



## Zygomatic complex fractures: a 5-year retrospective study

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### Abstract

The aim of this descriptive analytic retrospective study was to evaluate the etiology, clinical features and treatment data of patients with zygomatic complex fractures at our program during a 5-year period.

From March 1998 until February 2003, 69 patients presented with zygomatic complex fractures were treated by the department of Oral & Maxillofacial Surgery at Baghdad College of Dentistry and private clinic in Iraq. Patient's information was collected using a specifically designed form.

The patient age ranged from 5-68 years with a mean age of 30.5 years, 51 of them were males and 18 were females. Road traffic accidents (43.5%) was the major cause for fractures ( $P < 0.05$ ). regarding clinical features subconjunctival ecchymosis (61%) and circumorbital ecchymosis (53.6%) were most common observed. The Gillies approach (26%) was the commonest method of reduction.

This study has shown that road traffic accidents are responsible for most zygomatic complex fractures in our environment. It also showed a low utilization of technological advances in the imaging and treatment of these fractures.

**Key words: Zygomatic complex, fractures, etiology.**

### Introduction

Although there is abundant literature on the pattern of maxillofacial injuries all over the world, reports are scanty on zygomatic complex fractures (ZC) especially, in developing world.<sup>1-5</sup> The zygomatic bone is intimately associated with the maxilla, frontal and temporal bones and as they are usually involved when a zygomatic bone fracture occurs it is more accurate to refer to such injuries as 'zygomatic complex fractures'. The zygomatic bone usually fractures in the region of the zygomaticofrontal suture (ZF), the zygomaticotemporal suture (ZT), and the zygomaticomaxillary

suture (ZM). It is unusual for the zygomatic bone itself to be fractured, but occasionally it may be split across and when there has been extreme violence the bone may even be comminuted. The zygomatic arch may be fractured without displacement of the zygomatic bone. Fractures may be classified as fractures of the body (minimal or no displacement, inward and downward displacement, inward and posterior displacement, outward displacement, and comminution of the complex as a whole) or fractures of the arch (minimal or no displacement, V-type in-fracture, and comminuted

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fracture). Fractures of the ZC require reduction if the patient has diplopia, when there is limitation of mandibular movements, to restore the normal skeletal protection for the globe of the eye, or for restoration of the normal contour of the face the importance of which varies between individuals.<sup>6</sup> Fractures of the ZC are among the most frequent in maxillofacial trauma.<sup>7,8</sup> The ZC is responsible for the mid-facial contour and for the protection of the orbital contents.<sup>9</sup> The etiology of ZC fractures includes road traffic accidents, assaults, falls, sports, and missile injuries.<sup>10-15</sup> Common clinical features of ZC fractures include diplopia, enophthalmos, subconjunctival ecchymosis, flattening of the cheek, gagging of the occlusion and sensory disturbances.<sup>9,14,16-18</sup> Diagnosis of ZC fractures is usually clinical; with radiographic confirmation.<sup>19</sup> The aim of this analytical retrospective study was to evaluate the epidemiology and treatment of zygomatic complex fractures as seen in the Baghdad College of Dentistry Teaching Hospital in 5-years period.

## Materials and methods

This is a retrospective study of patients who presented with fractures of the ZC between March 1998 and February 2003 at the department of Oral & Maxillofacial Surgery, Teaching Hospital of Bagdad College of Dentistry. 69 patients were selected from a pool of 320 patients who sustained maxillofacial fracture during the period under review. Data was retrieved from the department case records and radiographs and patient's information was collected using a specially designed form. The evaluation included data regarding patient's age, gender and etiology of the fracture. Other data recorded were

the clinical findings, associated facial fractures and treatment methods of ZC fractures. Plain radiographs (occipitontental and submentovertex views) and (in more complex cases) facial computed tomography (CT) was used for radiographic analysis. Plain facial posteroanterior and lateral views utilized for diagnosis of associated facial fractures. Patient's clinical records and radiographs were individually reviewed by authors themselves. However cases with deficient data base were excluded. Statistical testing was done with the Chi-squared test. P value less than 0.05 were regarded as significant.

## Results

A total of sixty nine patients presented with ZC fractures during the study period. Of these, 51 (73.9%) males and 18 (26.1%) females were recorded, giving a male:female ratio of 3:1. They ranged from 5-68 years with a mean age of 30.5 years. Patients in the 21-30-year age group recorded the highest number of fractures (32 patients 46.4%) followed by patients in the fourth decade of life (15 or 21.7%) as shown in Table 1. Road traffic accidents were responsible for the majority of ZC fractures 30 (43.5%). This was followed by fights and assaults 17 (24.7%). There was a significant association between road traffic accidents and fractures among the age groups ( $P < 0.05$ ), other etiological factors are presented in Table 2. Fifty six patients (81.2%) sustained fractures of the zygomatic bone, 10 (14.5%) had fractures of the zygomatic arch and 3 (4.3%) had fractures of both. Patients with ZC fractures also suffered from associated facial fractures in 44 cases (63.8%) while isolated zygomatic complex fractures presented in 25 cases. Among these, the most common were Le Fort

I, II, III fractures 15 (34%) followed by mandibular fractures 11 (25%) as shown in Table 3. Clinical features are presented in Table 4, the most common was subconjunctival ecchymosis 42 (61%) followed by circumorbital ecchymosis 37 (53.6%) and limitation of mandibular movements 28 (41%). Gillies lift was the main approach utilized for the reduction of ZC fractures in 18 patients (26%), while 38 patients (55.1%) were treated by open reduction and transosseous wiring across suture lines. Seven patients (10.1%) were treated conservatively (Table 5).

## Discussion

This study recorded that more males than females ratio 3:1 sustained ZC fractures this is because most Iraqi women are house wives and are less susceptible to accidents, assaults, work and sport injuries, this is consistent with other reports.<sup>20,21,22</sup> The age group most frequently involved in our series were 21-30 years (third decade) 46.4% followed by 31-40- year age group 21.7%. The reason is attributed to the fact that individuals in the third decade of life are more physically active.<sup>23</sup> The leading cause of ZC fractures was road traffic accidents 43.5%. These figures commensurate with the findings of Menon,<sup>20</sup> Obuekwe<sup>23</sup> and Fasola.<sup>24</sup> In contrast Trivellato<sup>25</sup> and Rowe & Williams<sup>26</sup> found that fights and assaults was the predominant cause of maxillofacial injuries, while Gomes<sup>27</sup> in his study showed that falls as a main cause. There are a lot of contributory factors in road traffic accidents in maxillofacial trauma in Iraq. The young Iraqi male is likely to engage in jobs that require intercity vehicular transport. Due to nonenforcement of road traffic laws, many drivers notoriously exceed the speed limit, do

not use seat belts, and drive under the influence of alcohol and other psychoactive substances. As a result of economic recession in Iraq many drivers fit already used tires on their vehicles, while years of neglect have left the highway in disrepair. The present study recoded more fractures of the zygomatic bone 81.2% than those of the arch 14.5% or combined zygomatic bone and arch 4.3%. Isolated zygomatic arch fractures are uncommon.<sup>12</sup> This is probably because of the predominant role of road traffic accidents, in which most impacts to the face were most likely frontal. Arch fractures are more likely to involve some from lateral impact and were more encountered in cases of assaults, falls, missiles and other injuries. As a result of the intimate association of the ZC with the rest of the facial skeleton, associated maxillofacial fractures are common. In this study associated fractures presented in 63.8% of cases. Le Fort I, II, III fractures (34%) were most often associated with ZC fractures followed by mandibular fractures (25%). This consistent with Trivellato<sup>25</sup>, whereas other studies obtained different results<sup>20,23</sup>, probably because the number of subjects evaluated. Although several signs and symptoms accompany ZC fractures,<sup>9,12</sup> not all require active treatment. Subconjunctival ecchymosis (61%) and circumorbital ecchymosis (53.6%) were most frequently encountered in our series but were usually self-limiting. Limitation of mandibular movement occurred in 41% of patients and is usually a result of mechanical impinging of the ZC on the coronoid process of the mandible.<sup>12</sup> Diplopia was observed in 14.5% of patients in this study. Al-Qurainy et al.<sup>17</sup> reported diplopia in 19.8% of patients with mid-face fractures and found that zygomatic fractures were a principal risk factor in the development of

diplopia. There has been a paradigm shift in the management of ZC fractures from conservative to surgical in the last few decades.<sup>20</sup> In cases with little or no fracture displacement (no indications) or when subjects chose not to undergo surgery (usually for esthetic reasons as a relative indication or financial constraints or fear from operation or they refused treatment), conservative therapy was performed which consisted solely of diet therapy, no sleeping on the affected side, and clinical follow-up until complete recovery. 10.1% of patients received no treatment. Various closed and open reduction procedures are available as treatment option for ZC fractures. However, the choice of technique depends on the clinician's evaluation of the fracture, experience and preference as well as availability of equipments and facilities. In the present study, Gillies temporal approach was the commonest surgical procedure employed (26%), this was close to Obuekwe et al.<sup>23</sup> who reported 25.4% as the commonest method of reduction. In grossly displaced fractures, open reduction and fixation obtained with transosseous wires at the ZF suture (20.3%) was most common followed by two point fixation at ZF & ZM sutures (18.8%), this commensurate Menon et al.<sup>20</sup> who reported that the most optimum method of treatment was a 2 point fixation providing adequate stability to the fracture. In conclusion, this study has shown that road traffic accidents and increased violence rate responsible for most ZC fractures in our environment. It also showed a low utilization of technological advances in the imaging and treatment of these fractures.

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Table 1. Age and gender distribution

Age range (years)	Male (No)	Female (No)	Percent (%)
0-10	2	1	4.4
11-20	6	3	13
21-30	24	8	46.4
31-40	11	4	21.7
41-50	5	1	8.7
51-60	1	-	1.4
61-70	3	-	4.4
Total	52	17	100

Table 2. Etiology of ZC fractures

Cause	No	%
Road traffic accident	30	43.5
Fight & assault	17	24.7
Fall	9	13
Missile	5	7.2
Work injury	4	5.8
Sport	2	2.9
Horse kick	2	2.9
Total	69	100

Table 3. Distribution of associated maxillofacial fractures

Fracture type	No	%
Le Fort I, II, III	15	34
Mandible	11	25
Nasal	10	22.8
Orbital	8	18.2
Total	44	100

Table 4. Clinical features of ZC fractures

Clinical feature	No	%
Subconjunctival ecchymosis	42	61
Circumorbital ecchymosis	37	53.6
Depression of the arch	31	45
Limitation of mandibular movements	28	41
Flattening of the cheek		
Gagging of the occlusion	15	21.7
Diplopia	14	20.3
Sensory disturbances	10	14.5
Enophthalmos	7	10.1
	4	5.8

Table 5. Approaches and treatment for ZCF

Treatment	No	%
Conservative treatment	7	10.1
Gillies lift	18	26
Intraoral approach	3	4.4
Antral packing	3	4.4
Open reduction and fixation	38	55.1
Fixation at ZF suture only	14	20.3
Fixation at ZM suture only	11	16
Fixation at ZF& ZM sutures	13	18.8
Total	69	100