ORIGINAL ARTICLE OPEN ACCESS

Association of Infraorbital Nerve Injury with Zygomaticomaxillary Complex Fractures at a Tertiary Care Hospital, Karachi

Qasim Saleem[1], Tanzeela Shaikh[2], Tarique Hussain Shaikh[3], Ume-Habiba[4], Farah Irshad[5], Hamza A. Bajwa[6]

[1]Oral & Maxillofacial Surgery Department, Jinnah Postgraduate Medical Centre, [2]Oral Biology Department, Hamdard University Dental Hospital, [3]Isra University Hyderabad, [4]College of Physicians & Surgeons Pakistan, [5]Bahria University Health Sciences, [6]Hamdard University, Karachi

ABSTRACT

Background: The zygomatic region stands out as the most prominent facial portion, and zygomatic complex fractures (ZMC) are the second most prevalent facial fractures in the lateral mid-face area. This study investigated the associations between fractures in the ZMC and injuries to the infraorbital nerve at a tertiary care hospital.

Methodology: This cross-sectional study was conducted among 72 patients from September 2021 to March 2022, at the Oral and Maxillofacial Surgery Department, Jinnah Post Graduate Medical Centre, Karachi. Patients aged between 16 to 65 years, recently diagnosed with zygomatic bone fractures, were included in the study through consecutive non-probability sampling. Comprehensive patient histories, including demographic information, gender, age and residential status, obesity, and the identification of infraorbital nerve injuries diagnosed through clinical examinations and radiographic assessments. SPSS vr20 was used and the Chi-Square test was utilized to explore associations between categorical variables.

Results: Among the 72 cases, 45(62.5%) were male, while 27(37.5%) were females. The average age was 37.43 ± 11.04 years, with ages ranging from 16 to 65 years. Within this cohort, 47(65.3%) individuals were residents of urban areas, whereas 25(34.7%) hailed from rural regions. Notably, positive infraorbital nerve injuries were detected in 54 patients (p=0.02), constituting 75.0% of the total injuries. Among those with ZMC fractures, 25(34.7%) (p=0.02) also had infraorbital injuries, while 20(27.8%) (p=0.03) did not exhibited such injuries.

Conclusion: our study highlights a noteworthy correlation between ZMC fractures and infraorbital injuries. These results underscore the reciprocal relevance of assessing infraorbital injuries in ZMC fracture cases and vice versa, enhancing the comprehensive understanding and management of such injuries in clinical practice.

Keywords: Zygomatic Fractures, Nerve Injuries, Oral Surgical Procedures.

Corresponding author:
Dr. Tanzeela Shaikh
Oral Biology Department,
Hamdard University Dental Hospital,
Karachi, Pakistan.
Email:tanzeelasheikh@outlook.com
Doi: 10.36283/PJMD13-2/008

How to cite: Saleem Q, Shaikh T, Shaikh T H,Habiba U, Irshad F, Bajwa H A. Association of Infraorbital Nerve Injury with Zygomaticomaxillary Complex Fractures at a Tertiary Care Hospital, Karachi .Pak J Med Dent. 2024;13(2): 48-54. Doi: 10.36283/PJMD13-2/008

INTRODUCTION

Concerning the definition of the Zygomaticomaxillary Complex (ZMC), we outlined its anatomy, specifying that the central portion forms the malar prominence. Originating from the central part of the malar prominence, four attachments connect it to the skull: superiorly, it links to the frontal bone through a frontal zygomatic suture line; laterally, there's a connection to the temporal bone via the zygomaticotemporal suture line[1]. Medially, it attaches to the maxillary bone through the zygomatico-maxillary suture line and deeply connects to the greater sphenoid bone through the zygomatico-sphenoidal suture[2]. The diagnosis of ZMC fractures relied on clinical and radiographic assessments[3]. The Zygomaticomaxillary Complex (ZMC) constitutes a significant segment of the facial skeleton, contributing to 45% of mid-facial fractures and 25% of all facial fractures.[4,5] Disruptions at the zygomaticomaxillary and zygomatico-sphenoidal sutures involve crucial anatomical structures like the infraorbital foramen, infraorbital canal, and inferior orbital fissure leading to unintended injury to the infraorbital nerve[6,7]. The incidence of infraorbital nerve injury after ZMC fractures ranges from 80% to 90%. Infraorbital nerve damage can result in neurosensory disturbances, affecting various facial structures[7].

ZMC fractures are notably influenced by road traffic accidents (RTAs), prevalent in developing nations, and interpersonal violence, more common in the Western world. Indicative symptoms include depression of the affected side, pain, subconjunctival hemorrhage, periorbital ecchymosis, and restricted mouth opening. Infraorbital nerve injuries often accompany ZMC fractures, causing sensory disruptions[8,9]. Traumatic infraorbital nerve injury may result from compression, edema, ischemia, or laceration of the neural bundle. In 95% of ZMC fractures, the fracture line involves the infraorbital fissure or infraorbital canal, with reported incidence rates of infraorbital nerve injury ranging from 18% to 83%[10]. Notably, sensory disturbances along the Infraorbital Nerve (ION) distribution were identified through patient-reported complaints and clinical manifestations, highlighting the importance of addressing infraorbital nerve injuries in the treatment of facial fractures.[11,12]

This study aimed to highlight the relationship between infraorbital nerve injuries and the prevalent occurrence of Zygomaticomaxillary Complex fractures in our region. The findings will inform enhancements in resources and staff capabilities for more effective management. The purpose of our study is to examine the frequency and correlation between infraorbital nerve injuries and zygomatic complex fractures in our specific area. It seeks to stress the importance of addressing infraorbital nerve injuries alongside zygomaticomaxillary complex fractures, often overlooked in comprehensive facial fracture treatment. By clarifying this relationship and emphasizing its significance, this study in which the identification of the association of ZMC fractures with infraorbital nerve injury has been observed aims to improve resources, staff skills, and patient care in managing such cases, ultimately aiming for better outcomes and overall well-being in facial trauma management.

METHODS

This cross-sectional study, involving 72 cases, took place within the Department of Oral and Maxillofacial Surgery at Jinnah Post Graduate Medical Centre in Karachi. The study duration spanned six months, from September 24, 2021, to March 23, 2022. The sample size of 72 was determined using OpenEpi software, with a 95% confidence interval, 7% margin, and an 89.77% proportion for infraorbital nerve injury in Zygomatic Complex (ZMC) fractures derived from a prior study. Employing non-probability consecutive sampling, individuals newly diagnosed with all zygomatic bone fractures, aged 16 to 65 years, were eligible for inclusion. Exclusion criteria comprised those with only maxillary and Lefort III fractures, a history of prior infraorbital nerve sensory disturbances, diabetes, and neurological disorders. After the approval from the Review Board Committee of JPMC obtaining no. 39562/JPMC, all the eligible outpatients presented with ZMC fractures and meeting inclusion criteria were enrolled after providing informed consent.

Thorough histories and pertinent clinical examinations were conducted to gather baseline information regarding gender, age groups, residential status, and obesity. BMI, or Body Mass Index, was used as a screening tool to estimate body fat levels by dividing weight in kilograms by the square of height in meters (kg/m^2). The formula involves multiplying weight in pounds by 703, then dividing by height in inches squared. BMI, a widely used indicator of health, categorizes a BMI of 30.0 or higher as obesity according to the CDC. Radiological assessments, including water submentovertex and occipitomental views, as well as computed tomography scans, were utilized to assess the presence of fractures. The majority of cases exhibited distinctive features such as cheek flattening or Malar eminence, circumorbital ecchymosis, subconjunctival hemorrhage, trismus, and infraorbital nerve paresthesia, alongside radiological evidence revealing fracture lines extending through the zygomatico-maxillary and frontozygomatic sutures. Data collection was supervised by a senior consultant, a fellow of the College of Physicians and Surgeons Pakistan (CPSP), and meticulously documented using a pre-designed proforma.

The Data analysis involved the use of SPSS version

20.0, which computed frequencies and percentages for categorical variables such as gender, residential status, infraorbital nerve injury, and the specific type of nerve injury. Mean and standard deviation were provided for age, with stratification applied to account for effect modifiers such as age, gender, and residential status. To evaluate the association between categorical variables, the Chi-Square test was employed, with statistical significance set at P<0.05.

RESULTS

In our investigation, a comprehensive total of 72 patients, meeting the predefined inclusion criteria, participated. Within this cohort, 45 individuals (62.5%) were male, and 27 (37.5%) were female (refer to Table No. 1). The mean age of the study subjects was 37.43 ± 11.04 years, with males having a mean age of 40.44 ± 10.62 years, while females had a mean age of 32.40 ± 10.02 years. A significant proportion of the study cases, 51 (70.8%), belonged to the age group over 30 years. Regarding the residential distribution, 47 (65.3%) of the study cases hailed from urban areas, while 25 (34.7%) resided in rural regions. The mean body mass index (BMI) of the study participants was recorded at 24.77 ± 3.0 kg/m2, with 37 cases (51.4%) falling under the classification of obesity. (Table 1)

Table 1: Demographic characteristics of study participants (n=72)

Characteristics	n (%)
Gender	
Male	45 (62.5%)
Female	27 (37.5%)
Age	
<30years	21 (29.2%)
>31years	51 (70.8%)
Resident	
Urban	47 (65.3%)
Rural	25 (34.7%)
Infraorbital nerve injury	
Yes	54 (75%)
No	18 (25%)
Obesity (BMI ≥30.0 Kg/m^2)	37 (51.4%)

In Table 2A, the correlation between zygomatic complex fractures (ZMC) and demographic variables using Chi-square tests has been explored. The analysis revealed significant associations: ZMC fractures were more prevalent among males 35 (48.6%) compared to females 19 (26.4%) (p = 0.001), older individuals 40 (55.6%) compared to those <30 years 14 (19.4%) (p = 0.00), urban residents 33 (45.8%) compared to rural residents 21 (29.2%) (p = 0.001), and obese individuals 37 (51.4%) compared to non-obese 35 (48.6%) (p = 0.001). This suggests that males, older adults, urban dwellers, and obese individuals are at a higher risk of ZMC fractures.

Table 2B outlines the distribution of infraorbital nerve injuries among study cases, classified by demographic factors. Males comprised 33 (73.3%) of cases, with a significantly higher occurrence of nerve injuries compared to females 17 (63%) (p = 0.023). Older participants 38 (74.5%) exhibited a trend of increased injuries compared to younger ones 13 (59.1%). Infraorbital nerve injuries were prevalent among obese individuals 37 (51.4%) compared to non-obese individuals 35 (48.6%). Urban residents had a significantly higher prevalence of nerve injuries 32 (68.08%) compared to rural residents 20 (80%)

 DOI: https://doi.org/10.36283/PJMD13-2/008

Table 2A: Stratification of ZMC fracture among the study cases (n=72)

Variables	Gender		Age Groups		Residential status		Obesity
	Male n=45	Female n=27	<30years n=21	>31years n=51	Urban n= 47	Rural n=25	
ZMC fracture	35(48.6%)	19(26.4%)	14(19.4%)	40(55.6%)	33(45.8%)	21(29.2%)	37(51.4%)
p-value	0.001	0.01	0.000	0.002	0.00	0.001	0.001
Table 2B: Stratification of infraorbital nerve injury among the study cases							
Infra-orbital Nerve Injury	33(73.3%)	17(63.0%)	13(59.1%)	38(74.5%)	32(68.08%)	20(80%)	35(94.59%)
p-value	0.023	0.078	0.102	0.031	0.011	0.001	0.021

Chi-squared test was applied, p-value<0.05 is considered significant.

Table 3A presents the association between zygomatic complex (ZMC) fractures and infraorbital injuries among the study participants (n=72). Among individuals diagnosed with ZMC fractures, 25 (34.7%) also had infraorbital injuries, while 20 (27.8%) of those without ZMC fractures exhibited infraorbital injuries. The p-value for this comparison is 0.021, indicating a statistically significant association between ZMC fractures and infraorbital injuries.

Conversely, among participants without ZMC fractures, 15 (20.8%) had infraorbital injuries, whereas 12 (16.7%) did not. The p-value for this comparison is 0.035, also indicating a statistically significant association between the absence of ZMC fractures and the absence of infraorbital injuries.

Table 3A: Association between ZMC fracture and Infraorbital Injury (n=72)

ZMC	Infraorbital Injury	p-value
Yes	25(34.7%)	0.021
	20(27.8%)	
No	15(20.8%)	0.035
	12(16.7%)	

Table 3B: Association of Infraorbital Nerve Injury with ZMC Fractures.

Variables		ZMC	p-value
Age	<30years	20(66.7%)	0.027
	>31years	15(65%)	0.045
Gender	Male	22(70.9%)	0.011
	Female	13(68.4)	0.039
Obesity	Obese	17(68%)	0.023
	Non-obese	18(%)	0.017
Residential Status	Urban	19(76%)	0.019
	Rural	8(80%)	0.001

Chi-squared test was applied, p-value<0.05 is considered significant.

Table 3B delves into the relationship between infraorbital nerve injuries and zygomatic complex (ZMC) fractures, categorized by age, gender, and obesity status. For participants <30 years old, 15 out of 18 cases with ZMC fractures also had infraorbital injuries, showing a significant association (p = 0.032). Similarly, among those >31yrs., 15 out of 20 ZMC fracture cases exhibited infraorbital injuries (p = 0.027). Males demonstrated a higher incidence of infraorbital injuries among ZMC fracture cases (22 cases) compared to females (13 cases), with significant p-values of 0.011 and 0.039, respectively. Among obese individuals with ZMC fractures, 17 had infraorbital injuries (p = 0.023), while among non-obese individuals, 18 showed infraorbital injuries (p = 0.017). These findings emphasize significant associations between infraorbital nerve injuries and ZMC fractures across different demographic factors, as determined by chi-squared tests.

DISCUSSION

The zygomatic bone, a critical component of the facial skeleton, assumes a pivotal role in maintaining structural integrity by serving as a vital link between the cranium and the maxilla[13]. Beyond its structural importance, the zygomatic bone significantly contributes to facial aesthetics and function. It shapes the natural contours of the cheeks, acts as a separator for orbital contents, and acts as a protective barrier between the maxillary sinus and the temporal fossa[14,15]. However, owing to its convex structure and protrusion, the zygomatic bone is susceptible to fractures, ranking as the second most common facial fracture following nasal bone fractures[16]. Particularly in developing countries, road traffic accidents (RTAs) emerge as a primary cause of maxillofacial injuries, fueled by factors such as speeding, non-compliance with traffic rules, and vehicle-related incidents[17].

In orbitozygomatic fractures, sensory disruptions along the distribution of the infraorbital nerve are frequently observed. The incidence of posttraumatic neurosensory deficiency in the infraorbital nerve varies, influenced by factors such as the type and energy of impact, fracture displacement, timing of surgical intervention, and the chosen treatment method[18,19,20]. Our comprehensive study, encompassing 72 patients meeting specific inclusion criteria, revealed a demographic profile where 45 (62.5%) were male, 27 (37.5%) were female, and the majority were over <31 years old. Urban areas accounted for 47 (65.3%) with rural areas constituting 25 (34.7%). The mean age was 37.43 ± 11.04 years, and the mean BMI was 24.77 ± 3.0 kg/m2, with 19.4% classified as obese.

In our study, infraorbital nerve injury was identified in 75.0% of Zygomaticomaxillary Complex (ZMC) fracture patients, with paresthesia emerging as the most prevalent type of disturbance (59.7%). Hypoesthesia, dysesthesia, and complete anesthesia were also observed. These findings align with existing studies, pointing to a high incidence of infraorbital nerve injuries following ZMC fractures. The results contribute valuable insights into the demographic and clinical characteristics of patients with zygomatic complex fractures, enriching our understanding and management of these injuries.

Damage to the infraorbital nerve can result in a spectrum of neurosensory disturbances, including hyperaesthesia, hypoaesthesia, paraesthesia, or anesthesia in various innervated structures such as the lower eyelid, cheek, skin of the lateral wall of the nose, upper lip, and intraorally[21,22]. This encompasses the mucous membrane of the upper lip, cheek, and anterior as well as posterior teeth on the affected side. The resolution of these neurosensory issues occurs gradually, with mild injuries recovering within two months and moderate injuries within a year. Notably, the loss of static light touch/tactile sensation is a common feature of infraorbital nerve deficits post ZMC fractures, primarily attributed to damage to large myelinated Aβ fibers[23].

In terms of treatment modalities, Open Reduction Internal Fixation (ORIF) emerges as the preferred option for mild to moderately displaced Zygomaticomaxillary Complex (ZMC) fractures[6,14,20]. This approach not only yields favorable functional and cosmetic outcomes but also facilitates an early return to work post-surgery[24,25]. Research by De Man and Bax reported a 77.9% complete nerve recovery rate after ORIF, specifically at the fronto-zygomatic suture and/or zygomaticomaxillary buttress region. Notably, their findings cautioned against exploring the infraorbital region during surgery, as it could potentially lead to additional nerve damage, hindering the recovery process. This highlights the importance of careful surgical considerations to optimize patient outcomes in the management of Zygomaticomaxillary Complex fractures.

CONCLUSION

Our study demonstrates that infraorbital nerve injury is common in most cases of zygomatic complex fractures we examined. This correlation sheds light on the need to focus on infraorbital nerve injuries alongside zygomaticomaxillary complex fractures in our region. Our findings lay a crucial foundation for improving resources and staff capabilities to manage these cases effectively. Addressing infraorbital nerve injuries is vital in treating facial fractures comprehensively. This awareness enables clinicians to enhance patient care, leading to improved outcomes and overall well-being in facial trauma management.

ACKNOWLEDGEMENTS

The authors extend their appreciation to the Jinnah

Postgraduate Medical Centre for their facilitation of the study.

CONFLICT OF INTEREST

The authors declare no conflicts of interest related to the study.

ETHICAL APPROVAL

The ethical approval was taken from the Ethics Committee of Jinnah Post Graduate Medical Centre Karachi, with reference number F.2-81/2020-GENL/39562/JPMC.

PATIENT CONSENT

Participants were briefed on the procedure steps, and consent was appropriately obtained.

AUTHORS CONTRIBUTION

The authors made distinct contributions to the study. QS played a pivotal role in conceptualizing the study design. TS, the corresponding author, took on responsibilities encompassing writing, proofreading, and the overall write-up. THS conducted meticulous data collection, while UH skillfully performed data analysis. FI contributed her expertise to the interpretation of the gathered data. Finally, HAB was actively involved in the writing process. Together, their varied roles and expertise enriched the comprehensive development of the study.

REFERENCES

1. Noor M, Ishaq Y, Anwar MA. Frequency of infra-orbital nerve injury after a zygomaticomaxillary complex fracture and its functional recovery after open reduction and internal fixation. International Surgery Journal. 2017;4(2):685-689. DOI: 10.18203/2349-2902.isj20170214

2. Ishaq Y, Noor M, Anwar MA. Comparison of infraorbital nerve recovery after open and closed reduction of zygomaticomaxillary complex fractures. Int J Otorhinolaryngol Head Neck Surg. 2018;4(3):613-617. DOI: 10.18203/issn.2454-5929.ijohns20181851

3. Lakshmi R, Chitra A, Singh A, Pentapati KC, Gadicherla S. Neurosensory Assessment of Infraorbital Nerve Injury Following Unilateral Zygomaticomaxillary Complex Fracture–A Prospective Study. The Open Dentistry Journal. 2022;16(1). DOI: 10.2174/18742106-v16-e2206140

4. Dubron K, Verbist M, Shaheen E, Dormaar TJ, Jacobs R, Politis C. Incidence, etiology, and associated fracture patterns of infraorbital nerve injuries following zygomaticomaxillary complex fractures: a retrospective analysis of 272 patients. Craniomaxillofacial Trauma & Reconstruction. 2022;15(2):139-146. DOI: 10.1177/19433875211022569

5. Tabrizi R, Neamati M, Rajabloo S, Latifi F. Does the Lag Time Between Injury and Treatment Affect Recovery of Infraorbital Nerve Disturbances in Zygomaticomaxillary Complex Fractures. Craniomaxillofacial trauma & reconstruction. 2020;13(2):105-108. DOI: 10.1177/1943387520902896

6. Strong EB, Gary C. Management of zygomaticomaxillary complex fractures. Facial Plastic Surgery Clinics. 2017;25(4):547-562. DOI: 10.1016/j.fsc.2017.06.006

7. Jia-nan SU, XU Xiao-feng XB. Correlation between the pattern of zygomaticomaxillary complex fracture and infraorbital nerve injury: a clinical study in 70 patients. China Journal of Oral and Maxillofacial Surgery. 2017;15(1):56. DOI: 10.7518/hxkq.2016.05.020

8. Dhabaria H, Kolari V, Sequeira J, Shah A. Evaluation of Infraorbital Nerve Recovery and its Effect on Quality of Life following Open Reduction and Internal Fixation of Zygomaticomaxillary Complex Fractures–An Evaluative Study. Annals of Maxillofacial Surgery. 2022;12(2):128. DOI: 10.4103/ams.ams_100_22

9. Ullah N, Khan N, Hammad J, Mulk NU, Javed A, Khanda G, Ullah A. Comparison of Infra Orbital Nerve Outcome in Zygomaticomaxillary Complex Fractures Treated Surgically and Conservatively. Pakistan Journal of Medical & Health Sciences. 2022;16(12):323. DOI: 10.53350/pjmhs20221612323

10. Jabeen H, Sardar T, Riaz E, Ahmed A, Luni A, Hussain HM. Frequency of Infra Orbital Nerve Recovery after Open Reduction Internal Fixation of Zygomatico Maxillary Fracture. Pakistan Journal of Medical & Health Sciences. 2022;16(12): 706.DOI: 10.53350/pjmhs20221612706

11. Devoti JF, Nicot R, Roland-Billecart T, Ferri J, Schlund M. Characterization of infraorbital nerve sequelae after orbital floor or zygomaticomaxillary complex fractures. Journal of Craniofacial Surgery. 2022;33(1):52-56. DOI: 10.1097/SCS.0000000000007881

12. Bonanthaya K, Panneerselvam E, Manuel S, Kumar VV, Rai A, editors. Oral and maxillofacial surgery for the clinician. Springer Singapore; 2021. DOI: 10.1007/978-981-15-1346-6

13. Jia-nan SU, XU Xiao-feng XB. Correlation between the pattern of zygomaticomaxillary complex fracture and infraorbital nerve injury: a clinical study in 70 patients. China Journal of Oral and Maxillofacial Surgery. 2017;15(1):56. DOI: 10.7518/hxkq.2016.05.020

14. Prajapati VK, Shahi AK, Prakash O, Ekram S. Etiology, Modalities of Zygomaticomaxillary Complex Fracture, open reduction and fixation. Journal of Clinical and Experimental Dentistry. 2021;13(3): e215. DOI: 10.4317/jced.57445

15. Agarwal P, Chug A, Kumar S, Jain K. Facial nerve paralysis—a rare complication of open reduction of zygomaticomaxillary complex fractures. Journal of Oral and Maxillofacial Surgery. 2018;76(5): 1057-e1.-DOI: 10.1016/j.joms.2017.12.014

16. Boyes H, Fan K. Maxillofacial injuries associated with domestic violence: experience at a major trauma centre. British journal of oral and maxillofa-

cial surgery. 2020;58(2):185-189. DOI: 10.1016/j.bjoms.2019.11.009

17. Khan A, Khan S, Khan MT, Syed K, Shah SA, Younis R, Sohail M, Khitab U. Pattern of maxillary fractures in patients presented to tertiary care hospital-a study. Pakistan Oral & Dental Journal. 2019;39(3):247-250.

18. Peretti N, MacLeod S. Zygomaticomaxillary complex fractures: diagnosis and treatment. Current opinion in otolaryngology & head and neck surgery. 2017;25(4):314-319. DOI: 10.1097/MOO.0000000000000372

19. Cuddy K, Dierks EJ, Cheng A, Patel A, Amundson M, Bell RB. Management of zygomaticomaxillary complex fractures utilizing intraoperative 3-dimensional imaging: The ZYGOMAS Protocol. Journal of Oral and Maxillofacial Surgery. 2021;79(1):177-182. DOI: 10.1016/j.joms.2020.08.028

20. Strong EB, Gary C. Management of zygomaticomaxillary complex fractures. Facial Plastic Surgery Clinics. 2017;25(4):547-562. DOI: 10.1016/j.fsc.2017.06.006

21. Neovius E, Fransson M, Persson C, Clariden S, Farnebo F, Lundgren TK. Long-term sensory disturbances after orbitozygomatic fractures. J Plast Reconstr Aesthet Surg. 2017;70(1)120-126. DOI: 10.1016/j.bjps.2016.09.007

22. Jadhav A, Deshmukh V. Effect of location of fracture line and surgically visible nerve entrapment in recovery of infraorbital nerve following zygomatico-maxillary complex fracture-a prospective study. Int J Dent. 2017; 2:9-13.

23. Nam Y, Bahk S, Eo S. Anatomical study of the infraorbital nerve and surrounding structures for the surgery of orbital floor fractures. Journal of Craniofacial Surgery. 2017;28(4):1099-1104. DOI: 10.1097/SCS.0000000000003416

24. Ho JPTF, Schreurs R, Aydi S, Rezai R, Maal TJ, van Wijk AJ, et al. Natural variation of the zygomaticomaxillary complex symmetry in normal individuals. J Craniomaxillofac Surg. 2017.45(12):1927-1933. DOI: 10.1016/j.jcms.2017.09.017

25. Gomez Rosello E, Quiles Granado AM, Artajona Garcia M, et al. Facial fractures: classification and highlights for a useful report. Insights Imaging. 2020. 11 (1):49. DOI: 10.1186/s13244-020-00847-W