A study of morbodities related to infraorbital nerve injury due to zygomatico-maxillary bone fractures

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ABSTRACT

Objective: To assess the mechanism of injury and type of fracture and association with type of morbidity due to of infra orbital nerve lesions, in patients with zygomatico-maxillary bone complex fracture.

Study Design: Cross sectional Observational study

Place and Duration: Department of Oral and Maxillofacial Surgery, Nishtar Institute of Dentistry, Multan from 15th January 2019 to 15th May 2019.

Methodology: Patients presented within 14 days of trauma with isolated unilateral zygomatico- maxillary complex fracture were studied. Radiological examination was carried out in the form of occipito-mental view 30^0 submento-vertex views to assess the type of fracture. To confirm the type of nerve injury, patients detailed history, mode of injury and examination was carried out to detect infra orbital nerve injury and morbidities.

Results: A total of 215 patients were studied from both genders between ages 18-50 years. Mean age was 28.465 ± 7.60 years and mean duration of fracture was 5.507 ± 2.50 days. Majority of patients were males (88.4%). Road traffic accident in 42.3%, fall 36.3% and Interpersonal violence in 21.4% were the major mode of injuries. Non displaced fractures were 13%, Displaced 29.3% and Comminuted 57.7%. No infra orbital nerve injury was in 14.9%, Paresthesia in 14.4%, Hyperalgesia 3.3% and Hypoalgesia was in 67.4%.

Conclusion: Compression of infra orbital nerve leading to paresthesia was more common in displaced fractures of zygomatico-maxillary bone complex.

Keywords: Zygomatic complex fracture, Mechanism of injury, Morbid anatomy, Type of fracture, Infraorbital nerve injury, morbidity

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INTRODUCTION

When there is trauma to the face, besides injuries of the musculoskeletal system, an additional injury is trauma to the cranial nerves resulting in both neuropathic pain and loss of sensation[1-4]. The crucial buttress in the middle of cranium and maxilla is the Zygoma. The outline of cheek is mainly produced by Zygoma because of its convex shape and protuberance. This in turn makes this region of the midface more susceptible to injury or fracture[3].

Among all mid face fractures, injuries to the zygomatic complex (ZMC) have been found out to be 15%[3,5-9]. The commonest type of facial fracture involves the nasal bone and therefore, the frequency of ZMC fractures is second only to nasal fractures[5,7,9]. This is most common in young and middle-aged males[1,7]. The zygomatic fractures can lead to significant cosmetic and functional disorders such as enophthalmos, depression of malar eminence and parathesia due to injury of infraorbital nerve[4]. Cranial nerve trauma is an important component of neurotrauma whose incidence varies from 5 to 23% in patients with head injuries. Branches of the trigeminal nerve are also injured during severe maxillofacial trauma[6].

In 30 to 80% of the midfacial fractures, the infraorbital nerve is injured[2,9,10]. Sensory alterations of skin, cheek, lower eyelid, upper lip and upper gingivae in form of hypoalgesia, hyperalgesia, dysesthesia, paraesthesia, anesthesia and neuralgifom pain show infraorbital nerve injury[2]. Frequency of these indications varies from 35 to 94% of all ZMC fractures, with increased incidence in displaced than nondisplaced fractures[8]. In most of the cases, the ZMC fractures involve the infraorbital foramen and canal. Hence, neurosensory changes arise in the area supplied by infraorbital nerve[8]. In a previously performed study there is incidence of infraorbital nerve morbidity (paresthesia 20%, hypoalgesia 86.47%, hyperalgesia 5.26%) among zygomatico maxillary fractures[10,11]. Deep concerns of poor patients are there with this morbidity and more literature is required for better understanding in this regard which surely lead to prompt and exact diagnosis and future appropriate treatment of the suffering population.

Therefore, the rationale of the current study was to assess the mechanism of injury leading to fracture and related different types of infra orbital nerve morbidly in isolated zygomaticomaxillary complex fractures. The outcome of treatment on infra-orbital nerve injury was also studied. Results of this study will also be significant not only for the management of nerve injury but also for the post-operative counseling of patients. So, this study was conducted with an objective to assess the mechanism of injury and type of fracture and association with type of morbidity due to of infra orbital nerve lesions, in patients with zygomatico-maxillary bone complex fracture.

METHODOLOGY

This cross-sectional observational study was conducted from 15th January 2019 to 15th May 2019 at the Department of Oral & Maxillofacial Surgery, Nishtar Institute of Dentistry, Multan. Non-probability, consecutive sampling was performed. A total of 215 patients were recruited from both genders between 18-50 years of age and those who presented within 14 days of trauma with isolated unilateral zygomaticomaxillary complex fracture. Whereas, patients with nerve injuries because of pathological conditions like tumors, infected cyst, neuralgic conditions i.e. trigeminal neuralgia), patients undergone any type of treatment (Open Reduction Internal Fixation or conservative) received before visiting the Out Patient Department, with bilateral zygoma fractures and zygomaticomaxillary complex fracture associated with any other fracture (Naso-orbito-ethmoid fractures, any lefort fracture) were excluded from the current study.

A detailed patient history regarding mechanism and type of injury followed by appropriate relevant clinical examination to assess the nature of fracture, type of nerve injury and to detect infraorbital nerve injury (paresthesia, hyperalgesia and hyposthesia) using pin prick, two-point discrimination and light skin touch. Radiological examination was carried out in the form of occipitomental view 30^0 submento-vertex views to assess the type of fracture. All findings were recorded in performa for analysis.

Data Analysis: The collected data was entered and analyzed using SPSS version 20. Descriptive statistics were done for variables like age, gender, male to female ratio and duration of ZMC fractures. Frequencies and percentages were calculated for categorical variables like infraorbital nerve injury, type of fracture and mode of injury. Nerve injuries were stratified among age, gender, and type of fracture to see the effect modifications. Post stratification chi-square test was applied. P-value less than or equal to 0.05 was considered significant.

RESULTS

Among total of 215 patients studied, age range was found to be from 18 to 50 years with mean age of 28.465 ± 7.60 years. Mean duration of fracture was 5.50 ± 2.50 days. Majority of patients were males (88.4%) with male to female ratio were 7.6**:**1.

Regarding mechanism of injuries, road traffic accidents were found to be 42.3%, fall 36.3% and Interpersonal violence was in 21.4%. Non-displaced fractures were seen in 13%, displaced in 29.3% and comminuted in 57.7%.

As for as infra orbital nerve injury was concerned, no Injury was found in 14.9% (n=32), whereas paranesthesia was observed in 14.4% (n=31), hyperalgesia 3.3% (n=7) and hypoalgesia was in 67.4% (n=145) of the patients. Stratification of infra orbital nerve injury with respect to age, gender and type of fracture are shown in Table- I, II & III respectively.

Table-I: Stratification of Infra orbital nerve injury with respect to age groups (N=215)

	Infra orbital nerve injury				p-value
Age (years)	No Injury	Paresthesia	Hyperalgesia	Hypoalgesia	
18-30	22(15.4%)	22(15.4%)	5(3.5%)	94(65.7%)	0.894
31-50	10(13.9%)	9(12.5%)	2(2.8%)	51(70.8%)	
Total	**32(14.9%)**	**31(14.4%)**	**7(3.3%)**	**145(67.4%)**	

Table- II: Stratification of Infra orbital nerve injury with respect to gender (N=215)

	Infra orbital nerve injury				p-value
Gender	No Injury	Paresthesia	Hyperalgesia	Hypoalgesia	
Male	29(15.3%)	27(14.2%)	7(3.7%)	127(66.8%)	0.749
Female	3(12%)	4(16%)	0(0%)	18(72%)	
Total	**32(14.9%)**	**31(14.4%)**	**7(3.3%)**	**145(67.4%)**	

Table- III: Stratification of Infra orbital nerve injury with respect to type of fracture (N=215)

Type of fracture	Infra orbital nerve injury				p-value
	No Injury	Paresthesia	Hyperalgesia	Hypoalgesia	
Non Displaced	27(96.4%)	1(3.6%)	0(0%)	0(0%)	0.000
Displaced	5(7.9%)	9(14.3%)	2(3.2%)	47(74.6%)	
Comminuted	0(0%)	21(16.9%)	5(4%)	98(79%)	
Total	**32(14.9%)**	**31(14.4%)**	**7(3.3%)**	**145(67.4%)**	

DISCUSSION

In fractures of zygomatic complex (ZMC), intra orbital nerve is frequently involved and results in transformed neurosensory weaknesses. In the current study, majority of patients were males and road traffic accident and fall were the commonly found modes of injuries as compare to inter personal violence injuries. However, in most of the developed states, the usual cause of inter personal violence is greater use of alcohol leading to aggressive and violent attitudes[1]. Religious and socio-cultural restrictions on alcohol consumption in our part of the world may have resulted in reduced number of offensive cases and therefore low rate of trauma. This fact is evident by the results of the current study which is only 21.4% of ZMC fractures happened because of interpersonal violence. In this study, non-displaced and displaced fractures were found to be less than the comminuted fractures. This result is in line with the finding of Sakavicius et at.[7] and Renzi et al.[12]

The findings of this study are also similar to the results reported by Zingg et al.[13] and Westermark et al.[14] which supports a presence of an compromised infra orbital nerve function in around 80% of the cases. Another similar literature found lesser Intra orbital nerve sensory disturbances of 7.4% and 7% of the cases respectively[15,16]. Potential reason behind this dissimilarity is the technique applied to evaluate the neurosensory discrepancy. Essentially used methods to assess the nerve function are “two point discrimination, pressure threshold, pin prick test, sharp and blunt instrumentation and thermography”. The extent of the contributory force of trauma is a recognized factor in the domain of difference in the displacement of fractured zygomatic complex. This in turn affects the continuousness of bone. Road traffic accident predominantly fast-moving automobiles is the foremost reason behind these trauma in India which actually outcomes in gross displacement of fractured bone[1,2].

In the current study, in reference to the stratification of Intra Orbital nerve, Hypoalgesia was reported in majority of the cases (67.4%) as compare to Paresthesia and Hyperalgesia. This is in line with the conclusions reported by Benoliel et al.[17] In the present study, the options for treatment involved were the conventional medicines to decrease the clinical symptoms in cases of un-displaced fractures, closed reduction was chosen for minimally displaced and open reduction along with rigid fixation was selected for severely displaced or unstable fractures.

Paresthesia of the infraorbital nerve is a significant sign of ZMC fracture, exclusively in cases of displaced fractures. Compromised sensation of the nerve frequently exists in approximately 50% to 90% of the cases of ZMC damages. It has been found from this current study, that neurosensory alteration subsequent to ZMC fracture is not rare, nevertheless, the patients has defined them in diverse terms because they are of foremost distress to the patients far along the facial malformation because to fractures[18].

Likewise, in case of trauma the infra orbital nerve could agonize from several sort of injuries for the reason of its critical anatomical place. These injuries are either indirect which implicates the compression because of the development of post traumatic oedema and hematoma or direct compression in which displacement of fracture segment is the background reason. It has been reported that there exists a direct association between the retrieval of paresthesia and fracture reduction.[19] Furthermore, previous literature suggested that the sensory testing in this concern involves many errors. Karas et al described that only few study participants reacted to the given sensory stimuli through the direct testing of virgin area supplied by the infraorbital nerve. Karas et al has testified in a study that the lower part of the lip and the chin were sensitive to the finest filament in 92% and 83% of the cases respectively[19].

CONCLUSION

Compression of infra orbital nerve leading to paresthesia was more common in displaced fractures of zygomatico-maxillary bone complex.

Recommendations: During the process of this study and the relevant literature search, it has been observed that a big difference exist in the armamentarium used in the basic assessment of tests of sensory changes which may have led to the dissimilarities in reporting the description of sensory changes. This became the source of bias in many previous studies and the current study is not an exception. Therefore, it is recommended to standardize the instruments in this regard to avoid such inaccuracies.

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AUTHOR’S CONTRIBUTION

Amin F: Conceived idea, Designed research methodology, Literature search, Data collection, Manuscript writing

Malik A: Designed research methodology, Literature search, Data collection, Manuscript writing

Rehman A: Literature search, Data collection, Literature review, Manuscript writing

Khalid B: Data collection, Literature review, Data interpretation, Statistical analysis

Rehman M: Data collection, Literature review, Data interpretation, Statistical analysis

Rauf A: Manuscript final reading and approval

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