DOI: https://doi.org/10.53350/pjmhs2023176438

ORIGINAL ARTICLE

Frequency and Pattern of Presentation of Infra-Orbital Nerve Injury in Patients of Zygomatic Bone Fracture

AYESHA SHAUKAT[1], ASIF NAZIR[2], WAJEEHA CHAUHDRY[3], TANVEER AHMAD KHAN[4], ASFAR HUSSAIN[5], MUHAMMAD IBRAHIM[6]
[1]*PGR, Nishtar Institute of Dentistry Multan*
[2]*Assistant Professor OMFS Nishtar Institute of Dentistry Multan*
[3]*Consultant Surgeon DHQ Hospital Bahawalnagar*
[4]*Consultant OMFS PIMS Islamabad*
[5]*Lecturer OMFS Department Bibi Aseefa Dental College SMBB Medical University Larkana*
[6]*MSPH Trainee Alshifa School of Public Health Rawalpindi*
Correspondence to: Ayesha Shaukat, drayeshashokat@gmail.com, Cell: 03156146563

ABSTRACT

Aim: In order to evaluate the frequency and kind of infraorbital nerve injury in zygomatic bone fractures

Method: A cross-sectional study was conducted from February 2022 to January 2023 at the Oral and Maxillo-Facial Surgery Department, Nishtar Institute of Dentistry, Multan. Sixty-four zygomatic bone fracture patients were included, meeting inclusion and exclusion criteria after a complete clinical and radiological examination. Clinical neuro-sensory testing (NST) was performed to assess nerve injury. The patient's demographic data, cause of fracture, presence, and type of nerve injury were collected on a specially designed proforma. The data was analysed using SPSS version 22. Frequencies, percentages, and mean ± standard deviation were taken.

Results: Sixty four patients were included with male into female ratio of 4.34:1. There was male predominance. Most common cause of ION injury, in zygomatic bone fractures was RTA (n=13,46.4%) while nerve injury was present in 29 patients (46.77%) of patients. Most common presentation of ION nerve injury was paresthesia n=10,34.5%.

Conclusion: Zygomatic bone fracture is the leading cause of infra-orbital nerve injury and its most common presentation is paresthesia.

Keywords: infra-orbital nerve (ION) injury, paresthesia, zygomatic bone (ZMC) fracture

INTRODUCTION

The zygomatic bone exist as a central bone of the midfacial anatomy.[1] A protruding and forwarded positioning of this bone makes it an easy target for both intended and unintended traumas and itseparates it from its naturally fixed position. This zygomatico-maxillary complex (ZMC) holds its position as second most common bone that fractures followed by the nasal bone.25% of all face fractures and 45% of midfacial fractures are caused by ZMC trauma.[2] Other explanations include falls, conflicts, domestic violence, injuries from firearms, and sports injuries. With a peak age between 20 and 30 years old, males are four times more likely than females to have a fracture.[3] It may appear into emergency ward (ER) as separate individual injury following a physical assault or as a part of polytrauma following a serious RTA .[4]

RTA is the major cause of ZMC fractures in developing countries.In all traffic incidents, motorbike collisions are the most common, accounting for 24.8% of total cases with ZMC fracture that have been reported, followed by auto accidents (19.2%).57.6% of the detected causal events are generally caused by traffic-related factors.[5] However, in the western world, interpersonal violence and fights account for 15.2% of the causes.[6] These fractures present with malar depression, step deformity at frontozygomatic and infraorbital margins, associated subconjunctival haemorrhage, peri-orbital ecchymosis, trismus and malocclusion. Indications for open reduction and internal fixation include compromised vision, diplopia, enophthalmos, visible facial asymmetry, trismus, gross displacement of fractured bone and stepping at the infraorbital bony rim or zygomatico-frontal suture and infraorbital nerve injury.[7]

Zygomatic bone fractures are either conservatively or surgically managed by different surgical approaches.Surgical treatment options vary according to the type and severity of the fracture. Fracture which are Un displaced are often opted to be managed with a closed reduction as treatment modality using the Gillies/Keen approaches (temporal/transoral). Preferred course of treatment is open reduction with miniplate osteosynthesis if zygoma is predicted and assessed to have unstability after when reduction is done.[8] ORIF through navigation surgery is the newer modality with good results.

Common complications that maybe due to primary injury or inadequate or inefficient treatment include are infra-orbital dysesthesia, diplopiain eyes, continuous impression of malar bone depression, enophthalmos, trismus , cutaneous fistula due to infection, eyelid retraction, strabismus, upper lid's ptosis, effected visual acuity and problems related to hardware placement.[5]

Because the fracture line in 95% of recorded cases includes an infra-orbital fissure, canal, or foramen, the infra-orbital nerve is frequently involved in ZMC fractures.After ZMC fractures, there is an incidence of 18–83% of infraorbital nerve injury.[9]The damage may be a direct result of the trauma or may result from nerve compression when it emerges from the canal to supply the midface structures.Mid-facial structures such as the lower eyelid, cheeks, upper-lip, nasal skin, and intra-orally, including the anterior region of gingiva and teeth on the affected side, might experience sensory changes due to infra-orbital nerve injury such as hypoesthesia, dysesthesia, paresthesia, or anaesthesia.[9,10] As far as the functional recovery of the infra-orbital nerve is concerned, 77.3% of the patients reported complete functional recovery after open reduction and internal fixation.[7]

This study aims at finding out the frequency and pattern or type of sensory deficit of the infra-orbital nerve (ION) following a ZMC fracture.. Detailed elaboration is always better than seeking excuses therefore, this may help to counsel the patients for longer recovery period of paresthesia or persistent altered sensation after the treatment. There has been no such study previously conducted at local level within Pakistan.

MATERIAL AND METHOD

This was a cross sectional study that contained a series of cases treated in the department of Oral and Maxillofacial Surgery, Nishtar Institute of Dentistry, Multan. This study took 12 months for completion which extended from February 2022 to January 2023. We enrolled 64 patients, with both male and female genders represented. The technique that was used in this study was based on non probability. This study is based upon clinical and radiological investigation after a complete examination with no preexisting infra-orbital nerve sensory deficits. Patients reporting with only fracture of maxillary bone and Lefort III fractures were excluded from the study. Total patients reporting with trauma of midface fitting the inclusive & exclusive criteria were selected for the study. Before including into the study written consent was obtained. All other data was saved by writing it up on a Proforma .Basic radiographic views were advised for final diagnosis(Water's view, Submento-Vertex(SMV) radiographs and a true posterior-

anterior (PA) view).Examination of Patients was done as to assess post-trauma situation and initial basic assessment was put on record. Patients were treated according to standard protocols within 5 days of presentation. Fractures which were displaced were treated by open reduction and internal fixation. Neurosensory testing was done before and after the treatment. Two-point discrimination, brush stroke direction, light touch, temperature and deep pain were included to categorize the type of nerve injury.In this study we utilized statistical package for social sciences version 18.5.Frequencies and percentages were taken and analysed. Standard deviation and mean were taken for age and other categorical variables.

RESULTS

In this study 64 patients were included (male=52, female=12) with 4.34:1 male to female ratio while age was 37±11.3 years (mean ±SD) Table 1. Frequency of ION injury is presented in table 2.

Table 1: Demographic Data

Variable	n=64
Male (n,%)	52, 81.25%
Female (n,%)	12, 18.75%
Male:Female ratio	4.34:1
Age in years (Mean ±SD)	37.14±11.3

Table 2: Frequency of ION injury

	n=64
Intact ION (n,%)	33, 53.23%
ION injury (n,%)	29, 46.77%
Post-trauma cases	23, 79.31%
Post-ORIF	6, 20.69%

Most common cause of ION injury was RTA (n=13,46.4%) followed by fall, interpersonal violence, sport and gunshot injuries with frequency of 25%, 17.9% & 7% respectively (figure 2). Paraesthesia was the most prevalent type of nerve injury n= 10,34.5%.

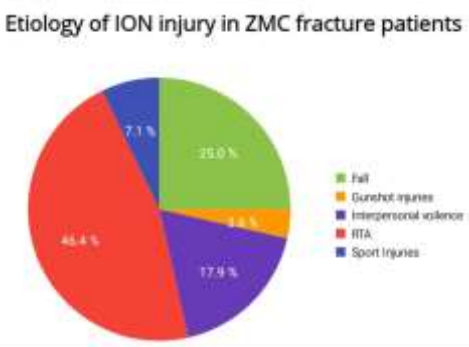

Figure 1: Pie chart representing frequency of etiology of Infra-orbital nerve (ION) injury in zygomatic bone fracture patients.

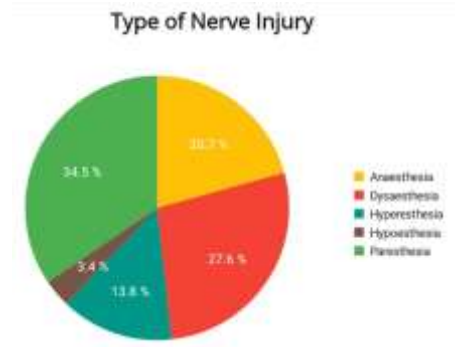

Figure 2: Pie chart representing frequency of type of ION injury in zygomatic bone fracture patients.

DISCUSSION

This study's primary goal was to determine the prevalence of infra-orbital nerve injury in zygomatic bone fractures in the surrounding community. Type of nerve injury was evaluated as well. In this study, 64 individuals with zygomatic bone fractures were included, with a male preponderance (4.34:1) and a mean age of 37.14±11.3years. These results were in accordance with previous studies. Probably outdoor activities might be the reason of increased incidence. Predominance of male patient might be due social and economical role in developing countries.[11,12,18]

Infra-orbital nerve injury is commonly reported clinical feature along with malar depression, limited mouth opening and peri-orbital ecchymosis and edema. This injury is due to mechanical compression of nerve by impacted bone or due to edema of soft tissue due to injury. Many previous studies have confirmed it. In the current study 46% of the zygomatic bone fractures exhibited ION injury.These outcomes agreed with the research that resulted in ION nerve injury in 47.3 % cases [14]. While other studies by showed different results and in this study ION was 80%.[14,15]

Zygomatic bone is the strong bone that formulates major bulk of the cheek and fracture is the result of direct force most of the time. This force can be in the form of road traffic accidents, fall interpersonal violence and other kind of injuries[11].In our study RTA was the most common cause ION injury in Zygomatic bone fractures. It was similar to previous studies. It might be due anatomical proximity of ION to the zygomatic bone.[11,14]

Infra-orbital nerve injury is manifested as different kind of presentations. It can be dysesthesia, hypo-aesthesia, paresthesia or anesthesia. All have different presentations according to level and intensity of injury. Paresthesia is abnormal sensation typically tingling while anesthesia is lack of any kind of sensation. Reduced but normal sensations come under the definition of hypoesthesia while in dysesthesia only touch is distorted and painful. In our study paresthesia was common presentation (34.5%)while hyposthenia was least common (3.4%) these findings were in accordance to some of previous studies[16]. A study by Takahashi et al showed results that are contrary to our study.[17] Degree or direction of force can the reason of this variance.

Limitation of the study was its being a retrospective in nature, small sample size and lack of follow up recovery of the ION nerve. These factors can lead to bias and lack of clinical impact. However this limitation can be overcome by increasing number of patients and monitoring follow up recovery of nerve at different time intervals. Recommendation is to include above mentioned factors in upcoming studies to increase the validity of results and authenticate it.

CONCLUSION

Zygomatic bone fracture is the leading cause of infra-orbital nerve injury and it commonly presents as paresthesia. However other presentations such as hypoesthesia are also present sometimes.

Conflict of interest: Nil
Funding source: Nil

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. Arosarena OA, Fritsch TA, Hsueh Y, Aynehchi B, Haug R. Maxillofacial injuries and violence against women. Arch Facial Plast Surg. 2009; 11(1): 48-52.
4. Nayyar MS, Ekanayake MBK. Assessment of maxillofacial injuries. Pak Oral Dental J. 2001; 21: 12-8.
5. Calderoni DR, GuidiMde C, Kharmandayan P, Nunes PH. Seven year institutional experience in the surgical treatment of orbito-zygomatic 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 Rehab. 2008; 35: 903-16.
8. Muto T, Yahara N, Hashiba T. Reduction and fixation of zygomatic complex fractures using a simple external device. Asian J Oral Maxillofac Surg. 2010; 22: 205-07.
9. Benoliel R, Birenboim R, Regev E, Eliav E. Neurosensory changes in the infraorbital nerve following zygomatic fractures. Oral Surg Oral Med Oral Pathol Oral RadiolEndod. 2005;99(6): 657-65.
10. Pedemontet T, Basili E. Predictive factors in infraorbital nerve sensory disturbances following zygomaticomaxillary complex fractures. Int J Oral maxillofac Surg. 2005; 34(5): 503-6.
11. Ahmad AA. Epidemiological Study of zygomatic Fractures: A Five year Retrospective analysis in a single Hospital Experience. Egypt J. PlastReconstr Surg. 2020; 44(4): 527-533.
12. Majiti A, Ling W, Tuerdi M, Maimaiti A, Tuerxun J, Tao YZ &Moming A. Epidemiological analysis of maxillofacial fractures treated at university hospital, xinjiaang, China J Craniomaxillofac Surg. 2014; 42(3): 227-33.
13. Shin J, Jung ER, Cho JT, Yoo G. Infraorbital nerve decompression surgery for infra orbital nerve hypoesthesia in patients of isolated anterior maxillary sinus wall. J Craniofac Surg. 2020;31:1274-8.
14. KathiaDubron. Incidence, Etiology, and associated nerve injuries following zygomaticomaxillary complex fractures: A retrospective analysis of 272 patients. Craniomaxillofac Trauma Reconstr. 2022; 15(2): 139-146.
15. Leena K, Snall J, Roine R, Sintonen H, Thorin H. Health related Quality of Life of patients with zygomatic fracture. Med Oral PatolOral Cir Bucal. 2017; 22(5): 636-42.
16. Natalie H, Lora RG, Grace GN, Lefebvre RD. assessment of infraorbital Hypesthesia following orbital floor and zygomaticomaxillary complex Fractures using a novel sensory grading system. Ophthalmic PlastReconstr Surg. 2019; 35(1): 53-55.
17. Takahashi y, Vaidya A, Kono S, Miyazaki H, Yokoyama T and Kakizaki H. The relationship between orbital floor fracture patterns around the infra-orbital groove and development of infra-orbital nerve hypoaesthesia: A computed tomographic study. Graefes Arch Clin Exp Ophthalmol. 2023: 261(3): 841-8.
18. Arun S, Nayak SS, Chitra A. Outcomes of the non-surgical management of Zygomaticomaxillary Complex fractures. J Maxillofac Oral Surg. 2023;10: 1007-12.