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Neurosensory deficit in cases of zygomatic complex fractures

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Abstract

Fractures of the maxillofacial skeleton are very common which may not only lead to disfigurement of face, but are also a cause of neurosensory disturbances. Among various injuries, zygomatic complex fractures are next to nasal bone fractures; however, involvement of infraorbital nerve is almost a constant features which is manifested by neurosensory alteration in the areas supplied by this nerve. We performed a clinical study on isolated cases of zygomatic complex fractures and studied the correlation of infraorbital nerve injury to displacement and reduction of bone. The results of our study indicate that in most of the cases neurosensory recovery takes a time of 4 months after reduction. Early surgical intervention may speedup the process of neurosensory recovery.

Key words: Zygomatic complx complex fractures, neurosensory deficit, two point discrimination

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Introduction

Trauma of facial region frequently involves the soft tissues of facial skeleton including maxilla, mandible, zygomatic complex and nasal bone etc. These injuries may be in the form of isolated injuries or may be associated with injuries of other parts of body.

However, among the maxillofacial injuries, zygomatic complex region is the second most commonly injured area of the mid-face, second to injuries of nasal region [1,2] and they compose up to 15% of all facial bone fractures [3,4,5]. The nasal bone injuries are most common in young and middle aged men.

With zygomatic complex fractures, injury to infraorbital nerve is inevitable and it accounts for 30-80% of mid-face fractures. Infraorbital nerve injury is manifested by hyperesthesia, hypoesthesia, dysthesia and anaesthesia of the upper lip, cheek, lower eyelid and lateral part of nose and skin of premaxillary region. The incidence of these symptoms varies from 35 to 94% of all the zygomatic complex fractures.

The purpose of this study was to investigate the incidence of neurosensory alterations due to infraorbital nerve injury in zygomatic complex fractures in Indian patients.

Material and Method

The patients attending the Out patients Clinic of department of Oral and Maxillofacial Surgery, Faculty of Medicine, Aligarh Muslim University, Aligarh were requested to participate in the study. Only those patients who presented with clinical findings of unilateral zygomatic complex fracture were included in the study and they signed a consent form to confirm their willingness to participate in the study. The patients suffering from any systemic disease or any previous maxillofacial trauma were excluded from the study.

Fractures of the zygomatic complex were diagnosed on the basis of clinical examination and findings were confirmed by radiological examination, which included computed tomography (CT) in which axial and coronal CT scans were taken with 1 mm and 2mm respectively. Fracture displacement was graded as:

0 No displacement
1 Minimal displacement and just palpable
2 Gross and palpable displacement

All the cases were examined by same consultant. Evaluation of neurosensory disturbance was done by two pint discrimination test.

Assessment of altered sensation

At the time of examination, the subjects were questioned about altered sensation on the injured side. If no alteration in the sensation was reported, the patient was categorized as 'no alteration' i.e. having normal sensation. If altered sensation was present, the patient was asked to describe his feeling which was noted and later on it compared and categorized as Essik.

The test was done by the same operator. Each area was stimulated for times at a gap of 10 minutes. The responses were recorded, compared and maximum occurrence of same sensation / word description was grouped accordingly. These tests were repeated at an interval of 15 days, 1 , 2, 3, 4, 6, 8, and 12 months.

Observation and Results

The findings of the study have been recorded in Tables 1, 2, 3 and 4. Table 1 show that how the patients described their altered sensation after zygomatic complex injury. The descriptions of the patients were first noted and then compared with the Table 1 and categorized accordingly. We have used the term hyperesthesia in place dysthesia (term used by Zuninga in the Table 1).

Table 2 shows age-wise distribution of zygomatic complex fractures. The zygomatic complex fractures were seen commonly in men (97.7%) and it is seen in females in 2.3% cases. When it comes to consideration of age, it is most in age group of 20-40 years (81.2), 41-60 years (13.5 %) and least in above 60 years (3. 3%).

Table 1: Words on list described by patient to express altered sensation

No alteration	No change, normal
Hypoesthsia	Numb, warm, rubbery, wooden, cool, stretched \and woody
Paresthesia	tickling, tingling, twisting, pulling, crawling, vibrating, Drawing, itching
Dysthesia	pricking, stinging, electric, painful, cold, hot, tender, Excruciating, sore, burning, shocking

***Adapted from Zuniga JR, Essik GK. A contemporary approach to clinical evaluation of trigeminal nerve injuries. Atlas oral Maxillofac Surg Clin North Am. 1992:4:353-367*

Table 2:Age-wise distribution of cases of zygomatic complex fractures

SEX				AGE GROUP					
Male		Female		20-40 years		41-60 years		61 and above	
n	%	n	%	N	%	n	%	n	%
130	97.7	3	2.3	108	81.2	18	13.53	7	3.27

Table 3: distribution of infra-orbital nerve injury in isolated zygomatic complex fractures

Fracture characteristic	No. of patients	Neurosensory alteration					
		No alteration		hypoesthesia		hyperesthesia	
		N	%	N	%	N	%
No displacement	16	11	8.27	5	3.76	0	-
Minimum displacement	27	0	0	24	18.5	3	3.26
Significant displacement	90	0	0	86	64.66	4	3.01
Total	133	11	8.2% 1	115	86.47%	7	5.260%

Table 4: Period of recovery of neurosensory alteration in Un-displaced, minimally displaced and severely displaced zygomatic complex fractures.

Type of fracture	No. of patients	Altered sensation	Period of recovery in weeks in number of patietnts							No recovery
			15 days	**1** months	**2** months	**3** months	**4** months	**6** months	**8** months	**12** months
Un-displaced	16 (12.0%)	11 no change								
		5 hypo		**2**	**3**					
Minimally displaced	27 (20.3%)	24 hypo		6	13	2	3			
		3 hyper			1	2				
Severe displaced	90 (67.7 %)	86 hypo				28	36	15	3	4
		4 hyper								
Total	133	No change 11(8.7%)	1	10	20	36	44	21	11	4
	Undisplaced fracture 12%	Hypoesthesia 115(86.47%) Hyperesthesia 07(5.26%)	.06%	7.5%	15.0%	27.1%	32.4%	15.9%	8.3%	3.00

Table 3 shows extent of displacement of zygomatic complex fractures and infra-orbital nerve (ION) sensory disturbance in 133 patients. It reveals that among 133 patients, 117 (88.0%) patients had displaced fractures and 16 (12.0 %) patients had un-displaced fractures. The hypoethesia was the only presentation in the un-displaced fracture and it was more (18.05%) in minimally displaced group and most (86.7%) in the significantly displaced fractures. This indicates that the hypoesthesia is the commonest presentation in the zygomatic complex fractures. Hyperesthesia is occasionally noticed and was seen only in 7 (5. 3 %) cases. However 8% of patients did not suffer from neurosensory alteration.

Table 4 shows progress of neurosensory recovery after trauma and treatment. Results of our study indicate that in maximum cases sensory recovery takes place in 4 months (32.4% cases) and period of recovery is related to reduction of fractured zygomatic bone. We noticed that nerve function was faster after reduction and stabilization of fracture which indirectly leads to nerve decompression.

Discussion

ION is commonly involved in zygomatic complex fractures and resultant altered neurosensory afflictions are cause great concern to the patients. We performed a clinical study on patients 133 patients with unilateral zygomatic complex fractures to study the neurosensory alterations in such cases. The results of this study revealed the infraorbital nerve sensory disturbances occurred in 122 (91.73%) patients. Of which (12.3%) had un-displaced and displaced (87.7%) zygomatic complex fractures. Our result match with the finding of Sakavicius et at [11]. This is again similar to the findings of Renzi et al [12]. Our findings are also similar and closer to findings presented by Sakavicius et al [11] and Westermark et al [7] . Westeramrk et al. reported an impaired infraorbital nerve function up to 80% of cases. Others authors on the other hand, have found far fewer ION sensory disturbances: Zingg et al. [13] in 7.4% and Larsen [14] in 7% of cases. The possible explanation for this difference would be the method used to study the neurosensory deficit. Further, it is a complicated issue to compare between different studies performed on different methods for assessment of neurosensory deficit). Various techniques employed to assess nerve function are two point discrimination, pressure threshold, pin prick test, sharp and blunt instrumentation, and thermography etc.

On the other hand the difference in the displacement of fractured zygomatic complex may conveniently be attributed to magnitude of causative force of trauma which affects the continuity of bone. Commonest cause of trauma in India is the road traffic accident and particularly speeding vehicles. Thus heavy impact usually results in gross displacement of fractured bone.

In our study hyperesthesia was present in only 5.26% cases and hypoesthesia was present in 86.47% of patients with neurosensory disturbances. This is in agreement with findings presented by Benoliel et al. [15]. No neurosensory alteration was seen in 8.7% of cases The treatment modalities included, conservative drug treatment for the reduction of clinical symptoms in patients with un-displaced fractures, closed reduction for minimally displaced and open reduction with rigid fixation in severely displaced/unstable fractures.

Neurosensory deficit in cases of zygomatic complex fractures

The results of our study reveal that neurosensory alteration after zygomatic complex fracture is not uncommon, however, patients describe them in different terms in Table 1 [16] and in fact they are major concerns of the patients after the facial deformity due to fractures. Because of anatomical position, the infraorbital nerve may suffer from various types of injury during trauma. These may be indirect, such as compression due to formation of post traumatic oedema or hematoma or direct compression due to the direct compression of due to displacement of fracture segment. It appears there is direct correlation between the recovery of paresthesia and reduction of fracture. Although in our study majority of patients (32.4%) recovered in 4 months, 3% of cases could not recover in 12 months. Other studies have also suggested that in rare cases 12 month is necessary to verify the resolution of neurosensory alteration and total recovery may take about 12 months [17,18] or some times more.

There are many studies which suggest that sensory testing involves errors. Zaytoun et al reported that not all subjects responded to stimuli during both directing test in virgin area innervated by the infraorbital nerve [19]. Karas et al reported 22 patients in which 20 (92%) the lower lip and in 18 (83%) the chin were sensitive to the finest filament (1.65) but the other required two filaments(2.44) [20].

When reviewing the literature big differences in the armamentarium used in objective evaluation of tests in sensory changes may be found. This could lead to differences in the definition of sensory changes. The only reason for these differences is that no standardization of the instruments has been done for this purpose.

From our study we conclude that cases where displacement did take place there was compression of nerve leading to paresthesia, it recovered rapidly after reduction of fracture, since it resulted in nerve decompression. As far as matter of sensory changes is concerned, hypoesthesia is the commonest finding (86.47%) followed by hyperesthesia (5.26%) in cases where displacement of segments had taken place in very few cases no alteration in neurosensory disturbances were seen. Further, while treating fracture the aim would be reduction to achieve normal form and function and decompression of nerve. When one aim is achieved, the next automatically follows. The hypoesthesia continues to decrease after reduction / decompression which usually started from 3rd day of procedure and recovery was complete in most of the cases in 4 months.

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