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Original Article

Management outcomes of zygomatico-maxillary complex fracture

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Abstract

The aim of this study was to evaluate the management options and the outcomes in different patterns of zygomatico-maxillary complex fractures.

Methods: A total of 50 zygomatic fractures were included in this prospective study conducted at de'Monmorency College of Dentistry, Lahore. Different patterns of zygomatic complex fractures were assessed and each case was managed accordingly. Patients were followed up for 2 months. The management outcomes of zygomatic complex fractures were assessed.

Results: Less than one fifth of the patients (14%) did not require any surgical intervention. Closed reduction was the most used method (54%) where as open reduction and internal fixation was done in one fourth of the patients. Persistent inferior orbital nerve dysfunction was seen postoperatively in 48%, facial deformity in 18% and persistent diplopia in 6%. Maxillary sinusitis (10%) was seen frequently in patients treated with antral pack.

Conclusion: Considerable number of patients do not require active surgical treatment. Indirect reduction technique is a relatively simple procedure, cost effective and commonly used but associated with high incidence of postoperative facial deformity. Open reduction and internal fixation is advocated for the unstable, markedly displaced or comminuted fracture; yields better stabilization of the fracture and hence has better aesthetic and functional results.

Key words: Zygomatico-maxillary complex, Zygomatic fracture pattern, Treatment modalities, Management outcomes

Introduction

The zygomaticomaxillary complex (ZMC) plays a key role in the structure, function, and aesthetic appearance of the facial skeleton. Because of its prominent position, the zygoma is the second most common facial bone fractured after nasal bone[1]. It overall represents 13% of all craniofacial fractures[1], 45% of all the mid facial fractures and 12% of all fractures of the facial skeleton[2].

Fractured zygoma is perhaps the least understood and most frequently mistreated facial fracture. Depending on the pattern of ZMC fracture different treatment modalities have evolved ranging from non intervention to indirect or closed reduction maneuvers to complicated open reduction and fixation including endoscopic assisted reduction[1]. Nondisplaced or minimally displaced malar fractures are managed nonsurgically. Investigations reveal that between 9 and 47 percent of zygomatic fractures do not require operative treatment[3]. Several surgeons feel that reduction alone does not produce adequate stability of the fractured zygoma, claiming that downward pull of the masseter muscle will cause a medial rotation of the zygomatic body prior to the healing[4]. Displaced fractures should be surgically reduced and plated. However controversy exists regarding the amount of exposure and fixation required[5].

Complications following zygoma fracture reduction are mainly related to improper reduction of the fracture segments or relapse, secondaries to the inadequate stabilization. Malposition of the bony segments, ocular complications, neurosensory disturbances and complications related to the mandibular functions and antral health are associated with ZMC fractures[6]. Failure to correctly reduce these fractures lead to

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facial asymmetry, trismus, diplopia, enophthalmos and paresthesia.

Materials and methods

A prospective descriptive case series study was conducted at the department of Oral and Maxillofacial surgery, de'Montmorency College of Dentistry, Punjab Dental Hospital, Lahore. 50 Patients with zygomatico-maxillary complex fractures were included in the study and non-randomised sampling technique was used. Patients of any age or sex presenting with zygomatico-maxillary complex fractures less than 2 weeks duration were included in the study. Already treated ZMC fractures but presenting with malunion or nonunion or patients with associated head injury were excluded.

A standardized structured proforma was used to collect necessary information of the study subjects. Definitive diagnosis of ZMC fractures was established with the aid of clinical and radiographic findings (occipitomental view or Water's view and the submentovertex view of the skull). Axial and coronal sections of computed tomography of the face were advised to those patients presented with enophthalmos, hypoglobus or restricted eyeball movement. Fracture pattern was categorized as follows: Type I- fracture showing no displacement, Type II- Isolated zygomatic arch fracture Type III- Unrotated displaced fracture Type IV- Medially rotated fracture Type V- laterally rotated fracture Type VI- Comminuted fracture.

Depending on the fracture patterns and the treatment required, patients were categorized in different groups. A) Patients requiring no surgical intervention and managed conservatively B) Patients treated with closed reduction method with or without antral support c) Patients treated with open reduction and internal fixation with miniplates. Conservative management consisted of a soft diet, antibiotics, not applying pressure on the affected cheekbone and reviewing the patient in approximately 10 days to exclude displacement. All patients were followed for a period of two months postoperatively. The management outcomes of zygomatic complex fractures were assessed under following criteria: i) Facial deformity (malar flattening) ii) Sensory nerve function iii) Ocular complications iv) Masticatory function v) Antral health

Results

The 50 patients in our study were aged between14 to 50 years and mainly males (80%), Type III zygomatic fractures comprised the highest proportion (34%) followed by Type IV fractures (22%), type VI was the least common (8%) (Fig 1).

Different treatment modalities were employed to treat zygomatic complex fractures (Fig 2). The most used treatment method was indirect reduction (54%) or closed technique. Closed reductions were performed in isolated arch fracture or rotated body fracture with intact or incomplete fracture of the lateral orbital wall. 14% of the cases required no reduction and were managed conservatively. Such fractures exhibited no or minimal displacement. 10% of the patients were treated with indirect reduction with antral support. 22% of the patients were treated through open reduction and internal fixation, using titanium mini plates. Out of 11 patients, four patients required exploration and reconstruction of the orbital floor. Parietal bone and anterolateral wall of the opposite site of the antrum were used in the orbital floor reconstruction. Plates were placed in the lateral orbital wall, zygomaticomaxillary buttress and in the infra orbital margin if required.

Patients were reviewed for two months after initial treatment for assessment of outcomes (Fig 3). The most common postoperative complication was persistent paresthesia or numbness (48%) in the lip, infraorbital region of the involved site postoperatively. Depressed cheekbone was present in 9 patients (18%). Primary diplopia normalized after 2 weeks but 6 % had persistent diplopia after 2 months and only one patient had post-traumatic enophthalmos. 5 patients (10%) presented with chronic sinusitis. 3 of them were treated with indirect reduction and antral support. Masticatory functions were restored except in 8% of the patients. Immediate postoperative hemorrhage was noted in only one case in the form of infratemporal hemorrhage. Postoperative infections were present in 8% of those patients who were treated with open reduction and fixation.

Table 1: Complications regarding treatment modality

Treatment Modality	Total No. of Patients	Facial deformity	Persistent Paresthesia	Ocular problems	Masticatory problems	Maxillary sinusitis / Infection*	Hemorrhage
Conservative	7	0	2	0	0	0	0
Closed Reduction	27	4	15	0	2	0	1
Closed + Antral support	5	3	3	2	2	3	0
Open reduction & internal fixation	11	2	4	1	0	2 / 4*	0
Total	**50**	**9**	**24**	**3**	**4**	**5 / 4***	**1**
Percentage	**100**	**18**	**48**	**6**	**8**	**10 (8)**	**2**

* Infection associated with internal fixation

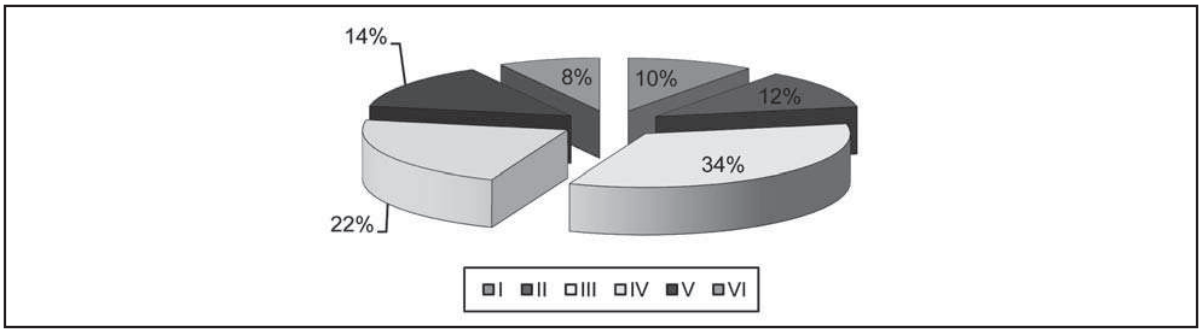

Fig 1: Fracture pattern

Type I: Minimally displaced or nondisplaced
Type II: Isolated arch fracture
Type III: Nonrotated displaced fracture
Type IV: Medially rotated fracture
Type V: Laterally rotated fracture
Type VI: Comminuted fracture

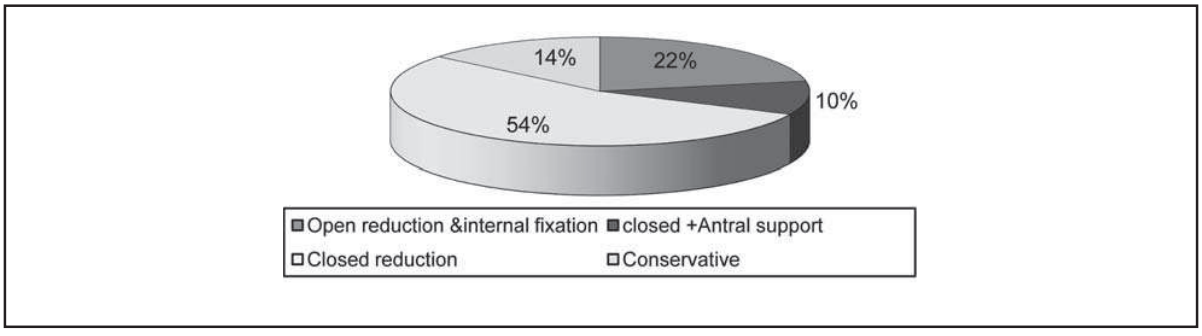

Fig 2: Treatment modalities

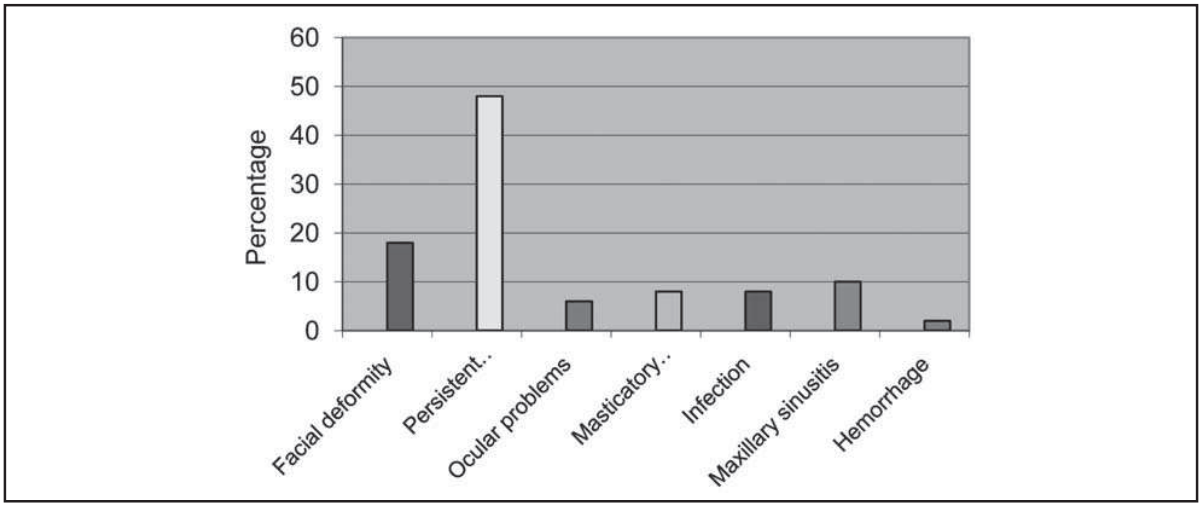

Fig 3: Treatment complications

Discussion

There are still unsolved questions with regard to the management of zygomatic fractures. One of the reasons could be the difference in etiological variables and treatment outcomes described in various studies. Various studies have advocated different treatment options that vary from conservative approach to more proactive technique including the advanced endoscopic assisted reduction[30]. However every patient should be dealt individually before a treatment decision is made.

In our study, conservative management was done in less than one seventh of the study population. Decision not to operate was made in those cases with minimal degree of displacement with no any cosmetic deformity, visual disturbance. Various studies revealed that between 9 and 47 percentage of zygomatic fractures did not require active treatment[3]. Ellis et al[7] in his case series of 2067 zygomatic fractures, reported that 23%of cases did not require operative treatment. Despite the wide variation, decision whether or not to intervene should be made cautiously and when doubtful, treatment can be delayed until facial edema resolves and thorough clinical examination can be made.

Some authors favor indirect method in cases of fresh fractures or consider it in cases of less complex fractures[8]. More than half of the patients in our study were treated with indirect reduction (54%) as compare to the open reduction and internal fixation (22%). The rational is that acceptable results can be achieved with a relatively simple procedure, cost effective and that complications caused by excessive incisions, manipulations and fixations are reduced as suggested by some authors[9]. In some study, ratio of closed reduction versus open reduction was as low as 1:4.[10] Our studied showed the ratio more than double (2.5:1) and open reductions were reserved for those fractures that were markedly displaced, with disruption in the FZ suture or comminuted or with ophthalmic problems. Of all the different combination of sites that received internal fixation, the lateral orbital rim was the most favored. Exploration and reconstruction of the orbital floor was performed in considerably less number of patients (8%). All of these patients had associated comminuted orbital floor fractures. Crumley and Leibsohn[11] noted significant orbital floor disruption in 39% of patients with zygomatic fracture.

Use of antral pack for the reduction and stabilization of the fractured zygoma had shown unreliable stabilization, postoperative swelling, infection and the higher incidence of maxillary sinusitis.

Persistent infraorbital nerve dysfunction (48%) was the most common complaint and noted mostly after indirect reduction of the fractures. The incidence of persistent sensory dysfunction reported in the literature ranges from 22-65% for open reductions and 9-40% for closed reductions[11]. Out of fifty patients, 3 patients (6%) had persistent diplopia and one had enophthalmos postoperatively. Armin et al[1] reported diplopia (9%), and enophthalmos (4.5%) with open reduction and fixation. Persistent diplopia could have resulted from scar contracture, adhesion within ocular muscles or neural injuries due to trauma.

Postoperative maxillary sinusitis was seen in two third patients treated with indirect reduction and antral pack support for the unstable ZMC fracture. Zingg[10] reported a 7% incidence of maxillary sinus opacification after ZMC fracture repair.

We found that the incidence of postoperative facial deformity (such as malar flattening) was higher in the closed reduction group (14%) with or without antral pack as compared to open reduction (4%) implying either a higher incidence of improper reduction or postoperative relapse. According to Karlan and Cassisi[4] masseter muscle pull can distract a repositioned zygoma causing the medial rotation of the zygomatic body prior to the healing. Perino et al[12] reported postoperative facial asymmetry in 20-40% of patients and most postoperative irregularities required no surgical intervention. Immediate postoperative trismus was attributed to the pain, swelling or trauma to the muscle itself.

Conclusion

This study presents information that can be valuable in describing the pattern and spectrum of zygomaticomaxillary complex fractures in local population. Since the RTAs, the leading cause of facial trauma, are usually associated with greater severity of injuries as compared to the fall and assaults, treatment approach needs to be comparatively aggressive e.g. exposure of fracture sites and internal fixations, for better aesthetic and functional restoration.

However, indirect (closed) reduction is still the most used treatment methods. Sizable number of ZMC fractures having undisplaced fracture does not require any active treatment. Antral pack does help to support the unstable ZMC fracture but results in poor antral health, stability and less satisfactory mandibular function. With open reduction and internal fixation, one can be sure of proper reduction and adequate stabilization. Indirect techniques are relatively simple procedure, cost effective and that complications caused by external incisions, manipulations and fixations are reduced. However a sizeable number of complications like persistent facial deformity, paresthesia, diplopia and limited opening of mouth are associated with indirect reduction and may indicate the necessity for a more aggressive approach in future. Open reduction and internal fixations with two points fixation at the FZ suture and the zygomaticomaxillary buttress can yield better stabilization of the ZMC fracture and hence better aesthetic and functional results.

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