

Causes, Types and Management of Zygomatic Bone Fracture in Patients Presenting at Tertiary Care Hospital

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ABSTRACT

Aim: To assess the frequency of different causes, types and management options of zygomatic bone fractures.

Method: A cross sectional study was conducted from March 2022 to March 2023 at Oral & Maxillo-Facial Surgery Department, Nishtar Institute of Dentistry, Multan. Seventy two zygomatic bone fracture patients were included meeting inclusion & exclusion criteria after complete clinical & radiological examination. Patient's demographic data, cause, type of fracture and treatment modality executed were collected on a specially designed proforma. Data was analyzed using SPSS version 22. Frequencies, percentages, mean \pm standard deviation were taken.

Results: Male to female ratio was 3.8:1 with male predominance. Road traffic accident was the leading cause of zygomatic bone fractures (n= 43,60.6%) while Rowe & Kelly's type IV (inward & posterior) Fracture was most common type of fracture (n=21, 29.2%). ORIF with Two-point fixation was the most common treatment modality executed (n=27,37.5 %).

Conclusion: Etiology varies due to geographic area, socio-economic status & degree of RTA. Type fracture depends upon side of impact and Open reduction is modality of choice for the treatment of zygomatic bone fractures.

Keywords: Road traffic accidents (RTA); Open reduction & internal fixation (ORIF); zygomatic bone fracture.

INTRODUCTION

The zygomatic bone, integral part of facial anatomy, maintains facial width and cheek prominence.¹ Prominent location of the zygomatic bone make it vulnerable site of fracture. This is second most commonly fractured bone followed by nasal bone. Causes of fracture include road traffic accident and fall, fights, interpersonal violence and sports injury.^{2,11} Males are more prone to the fracture than females with peak age between 20 to 29 years.³ It presents as an isolated injury (37%) in case of violence or as a part of polytrauma.⁴

Roadside trauma is the main cause of zygomatic bone fractures in the developing world. Among all the traffic accidents, motorbike accidents comprise of 24.8% of the report ed cases followed by car accidents (19.2%). As a whole, traffic-related events represent 57.6% of zygomatic bone fractures.⁵ Surprisingly, in the western world interpersonal violence accounts 15.2% of zygomatic one fractures⁶.

Patient with zygomatic bone fracture presents with flattening of cheek, pain, subconjunctival hemorrhage, periorbital ecchymosis, trismus and malocclusion. Indications for the surgical reduction of zygomatic arch fractures are based on sign and symptoms that indicate aesthetic and functional impairments. There are several clinical signs and symptoms including altered vision, diplopia, enophthalmos, facial asymmetry, trismus, displacement at infraorbital rim or zygomaticofrontal suture and infraorbital nerve injury.⁷ Occipitomental or waters view along with submento-vertex are the basic plain radiographs to evaluate the fracture while CT and its 3D reconstruction is used to evaluate degree of orbital involvement^{7,8}. It is imperative to classify the type of Zygomatic bone fracture according to rotation of fractured zygomatic bone, site of fracture, degree of comminution and orbital involvement. It helps to understand the complexity of fracture, its management plan and expected postoperative sequelae/ complications. Different classification systems are proposed. Most conventionally and widely used was proposed by Rowe and Killey's.⁸

Surgical treatment modality depends upon type of the fracture. Un-displaced or minimally displaced fractures can be managed by close reduction (Gillies or Keen approach). If the zygomatic complex is likely to be unstable after closed reduction, open reduction and internal fixation with miniplate is the best option.^{9,10} Navigation guided approach is recently introduced but not widely used due to technological difficulties¹¹. Common

complications result in postoperatively are sensory alterations, infection, diplopia, persistent malar depression, enophthalmos, cutaneous fistula, persistent lid retraction, strabismus, upper lid ptosis, altered visual acuity, proptosis and persistent paraesthesia.^{7,8}

As the social dynamics of lifestyle, road safety parameter are evolving day by day. There is continuous developments in medical diagnostics and treatment options and there is atypical form of trauma patterns. Rationale of this study is to determine causes, type and management of zygomatic bone fractures in modern day society and observe any alteration/deviation from the previous trends.

MATERIAL AND METHOD

It was a cross sectional, descriptive study conducted in the department of Oral and Maxillofacial Surgery, Nishtar Institute of Dentistry, Multan. The study was completed in 12 months (March, 2022 to March, 2023). A total of seventy two adult patients presenting at OPD were selected and non-probability consecutive sampling technique was used. Permission was taken from Ethical review committee before individuals were included in study and confidentiality was maintained, informed consent was taken and study protocols, usage of personal data and risk/benefit ratio was explained to the patient as well. The inclusion criteria comprised of subjects from both genders. Zygomatic bone fractures diagnosed clinically and radiographically (Water's view, Submento-Vertex and CT Scan) with no previous treatment were included. Patients presenting with isolated maxillary fractures and Lefort III fractures were excluded from the study. All patients presenting with midfacial trauma fulfilling inclusion & exclusion criteria were included in the study. Patient's demographic data, cause, investigations, type of fracture and treatment modality executed were collected on a specially designed proforma. Data was analyzed using SPSS version 22. Frequencies and percentages were computed for all categorical variables and age was presented as mean \pm standard deviation.

RESULTS

In this study 72 individuals were included and male to female ratio was 3.8:1. Mean age of the patient was 35.74 \pm 12.52 (Table.1).

Road traffic accidents was the most common cause of zygomatic bone fractures (n=43) followed by fall (n=10),

interpersonal violence(n=6),sport(n=6) and gunshot injuries (n=6) respectively.(fig.1)

Table 1: Demographic data

Variable	n=72
Male (n,%)	57, 79.17%
Female(n,%)	15, 20.83%
Male: Female	3.8:1
Age in years Mean ±SD	35.74±12.52

Causes of Zygomatic bone Fracture

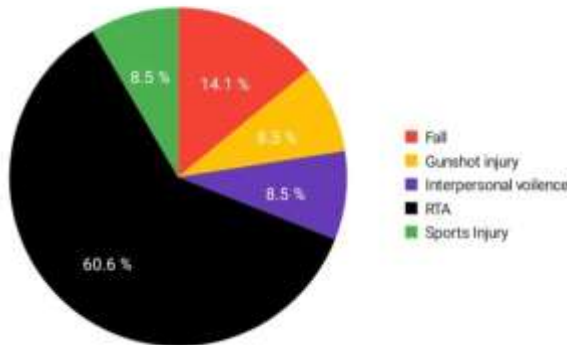


Figure 1: Pie chart representing frequency of causes of zygomatic bone fractures

Rowe & Kelly's type IV fracture of zygomatic bone was common among all types(n=21) followed by outward displacement (n=17) while frequency of type II fracture was 12,16.7% Minimal displacement was presented by 8 patients and only 4 comminuted zygomatic bone fractures were there. Zygomatic arch fracture included 10 patients (figure 2).

Types of Zygomatic bone Fractures

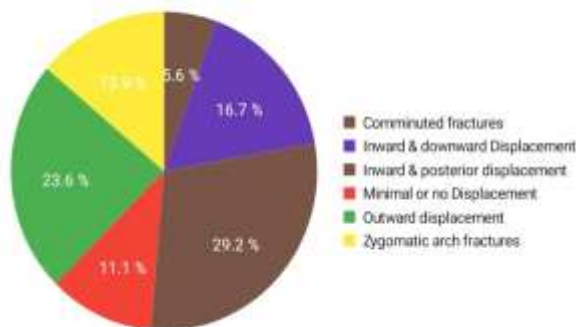


Figure 2: Pie chart representing frequency of type of zygomatic bone fracture.

Patient was treated by conservative (n=22) and with ORIF (N=50) Frequency of treatment modality was determined Table 2.1 & 2.2.

Table 2.1: Management of Zygomatic bone fracture (n=72) Conservative management (n=22, 30.55%)

Observation (n,%)	10, 13.88%
Gillies Approach	5, 6.94%
Dingman Approach	5, 6.94%
Stromayer's hook	2, 2.78%
Antral pack	2, 2.78%

Table 2.2: Open Reduction Internal Fixation (n=50, 69.44%)

1-point fixation (n,%)	4, 5.55%
2-point fixation	27, 37.5%
3-point fixation	14, 19.44%
4-point fixation	3, 4.16%

DISCUSSION

This article provides an overview of aetiology, type of fracture based on Rowe and Kelly's classification system and management of zygomatic bone fractures in our Hospital. Seventy two patients were included with male to female ratio of 3.8:1 showing male prevalence. The mean age of the patients was 37.74±12.52 years. Incidence was greater in male patients (79.17%) as compared to 20.83%. Younger age group and male predominance is possibly explained by increased outdoor activities in early years of life in males in developing countries like Pakistan. Results of the recent studies are comparable to the Ahmad AA Ali et al., and others.^{12,13}

Road traffic accident is the most common cause of zygomatic bone fracture in developing countries. In the current study major cause zygomatic bone fracture is RTA (60.6%) followed by fall (14.1%). While interpersonal violence, gunshot and sport injuries have equal level of incidence (8.5%). According to previous literature aetiology is variable. Epidemiological study conducted in Egypt shows similar results while results of Major trauma centre in UK are different (Inter-personal violence as major cause, 53%).^{12,13} Social dynamics, intensity of restrictions on road safety measure, law enforcement are different geo-socially. These variations may depend upon geographic location, social trends and incidence of trauma of Pakistan. These factors can be altered by changing these parameters. Hence these factors are not absolute and can be changed.

Different systems are proposed to classify ZMC bone fractures. Classification by Peterson & Kelley's is most conventional and well elaborated. In the current study zygomatic bone fractures were stratified according to Peterson and Kelley's classification system.⁸ Most common type of fracture in our study was fracture of body with inward and posterior displacement (type IV) fracture (n=21, 29.4%) while isolated arch fracture were 13.9% (n=9). Almost all zygomatic arch fractures were treated by indirect reduction by using Gillies or Keens approach. This treatment was similar to previous studies.^{13,14}

Due to advances in management perspective, access to hardware and better outcome ORIF is most common treatment now a days. Janardan et al. In our study we used miniplates for ORIF and one to four-point fixation was done as per requirement of the complexity of fracture. Two point fixation was applied in most of cases (n=27, 37.5%) followed by three-point fixation (14, 19.44%). This was in accordance with the study of Janardan et al., while study of Ahmad AA et al., has results contrary to it and three point fixation was employed.^{12, 15} Minimally displaced or un-displaced fractures (n=10, 13.88%) were treated by just observation and employing no treatment.¹⁶

Unavailability of post-operative 3-D reconstruction, inability to include orbital floor fractures and lack of follow up were some of limitations of our study. While treatment outcome was not evaluated as well. Some of cases were excluded from the study due to unavailability of records. These shortcomings can be overcome in future studies. Orbital floor fracture must be included that is integral part of the management plan in zygomatico-complex fractures.

CONCLUSION

This study supports different aspects of recent management protocols of ZMC fracture. It has been concluded that aetiology varies with the geographic areas, socio-economic status and incidence of RTA. Further work for developing consensus will decrease variability in treatment.

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REFERENCES

1. Strong EB, Sykes JM. Zygoma complex fractures. *Facial Plast Surg.* 1998;14(1):105-15.
2. Michael MP. Peterson's Principles of Oral and Maxillofacial Surgery. 2nd edition. PMPH-USA. 2004:148-90.
3. Brucoli M, Boffano P, Broccardo E, et al. the European zygomatic research project: the epidemiological results from a multicenter European collaboration. *J Craniomaxillofac Surg.* 2019;47:616-21.
4. Burkhad JPM, Pitteloud C, Klukowska-Rotzler J, Exadaktylos AK, Lizuka T and Schaller B. Changing trends in epidemiology and management of facial trauma in a Swiss geriatric population. *Gerodontology.* 2019.
5. Calderoni DR, Guidi M de C, Kharmandayan P, Nunes PH. Seven year institutional experience in the surgical treatment of orbitozygomatic fractures. *J Craniomaxillofac Surg.* 2011;39(8):593-9.
6. Israr N, Shah AA. Retrospective study of zygomatic complex fractures in Sheffield England. *Pak Oral Dent J.* 2001;21:50-9.
7. Sakavicius D, Juodzbalys G, Kubilius R, Sabalys GP. Investigation of infra-orbital nerve injury following zygomaticomaxillary complex fractures. *J Oral Rehabil.* 2008;35:903-16.
8. Kamadaja DB and Pramono CD. Management of zygomaticomaxillary fracture (the principles of diagnosis and surgical management with a case illustration). *Dent J.* 2008; 41:77-83.
9. Bradley D, Leung B, Saxena S, Dungerwalla M et al. Surgical Management of Zygomatic Complex Fractures in a major trauma Centre. *Plast Esthet Res.* 2019;6;11.
10. McGalliard RJ, Kimpton J and McLeod NMH. Ophthalmic outcomes of fractured zygomas. *Br J Oral Maxillofac Surg.* 2017;55:363-6.
11. Yu H, Shen G, Wang G and Zhang S. Navigation-guided reduction and orbital floor reconstruction in the treatment of zygomatico-orbitomaxillary complex fractures. *J Oral Maxillofac Surg.* 2010;68:28-34.
12. Ahmad AA. Epidemiological Study of zygomatic Fractures: A Five year Retrospective analysis in a single Hospital Experience. *Egypt J Plast Reconstr Surg.* 2020; 44(4):527-533.
13. Bradley D, Leung B, Saxena S, Dungerwalla M. Surgical management of zygomatic complex fractures in a major trauma Centre. *Plast Esthet Res.* 2020;6:11.
14. Lobo MV, Nascimento LY, DeAndrade TI, Pontes KT, Andrade JS, Barbosa LN, Closed reduction with minimal access for treating isolated arch fractures: Case series. *Research Society & Development* 2021;10(6):1-11.
15. Janardan GM, Pravin LN, Chndrashekhar B, Gupta MK, Monica M. Two-point versus three-point fixation in the management of zygomaticomaxillary complex fractures: A comparative study. *Annals Of Max Surg.* 2021;11(2); 229-35.
16. Arun S, Nayak SS, Chitra A. Outcomes of the non-surgical management of Zygomaticomaxillary Complex fractures. *J Maxillofac Oral Surg.* 2023;10:1007-12.