



# Prevalence of Ocular Complications in Patients with Zygomatic Bone Fractures in an Iranian Population

Hamid Mahmood Hashemi<sup>1,2</sup>, Sarvenaz Karimi Avval<sup>2\*</sup>

1. Department of Oral and Maxillofacial Surgery, School of Dentistry, Tehran University of Medical Sciences, Tehran, Iran
2. Craniomaxillofacial Research Center, Tehran University of Medical Sciences, Tehran, Iran

## Article Info

**Article type:**  
Original Article

**Article History:**  
Received: 24 Aug 2019  
Accepted: 28 Nov 2019  
Published: 15 May 2020

**\* Corresponding author:**  
Craniomaxillofacial Research Center,  
Tehran University of Medical Sciences,  
Tehran, Iran  
Email: zarastvand@gmail.com

## ABSTRACT

**Objectives:** Damages to the middle third of the facial bone generally involve the orbital skeleton and can lead to eye impairment. In this study, it is attempted to determine the incidence of ophthalmic injuries in maxillofacial trauma with zygomatic bone fractures.

**Materials and Methods:** One hundred and fifteen cases with ophthalmic (ocular) involvement after maxillofacial trauma were referred to the Shariati Hospital, Tehran, Iran, and were visited at the Ophthalmology Department between 2016 and 2018. Zygomatic fractures and resulting ocular complications were evaluated in 87 males and 28 females with the mean ages of 26 and 32 years, respectively.

**Results:** Subconjunctival ecchymosis was detected in 23.07% of men and 21.05% of women. Displacement of the palpebral fissure was detected in 26.5% of men and 27.6% of women. Furthermore, the unequal pupillary level was observed in 18.37% of men and 15.78% of women. Diplopia was detected in 8.9% of men and 10.5% of women. Additionally, enophthalmos was observed in 23.1% of men and 25% of women.

**Conclusion:** The most common ocular presentations in midfacial trauma are diplopia and reduced visual acuity. Even after the operation, a significant number of patients experience poor vision and diplopia. Ophthalmology consultation is essential for these patients.

**Keywords:** Zygomatic Fractures; Diplopia; Enophthalmos; Subconjunctival Ecchymosis

- **Cite this article as:** Mahmood Hashemi H, Karimi Avval S. Prevalence of Ocular Complications in Patients with Zygomatic Bone Fractures in an Iranian Population. *Front Dent.* 2020;17:9. doi: 10.18502/fid.v17i9.4127

## INTRODUCTION

The zygoma constitutes a strong convex buttress; it is quadrilateral in shape and is located at the lateral midface. It plays an important role in facial contour [1,2]. It has four processes including the temporal, orbital, frontal, and maxillary processes. It articulates with the frontal bone at the zygomaticofrontal suture and with the maxillary bone along the orbital floor and the anterior maxilla. The temporal process is flat and forms the zygomatic arch with the

zygomatic process of the temporal bone. It has also a weak articulation with the greater wing of the sphenoid bone inside the orbital wall [1,2]. The disarticulation of the zygoma at the zygomaticofrontal suture results in lateral and inferior displacement and rotation [1,2].

Anatomically, the zygoma holds some foramina at its lateral aspect, which contain the zygomaticofacial and zygomatico-temporal arteries and corresponding nerves of the maxillary branch of the trigeminal

nerve that supply sensation to the temple and the cheek. Similarly, the infraorbital nerve path passes through the floor of the orbit and exits the infraorbital foramen in the maxilla [3]. Consequently, the zygomatic arch disruption results in hypoesthesia in relevant areas. The strong structure of the zygoma provides an origin to the masseter muscle, the zygomaticus major muscle, and some fibers of the temporalis fascia [3]. The Whitnall's tubercle, which has a major role in maintaining the position of the globe, is detected on the zygomatic bone 2 mm behind the lateral orbital rim [3]. In this study, the prevalence of ocular complications in patients referring to the Oral and Maxillofacial Surgery Department of the Shariati Hospital, Tehran, Iran, is investigated.

## MATERIALS AND METHODS

In this cross-sectional study, 115 cases with zygomatic fractures and ophthalmic involvement were registered at the Department of Oral and Maxillofacial Surgery of the Shariati Hospital between 2016 and 2018. Patients that sustained other facial bone fractures were excluded. All patients with fractures were referred for an eye examination by the ophthalmology service after the primary visit by the maxillofacial surgeon. Therefore, all patients received ophthalmology-consulting services in addition to the oral and maxillofacial surgery clinic examination papers. According to the thorough ocular and funduscopic examinations, ocular injuries, such as vitreous hemorrhage, hyphema, globe laceration, severance of the optic nerve, and traumatic optic neuropathy were ruled out. The demographic data, the pattern of injury, and the mode of fracture were collected, and the state of serious ocular disturbances was noted. The data on visual acuity, diplopia, and enophthalmos were registered at the first and last visits. SPSS version 23 (SPSS Inc., Chicago, IL, USA) was used for statistical analysis. It should be noted that patients with zygomatic fractures but without ocular complications were excluded from the study.

## RESULTS

In the present study, one hundred and fifteen patients were examined (87 males and 28 females). The mean age of the males was 26 years (from 16 to 70 years), and the mean age of the females was 32 years (from 12 to 65 years). As shown in Figure 1, the most common complication was the eye groove displacement with a prevalence of 27.60% in women and 26.5% in men.

Diplopia (double vision) had the lowest incidence with a rate of 8.9% in men and 10.5% in women. Overall, 54 men (62.02%) and 16 women (57.14%) had a subconjunctival hemorrhage, and 62 men (71.2%) and 21 women (75%) exhibited displacement of the palpebral fissure (the lateral palpebral ligament is attached to the zygomatic part of the orbital rim. Fracture of the zygoma damages the palpebral attachment and causes a substantial visual impairment. When the zygoma is displaced inferiorly, the lateral palpebral ligament is depressed and causes a downward slope to the fissure). Forty-three men (49.4%) and 12 women (42.8%) showed unequal pupillary levels (the disruption of the orbital floor and the lateral aspect of the orbit, lack of osseous support for orbital contents, and displacement of the Tenon's capsule and suspensory ligaments of the globe lead to depression of the globe).

Twenty-one men (24.1%) and eight women (28.5%) had diplopia. Fifty-four men (62.02%) and 19 women (67.8%) exhibited enophthalmos (increase in orbital volume). In this study, no statistically significant relationship was found between gender and ocular side effects. No significant correlation was noted between the numbers of ocular complications and sex. In this study, most patients suffered more than one ocular complication.

As indicated in Figure 2, 46.4%, 39.3%, 10.7%, and 3.6% of women had two, three, four, and five eye complications, respectively. Of men, 5.7% had only one eye problem, 29.9% had two ocular complications, 54% had three eye problems, and 10.3% showed four eye complications.

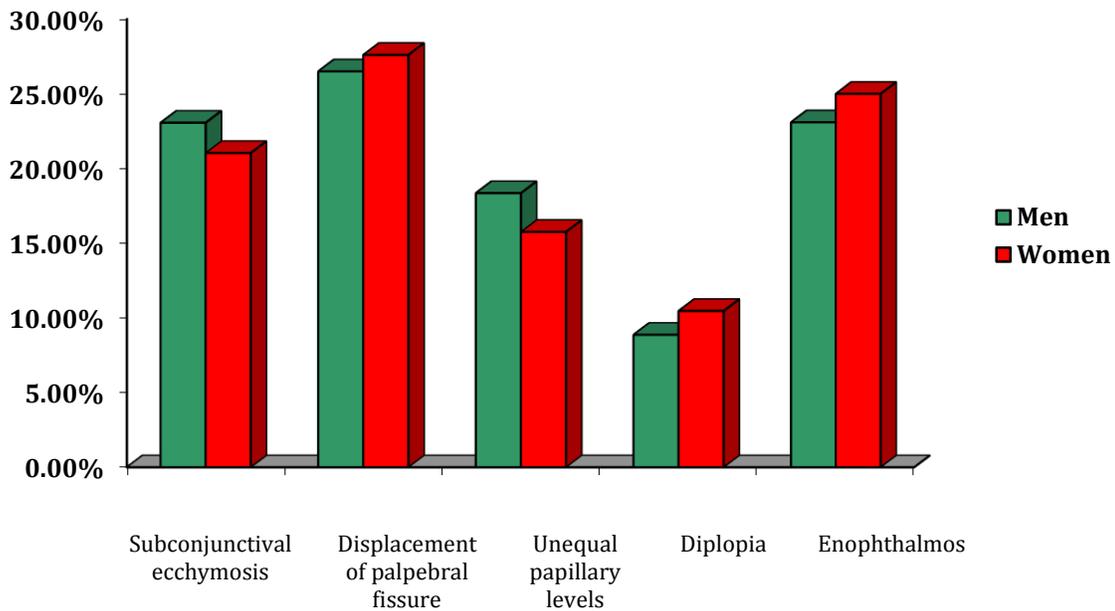


Fig. 1. Prevalence of common ocular complications

**DISCUSSION**

The prevalence of zygomatic fractures and eye problems in men was more than that in women. In this study, the most common eye complication was the displacement of the palpebral fissure, and the least common was diplopia.

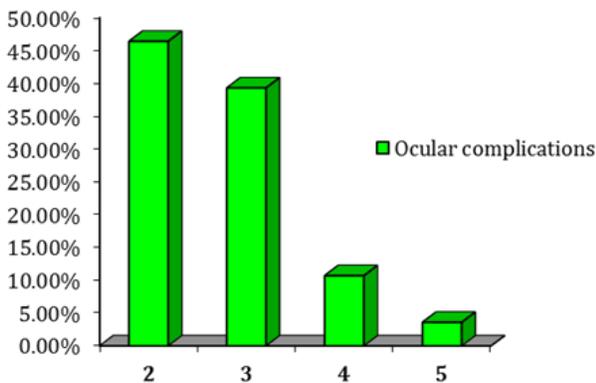


Fig. 2. Ocular complications with respect to number of patients

Siritongtaworn et al [4] studied patients with facial fractures. From 675 patients with facial fractures, 265 showed orbital impairment. Diplopia was detected in 17 cases. Additionally, eight orbital floor fractures, four

zygomatic fractures, four Le Fort fractures, and fractures of the medial aspect of the maxilla were detected. Diplopia disappeared after the operation in 14 cases.

They showed that 6.64% of patients with orbital fractures had diplopia. Orbital floor fractures were recognized as the most common cause of diplopia [4]. In another approach, visual acuity and diplopia were identified as the most typical symptoms of craniofacial trauma [5]. In the cited study, most patients had poor vision and significant diplopia after treatment [5]. In a study by Al-Qurainy et al [6], from 438 blunt traumas, 363 patients suffered from midfacial fractures and were examined during the first week following trauma for 2 years. The main risk factors for diplopia include traffic accidents, blowout fractures, and comminuted cheek fractures [6]. The cause of diplopia in very few patients was the early surgical reconstruction of midfacial fractures with conservative management of associated disorders [6]. Nam [7] reviewed the classification of zygomatic bone fractures according to the investigation by Knight and North wherein group 3 fractures were most prevalent followed by groups 2, 1, 4, and 6.

The six key manifestations were upper cheek flattening, lower eyelid ptosis, subconjunctival ecchymosis, epistaxis, limited mouth opening, and pain during mouth opening [7]. In addition, 93.4% of zygomatic bone fractures have been treated surgically while the rest have been treated conservatively; shaped elastic staple wires have been effectively used for fixation when zygomaticomaxillary fractures are present [7]. Hoşal and Beatty [8] assessed the prevalence of diplopia, enophthalmos, and predictable risk factors in patients with reconstructed orbital blowout fractures. They concluded that the incidence of postoperative diplopia was higher in old patients. Surgical reconstruction of fractures within two weeks of trauma decreases the risk of this complication [8]. Hammer and Prein [9] reconstructed post-traumatic malformations, which included malformations in the zygomatic complex, the nasoethmoid area, and the internal orbit. They operated on 31 patients with major post-traumatic orbital deformities. They performed 61 operative procedures using craniofacial techniques. The most prevalent deformity was reported to be enophthalmos [9]. Ellis et al [10] investigated 2067 cases of zygomatico-orbital fractures over 10 years according to age, sex, anatomical pattern of fractures, related maxillofacial and nonmaxillofacial trauma, and causes of injuries. Motorcycle accidents were the main cause of trauma followed by motor vehicle accidents in which the victim applied no seat restraint [10]. Treatment consisted of elevation through a temporal approach followed by fixation [10].

## CONCLUSION

Considering the importance of eye problems associated with zygomatic bone fractures, this type of fracture of the jaw requires special attention. Therefore, in addition to the clinical examination required in these patients before

surgery, ophthalmologic consultation is suggested. In some cases, the presence of an ophthalmologist in the operating room is necessary. There is a need to enrich educational ophthalmologic programs for oral and maxillofacial surgeons.

## CONFLICT OF INTEREST STATEMENT

None declared.

## REFERENCES

1. Gruss JS, Van Wyck L, Phillips JH, Antonyshyn O. The importance of the zygomatic arch in complex midfacial fracture repair and correction of posttraumatic orbitozygomatic deformities. *Plast Reconstr Surg*. 1990 Jun;85(6):878-90.
2. Song WC, Choi HG, Kim SH, Kim SH, Hu KS, Kim HJ, et al. Topographic anatomy of the zygomatic arch and temporal fossa: A cadaveric study. *J Plast Reconstr Aesthet Surg*. 2009 Nov 1;62(11):1375-8.
3. Zingg M, Laedrach K, Chen J, Chowdhury K, Vuillemin T, Sutter F, et al. Classification and treatment of zygomatic fractures: a review of 1,025 cases. *J Oral Maxillofac Surg*. 1992 Aug;50(8):778-90.
4. Siritongtaworn P, Tongasawas S, Siltharm S. Diplopia in facial fractures. *J Med Assoc Thai*. 2001 Oct;84 Suppl 2:S491-4.
5. Amrith S, Saw SM, Lim TC, Lee TK. Ophthalmic involvement in cranio-facial trauma. *J Craniomaxillofac Surg*. 2000 Jun;28(3):140-7.
6. Al-Qurainy IA, Stassen LF, Dutton GN, Moos KF, el-Attar A. Diplopia following midfacial fractures. *Br J Oral Maxillofac Surg*. 1991 Oct;29(5):302-7.
7. Nam IW. [Clinical studies on treatment of fractures of the zygomatic bone]. [Article in Korean]. *Taehan Chikkwa Uisa Hyophoe Chi*. 1990 Jun;28(6):563-70.
8. Hoşal BM, Beatty RL. Diplopia and enophthalmos after surgical repair of blowout fracture. *Orbit*. 2002 Mar;21(1):27-33.
9. Hammer B, Prein J. Correction of post-traumatic orbital deformities: operative techniques and review of 26 patients. *J Craniomaxillofac Surg*. 1995 Apr;23(2):81-90.
10. Ellis E 3rd, el-Attar A, Moos KF. An analysis of 2,067 cases of zygomatico-orbital fracture. *J Oral Maxillofac Surg*. 1985 Jun;43(6):417-28.