FREQUENCY OF TRISMUS AND DIPLOPIA IN PATIENTS WITH ZYGOMATIC COMPLEX FRACTURES

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ABSTRACT

Objective: *To determine the frequency of trismus and diplopia in patients with zygomatic complex fractures.*

Materials and Methods: *This descriptive, cross-sectional study was conducted on 82 patients using non-probability consecutive sampling technique. Patients with ZMC fractures of age above 15 years of both genders were included. Patients with TMJ pathologies, history of previous surgery and having orbital pathologies were excluded. Trismus and diplopia were assessed clinically. Data was analyzed by using SPSS version 26. P value of ≤ 0.05 was considered significant.*

Results: *Out of total 82 participants, mean age of the patients was 32.06±12.092 years. According to distribution of fracture sites, 36(43.9%) patients had Frontozygomatic (FZ) suture fracture, 45(54.9%) patients had zygomaticomaxillary suture fracture, 48(58.5%) patients had infraorbital rim fracture and 42(51.2%) patients had Zygomatic arch fracture. Trismus was present in 42(51.2%) patients and diplopia in 13(15.59%) patients. Association of trismus with various processes of ZMC, such as frontozyomatic process (p=0.275), zygomaticomaxillary process (p=0.825), infraorbital rim (p=0.122) was not statistically significant but on the other hand it was assocaited with zygomatic arch fracture (p=0.001). Association of diplopia with sight of fracture was not statistically significant except in infraorbital rim fracture (p=0.000) which was statistically highly significant.*

Conclusion: *Frequency of trismus was high (51.2%), and that of diplopia was 15.9% in known cases of zygomatic complex fractures.*

Keywords: *Zygomatic complex fracture; Trismus; Diplopia*

INTRODUCTION

The term zygomatic complex fracture refers to the osseous disruption of malar eminence at four buttresses i.e. zygomaticomaxillary, frontozygomatic, zygomaticoshenoid, and zygomaticotemporal. It is the second most common facial fracture after the nasal bones.[1] These (zygomatic complex) are a group of fractures that can significantly alter the structure, function and appearance of the midface including globe.[2] Patients may present with the symptoms of pain on mastication and trismus which is usually due to the impingement of the displaced zygomatic arch on the coronoid process of the mandible.[3] Frequently the cause of trismus may be the temporomandibular

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joint inolvement.[4]

In healthy individuals the normal mouth opening ranges between 30 to 50mm and it is said to be trismus or limited mouth opening when it becomes less than 20mm.[5] Another common symptom is diplopia in patients with midfacial/zygomatic complex fractures.[6] Patient is said to have diplopia when an object appears double.[7]

Disturbance in ocular mobility and the resulting diplopia are due to soft tissue and recti muscle's entrapment, motor nerve palsies, edema of the ocular muscles, haemorrhage, and muscle fibrosis (late complication).[8] All patients with zygomatic complex or midface fractures should undergo examination by ophthalmologist as early as possible.[9] Zygomatic complex fractures can be treated with primary surgery within the first 21 days while osteotomies and bone grafts are required after day 21 and 4th month of injury respectively.[10]

The associated incidence of ocular injury (10%) and visual sequelae (41%) is quiet higher with zygomatic complex fractures than with other midfacial injuries (15%).[3] A study conducted on 28 patients with zygomatic complex fractures, reported the frequency of trismus as 94.40%,[4] while another study determined 16% incidence of diplopia among patients of zygomatic complex fractures.[9] The associated problems of trismus and diplopia can lead to chronic complications, burden on health system and increased cost on treatment if not detected and promptly managed at early stage.

This study was planned to assess the magnitude of the problem in this part of the country. This will help in planning the early diagnosis and management of trismus and diplopia in zygomatic complex or midface fractures patients with primary surgery within first 21 days; thereby reducing the delayed complications like temporomandibular dysfunction syndrome (TMDS) leading to trismus and cost over patient and health system.

MATERIALS AND METHODS

This descriptive cross-sectional study was conducted in the Department of Oral and Maxillofacial Surgery, Ayub college of dentistry, Abbottabad from Jan 2016 to Dec 2018. Non-probability consecutive sampling technique was used for the study. All the patients reporting to the department of Oral and Maxillofacial Surgery Ayub College of Dentistry with zygomaticomaxillary complex fractures above the age of 15 years, including both genders were included in the study while patients with previous temporomandibular joint (TMJ) pathologies (e.g. TMJ ankylosis causing trismus) and ocular pathologies (e.g. strabismus causing diplopia) were excluded. The Sample size was 82, considering 94.4% frequency of trismus after zygomatic complex (ZMC) fractures, 95% confidence interval and absolute precision of 5% using WHO sample size calculator.[4]

Approval of institutional ethical committee was taken. The purpose, procedure, risks and benefits were discussed with and explained to the patients and informed consent was taken regarding their participation in the study. A detailed history was taken followed by relevant extra-oral and intraoral clinical examination i.e. inspection, palpation, visual acuity, detection of diplopia in all nine gazes clinically was done. Maximal mouth opening was measured in milli meters (mm) between the edges of upper central incisors and lower central incisors by Vernier calliper.

Radiographically all the patients were assessed through paranasal sinus (PNS) view, submento vertex (SMV) view, occipitomento vertex (OMV) view and CT-scan where necessary. The exclusion criteria were strictly followed to control the results confounder and bias in this study. All the information was gathered by the researcher and recorded on a pre-formed proforma.

Data was entered into computer using SPSS version 26.0 for analysis. Numeric variables like age and trismus range in mm was described in terms of Mean ± standard deviation. Categorical variables like gender, diplopia, trismus and fractures were described as frequencies and percentages. Data was presented in the form of tables and graphs. P value of equal or less than 0.05 was considered significant.

RESULTS

A total of 82 patients were enrolled in this study. Mean age of the patients was 32.06±12.092 years with lowest and highest age being 15 and 65 years respectively. Distribution of patients in different age groups and gender distribution are shown in figure 1 & 2. Table 1 shows the details of site wise distribution of Zygomatic complex fracture among the enrolled 82 patients.

Trismus was present in 42(51.2%) patients while 40(48.8%) patients did not have trismus. Association of trismus with various processes of ZMC, such as frontozyomatic process (p=0.275), zygomaticomaxillary process (p=0.825), infraorbital rim (p=0.122) was not statistically significant but it was statistically highly significant with zygomatic arch fracture (p=0.000). Similarly, diplopia was present in 13(15.59%) patients, while 69(84.1%) patients did not have diplopia. Association of diplopia with sight of fracture was not statistically significant except in infraorbital rim fracture (p=0.000) which was statistically highly significant. Details of statistical association of trismus and diplopia with site of zygomatic complex fracture, age, and gender are given in tables 2, 3 & 4 respectively.

Table 1: Site wise distribution of Zygomatic complex fracture

Site of fracture	Frequency	Percent
Frontozygomatic suture	36	43.9
Zygomaticomaxillary suture	45	54.9
Infraorbital rim	48	58.5
Zygomatic arch	42	51.2

Table 2: Association of fracture site with trismus and diplopia

Site of fracture		Trismus			Diplopia		
		Yes	No	p-Value	Yes	No	p-Value
Frontozygomatic suture	Yes	21 (25.6%)	15(18.29%)	0.275	09(10.9%)	27(32.9%)	0.067
	No	21 (25.6%)	25 (30.4%)		04(4.8%)	42(51.2%)	
Zygomaticomaxillary suture	Yes	24 (29.2%)	21(25.6%)	0.825	07(8.5%)	38(46.3%)	1.000
	No	18 21.9%)	19(23.1%)		06(7.3%)	31(37.8%)	
Infraorbital rim	Yes	21 (25.6%)	27(32.9%)	0.122	13(15.8%)	35(42.6%)	0.001
	No	21(25.6%	13(15.8%)		0	34(41.4%)	
Zygomatic arch	Yes	32 (39%	10(12.1%)	0.001	05(5.8%)	37(45.1%)	0.375
	No	10 (12.1%)	30 36.5%)		08 9.7%)	32 (39%)	

Table 3: Association of Trismus and Diplopia with age groups

Age Group	Presence of Trismus(Frequency)			Presence of Diplopia(Frequency)		
	Yes	No	Total	Yes	No	Total
15-35 years	31(31.8%)	29 (35.3%)	60 (73.1%)	09 (10.9%)	51 (62.1%0	60 (73.1%)
36-55 Years	09 10.9%)	10 (12.1%)	19 (23.1%)	03 (3.6%)	16 (19.5%)	19 (23.1%)
Above 55 years	02 (2.4%)	01(1.2%)	03 (3.6%)	01(1.2%)	02 (2.4%)	03 (3.6%)

Table 4: Association of gender with Trismus and Diplopia

Gender	Trismus (Frequency)				Diplopia (Frequency)			
	Yes	No	Total	p-Value	Yes	No	Total	p-Value
Male	34 (41.4%)	36 (43.9%)	70 (85.3%)	0.351	11 (13.4%)	59 (71.9%)	70 (85.3%)	1.00
Female	08(9.7%)	04 (4.8%)	12 (14.6%)		02 (2.4%)	10 (12.1%)	12 (14.6%)	

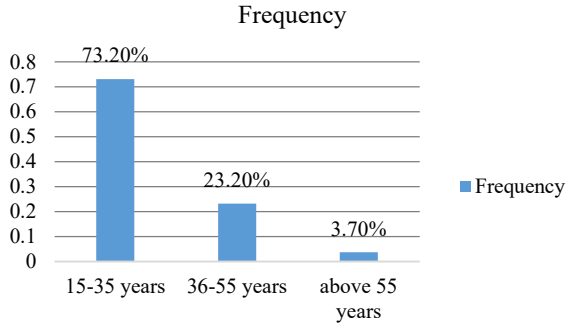

Fig 1: Frequency of age distribution

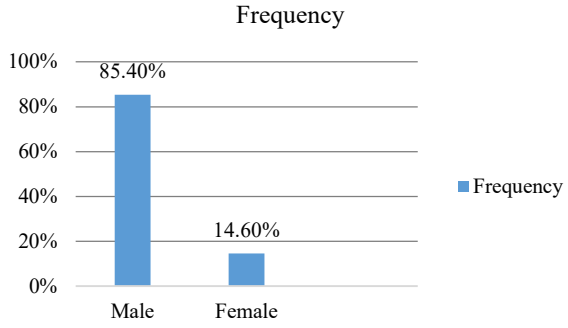

Fig 2: : Frequency of Gender Distribution

DISCUSSION

Zygomaticomaxillary complex is the second most common facial bone involved in fractures after the nasal bones.[1] These fractures are almost always associated with fractures of the floor of the orbit. Bones of the middle third of the face form a complex and fragile network held together across sutures and easily damaged by force than other body parts. Early diagnosis and management is the key to restoration of function and esthetics along with prevention of associated complications.

In this study, 70(85.4%) patients were male and 12(14.6%) patients were female. Another study by Khreisat MH et al had 50 patients, among them 38(76%) were male and 12(24%) female. The ratio of male to female was 3:1.[11] Boqusiak K, Arkuszewski P et al had included 468 patients in their study with 400 males and 68 females. Male to female ratio in their study was 5.88:1.[12] Regarding gender distribution these studies show that as males are more commonly involved in outdoor activities as compared to females so they are more affected by trauma. In our local population mostly drivers are male and motor cycle is the main source of transport in the local population which is mainly used by males.

Age distribution was such that 73.2% patients were in age range 15-35 years, 23.2% patients were in age range 36-55 years, 3.7% patients were in above 55 years range. In a local study conducted by Alamgir et al, the age range of the patient was between 5 and 60 years, with mean age of 32.5 years.[13] This study correlates with other studies as the groups with high percentages are involved in most of the sports, social, business and violence activities.

Zygomatic bone may be fractured at one process or multiple processes depending upon the force transmitted during the trauma. We have observed that 43.9% patients had frontozygomatic suture fracture, 54.9% patients had zygomaticomaxillary suture fracture, 58.5% patients had infraorbital rim, 51.2% patients had zygomatic arch fracture. The fracture site distribution also corresponds with other studies. In one study, frontozygomatic suture was involved in 37%, infraorbital rim in 31%, zygomaticomaxillary suture in 23% and zygomatic arch in 9% cases.[14]

Trismus and diplopia are associated with zygomatic bone fractures. We observed that 51.2% patients had trismus while 15.9% patients had diplopia. Various other observations and studies also show similar results regarding frequencies of trismus and diplopia. Cornelia KM et al observed that trismus was present in 21.3% of patients and resolved postoperatively in all but 2 cases.[15] Meslamani D et al had observed that injuries to the mid face are frequently complicated by injury to the eye ranging between 2.7% and 90.6% in repeated series[1]. Iqbal HA et al had observed that likewise a local study showed frequency of diplopia and limited mouth opening to be 9.6% and 21.1 % respectively.[16]

Trismus was considered to be present when maximal interincisal distance was less than 20 mm. The most common cause of trismus in patients having ZMC fracture is due to impingement of zygomatic arch on coronoid process of mandible[13]. Other causes include pain, swelling and inward rotation of zygomatic bone[8]. Trismus was present in 51.2% of patients. Association of trismus with gender was not statistically significant (p= 0.351). Association of trismus with various fractured processes of ZMC was assessed and its frequency was variable. Association of trismus with various processes of ZMC, such as frontozyomatic process (p=0.275), zygomaticomaxillary process (p=0.825), infraorbital

rim (p=0.122) was not statistically significant but it was statistically highly significant with zygomatic arch fracture (p=0.000). So it can be concluded that impingement of zygomatic arch on coronoid process is the main cause of trismus.

Diplopia may occur in patients having zygomaticomaxillary complex fractures. The most common causes leading to post traumatic diplopia in patients having zygomaticomaxillary fractures are edema, muscles entrapment, nerve injuries, dystopia and head injury.[6] Diplopia may be mono ocular or binocular. Binocular diplopia is significant for maxillofacial surgeons as mono ocular diplopia is managed by ophthalmologists. Usually diplopia occurs due to entrapment of inferior rectus muscle or inferior oblique in orbital floor fractures. We evaluated the association of site of zygomaticomaxillary complex fracture with the presence of diplopia. Frontozygomatic suture was fractured in 36 patients out of 9 had diplopia (p=0.067), zygomaticomaxillary suture was fractured in 45 patients out of which 7 patients had diplopia (p=1.000), zygomatic arch was fractured in 42 patients out of which 5 patients had diplopia (p=0.375) and infraorbital rim was fractured in 48 patients out of 13 patients had diplopia (p=0.000). So the association of diplopia with sight of fracture was not statistically significant except in infraorbital rim which was statistically highly significant. This also proves that diplopia has been occurred due to entrapment of muscle in orbital floor fracture as infraorbital rim is always involved in impure blow out fracture of orbit. Mansfield OT et al showed that diplopia was the presenting symptom in 4 patients with zygomatic complex fractures and 6 patients with zygomatic complex fractures involving the orbital floor also had diplopia. Among 4 cases involving only the zygomatic complex fracture, 3 fractures were rotated around the longitudinal axis, and 1 case had rotation around vertical axis. Fractures involving the orbital floor had the greatest incidence of diplopia. But not all orbital defects in all mid-facial fractures present with diplopia.[17]

Early intervention for surgery resulted in a more rapid improvement of preoperative limitation of ocular motility and diplopia along with improvement in visual acuity. Diplopia resolved within one week after surgery in 2 patients (22.2%) and within 3 weeks after surgical intervention for 6 patients (66.7%). Only one patient recovered after 12 weeks of surgery. The association between diplopia and resolution of the limitation of ocular motility was found to be negative due to the delay of surgical intervention. The one patient with late recovery of diplopia had surgery after 2 weeks of trauma and this delay may have been a contributing factor for the late resolution.[18]

Study by Khreisat JH had shown that diplopia was present in 83% of patients preoperatively and postoperatively resolved in all but 3 cases.[19] Another study conducted by Ellis E et al had 9 patients with diplopia, 1 patient received treatment within 4-7 days following injury, 5 out of them underwent surgical exploration and treatment for the orbital floor within 8-13 days of presentation and 3 patients were treated after 14 days of injury. They recommended that if there is vertical limitation of the globe with large herniation of the orbital contents into the maxillary sinus, then allowing for the resolution of initial hemorrhage and residual edema with a "wait and watch" policy should be observed. If, following examination and wait and watch policy, eye movements improve, operation can be delayed. This policy was adopted at Manchester Royal Infirmary by the maxillofacial surgeons.[20]

CONCLUSION

Our study concluded that most patients with zygomaticomaxillary complex fractures were male i.e., 85.4% with common age group between 15 to 35 years, which is 73.2 % of total number of patients. Infraorbital rim is the most commonly involved site i.e. 58.5% in all cases of zygomatic complex fractures. Trismus and diplopia were observed in 51.2% and 15.9% of patients respectively. Through history, clinical and radiological examination, early diagnosis and management are of great importance to avoid further complications in patients with zygomatic complex fractures.

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