Original Article

POST TRAUMATIC INFERIOR ALVEOLAR NERVE IMPAIRMENT AND RECOVERY PATTERN IN MANDIBULAR FRACTURES

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ABSTRACT

Objective: *The purpose of study is to determine the incidence of inferior alveolar nerve injury in mandibular fracture, recovery rate and time period in patients with sensory disturbance.*

Methodology: *This study was carried out in the Department of Oral & Maxillofacial Surgery, Khyber College of Dentistry Peshawar from November 2012 to October 2013. A total of 100 patients with mandibular fractures having complaint of lip numbness were included in the study. Thorough history, clinical examination and imaging were carried out for diagnosis of fracture mandible. Patients complaining lip numbness were included and assessed objectively by neurosensory testing at Level A and Level B sensations preoperatively and in follow up period. The data was recorded on specifically designed proforma, evaluated and analysed by applying descriptive statistics using SPSS version17.*

Results: *A total of 100 patients with mandibular fracture were included in this study. Symptoms of nerve injury were present in 73 patients (73%). Out of 73 patients having nerve injury, 58 were male and 15 were females with male to female ratio of 3.86:1. Their ages ranged from 18 to 57 years with mean age of 27.16± 9.52 years. In 100 patients, 53 had fracture site located between lingula and mental foramen while 47 patients had fracture site anterior to mental foramen. Nerve injury was present in 43 (81%)out of 53 patients who had fracture located between lingula and mental foramen. In 47 patients having fracture site distal to mental foramen 30 patients (63%) had nerve injury. Fifty nine patients had mild hypoesthesia at Level A and 14 patients had moderate hypoesthesia. In this study 98 % had recovered sensation at level A and 100 % recovery at level B sensation in 4 months' time.*

Conclusions: *Majority of patients having mandibular fracture and inferior alveolar nerve injury are young males. Mild hypoesthesia is common and majority of patients having alveolar nerve injury recover in 4 months' time.*

Key words: *Inferior dental nerve, Lip parasthesia, Fracture mendible.*

INTRODUCTION

Maxillofacial injuries comprise of 3.2 to 8% of all injuries[1]. Branches of the trigeminal nerve are injured during severe maxillofacial trauma. The supraorbital and infraorbital nerves are injured in trauma of forehead, orbit and maxilla[2]. In 30 to 80% of the midfacial fractures, the infraorbital nerve is injured[3]. Incidence of inferior alveolar nerve damage in mandibular fracture varies from 0.9%-46.6%[4]. Trauma is the second most common cause of facial paralysis after Bell's palsy and has been reported in 45-50% of patients with gunshot injuries[2].

Fracture mandible frequently results in inferior alveolar nerve injury and alteration of neurosensory function. Primary nerve injury may be due to indirect traumatic injury of nerve bundle, compression by soft tissue edema or direct nerve involvement within fracture rims with consequent dislocation, traction, or compression or secondary due to manipulation and fixation of fracture[5,6].

The prevalence of post injury pre-treatment in¬ferior alveolar nerve deficit range from 5.7% to 58.5% and post treatment range from 0.4% to 91.3%. Permanent inferior alveolar nerve injury after fracture mandible range from 0.9% to 66.7%[7,8].

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Patients with inferior alveolar nerve injury suffer from varying degrees of the symptoms like numbness in the lower teeth, chin, and lower lip with biting injuries, problems with speech, problems with mastication, an inability to control food and liquid with unnoticed drooling of fluids and occasional chronic painful invalidism such as allodynia[9,10]. Depending upon the type and degree of nerve injury loss of sensation can be temporary or permanent, moderate or severe and partial or complete[6].

There are various systems to classify nerve injuries. Seddon in 1943 classified nerve injuries into three categories i.e neuropraxia which is an interruption in conduction of the impulse down the nerve fiber, axonotmesis loss of the relative continuity of the axon and its covering of myelin and neurotmesis which is complete transection of nerve. Nerve damage can also be classified as paresthesia, dysesthesia, or anaesthesia[11,12].

There are various diagnostic tests that can be of aid in predicting as well as determining the degree of nerve injury. Clinical neurosensory testing is one of those diagnostic tests. Neurosensory testing can be divided into two basic categories, mechanoceptive and nociceptive testing, based on the specific receptors stimulated through cutaneous contact. Mechanoceptive testing is based on two point discrimination, static light touch and brush directional stroke. Nociceptive testing is by pinprick and thermal discrimination[13].

Factors that affect spontaneous recovery of the IAN function after facial fractures include gender, age, fracture displacement, fracture site, type of fracture treatment, and interval between injury and fracture repair[1].

The purpose of study is to determine the incidence of inferior alveolar nerve injury in mandibular fracture, recovery rate and time period in patients with sensory disturbance

METHODS AND MATERIALS

This study was carried out in the Department of Oral and Maxillofacial Surgery, Khyber College of Dentistry Peshawar from November 2012 to october 2013. A total of 100 patients with mandibular fractures having complaint of lip numbness were included in the study. Approval of Institutional ethical review committee was taken. After taking consent, a thorough history was recorded followed by clinical and radiological examination of the patients presenting with mandibular fractures. Site of fracture mandible was confirmed by orthopentomogram (OPG). The sub¬jective complaint of the patient as altered sensation in the form of lip numbness was noted preoperatively and neurosensory tests were carried out at Level A and Level B. Level A neurosensory tests include two point and directional discrimination and stimulus localization and level B test include static light touch. The patients were asked to close eyes and tests were carried out on normal side first and then on affected side. The responses of the two sides were compared. Mechanreceptor testing was used only to test nerve injury in this study as pain in the form of nociception is one of the features of trauma and mandibular fracture. The responses were noted as normal and abnormal. After treatment follow up of patients at interval of 1 week, 1 month, 2 months, 3 months and 4 months were carried out. Patients under 17 years of age were excluded from the study as results of neurosensory tests are difficult to evaluate and not reliable in younger patients. The data was recorded on specifically designed proforma, evaluated and analysed by applying descriptive statistics using SPSS version17.

RESULTS

A total of 100 patients with mandibular fracture were included in this study. Symptoms of nerve injury were present in 73 patients as shown in Table-1. Amongst them 84 (84%) were males and 16 (16%) females. Out of 73 patients having nerve injury 58 were male and 15 were females with male to female ratio of 3.86:1. Their ages ranged from 18 to 57 years with mean age of 27.16± 9.52 years. Majority (68%) were in the age group of 18-27 years followed by 18%

Table-1: Nerve injury in mandibular fractures.

Nerve Injury	n	%
Yes	73	73
No	27	27
Total	**100.0**	**100.0**

Table-2: Age distribution of mandibular fractures.

Age group in years	n	%
18-27	68	68.0
28-37	18	18.0
38-47	8	8.0
48-57	6	6.0
Total	**100.0**	**100.0**

in the age group of 28-37 years as shown in Table- 2.

In 100 patients, 53 had fracture site located between lingula and mental foramen while 47 patients had fracture site anterior to mental foramen. Nerve injury was present in 43 out of 53 patients who had fracture located between lingula and mental foramen. In 47 patients having fracture site distal to mental foramen, 30 patients had nerve injury. The details are shown in Table-3.

In these 73 patients who had nerve injury, 59 had abnormal sensation (mild hypoesthesia) at Level A while at Level B 14 patients had abnormal sensation (moderate hypoesthesia). The details are shown in Table- 4.

Table 5 shows the details of recovery rate of nerve injury on follow up. Out of 59 patients with abnormal level A sensation preoperatively 11.86 % patients had recovered to normal sensation at one week follow up and 98% recovered at 4 months follow up. At Level B neurosensory testing, 28.57% patients had recovered at 1 week time and all patients recovered level B sensation at 4 month time.

Table-3: Site of mandibular fracture.

Site of fracture	n	Nerve injury	
		yes	No
Lingula to mental foramen	53	43	10
Anterior to mental foramen	47	30	17
Total	**100**	**73**	**27**

Table-4: Neurosensory Tests

Neurosensory Tests	n	%
Level A absent	59	80.82
Level A+ B absent	14	19.18
Total	**73**	**100**

DISCUSSION

The present study was aimed to determine the incidence of inferior alveolar nerve injury, progression, rate of recovery and time period. Clinical tests were carried out to examine the area containing the sensory dysfunction, determine its course, character of the deficit and recovery time period. Subjective complaint of lip numbness was taken as guide to proceed for neurosensory testing.

Lip numbness is a vague term and the level of sensory impairment may vary from mild, moderate, severe hypoesthesia to complete loss of sensation. The goal of the neurosensory tests is to grade the level of sensory impairment. While performing neurosensory tests it is important to understand the concept of response threshold and IQ level of the patient. If a stimulus is applied without pressure and indentation on skin or mucosa and the patient feel stimulus, it is termed as the response is at normal threshold. If the patient does not respond, further pressure is applied to cause indentation but not piercing the skin or mucosa and response is noted. If patient now feel the response, the response is at higher threshold which is defined as altered sensation. Pre-treatment neurosensory tests were carried out to quantify the magnitude and determine the area of sensory deficit.

Injury to the inferior alveolar nerve is a common complication of mandibular fractures. Posttraumatic peripheral sensory disorders of trigeminal nerve (TN) represent troublesome sequale of facial trauma affecting the quality of life for patients. Immediate

Table-5A: Recovery rate of inferior alveolar nerve injury.

Follow up																	
Neurosensory test	**n**	**1 week**		**%**	**1 month**		**%**	**2 month**		**%**	**3 month**		**%**	**4 month**		**%**
Level A	59	Ab	Pr	11.86	Ab	Pr	23.72	Ab	Pr	50.84	Ab	Pr	74.57	Ab	Pr	98.30
		52	7		45	14		29	30		15	44		1	58	

Table-5B: Recovery rate of inferior alveolar nerve injury.

Follow up																	
Neurosensory test	**n**	**1 week**		**%**	**1 month**		**%**	**2 month**		**%**	**3 month**		**%**	**4 month**		**%**
Level B	14	Ab	Pr	28.57	Ab	Pr	50	Ab	Pr	64.28	Ab	Pr	85.71	Ab	Pr	100
		10	4		7	7		5	9		2	12		0	14	

posttraumatic impairments of TN branches can be encountered in a range of 7.2% to 66.7% of mandibular fractures. Renzi et al[6] have given argument that this variability of incidence reported in literature is due to the different assessment methods of TN dysfunction, ranges of follow up and different study design. It may also be due to a number of reasons like conditions in which sensory examination of inferior alveolar nerve is impossible, unreliable or overlooked during assessment of the patient. Another factor is that patients with mandibular fractures are rarely followed up on long term basis after clinical union and once satisfactory occlusion have been achieved[4].

In this study 43% patients, who had mandibular fracture, sustained inferior alveolar nerve injury had fracture site located between lingula to mental foramen. This finding is consistence with the study conducted by Halpern et al[5].

In this study incidence of inferior alveolar nerve injury in mandibular fractures was 73%. Similarly Halpern et al[5] reported high incidence 81% of inferior alveolar injury in fracture mandible. However Marchena et al[4] and Itzuqa et al[8] reported post traumatic inferior alveolar nerve injury of 56% and 58% respectively.

In this study fracture mandible and associated nerve injury was common in male as compared to female with male to female ratio of 3.86:1. This finding is consistence with the results reported by Bede et al[14]. The relative high male to female ratio having inferior alveolar injury is attributed to the fact that males have high number of mandibular fractures and so injury of the nerve.

The age of the patients in this study ranged from 18-57 years with predominant age group of 18-27 years. These findings are similar with the results of previous studies[15,16,17].

Neurosensory testing is divided in to 2 categories of mechanoceptive and nociceptive. Although they are called objective evaluation of neurosensory testing it has a component of subjective evaluation. This method is difficult to standardize because of the difference in interpretation of these tests. Patient may adapt to a deficit and give response of normal sensation whereas clinical investigation show deficit[18]. Similarly patient may still complain of neurosensory alteration where as clinical tests are normal[19]. We have used mechanoceptive category of neurosensory testing in this study both for pre-treatment assessment and recovery of inferior alveolar nerve injury.

The rate of recovery of inferior alveolar nerve injury was assessed by directional discrimination, 2 point discrimination and light touch neurosensory tests which are considered to be more reliable and standard method of assessing neurosensory deficit[13,20]. The rate of recovery of inferior alveolar injury depends upon the severity of the nerve injury. In our analysis displaced fractures had more incidence and severity of inferior alveolar nerve injury and slow recovery rate than non-displaced fractures. Razukevicius[21] classified inferior alveolar nerve injury in to mild, moderate and severe injury and found that recovery period was prolonged with the increase in severity of injury. Bede et al[14] reported prolonged recovery time of inferior alveolar nerve sensory function extending from 6 weeks to 5 months in comminuted and displaced linear fractures which indicates severe nerve injury associated with these types of fractures. This study showed rapid recovery of Level B testing (light touch) sensation during first week than Level A neurosensory testing (directional stroke and two point discrimination) and complete recovery of light touch sensation at four months follow up post operatively. The reason is that there is fastest recovery of small diameter myelinated and nonmyelinated fibers containing light touch, thermal and nociception sensibilities than large diameter myelinated fibers conducting discriminative sensibilities i.e 2 point and direction discrimination[22,23]. Ninety eight per cent patients had recovery of Level A sensation at 4 months follow up.

The incidence of nerve injury in maxillofacial trauma is poorly documented in literature; the incidence of peripheral posttraumatic TN dysfunction should be investigated in large series of patients with facial trauma involving emergence areas of TN branches. The influence of patients age, gender, trauma site, fracture type, displacement, surgical timing, and fixation technique in determining different recovery patterns should be analyzed by means of objective assessments. This would lead to a more complete prognosis of facial fractures and would provide further information to maxillofacial surgeons to deal with nerve injuries in facial trauma.

CONCLUSIONS

From this study it is concluded that:

1 Majority of the patients who had mandibular fractures and inferior alveolar nerve injury were young males.

2 Light touch was recovered faster and completely than 2 point and direction discrimination and stimulus localization in inferior alveolar nerve injury in mandibular fractures.

3 Recovery time depended on severity of nerve injury and in majority of patients with IAN injury, sensory function recovered in 4 months.

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