

ORIGINAL ARTICLE



Sensory disturbances in the region of inferior dental nerve in post-traumatic patients of angle of mandible and its relation to degree of displacement and time duration: A descriptive study

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ABSTRACT

Introduction: Inferior alveolar nerve (IAN) is one of the most important structures in maxillofacial region. Sensation abnormalities arise at the innervation point of the inferior alveolar nerve, which is often affected when a mandibular fracture occurs at the angle area. As a result of nerve injury, disturbances in sensitivity of the skin, mucous membrane and teeth occur. Patients feel discomfort, paraesthesia, sometimes even pain in its area of innervation. This illness impairs a person's psycho-emotional state and limits their ability to work. Long-term neurosensory function is negatively impacted by the extent of displacement caused by mandibular angle fractures.

Objective: The study's goal was to ascertain the general prevalence and degree of inferior alveolar nerve damage in patients who had mandibular angle fractures.

Study design: Descriptive, cross sectional.

Setting: Department of Oral & Maxillofacial surgery, Khyber College of Dentistry Peshawar.

Duration of study with dates: Six months from 18th September, 2015 to 20th December, 2016.

Materials and methods: A detailed history was taken from them followed by radiographic examination using Orthopantomograph (OPG) to assess the presence of angle fracture and degree of displacement of proximal and distal segments. The displacement was as un-displaced, 1-3mm displacement, 3 to 6mm displacement and 6 to 9mm displacement confirmed on the basis of separation of tramlines on OPG. Displacement greater than 9mm was excluded from study. Inferior alveolar nerve injury was assessed clinically using neurosensory testing.

Results: This study comprised 264 patients who had fractures of the mandibular angle. Male were more than female patients. Male patients were 222(84.1%) while female patients were 42(15.9%). The patients were between the ages of 17 and 50. It was 29.06 ± 7.7604 years old on average. Of total sample 71% had inferior alveolar nerve injury. Duration of angle fracture was ranged from 10 to 68 hours. Mean duration of fractures was 39.38 ± 13.351 hours.

Conclusion: Patients having mandibular angle fracture had a prevalence of 71%. Patients presented after trauma by 10 to 68 hours. Patients who had displaced angle fracture had more IAN injury than non-displaced side. Least Inferior alveolar nerve injury was in age group 15-20 years may due to elastic bone. Male have more IAN injury than female.

KEYWORDS

Inferior alveolar nerve injury; Mandibular angle fracture; Displacement of segments

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Introduction

The mandible is one of the most often fractured bones in facial trauma due to its prominent position, with a prevalence of 79.7%. Because of the transition zone between the dentate and edentate region and location of 3rd molar in this area, angle fracture accounts for about 40% of all mandibular fractures [3, 5]. Fracture of angles is greatly associated with inferior alveolar nerve injury, causing disturbance of sensation in the skin, mucous membrane and teeth of the involved side, which subjectively results in discomfort, paraesthesia, anesthesia and sometimes pain in the involved area [4, 7]. The prevalence of traumatic injury to inferior alveolar nerve ranges from 5.7% to 58.5% with permanent dysfunction in 0.9% to 66.7% of the patients [6].

Long-term neurosensory function may be negatively impacted by the degree of displacement caused by a mandibular fracture. Such presumptions about the existence of displaced fractures and the ensuing paraesthesia, however, have not been consistently demonstrated. One study, for instance, showed that the displacement of mandibular fractures was solely associated with preoperative paraesthesia but postoperative paraesthesia was not and iatrogenic range from 0.4% to 91.3% [8].

Following a mandibular fracture, permanent inferior alveolar nerve damage ranges from one study, the overall prevalence of IAN injury was 33.7% [9]. The frequency and history of post-trauma neurosensory impairment of the inferior

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alveolar nerve are not well documented. Clinical circumstances where sensory assessment of the inferior alveolar nerve is impossible, unreliable, or missed may be the cause of inadequate recording of pre-treatment nerve injury [6].

The goal of the current study was to compile information regarding the incidence of inferior alveolar nerve damage in mandibular angle fractures. The results of this study will be shared with other local health professionals so that future guidelines can be set, and it will give us local statistics regarding the frequency of inferior alveolar nerve injury. It will enable dental professionals to manage these nerve injuries effectively, in order to prevent psychological trauma to patients in addition to normal functioning of stomatognathic system.

Materials and Methods

After receiving approval from the hospital's Ethical Review Committee, this prospective descriptive study was conducted over the course of a year in the oral and maxillofacial surgery department at Khyber College of Dentistry Peshawar. All patients irrespective of the gender and 16-60 years of age coming to the surgical unit with mandibular angle fractures as operated within 72 hours of trauma were included in the study. Nerve injuries because of iatrogenic trauma or pathological conditions/fractures, Fracture with significant tissue loss in angle of mandible (e.g. gunshot wound or comminuted fractures) and Fracture mandible with displacement greater than 9mm were excluded from the study to control bias and confounders. Patients were informed about the study's purpose, process, risks, and benefits, and they were given the assurance that their personal information and other data would be kept private. Informed consent was then obtained.

A detailed history was taken from them followed by radiographic examination using Orthopantomogram (OPG) to assess the presence of angle fracture and degree of displacement of proximal and distal segments. The duration after injury was also recorded by the patient or attendant about the exact timing of trauma and time of presentation to hospital. The displacement was categorized as un-displaced, 1-3mm displacement, 3 to 6mm displacement and 6 to 9mm displacement confirmed on the basis of separation of tramlines on OPG. Detailed neurosensory testing was used to clinically evaluate inferior alveolar nerve damage. By contrasting the cutaneous pain sensation at the injured side's innervation point with the discomfort at the infraorbital nerve's innervation point, a lesion of the inferior alveolar nerve was identified. Measurements were taken on dry skin after the skin was cleansed with 70° alcohol. Then, by splitting the pain thresholds of the infraorbital and inferior alveolar nerves, the lesion index of neural function was determined.

The collected data was analyzed by SPSS version 22. The post-stratification chi-square test was used, with a p-value of less than 0.05 considered significant. Every result was displayed as a table.

Results

After following inclusion and exclusion criteria a total of 264 patients presented with angle with 189 (71.6%) having disturbance in the region of inferior alveolar nerve. Angle fracture was stratified according to displacement and duration

of fracture segments. Most common displacement was 4-6mm (42.4%) followed by non-displaced (25.8%). Displaced fracture of 7-9mm were carrying the least percentages (8.3%). Duration of angle fracture was grouped according to time of injury in hours. Maximum patients (24.2%) presented in 31 to 40 hours followed by those (23.9%) presented in 21 to 30 hours. Minimum patients (6.4%) presented in 61-70 years (Table 1). Inferior alveolar nerve injury was also stratified by displacement of mandibular angle fracture. Nerve injury was more (40.5%) in fracture displacement of 4-6mm followed by 1-3mm displacement (19.7%). Nerve injury was least (3%) in non-displaced fractures. This difference among different degree of mandibular angle fracture displacement was highly statistically significant ($P=0.000$) (Table 1). Inferior alveolar nerve injury was stratified by time elapsed after angle fracture. Maximum nerve injury (19.7%) was found in patients who presented for treatment after 41-50 hours duration followed by those who presented after 21-30 hours and 31-40 hours (17%). Least nerve injury (3%) was found in patients who presented after 61-70 hours duration. But these variation in frequency of inferior alveolar nerve injury was not statistically significant ($P=0.061$) (Table 1).

Table 1. Frequency of severity of displacement.

Variables	Percent (%) of cases	Injury to inferior alveolar nerve	P Value*
Severity of displacement of angle fractures in mm			
Non displaced	25.8	3.00%	0.000
1-3 mm displacement	23.5	19.70%	
4-6 mm displacement	42.4	40.50%	
7-9 mm displacement	8.3	8.30%	
Total	100.00%	71.50%	
Categories of duration of angle fractures in hours			
10-20	6.8	4.90%	0.061
21-30	23.9	17.00%	
31-40	24.2	17.00%	
41-50	23.5	19.70%	
51-60	15.2	9.80%	
61-70	6.4	3.00%	
Total	100.00%	71.50%	
*Chi-square test			

Discussion

The acceptance and activation of receptors as well as the transmission of impulses from afferent nerves to the central nervous system constitute sensation. These feelings exist to shield an organism from harm caused by its surroundings [1, 2, 3]. The inferior alveolar nerve (IAN) is an important sensory nerve in maxillofacial region. it innervates lower teeth and some muscles as the mylohyoid or digastric muscles and the gums or lip by its mental branch [6]. Inferior alveolar nerve is frequently injured in mandibular angle fractures and sensation disorders

emerge at its innervation point. Sensory disturbances of the skin and mucous membrane as well as teeth occur leading to discomfort, paraesthesia, sometimes even pain in its area of innervation. This illness impairs a person's psycho-emotional state and limits their ability to work [4, 7]. In addition to being damaged or even severed at the time of the fracture, the inferior alveolar nerve may sustain additional harm during the closed or opened reduction. If the pieces are just little misplaced or not at all displaced, the damage is typically minimal; nevertheless, as the segments get more dislocated, the harm increases [1,2,4].

The inferior alveolar nerve has complex anatomy which make it prone to injury during mandibular fracture. IAN injury leads to lip numbness and paraesthesia [7]. The aim of this study is to evaluate the inferior alveolar nerve injury in mandibular angle fractures because most of the time inferior alveolar nerve injury remained unnoticed. The study will provide valuable information to the practitioners and will guide them to properly address these injuries for the wellbeing of the public. Prior research has not adequately documented the prevalence of neurosensory loss in the IAN distribution following mandibular fractures. Furthermore, the prognosis for the recovery of IAN neurosensory function is not well understood [1, 2, 6].

The study included all patients aged 15 to 60 who had a mandibular angle fracture and inferior alveolar nerve damage. Patients having iatrogenic nerve injury as in case of third molar extraction and pathological fractures were excluded from this study. As the current study aimed to know the discrete statistics for prevalence of IAN injury restricted to mandibular fracture with displaced angle. Similarly, patients having avulsive injuries as in case of gunshot injuries and nerve injuries in fracture having displacement more than 9mm were also excluded from the study. Avulsive and gunshot injuries lead to much more incidence of IAN than the simple fracture. So, avoid over inflation of data the such cases were put in exclusion criteria [1, 2, 7].

Displacement of mandibular angle fracture was classified in three groups. These groups were non-displaced, 1-3mm displacement, 3.1-6mm displacement and 6.1-9mm displacement on orthopantomogram (OPG). It also classified angle fracture into similar groups to evaluate the inferior alveolar nerve injury in UK population [8].

In the current study maximum prevalence of nerve injury was found in patients presented late for treatment. Patients who presented after 41 to 50 hours of injury had maximum inferior alveolar nerve injury followed by 21 to 30 hours and 31 to 40 hours. In a study also showed similar results that nerve injury was more in patients who presented late for treatment [8]. The reason for this is due to maximum swelling and edema which occur if fracture is not treated soon. The presented edema can compress the inferior alveolar nerve and leads to nerve injury. Another reason is that the displaced fragments impinge on the nerve more frequently than non-displaced fractures if presented late for treatment leading to more inferior nerve injury.

In the present study nerve injury was common among patients who presented with displaced fractures than non-displaced fractures. Inferior alveolar injury was maximum

(40.5%) in angle fractures having displacement of 4-6mm followed by 1-3mm displaced fractures. In his study on Indian population reported that nerve injury was common in fractures displaced more than 5mm [1, 2, 9]. In another study also showed that inferior alveolar nerve injury was more in angle fractures which are displaced of 6 to 9mm [8]. The results of both studies are similar to the current study. The reason for the greater number of nerve injury was due to more traction on nerve in displaced fractures [10].

Limitations of this study are single center and non-comparative and non-randomized controlled study. Further multicenter and well controlled randomized trial are required to study the effect of angle displacement on frequency of IAN injury [11].

Conclusion

Inferior alveolar nerve (IAN) injury was found to be more common in male patients, with a particularly high prevalence of 71% among those with mandibular angle fractures. Most patients reported to the hospital between 10 to 68 hours after trauma, and delayed presentation was associated with increased risk of nerve damage. Displaced angle fractures were more frequently linked to IAN injury compared to non-displaced fractures. The lowest incidence of nerve injury was observed in the 15–20 year age group, likely due to greater bone elasticity. To reduce the occurrence of such injuries, stricter road safety regulations should be enforced, and efficient ambulance services should be made readily available to minimize treatment delays. Early diagnosis and proper documentation of nerve injuries in maxillofacial trauma cases are crucial to ensure timely and effective management.

Disclosure Statements

The authors hereby declare no conflict of Interest.

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