

Etiology and incidence of zygomatic fracture: a retrospective study related to a series of 642 patients

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Abstract. – BACKGROUND AND OBJECTIVES: The aim of this paper is to investigate epidemiological data (age, gender), sites, etiology and surgical approach of zygomatic fracture.

MATERIALS AND METHODS: A 9 years retrospective clinical and epidemiologic study evaluated 642 patients treated for zygomatic fracture. There were 569 men and 77 women. The age range was 2 to 86 years with 205 (31.9%) in the 21 to 30 years age group. A number of parameters, including age, gender, cause of injury, site of injury, treatment modalities were evaluated.

RESULTS: There were 552 (86%) zygoma fractures and 90 (14%) zygomatic arch fractures. The left zygoma was involved in 309 cases (56%); the right zygoma was involved in 243 cases (44%). Concerning the zygomatic arch, the left side was involved in 43 cases (48%) and the right side in 47 cases (52%). 7% of the patients were younger than 9 years old, about 70% between 10 and 39 years, and 18% between 40 and 59 years, while 4% were older than 60 years. Causes of zygoma fracture were traffic accidents in 151 (26%), assault in 117 (20%), accidental falls in 105 (19%), sports injuries in 56 (10%), home injuries in 45 (8%), work accidents in 34 (6%). Causes of zygomatic arch fractures 28 (29.1%) were assaults in 28 (29.1%), traffic accidents in 20 (21.5%), sports injuries in 14 (15.8%), accidental falls in 11 (14%), domestic accidents in 8 (8.8%) and work accidents in 4 (5%). The access to the fronto-zygomatic suture (74.6%) and the maxillary vestibular approaches (66.8%) were the commonest method of reduction of zygomatic fracture. About arch fractures, the Gillies temporal approach was the most used method of reduction (94.4%).

CONCLUSIONS: 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 and assault are the most frequent.

Key Words:

Zygomatic complex fractures, Facial fracture, Etiology, Surgical approach.

Introduction

The zygomatic bone has a prominent and important position in the facial skeleton. The zygoma

takes part in a significant portion of the floor, lateral wall of the orbit and the zygomatic arch, the malar eminence, playing a fundamental role in the determination of facial morphology.

Facial bones results extremely exposed to trauma as for their anterior location and the zygomatic complex injuries are very common in trauma patients. They might be isolated or in combination with other serious injuries, including cranial, spinal, upper and lower body injuries^{1,2}.

The prevalence and location of zygomatic complex fractures and facial fractures in general depend on sample population studied³ but the zygomatic complex fractures represent the second most frequent fractures of the middle face after the nasal bones⁴⁻⁶. These occur for the rotation of the zygoma associated with the disarticulation of the zygomatic bone at the zygomaticofrontal suture, the zygomaticomaxillary suture, and along the zygomatic arch to the temporal bone^{7,8}.

The aim of this paper is to describe the caseload of the Department of Maxillo-Facial Surgery, Policlinico Umberto I, "Sapienza" University of Rome, Italy in the treatment of zygomatic complex fracture patients. This study was designed to investigate epidemiological data (age, gender), fracture sites (malar bone, zygoma arch), fracture etiology and surgical approach.

Materials and Methods

From January 1st 2001 to December 31th 2009, 642 patients with zygomatic complex fractures were treated. Data were collected regarding the clinical presentation, patient's symptoms, medical history, and the CT-scan examinations. Frequency and site of zygomatic fractures, as well as age and gender distribution, etiology, yearly distribution and type of surgical approach were analyzed. The analysis not included orbital floor fractures and trauma outcomes.

Results

Fracture Sites

In this study, we observed 642 zygomatic complex fractures. There were 552 zygoma fractures (86%) and 90 zygomatic arch fractures (14%). The most common site was the left zygoma, with 309 cases (56%); the right zygoma was involved in 243 cases (44%). Concerning the zygomatic arch, the left side was involved in 43 cases (48%) and the right side in 47 cases (52%).

Age Distribution

The age range was 2 to 86 years. 7% of the patients were younger than 9 years old, about 70% between 10 and 39 years, and 18% between 40 and 59 years, while 4% were older than 60 years (Table I). The mean age of the patients at the time of surgery was 23.71 years old.

The overall age distribution of the 561 patients showed decreasing rates of accidents every decade of life, except in the first three decades. The highest prevalence was in the 21 to 30 years age group (31.9%) while the lowest prevalence was in the 70+ years age group (1.7%).

Sport accidents and falls dominated in the first decade of life. Traffic accidents, assault and sport injuries were most prevalent in the second and third decade of life. Accidental falls became the most frequent cause in the seventh decade of life.

Gender Distribution

The patients included in this study were 569 men, respectively 492 with zygoma fractures and 77 with zygomatic arch, and 77 women, respectively 60 with zygoma fractures and 17 with zygomatic arch (Table II). The male to female ratio was 7:1.

Causes of Accidents

The etiology of fractures is shown on Table III. Concerning zygoma fractures 151 (26.7%)

Table I. Patients distribution according to the age range.

Age range	Percentage
0 to 10	7%
11 to 20	16%
21 to 30	33%
31 to 40	21%
41 to 50	13%
51 to 60	6%
61 to 70	3%
70+	2%

Table II. Distribution of zygoma and arch fracture according to gender patients.

	Male	Female
Zygoma	77	17
Zygoma arch	492	60

were traffic accidents, 117 (20.3%) assaults, 105 (19.2%) accidental falls, 56 (10.2%) sports injuries, 45 (8.5%) domestic accidents, 34 (6.6%) work accidents and 46 (8.2%) others.

Concerning zygomatic arch fractures 28 (29.1%) were assaults, 20 (21.5%) traffic accidents, 14 (15.8%) sports injuries, 11 (14%) accidental falls, 8 (8.8%) domestic accidents, 4 (5%) work accidents and 5 (6.2%) others.

Yearly Distribution

In our analysis, the annual numbers of accidents treated showed a constant increase during the period in exam: 48.21% was the increase between 2001 to 2009 (Table IV). We did not collect data about monthly distribution.

Surgical Approach

The zygoma fractures were treated exposing the frontozygomatic suture in 412 cases (74.64%). The approach to the inferior orbital rim was performed through a lower eyelid incision in 369 cases (66.84%), transconjunctival approach in 37 (6.70%) and subciliary in 6 cases (1.08%). Other approaches were hemicoronal in 24 cases (4.24%), injury wounds in 12 cases (2.17%) and coronal in 4 cases (0.72%).

As for the zygomatic arch, Gillies temporal approach was the first choice and was performed in 85 cases (94.44%). The hemicoronal approach was performed in 4 cases (4.44%) and others approach in 1 case (1.12%).

Plating or mini-plating systems were used for the bone fragment fixation. Resorbable plates and screws was used for fixation of zygomatic complex fracture in children patients.

Discussion

One of the most important data of our study was the difference in the prevalence of zygomatic complex fractures in men and women. The predominance of men in this patient population is a relatively consistent finding in most studies⁸⁻¹⁰.

Table III. Etiology of zygoma and arch fractures in the patients sample studied.

Zygoma		Zygomatic arch	
Traffic accidents	151 (26%)	Assaults	28 (29%)
Assaults	117 (20%)	Traffic accidents	20 (21%)
Accidental falls	105 (19%)	Sports injuries	14 (15%)
Sports injuries	56 (10%)	Accidental falls	11 (13%)
Home injuries	45 (8%)	Home injuries	8 (8%)
Work accidents	34 (6%)	Work accidents	4 (5%)
Other causes	44 (8%)	Other causes	5 (6%)

This data may be explained since men are more frequent drivers, particularly on highways. Men also tend to practice physical contact sports such as soccer, basketball or martial arts, frequently go to bars and tend to make greater use of drugs, including alcohol, before driving.

However, in the last three decades, there has been a growing incidence of trauma in women, mostly before 40 years of age. This is due to a change in female behaviours in society, including a higher number of women drivers, an association between alcohol and driving, a larger number of women working out of home and the practice of sports as leisure and health activities, including sports involving physical contact¹¹⁻¹³.

The zygomatic complex fractures are commonly caused by traffic accidents, assaults, accidental falls and sports injuries. According to the Authors, motor vehicle accidents were the predominant etiology of zygomatic fractures in our study, followed by assaults and accidental falls. As, concerning zygomatic arch fractures, the most common causes were the assaults, followed by traffic accidents and sport injuries.

This is mainly due as, in road traffic accidents, many impacts to the face were most likely frontal. As showed by McCullin et al¹⁴ the most significant risk for all fracture types was impact

with non-automobile, non-truck objects; the majority of these impacts were with stationary objects such as trees, telephone poles, or other static structures. A significant proportion of these accidents are associated with drug and alcohol abuse, speeding and disregard for the use of seat belts and mandatory helmet. Shapiro et al¹⁵ show the importance of protective devices on morbidity and mortality: seat belts have been shown to reduce both the frequency and severity of facial injuries that occur secondary to motor vehicle accidents and motorcycle helmets have also been shown to protect motorcyclists and reduce the prevalence of maxillofacial fractures.

Instead, 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.

Another important data showed in the present study was the highest prevalence of zygoma complex injuries in the age group 21 to 30. From such analysis Authors might suggest that sport accidents and falls dominated in the first decade of life. Traffic accidents, assaults and sport injuries were most prevalent in the second and third decade of life. Accidental falls became the most frequent cause in the seventh decade of life. The majority of zygomatic complex fractures about sport activities, occurred in collective sports, as expected mostly soccer, as the sport most frequently practiced in Italy.

Various approaches to zygomatic complex fractures have been well described in the literature¹⁶⁻¹⁹. These include coronal, hemicoronal, temporal, eyebrow, lower eyelid, upper eyelid, transconjunctival and infraciliary lower eyelid, and maxillary vestibular approaches. The approach is dictated by the degree of injury and need for exposure for open reduction and internal fixation. As shown in the Authors' results, the access to the frontozygomatic suture (74.6%) and the maxillary vestibular approaches (66.8%)

Table IV. Relationship between number of patients surgically treated and period studied.

Years	Operations
2001	56
2002	63
2003	67
2004	69
2005	71
2006	74
2007	78
2008	81
2009	83

were the commonest method of reduction of zygomatic fracture. About arch fractures, the Gillies temporal approach was the most used method of reduction (94.4%).

Conclusions

Zygomatic complex fractures remain one of the most common maxillofacial fractures and result frequently from traffic accidents, physical violence and falls. The highest prevalence is in young male patients (21 to 30 age range) and not uncommonly is associated with other fractures and potentially severe injuries. Use of protective devices, strict laws and severe punishments for violators must be implemented to reduce the frequency of zygomatic complex fractures.

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