behaviors are more frequent in men and because of the higher proportion of male drivers compared with female drivers it is not surprising that most patients were male. Mean patient age was 32.8 years (SD=12.85), consistent with the mean age of 32 years of age in Juric's study [11] and 31.6 years in Lee's study.[10] Patients in the 21-30 age range with 61 cases (38.1%) and those in 31-40 age range with 43 cases (26.8%) comprised the largest numbers of patients in the present study, which was predictable because of the low average age of the population in Iran and uncontrolled emotional behaviors in young people. The results of this study were consistent with those of a study by Ungari et al [21]. The 16-30-year age group constituted the largest number of patients; also in studies by Juric [11] and Sakavikius [17], male-to-female ratio was almost 4:1.

According to UNICEF reports, the rate of road accidents in Iran is twenty times more than the world's average. Each year, road traffic accidents kill nearly 28,000 people and injure or disable about 300,000 in Iran [21]. The results of the present study confirmed that, like most of the previous studies, motor vehicle accidents (66.8%) are the most common causative factors in the fracture of zygomaticomaxillary complex. Despite the existence of traffic rules, lack of respect for these rules by drivers of vehicles continues to create problems for our community. Other factors such as lack of deterrent penalties may lead to speeding, not fastening seat belts, using non-standard cars and roads, lack of protective gears in most cars, not wearing a helmet by motorcyclists, which are the most common reasons for the high incidence rate of motor vehicle accidents leading to maxillofacial injuries.

Falls with 18.7% and interpersonal violence with 10% were the next common causes of ZMC fractures, confirming the results of other studies [12,15,20].

In a 5-year retrospective study by Anwar et al [3]. The incidence of causing factors for maxillofacial injuries were as follow: 55.2% MVA, 19.7% falls, 16.9% assaults and 6% sports. In countries with low MVA rates, interpersonal violence is the most common cause of ZMC fractures [9].

In the present study, probably because of the fear of legal consequences, spouse and child abuse were not reported as a cause of ZMC fracture by patients or their family members.

Addiction to opioids and alcohol use were observed in 6.2% and 7.5% of cases, respectively. Likewise, due to the possibility of concealing some information by patients or their families, it is more probable that a greater number of patients were involved in drug- or alcohol-related issues.

Pure zygomatic arch fractures are more likely to involve some form of lateral impact and were more often encountered in cases of assaults and sport injuries. In the present study, pure zygomatic arch fracture was seen in only 10 cases (6%) and interpersonal violence was the most common cause of isolated zygomatic arch fractures. In a study by Forouzanfar [18], 236 patients were studied (170 males and 66 females). Zygomatic complex fractures were seen in 210 cases and 26 cases had isolated zygomatic fractures, which is similar to the results of the present study. A retrospective epidemiological and clinical study undertaken by Ungary [20] during a 9-year period showed that 642 patients were treated for ZMC fractures, 552 (86%) of who had zygomatic body fractures and 90 patients (14%) had zygomatic arch fractures.

The signs and symptoms of ZMC fractures are different. Table 2 shows that in this study ION paresthesia was the most common symptom after ZMC fracture with 64.3%. Cakavicius [17] et al also reported this symptom in 64.4% of cases and stated that functional recovery of ION depended on the severity of trauma and injury to the infraorbital canal. This finding was in agreement with the Foruzanfar`s [18] study who found the ION paresthesia the most common symptom with the incidence of 64.4% .

Step in the inferior orbital rim with a prevalence rate of 56.2% and facial asymmetry with 51.8% were the second and third common signs.

In a study by Obuekwe [15] subconjunctival hemorrhage was the most common sign; however, in the present study this symptom was seen in 52.5% cases and was the third, probably because of referral delays or existence of other serious injuries. Subconjunctival hemorrhage was resolved before our clinical examination.

Restriction of mouth opening was seen in 33.1% of cases. This is mainly due to compression of fractured ZMC to coronoid process. In the study by Obuekwe [15] 56% of cases had restriction of mouth opening. It is obvious that the amount of displacement of ZMC and zygomatic arch fracture had a very important role in the incidence of limitation of jaw movement. Because of the close relationship between ZMC and the rest of facial bones, fracture in either of the facial bones is possible and common. In this regard, the results of this study are similar to other studies.

Diplopia was seen in 9.9% of cases, which is similar to the results of Obuekwe's study [15] (7.9%) and Forouzanfar's study [18] (8.5%); however, in Al-Qurainy's [2] study it was seen in 19.8% of patients with midface fractures, indicating that the fracture of zygomatic bone is the most important factor in the incidence of diplopia.

Many other facial fractures may be concomitant with ZMC fractures [15]. In the present study fracture of mandible occurred in 23.1% of cases nasal fractures were the second most prevalent concomitant injury(12.5%).Epidemiological surveys vary with geographic region, population density, socioeconomic status, regional government, era in time, and type of facility in which the study was conducted. Comparison of studies requires consideration of these factors. The increasing prevalence of facial bone injuries emphasizes the necessity for epidemiological surveys to determine optimal prevention strategies and patient management. Such data can inform clinicians about the causes and incidence of zygomatic fractures. Long-term data collection and also thorough analysis of epidemiological data regarding orbital fractures in severely injured patients are important steps to evaluate

the effectiveness of conventional preventative measures. It is also necessary to determine the trends to help guide the development and implementation of new methods to prevent injuries.

In conclusion, zygomatic complex fractures remain one of the most common maxillofacial fractures and result frequently from traffic accidents. The highest prevalence is in young male patients (21 to 30 age range) and ION paresthesia is the most common symptom. Insight into the epidemiology of zygomatic fractures and associated injuries is useful not only for developing preventive strategies, but also for making decisions with regard to patient care, development of optimal treatment regimens and appropriate resource allocation.

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