

Incidence of Infraorbital Nerve Involvement and Neurosensory Changes Following Zygomaticomaxillary Complex Fracture- A Retrospective Study.

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Citation of this Article: Dr. Kritant Bhushan , Dr. Mansi Luthra Sharma , Dr. Neha Sharma, Dr. Manmohan Bramta, “Incidence of Infraorbital Nerve Involvement and Neurosensory Changes Following Zygomaticomaxillary Complex Fracture- A Retrospective Study.”, IJDSIR- September - 2020, Vol. – 3, Issue - 5, P. No. 345 – 349.

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Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Objective : The main objective of the study is to document neurosensory changes in the infraorbital (IO) nerve following Zygomaticomaxillary Complex (ZMC) fracture and to evaluate the incidence and recovery of persistent sensory disturbance of IO nerve after ZMC fracture pre and post operatively.

Study design: A retrospective study is conducted in which 450 patient were included over period of 10 yr from 2009 to 2019. Neurosensory function was assessed preoperatively and post operatively at 1 week, 1 month, 3 month and 6 months with two point discrimination.

Result : Out of 450, 320 patients were reported with road traffic accidents, 80 by fall, 50 by physical dispute. The fracture was further divided into undisplaced, minimum displaced and significant displaced. The neurosensory disturbance was present in 96% of patient with ZMC

fracture. After one month post operatively some neurosensory deficit was present and after 3 months there was significantly improved infraorbital nerve function.

Conclusion: Study shows that the treatment of ZMC fracture by surgical intervention shows significantly faster improvement of IO function as compared to cases where only conservative management was used to treat fracture, also 2 point discrimination is reliable method in terms of assessment of neurosensory deficit.

Keywords: Infraorbital (IO) nerve, Zygomaticomaxillary fracture (ZMC), Neurosensory changes, Two point discrimination test (TPD)

Introduction

The incidence of maxillofacial fracture has been increasing over the past decade as a result of increase in number of RTA and physical assault. Among the maxillofacial injuries, ZMC region is the second most

common area of the midface to be injured, second to the injuries of the nasal region and they compose of 15 % fracture of the facial bone region. In ZMC fracture injury to IO nerve is inevitable, as in most cases fracture line involve infraorbital foramen, canal and fissure, hence ZMC fracture are often characterized by sensory neuropathy in the area of innervations of infraorbital nerve. Traumatic injury to infraorbital nerve may be due to compression, edema, ischemia or laceration^{14,19,20}.

Materials and methods

It is a retrospective study in which total 450 individuals from the records of Oral and Maxillofacial Surgery department of Dental college and Dentistry department of a Medical College of in India were analyzed. Patient included in the study were only patients with isolated ZMC fracture. The fracture was graded as non-displaced, minimally displaced and significantly displaced and in all cases neurosensory disturbance was evaluated by using 2 point discrimination.

Subject excluded in the study: patients with multiple facial bone fractures, children below 18 years and patients with no neurological abnormality of any kind. The areas tested for infraorbital nerve damage : lower eyelid, anterior cheek, lateral side of the nose, upper lip. All the patients were examined pre-operatively and post operatively according to standardized test of neurosensory functions to clarify the subjective and objective neurosensory function of the injured nerve pre operatively and postoperatively after 1 week, 1 month, 3 months, and 6 months in patients with zygomatic complex fractures.

Neurosensory evaluation

Two point discrimination test (TPD) is used to examine neurosensory deficits. In this test end tip of a rigid instrument like caliper is used, either one point or two points are slightly pressed on the patient’s skin in the area to be tested. During the test patient is ask for closing his or

her eyes and consistently inform whether one point or two point was felt. The smallest distance between the two points that result in the perception of two distinct stimuli is recorded as patients two point threshold^{14, 20}. A five point scale was used to describe the sensation1- no sensation, 2- almost no sensation, 3- some sensation, 4- almost normal sensation, 5- completely normal sensation. The patient subjective perception was recorded and evaluated preoperatively and post operatively after 1 week, 1 month, 3 month and 6 months.

Observation and Result

Finding of the study have been recorded, description of the patients were noted and then compared.

Sex				Age Group					
Male		Female		20-40 years		41-60 years		61 and above	
n	%	n	%	N	%	n	%	n	%
388	86.2	62	13.7	282	62.6	133	29.5	35	7.7

Table 1: Age wise distribution of cases of ZMC fracture

Table 1 shows ZMC Fracture were seen commonly in men (86.2%) and in females (13.7%). When it comes in consideration of age it is most commonly seen in age group of 20 to 40 years and least in above 60 year age group.

Fracture characteristic	No. of patients	Neurosensory alteration					
		No alteration		Preoperative alteration		Post operative alteration	
		N	%	N	%	N	%
No displacement	70	11	2.4	59	13.11	0	-
Minimum displacement	150	7	1.5	150	33.33	18	4
Significant displacement	230	0	0	230	51.1	39	8.6
Total	450	11	3.9	439	96.1	57	12.6

Table 2 : extent of displacement of ZMC and infraorbital nerve disturbance (IO) in 450 patients. It reveals that among 450 patients, 380 had displaced fracture and 70 had

undisplaced fracture. Only 3.9% patients have no neurosensory alteration. Preoperative altered sensation is found in all minimal and significant displaced cases, while postoperatively it is seen no change in neurosensory alteration in undisplaced fracture but 12% of changes is seen in displaced fracture.

Type of fracture	No of patients	Period of recovery				No recovery
		1week	1 month	3 month	6month	
Undisplaced	70	0.6%	2%	7.5 %	7.1%	
Minimum displaced	150	1%	5.5%	12.2%	12.9%	0.8
Significant displaced	230	Nil	7%	19.7%	21.5%	2.2
Total	450	1.6%	14.5%	39.4%	41.5%	3%

Table 3 : In our study result indicate that in maximum cases sensory recovery take place in 6 months and period of recovery is related to reduction of fractured zygomatic bone. It is also seen that nerve function was faster after reduction and stabilization of fracture which indirectly leads to nerve decompression.

Discussion

Zygomatic complex fractures are the common injuries of craniomaxillofacial skeleton. Sensory disturbance in the distribution of the infraorbital nerve are almost always present in zygomatic complex fractures^{2,3,14}. IO nerve is commonly involved in zygomatic complex fractures and resultant altered neurosensory afflictions are of great concern to the patients^{14,15}.

According to Waldhart disturbance of sensitivity of the infraorbital nerve is present in 70 % of the cases initially, while a follow-up of 40 patients 1-6 years later showed residual disturbance in 25 % of them¹⁸. Momma and Pfeifler recorded a similar disturbance (> 65 %) on 67 patients. According to them sequence of events leading to normal function is anesthesia, paraesthesia, hypoaesthesia in that order^{16,18}. Jungell and Lindqvist

reporting on 68 patients with fractures of the zygomaticomaxillary complex found that 56 had sensory disturbance of the infraorbital nerve, while in 42 % of the cases operated upon some degree of persistent hypoaesthesia¹⁴. According to them most of the improvement takes place in the first two weeks¹⁴. De Man and Bax stated that infraorbital nerve involvement alone with minimal or no displacement of the zygoma is not an indication for surgical intervention, since full regression of neurological symptoms in undisplaced fractures may occur spontaneously, while decompression of the infraorbital nerve, even in markedly displaced fractures, may damage it.^{5,6}

We performed a retrospective study on 450 patients with isolated ZMC fracture to study the incidence of infraorbital nerve altered sensation. The result of study revealed that altered sensation due to involvement of ION occur in 96.1% of cases. In our study total of 450 patients 70 had undisplaced fracture and 360 had displaced fracture. All displaced fracture are treated by ORIF, while in case of undisplaced fracture only those cases are treated by ORIF in which altered sensation was positive. Our result match with the finding of Sakavicius et al and Westermark et al^{1,13}. Were they reported an impaired infraorbital nerve function up to 80% of cases in zygomatic complex fractures. According to the literature the incidence of the sensory disturbances in zygomatic complex fractures in post-trauma period varies from 24% to 95%^{1,3,6,7,13}. All patients in our series had neurosensory deficits in the cutaneous distribution of the infraorbital nerve after the trauma.

According to various studies, persistent sensory disturbance were found in 50% of the zygomatic fractures treated by elevation only, the number of zygomatic fracture with involvement of infraorbital nerve that have been treated by reduction only, has decreased

substantially^{11,12}. So they recommend that, it is justifiable to stabilize the zygoma with a miniplate even in those cases in which the fracture is stable after elevation. The changing pattern of increasing use of plates rather than wiring for fixation has been previously noted. Indeed the routine use of miniplates for midface and mandibular fractures has resulted in low levels of residual sensory nerve dysfunction, and has been recommended as the treatment of choice for fixation¹².

Fortunately, It is also seen because of the anatomical position of IO nerve may suffer various type of injuries such as trauma which is either from compression, edema, ischemia, hematoma, laceration. It is also seen that there is a correlation between recovery of parasthesia and reduction of fracture^{19,20}. Result in our study shows that neurosensory alteration after ZMC fracture are very common. From our study we concluded that compression of nerve leading to altered sensation occur in displaced fracture of ZMC and recover rapidly after the reduction of the fracture. Further while treating fracture the main aim of reduction is to achieve normal form function along with the decompression of the nerve. It is also seen that altered sensation continue to decrease after reduction and decompression and recovery was almost complete in most of the cases after 3 months but 3% of cases not able to recover even after 8 to 12 months period. In our study we have not seen any relation between age and sex with neurosensory recovery which correlates with the study conducted by Benolielet al.⁵

Conclusion

In conclusion, most cases of IO nerve dysfunction following zygomatic fractures will recover by between 3 to 6 months. The incidence of residual sensory dysfunction varies with the testing modality. Open reduction and fixation of the zygomatic complex fracture offers a better prognosis for complete recovery of

infraorbital nerve function than elevation only. The clinical sensory tests are an effective guide to study the neurosensory deficit post zygomatic complex fractures. There was a difference in subjective and objective perception of the clinical neurosensory test interpretation. The two point discriminator tests was more reliable in terms of assessment of neurosensory deficits. Further while treating fracture aim is to maintain the normal form and function and relieve the pressure from the nerve.

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