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Frequency of Common Nerve Injuries in Patients with Oral and Maxillofacial Trauma

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ABSTRACT

Objective: To determine the frequency of common nerve injuries in patients with maxillofacial trauma and to compare the frequency of sensory and motor nerve dysfunction in these patients.

Study Design: Prospective longitudinal study

Place and Duration of Study: Oral and Maxillofacial Surgery Department, Armed Forces Institute of Dentistry (AFID), Rawalpindi, Pakistan from Mar to Dec 2023.

Methodology: A total of 190 patients with oral and maxillofacial trauma were reported to the Oral and Maxillofacial Surgery Department of the Armed Forces Institute of Dentistry. The study was conducted after approval from the Ethical Committee of the Armed Forces Institute of Dentistry.

Results: Out of 190 individuals, 176(92.6%) were male and 14(7.3%) were female. Whereas 72 patients (37.8%) presented with trigeminal nerve injury, and 118 patients (62.2%) did not. Out of the nerve injury patients, 16(22.2%) had ophthalmic sub-branch injury, 22(30.5%) had maxillary nerve injury, and 34(47%) had mandibular nerve injury. 4 patients (2.1 %) with peripheral facial nerve injury and 186 patients (97.9%) without facial nerve injury were identified.

Conclusion: The majority of maxillofacial trauma patients were young. Males significantly suffered more from oral and maxillofacial trauma as compared to females. The trigeminal nerve was damaged more as compared to the facial nerve in these craniofacial trauma patients.

Keywords: Common nerve injury, Frequency of nerve injury, Maxillofacial Trauma, Neurosensory dysfunction (NSD).

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INTRODUCTION

The maxillofacial trauma is one of the serious public health issues having variable epidemiology. Males are more prone to maxillofacial injuries as compared to females. Road traffic accidents are the major contributors to maxillofacial trauma in young male victims.[1,2] Other causes of maxillofacial trauma include falls, interpersonal violence, ballistic, and sports injuries. Maxillofacial trauma can affect the upper face and midface at Lefort I, Lefort II, and Lefort III levels. The nasal bones, mandible, and zygoma are the most often fractured bones, depending on the type of accident.[3,4]

Chronic neurosensory dysfunction results due to trauma, surgical manipulation, and dissection, or a combination of these. Nerve damage can happen either directly or indirectly. Sharp, penetrating injuries can directly harm nerves, or they might sever nerves between two broken bone pieces. Blunt trauma is the cause of indirect nerve injuries.[5] Nerve involvement and consequences, including paresthesia and neurosensory impairment, can result from maxillofacial fractures. The frequency of facial nerve (motor) and trigeminal nerve (sensory) damage in maxillofacial trauma is 33.8% and 14.1%, respectively.[6]

On the other hand, the facial nerve is not located in bony canals that are prone to fracture. The facial nerve is only damaged as a result of deep facial lacerations, causing transection of the nerve. However, the consequences of facial nerve damage are more severe compared to the trigeminal nerve, as they result in motor dysfunction and paralysis of facial muscles, causing aesthetic and functional concerns for patients. Trigeminal nerve impairment only causes numbness and paresthesia in the distribution of the affected nerve, and these symptoms also recover significantly with time. Facial nerve damage is challenging to treat, and the return of motor functions is also unpredictable even after repair of the damaged nerve. The role of prevention in maxillofacial trauma cannot be overemphasized. The use of a helmet by motorcyclists can significantly reduce the frequency and severity of maxillofacial trauma.[7] Excruciating aberrant sensory and functional impairments caused by trigeminal and facial nerve injuries often interfere with patients' daily activities. A few examples include difficulty in

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speaking, chewing, mastication, brushing teeth, smiling, whistling, expressing emotions, and maintaining lip proficiency for oral hygiene.[8] Patients should be counseled about the outcomes of their lost sensations in order to avoid any distress and medico-legal complications.[9] The duration of recovery of neurosensory dysfunction varies from patient to patient. It usually takes 6 months for recovery of neurosensory dysfunction after maxillofacial trauma. A study suggested that recovery of neurosensory deficit is faster in patients who were treated with open reduction and internal fixation of their fractures as compared to indirect reduction without fixation. However, these injuries resolve over time but cause significant discomfort to the patient. Follow-up is advised for these patients who suffered from nerve damage in order to evaluate any recovery of lost sensations.[10] The objective is to determine the prevalence of common nerve damage among individuals who have suffered from craniofacial trauma and to compare the frequency of trigeminal nerve (sensory) injury with facial nerve (motor) dysfunction.

METHODOLOGY

The prospective longitudinal study was conducted from March 2023 to December 2023 at Oral and Maxillofacial Surgery Department Armed Forces Institute of Dentistry, Rawalpindi, Pakistan after approval from Ethical Committee (Ethical approval letter Ref No:918/Trg dated 13 May 2020). A consecutive sampling technique was used to collect a sample size, and a total of 190 patients were included. The sample size was calculated using the WHO sample size calculator using the prevalence of facial nerve injury as 14.1%.[11]

Inclusion Criteria: Patients aged 10 or above who had their first maxillofacial trauma. Clinical evaluation of all patients, including inspection and palpation of the maxillofacial hard and soft tissue, history of facial skeleton damage, and diagnosis of maxillofacial fractures, was made. Radiographic findings of oral and maxillofacial trauma followed by mandibular or maxillary fracture.

Exclusion Criteria: Patients previously operated on for maxillofacial fractures and psychologically ill patients were excluded from this study. Patients who had multiple comorbidities, neurological impairment, and previous facial nerve palsy were not included.

Data was collected after approval of the said ethical committee. The demographic data of the patients, such as age, sex, the type of fracture, and the location of the fracture, were taken after obtaining informed consent. Any bone fractures and soft tissue injuries were recorded. Cotton pellets were used to investigate mild touch for the objective examination of sensory dysfunction following trauma, and a sterile dental needle was used to prick the trigeminal (sensory) nerve spreading bilaterally over the face. The patient was requested to demonstrate various facial motions, such as frowning, eyebrow lifting, tightly shutting the eyes, exposing the teeth, smiling, and making whistling gestures, in order to diagnose any motor functional deficit. All of these functions were lost and were regarded as peripheral nerve injuries.

The data was analyzed using Statistical Package for the Social Sciences version 23.0. For quantitative data, the mean± standard deviation (SD) was calculated, and for qualitative data, frequency and percentage were determined.

RESULTS

Out of the total, 176(92.6%) were male and 14(7.4%) were female. Out of the total, respondents aged between 10-19 years were 24(12.6%), 42(22.10%) between 20-29 years, 30-39 years 76(40%), and 40 years or above had 48(25.2%). Common nerves in the maxillofacial area include the trigeminal and facial nerves. In a study of 190 patients, 72 patients (37.8%) with trigeminal nerve injury and 118 patients (62.10%) without trigeminal nerve injury were identified, out of the nerve injury patients, 16(22.2%) had ophthalmic sub-branch injury, 22(30.5%) had maxillary nerve injury and 34(47%) had mandibular nerve injury. In a study of 190 individuals, four patients (2.1 %) with peripheral facial nerve injury and 186 patients (97.9%) without facial nerve injury were identified. Out of the facial nerve injury,1(25%) had zygomatic nerve injury and 3(75%) had mandibular sub-branch nerve injury. Frequency of common nerve injuries is shown in Table.

Table: Frequency of Nerve Injuries in Maxillofacial Trauma Patients (n=190)

Variables	Present	Absent
Trigeminal Nerve Injuries	72(37.8%)	118(62.1%)
Facial Nerve Injuries	4(2.1%)	186(97.9%)

The results here proved that 72(37.8%) had trigeminal nerve injury and 4(2.1%) had facial nerve injury. This trend of increased dysfunction of the trigeminal nerve as compared to the facial nerve in maxillofacial trauma is attributed to its close relation with bones and bony canals of the maxillofacial skeleton. The facial nerve is, however, damaged in soft tissue laceration due to its anatomical location. These instances were not so frequent.

DISCUSSIONS

In our study, the majority of maxillofacial trauma patients were young. Males significantly suffered more from oral and maxillofacial trauma as compared to females. The trigeminal nerve was damaged more as compared to the facial nerve in these craniofacial trauma patients. The study conducted by Tayyab *et al.* and Khan *et al.* favored our study, where trigeminal and facial nerves were significantly injured in oral and maxillofacial trauma at the rate of 35% and 16% respectively,[2,6] The present study found that males significantly suffered more from maxillofacial trauma than females. These results were in favor of research conducted by Halim *et al.* and Khan *et al.*, in which they found that men experience maxillofacial injuries more frequently than women.[12,4] The present study found that 21 to 35-year-old young adults had a greater frequency of maxillofacial trauma than subsequent groups. The results of this study are in favor of a study conducted by Wusiman *et al,* in which they found that the most likely category to develop maxillofacial trauma is young adults (p<0.05). This is because drivers in this age range are inexperienced, more inclined to go over the posted speed limits, and disregard safety precautions.[13] The present study found that maxillofacial trauma was mainly due to road traffic accidents(RTA); the results were in favor of research conducted by Kumar et al, Agarwal et al., and Othman et al., who found that the majority of maxillofacial injuries are caused by automobile accidents.[14,15,16] The leading causes of road traffic accidents in developing countries include a lack of road safety education, unsafe driving conditions that arise without the expansion of the motorway network, speeding above the posted limit, driving an older car without safety features, not using seat belts or helmets, breaking the highway code, and drinking alcohol or other intoxicants. A study conducted Al-jubory et al. in Iraq and by Aril et al., in Syria concluded that firearm injury was the most common cause of maxillofacial trauma, which is not in favor of this study as it may be due to ongoing conflicts in that region.[17,18] In the current study, the damage to the trigeminal nerve was significant as compared to the facial nerve, which is in accordance with studies conducted by Tahirullah *et al.* in which they concluded that the frequency of trigeminal nerve damage was significant as compared to the facial nerve.[6] However, a study conducted by Othman *et al.* in Iraq concluded that the facial nerve was commonly injured in presenting patients, which contradicts this study. The reason for this finding may be due to missile injuries causing soft damage in patients residing in those regions.[16]

LIMITATIONS OF STUDY

Cases of neurosensory dysfunction that resulted from maxillofacial trauma were not followed to notice recovery of sensations and return of normal motor functions; therefore outcome of these patients was not recorded.

CONCLUSION

The majority of maxillofacial trauma patients were young. Males significantly suffered more from oral and maxillofacial trauma. Road traffic accidents are the most common etiology of craniofacial trauma. 37.8 % patients suffered from trigeminal nerve injuries, whereas 2.1% individuals sustained facial nerve injuries resulting from deep facial lacerations. The trigeminal nerve was affected significantly more as compared to the facial nerve.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

ZD & MI: Data acquisition, data analysis, critical review, approval of the final version to be published.

AAK & SU: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

AY & TM: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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