COMMON NERVE INJURIES IN ORAL AND MAXILLOFACIAL TRAUMA: A CROSS-SECTIONAL STUDY AT KHYBER COLLEGE OF DENTISTRY PESHAWAR

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Abstract

Objective: *To determine the frequency of common nerve injuries among patients presented with maxillofacial trauma.*

Materials & Methods: *This analytical non-experimental study consisted of 158 participants were conducted at the Department of Oral and Maxillofacial Surgery Khyber College of Dentistry, Peshawar from February 2016 to December 2017 by using non-probability consecutive sampling. Patient's detailed history and examination were carried out to detect olfactory, infraorbital, inferior alveolar and facial nerve injuries. Data analysis was done using SPSS version 20.0. Descriptive statistics were calculated for all variables (age, gender and nerve injuries etc.). Common nerve injuries were stratified among age group, gender and type of trauma using chi-square test. P<0.05 was considered significant.*

Results: *The mean age was 29.36±12.41 years. Males (n=141, 89.8%) were more than females (n=17, 10.2%). The causes of nerve injury were road traffic accident (RTA) in 86(54.4%) cases followed by firearm injury (n=32, 20.3%) and fall (n=22, 13.9%). Injury to the inferior alveolar was found in 94(59.5%), infraorbital in 34(21.5%) and facial nerve in 28 (17.7%) cases.*

Conclusion: *The findings of this study support that males were more commonly involved in nerve injury than females. Maxillofacial trauma was more common in the third decade of life. Road traffic accident was the most common cause of maxillofacial trauma. Inferior alveolar nerve injury was more common than other nerves.*

Key Words: *Road traffic accident, Nerve injury, sensory alterations, facial paralysis*

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].

Cranial nerve trauma is an important component of neurotrauma in patients with head injuries whose incidence varies from 5 to 23% in patients with head injuries. The olfactory nerve is the most commonly injured nerve in head injuries resulting in anosmia. Parosmia has been reported in 25 to 33% of patients with head injuries[2]. Maxillofacial injuries comprise of 3.2 to 8% of all injuries[3]. Branches of the trigeminal nerve are injured during severe maxillofacial trauma. The supraorbital (SON) & infraorbital nerves (ION) are injured in the trauma of forehead, orbit & maxilla[4]. Fractures of the midface, mainly the zygomaticomaxillary complex (ZMC) fractures, comprise up to 15% of all facial bones fractures and second in frequency to nasal bone fractures which are the most common type of facial fractures. In 30 to 80% of the midfacial fractures, the infraorbital nerve is injured. ION injury occurs in 64% of patients with ZMC fractures as a result of maxillofacial trauma. Sensory alterations of the skin of cheek, lower eyelid, upper lip & upper gingivae in the form of hypoalgesia, hyperalgesia, dysesthesia, paraesthesia & anaesthesia show infraorbital nerve injury[5].

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The incidence of these symptoms varies from 35 to 94% of all ZMC fractures, with increased incidence in displaced than undisplaced fractures[6]. In most of the cases, the ZMC fractures involve the infraorbital foramen, canal & fissure. Hence sensory neuropathy of the ION occurs[7].

Of all the maxillofacial injuries, 79% are the mandibular fractures[3] in which the incidence of inferior alveolar nerve (IAN) injury is about 56%[8]. Hypoalgesia, hyperalgesia, dysesthesia, paraesthesia, anaesthesia, and all these sensory alterations of the lower lip, chin, lower alveolus & teeth show IAN injury. IAN injury is reported in 18 to 30% of cases with mandibular fractures. These altered sensations have a negative influence on the psycho-emotional status of the patient and decreased work capacity. There is drooling of saliva with drinking or eating & difficulty in speech[3].

The IAN injury commonly occurs in case of mandibular fracture between the mandibular and mental foramena[9], most frequently in posterior mandibular fractures[10]. Trauma is the second most common cause of facial paralysis after Bell's palsy. Facial palsy has been reported in 45-50% of patients with gunshot injuries[4].

Facial nerve palsy is not a life-threatening condition, but it has severe effects on the quality of life. Traumatic injury to the facial nerve may be intra-temporal or extratemporal depending upon the site of impact. Incidence in children is from 3 to 8% and in adults is from 30 to 70%. Of the two types of injuries, the prognosis of extratemporal injury is better[11].

Besides esthetic deformities, soft tissues trauma of the face also affects the neural function, mastication, salivary outflow, keratitis, corneal breakdown & blindness. Facial nerve injury medial to the vertical line drawn from the lateral canthus of the eye carries greater chances to regain function because it has enough cross innervations from the surrounding branches. For this reason, nerve repair is not attempted when the injury is medial to the vertical line but lateral to this vertical line should be repaired[12].

The purpose of the study was to determine the frequency of common nerve injuries among patients with maxillofacial trauma.

Materials and Methods

This analytical non-experimental study was conducted at the Department of Oral & Maxillofacial surgery, Khyber College of Dentistry, Peshawar from February 2016 to December 2017 has a total of 158 sample size.

All those patients irrespective of the gender and age group above 16 years coming to the Oral & Maxillofacial surgical unit of Khyber College of Dentistry with trauma to the oral & maxillofacial region were included in the study. Patients have nerve injuries because of iatrogenic trauma or pathological conditions/fractures, any type of treatment received before visiting the outpatient department was excluded.

The purpose, procedure, risks and benefits were explained to the patients, and informed consent was taken. A detailed history was taken from them followed by appropriate, relevant clinical examination (for the nerve involved in maxillofacial trauma). The radiological examination was carried out in the form of Orthopantomogram (OPG), and Paranasal sinus (PNS) views to assess the presence of fracture and hence any associated nerve injury. To confirm the type of nerve injury, patients detailed history and examination was carried out to detect olfactory, infraorbital, inferior alveolar and facial nerve injury.

The collected data were analyzed by SPSS version 20.0. Descriptive statistics like mean and standard deviation was calculated for numerical variables like age. Frequencies and percentages were calculated for categorical variables like gender, common nerve injuries (olfactory, infraorbital, inferior alveolar and facial nerve) and type of trauma. Common nerve injuries were stratified among age group, gender and type of trauma to see the effect modifications. $P<0.05$ was considered significant.

Results

Out of the total, the sample the age of the patients ranged from 17 to 76 years with the mean age of 29.36±12.41 years. The frequency of nerve injury was high in the age group 17-26 years (53.2%) followed by age group 27-36 years (25.3%) and 37-46 years (12.7%) respectively. The details of age distribution are given in table 1. Females (n=17) were more than male (n=141). Male to female ratio was 8.29.

Among 158 patients, 141(89.2%) were males, and 17(10.8%) were females had a nerve injury. The road traffic accident (RTA) was the most common cause of nerve injury (54.4%) followed by firearm injury (FAI) (20.3%), fall (13.9%) and assault (11.4%) respectively. (Table 2)

Inferior dental nerve (IDN) injury was most common (n=94, 59.5%) followed by infraorbital nerve (ION) (n=34, 21.5%), facial (n=28, 17.7%) and olfactory nerve (n=2, 1.3%) respectively. (Table 3)

IDN, ION, olfactory nerves were affected in males, and facial nerve was more affected in females. (Table 4) Most cause common of IDN, ION and the olfactory injury was RTA while for facial nerve was fall. (Table 5) The most common age group for all nerve injury was 17-26 years. (Table 6) Stratifications of the type of nerve injury with gender, the cause of trauma and age are given in table 4,5 and 6. All these were statistically significant (P <0.05).

Table 1: Age distribution of the sample (n=158)

Age group(years)	Frequency	Percentage
17-26	84	53.2
27-36	40	25.3
37-46	20	12.7
47-56	6	3.8
57-66	6	3.8
67-76	2	1.3
Total	158	100.0

Table 2: Descriptive statistics for causes of nerve injury

CAUSE	Frequency	Percentage
RTA	86	54.4
Assault	18	11.4
Fall	22	13.9
FAI	32	20.3
Total	158	100.0

Table 3: Distribution of type of nerve injury

NERVE	Frequency	Percentage
IDN	94	59.5
ION	34	21.5
Facial	28	17.7
Olfactory	2	1.3
Total	158	100.0

Discussion

The results of our study showed that the road traffic accident (RTA) was the most common cause of nerve injury and the inferior alveolar nerve was the most commonly injured nerve.

In the present study, only 2 (1.3%) patients had olfactory nerve injury and consequent anosmia. Kalavrezos et al[13] reported anosmia in 33 (46.5%) patients with maxillofacial trauma. Joung et al[14] reported anosmia in 22 (21%) patients. Akdogan et al[15] reported anosmia in 12 (28.5%) patients. The decreased frequency of anosmia in the present study may be because olfactory dysfunction most frequently occurs in craniofacial trauma involving the frontonasal region. These patients are treated by the neurosurgeons and otorhinolaryngologists and are least reported to the oral and maxillofacial trauma unit.

In the present study inferior alveolar nerve injury was noted in 94 (59.5%) cases. Bradjic et al[9] studied 459 patients with mandibular fractures and found inferior alveolar nerve injury in 273 (60%) cases. Rehman et al[16] conducted a study on 117 patients with mandibular fractures and found inferior alveolar nerve injury in 75 (64.1%) patients. The results of these studies are in accordance with the current study.

In the present study, infraorbital nerve injury was found in 34 (21.5%) patients. Sakavicius et al[5] studied 478 cases of ZMC fractures and noted infraorbital nerve injury in 305 (64.4%) patients. Benoliel et al[17] carried out his study on 25 patients with ZMC fractures and found infraorbital nerve injury in 58.3% of cases. The decreased frequency of infraorbital nerve injury in the present study may be due to the less frequent involvement of the infraorbital region in maxillofacial trauma as compared to other maxillofacial areas.

The present study showed facial nerve injury in 28 (17.7%) patients. Kalavrezos et al[13] studied a total of 79 patients with maxillofacial trauma and reported facial nerve injury in 10 (14.1%) patients. The results of Kalavrezos et al. correlate with our findings.

In the present study nerve injury during maxillofacial trauma was common in males 141 (89.25%) as compared to females 17 (10.8%). Males are more

Table 4: Stratification of the type of nerve injury by gender

Nerve					p-value*
	IDN N(%)	ION N(%)	Facial nerve N(%)	Olfactory nerve N(%)	
Male	85 (60.28)	34 (24.11)	20 (14.18)	2(1.41)	0.003
Female	9(52.94)	0(0)	8(47)	0(0)	
Male	85 (60.28)	34 (24.11)	20 (14.18)	2(1.41)	
Female	9(52.94)	0(0)	8(47)	0(0)	

*Chi-Square value

Table 5: Stratification of nerve injury by cause

Cause	Nerve				p-value*
	IDN N(%)	ION N(%)	Facial nerve N(%)	Olfactory nerve N(%)	
RTA	56(65.11)	24(27.90)	4(4.65)	2(2.32)	0.000
Assault	12(66.66)	4(22.22)	2(11.11)	0(0)	
Fall	14(63.63)	6(27.27)	2(9.09)	0(0)	
FAI	12(37.5)	0(0)	20(62.5)	0(0)	

*Chi-Square value

Table 6: Stratification of nerve injury by age group

Age Group (years)	Nerve				p-value*
	IDN N(%)	ION N(%)	Olfactory Nerve N(%)	Facial Nerve N(%)	
17-26	54(64.28)	12(14.28)	16(19.04)	2(2.38)	0.008
27-36	28(70)	8(20)	4(10)	0(0)	
37-46	8(40)	10(50)	2(10)	0(0)	
47-56	0(0)	2(33.33)	4(66.66)	0(0)	
57-66	2(33.33)	2(33.33)	2(33.33)	0(0)	
67-76	2(100)	0(0)	0(0)	0(0)	
Total	94(59.49)	34(21.51)	28(17.72)	2(1.26)	

*Chi-Square value

involved in outdoor activities and exposed to risks for facial trauma like road traffic accidents, assaults and falls etc. Similar results were reported by Razukevicius et al[3] and Rehman et al[16].

The most common cause of nerve injury in maxillofacial trauma in this study was road traffic accidents which accounts for 54.4% of cases followed by firearm injury (20.3%) and fall (13.9%). Chalya et al[18] studied 154 patients with maxillofacial injuries and found the cause of injury as road traffic accident in 57% of the patients followed by assault (16.2%) and falls (14.3%). Chalya's study supports the present study results. Agrawal et al[19] included 1088 patients in his study and found that the cause of maxillofacial trauma was road traffic accident in 51% of patients followed by fall (21%) and assault (15%). Regarding the aetiology of maxillofacial trauma, there is wide variation in studies across the world. These variations may be attributed to the changes in geographical conditions, road safety regulations,

socioeconomic status, cultural values, alcohol abuse etc. The high number of road traffic accident in this region can be attributed to underage driving, poor road condition, over speeding, overloading. In addition to it, lack of seat belt law obligation, substance abuse, driving a motorbike without safety measures, use of the mobile phone during driving, social factors leading drivers to aggressive behaviour and either poor legislation regarding road safety or lack of implementation of existing laws are considered to be the major risk factors of road traffic accidents.

In the present study, the second most common cause of nerve injury was found to be firearm injuries. The reason for this high percentage of nerve injuries due to firearms can be directly attributed to the existing law and order situation in Khyber Pakhtunkhwa. This province has been a prime target for the terrorists since the start of the war on terror since the early 2000s. Furthermore, guns culture has deeply penetrated the Pakhtun society leading to more cases of firearm injuries.

Conclusion

Males were more commonly involved in maxillofacial trauma and nerve injury than females. Maxillofacial trauma was more common in the third decade of life. Road traffic accident was the most common cause of maxillofacial trauma. Inferior alveolar nerve injury was more common than other nerves.

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