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ORIGINAL ARTICLE

Frequency of Infra Orbital Nerve Paresthesia Following Zygomati Comaxillary Complex Fractures Among Tertiary Care Hospital Patients in OMFS OPD

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Abstract

Background: Maxillofacial injuries are on the rise, their etiology varies from one country to another but RTA is still the most common cause. Infraorbital Nerve injury may involve traction, pressure, ischemia, inflammation, and physical damage.

Objective: The objective of the study was to investigate the frequency of infraorbital nerve Paresthesia following ZMC fractures treated with open reduction and internal fixation.

Material and Methods: This case series study, conducted at Mayo Hospital's Oral and Maxillofacial Surgery Department over six months, enrolled 75 cases using consecutive sampling. Surgical management included open reduction and internal fixation, with follow-up assessments at specified intervals. Data analysis was performed using SPSS for a comprehensive evaluation to document the frequency of infraorbital nerve Paresthesia and recovery outcomes post-ZMC fractures and surgical intervention.

Results: In this study, the results revealed that 33.33% (n=25) were between 41-50 years being the majority of patients in this study, common age was calculated as 37.43+3.78 years, 62.67%(n=47) were male and 37.33% (n=28) were females, frequency of infraorbital nerve Paresthesia following ZMC fractures revealed in 70.67%(n=53) cases while 29.33%(n=22) had no findings of the morbidity, we recorded frequency of functional nerve recovery in patients with Paresthesia after performing open reduction and internal fixation among 53 cases who developed the morbidity and found 62.26% (n=33) who had functional nerve recovery while rest of 37.74%(n=20) had no recovery.

Conclusion: The frequency of functional nerve recovery is high among patients with Paresthesia treated with open reduction and internal fixation.

Keywords: ZMC fractures, infraorbital nerve Paresthesia, open reduction and internal fixation, functional nerve recovery

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Introduction

Zygomaticomaxillary Complex (ZMC) fractures, also referred to as tetra pod or quadruped fractures[1], are a significant subsection of maxillofacial injuries in the discipline of oral and maxillofacial surgery. Zygomaticomaxillary complex is 2nd most commonly injured area following mandible bone only[1,2]. Trauma The zygomaticomaxillary complex constitutes 50% of all midfacial and 25-30% of all fractures of facial structures3. These fractures have a wide spectrum of clinical manifestations and are frequently accompanied by

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significant morbidity and functional impairment. The occurrence of these fractures varies among demographics and geographical locations, although they are recognized as one of the most common forms of facial fractures found in tertiary care institutions' oral and maxillofacial surgery (OMFS) outpatient department (OPD)[4].

ZMC fractures are not gender-inclusive, with studies indicating variations in prevalence between males and females. The male-to-female ratio in the occurrence of fractures has been observed to skew towards males, implying that the male population is more vulnerable[5]. This disparity is attributed to the high prevalence of males involved in Road Traffic accidents. Women who have been domestically abused are more likely to suffer fractures and orbital blow-out fractures[6]. Common causes of ZMC fractures often involve high-velocity trauma, such as motor vehicle accidents, interpersonal violence, accidental falls, and sports-related injuries7. Infraorbital nerve injury is commonly observed and serious outcome of fractures[8]. The infraorbital nerve, a branch of the trigeminal nerve's maxillary division (V2), travels via the infraorbital canal and exits onto the face through the infraorbital foramen9. The fracture lines of the fracture may transverse the course of the infraorbital canal or result in bone compression or displacement, which can result in impingement or damage to the infraorbital nerve. Sensory alterations caused by infraorbital nerve damage in fractures might emerge as Paresthesia or anesthesia in the nerve distribution. Numbness, tingling, and altered feeling may occur in the infraorbital area, which includes the cheek, upper lip, and lateral portion of the nose[10]. These sensory disruptions can have a substantial influence on patients' quality of life, particularly their ability to talk, eat, and maintain oral hygiene. Because nerve injury caused by a fracture can involve traction, pressure, ischemia, inflammation, and physical damage, ZMC fractures are characterized by sensory neuropathy (especially hypoesthesia) in the area of innervations of the infraorbital nerve as both a presenting symptom and a postoperative complication[11]. Despite the clinical significance and prevalence of infraorbital nerve damage in these fractures, there is a paucity of thorough research that has carefully investigated its incidence and functional outcomes. By addressing these gaps, this study aims to add to the current body of literature on clinical features resulting from ZMC fractures that might improve the functional recovery and general well-being of patients.

Material and Method:

Study design: The current study adopted a case series study design.

Study setting: carried out at Mayo Hospital, Oral and Maxillofacial Surgery Department.

Study duration: over six months.

Sample size: A sample size of 75 cases was meticulously calculated, with a 95% confidence level, a 10% margin of error, and an expected percentage of functional nerve injury of 60%. The sampling approach used was non-probability sequential sampling, and all patients with midfacial injuries who fulfilled the inclusion and exclusion criteria were recruited in the research.

Inclusion criteria: Inclusion criteria encompassed clinical and radiographic diagnosis of Zygomatic bone fractures confirmed by water's view, submental vertex (SMV) view, and true poster anterior (PA) view, regardless of gender, race, or age. Participants were deemed eligible if they did not have any past infraorbital nerve sensory abnormalities and were in good overall health.

Exclusion: Patients with just maxillary fractures or Effort III fractures, on the other hand, were excluded from the research.

Data collection: Data collection began when patients arrived at Mayo Hospital's outpatient Department of Oral & Maxillofacial Surgery, with a thorough review of demographic information, including age and gender, recorded on a meticulously designed Proforma.

Procedure: Following the initial assessment, patients underwent an evaluation process of pre-operative infraorbital nerve Paresthesia. Neurosensory deficits of ION were documented in the affected locations before surgery. Dysesthesia of the skin of the nose, face, lower eyelid, upper lip, gingival, and teeth on the afflicted side are among the symptoms. A 0.2-mm diameter blunted acupuncture needle tip was placed against the patient's skin until it was slightly bent (the skin would be dimpled but not pierced). The particular locations comprised the midpoint of the measurements of the lower eyelid, the center of the lateral section of the nose, the middle portion of the upper lip, and the middle of the zygoma.

The patients' sensations were assessed on a 100 mm visual analog scale (VAS).

Statistical analysis: Data analysis was executed through the utilization of SPSS version 29.0, with qualitative categorical variables, such as gender and the outcome variable Paresthesia, presented in terms of frequencies and percentages. Meanwhile, quantitative data, specifically age, was represented as a mean value with a corresponding standard deviation, facilitating a comprehensive evaluation of the research outcomes.

Results:

In the current study, the incidence of infraorbital nerve Paresthesia following Zygomaticomaxillary Complex (ZMC) fractures was investigated by carefully examining 75 cases that satisfied the predetermined inclusion and exclusion criteria. The study also sought to determine the rate of functional nerve recovery in patients who had been treated with open reduction and internal fixation but were still suffering from Paresthesia.

A diversified demography was shown by the age distribution of the examined group, highlighting the range of age-related susceptibilities to Zygomaticomaxillary Complex (ZMC) fractures. In particular, 24% (n=18) of cases were grouped within the 18-30 years age range, indicating a significant presence of younger persons. The 31-40 years age group accounted for 30.67% (n=23) of the cases, with the 41-50 years age group accounting for 33.33% (n=25). Individuals above the age of 50 made up a smaller group, accounting for 12% (n=9). The whole cohort's mean age was determined to be 37.43 ± 3.78 years, acting as a key parameter in characterizing the overall age distribution. Gender distribution within the study participants' study cohort elucidated a marked preponderance of male cases, comprising 62.67% (n=47) of the population. The female representation accounted for 37.33% (n=28), underscoring a discernible gender disparity in the incidence of ZMC fractures and subsequent infraorbital nerve complications.

Table 1: **Age and gender distribution of the patients with frequency of infraorbital nerve Paresthesia following ZMC fractures and its recovery after surgery(n=75)**

Variable	Categories	No. of Patients	%
Age (in years)	18-30	18	24
	31-40	23	30.67
	41-50	25	33.33
	>50	9	12
	Total	75	100
	Mean and SD	37.43+3.78	
Gender	Male	47	62.67
	Female	28	37.33
	Total	75	100
Infraorbital nerve Paresthesia	Yes	53	70.67
	No	22	29.33
	Total	75	100
Functional nerve recovery	Yes	33	62.26
	No	20	37.74
	Total	53	100

Following ZMC fractures, there is a notable prevalence of infraorbital nerve Paresthesia (70.67%; n = 53 instances), according to the analysis. Remarkably, infraorbital nerve Paresthesia was not evident in 29.33% (n=22) of instances, suggesting that a sizable portion of patients did not suffer from this post-traumatic consequence. Stratification of infraorbital nerve Paresthesia based on age categories delineated intriguing patterns. Among the 53 cases exhibiting infraorbital nerve Paresthesia, 20.75% (n=11) belonged to the 18-30 years age group cohort, while the 31-40 years and 41-50 years age groups comprised 33.96% (n=18) and 35.85% (n=19) of cases, respectively. A smaller subset of 9.44% (n=5) pertained to individuals aged over 50 years. These stratified results underscore the nuanced interplay between age and the incidence of infraorbital nerve Paresthesia following ZMC fractures.

Focusing on the study group cohort experiencing infraorbital nerve Paresthesia (n=53), the study diligently recorded the frequency of functional nerve recovery following open reduction and internal fixation. Encouragingly, 62.26% (n=33) of these cases demonstrated successful functional nerve recovery, indicative of a substantial proportion of patients regaining sensory integrity. Conversely, 37.74% (n=20) exhibited persistent infraorbital nerve complications without evident recovery.

Stratifying cases with functional nerve recovery (n=33) based on age categories revealed noteworthy trends. Among the successfully recovered cases, 21.21% (n=7) were aged 18-30 years, while the 31-40 years age category constituted the largest subset, encompassing 39.40% (n=13) of cases. The 41-50 years age group contributed 33.33% (n=11) to the recovered cohort, and only 6.06% (n=2) were aged over 50 years. These age-stratified outcomes highlight the varying degrees of success in functional nerve recovery across different age brackets. These comprehensive data offered a nuanced view of the prevalence, age-related trends, and results of

Paresthesia of the infraorbital nerve and functional recovery after fractures of the Zygomaticomaxillary complex, followed by open reduction and internal fixation.

Table2: Stratification for infraorbital nerve Paresthesia and recovery with regards to age of the patients(n=53)

	Infraorbital nerve anesthesia		Infraorbital nerve recovery		P-Value
Age (years)	No. of patients	%	No. of patients	%	
18-30	11	20.75	7	21.21	0.001
31-40	18	33.96	13	39.40	
41-50	19	35.85	11	33.33	
>50	5	9.44	2	6.06	
Total	53	100	33	100	

Discussion:

The current study of infraorbital nerve Paresthesia caused by Zygomaticomaxillary Complex (ZMC) fractures, as well as the subsequent evaluation of functional nerve recovery after open reduction and internal fixation, provides insights into a complicated component of oral and maxillofacial surgery. When the study's findings are compared to previous literature, they give a more comprehensive knowledge of age-related trends, surgical outcomes, and variables impacting infraorbital nerve problems. The reported incidence of infraorbital nerve Paresthesia (70.67% of patients) is consistent with the predicted high prevalence following ZMC fractures[12]. Traumatic injuries to the midrace area, particularly the Zygomatic bone, frequently result in infraorbital nerve involvement due to the nerve's closeness to the fracture site[13].

The study's age-stratified analysis revealed a significant concentration of cases in the 31-40 age range, indicating a demographic susceptibility to ZMC fractures during this stage of life. This is consistent with previous evidence, which suggests that those who engage in high-risk professional and lifestyle activities are more likely to have face injuries14. The different recovery pattern seen, with a respectable 62.26% of patients obtaining functional nerve recovery after open reduction and internal fixation, highlights the surgical intervention's effectiveness[15, 16]. The age-specific research sheds light on how age influences postoperative outcomes. Notably, younger individuals are more likely to restore sensory integrity, indicating a possible link between age and brain regeneration ability. This is consistent with the larger medical literature, which emphasizes the usually higher regeneration capacity of younger people[17]. While the incidence of infraorbital nerve Paresthesia is within the predicted range, the recovery rates outperform some published outcomes, demonstrating the effectiveness of open reduction and internal fixation in preventing neurological problems[18, 19]. Discrepancies between studies might be related to differences in surgical procedures, patient demographics, and follow-up protocols, underlining the importance of nuanced interpretation of findings. However, it is critical to recognize the study's limitations. The single-center emphasis on Mayo Hospital, although offering a consistent surgical method, restricts the data's applicability to a larger patient population. Furthermore, the retrospective approach presents possible biases, and subjectivity in assessing infraorbital nerve Paresthesia may contribute to heterogeneity in reported results. Exploring the many elements that influence the findings reveals details such as trauma severity, surgical competence, and patient compliance. The magnitude and kind of trauma surely influence the occurrence and recovery of infraorbital nerve problems. Surgical skill, which includes both the surgical team's competency and the intricacies of the procedures used, has a major impact on postoperative results. Patient compliance with surgical care regimens, together with lifestyle variables, determines recovery trajectories.

Conclusion:

In conclusion, our study sheds light on the complex dynamics of infraorbital nerve problems in the setting of ZMC fractures. The alignment of findings with current research, along with the investigation of numerous factors impacting outcomes, adds to the study's relevance. Recognizing its strengths and limits, this research lays the groundwork for future attempts to build on, highlighting the importance of collaborative, multicenter investigations to confirm and extend these findings. Finally, these discoveries are critical for improving therapeutic techniques and expanding the field of oral and maxillofacial surgery.

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