

Incidence of Inferior Alveolar Nerve Damage and Recovery Following Mandibular Third Molar Surgery: Two Year Prospective Study

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Abstract: Neurosensory disturbance is the most serious complication following surgical extraction of impacted mandibular third molar. The aim of the present study was to evaluate the incidence of inferior alveolar nerve (IAN) damage after mandibular third molar surgery. Impacted mandibular third molars extracted by a single experienced surgeon under same protocol. Subjective (self-reported) sensory changes were evaluated 1 week after the surgery to determine the IAN damages. Cases with IAN injury were re-evaluated 3 months, 6 months and 1 year after the surgery to record the recovery pattern. Data were collected in SPSS software and analyzed using t-test and chi-square tests. 589 impacted third molars in 417 patients were included in this study. 29 (4.92%) cases experienced neurosensory alteration after surgery. However, 27 (93.1%) IAN injuries were recovered after 6 months. While no significant association was found between age or gender and IAN injury rate (P -value > 0.05), surgeries with higher difficulty level had significantly higher rate of IAN injury (P -value < 0.05). Based on the results of the present study, the risk of neurosensory disturbances following mandibular third molar surgery was relatively low and most of the injuries were transient and resolved within 6 months.

Keywords: Neurosensory Disturbance, Mandibular Third Molar, Inferior Alveolar Nerve, Recovery Rate.

I. Introduction

One of the most common surgeries of the oral cavity is the surgical extraction of impacted third molar [1]. Among the complications of this surgery, neurosensory deficit is the most serious complication which can affect the patient quality of life negatively [2].

Direct or indirect forces during mandibular third molar surgery may lead to Inferior alveolar nerve (IAN) or lingual nerve (LN) injury. IAN damage lead to anesthesia or paresthesia of chin, lower lip, and also gingivae of buccal vestibule. On the other hand, LN injury results in tongue numbness (anterior two third) and taste disturbance [3-5].

The incidence of IAN injury after mandibular third molar surgery varies between 0.26% and 8.4% in different studies. While most of the deficits resolve within 6 months, some of the neurosensory damages would last more than 6 months and are considered as permanent [6-8]. The aim of the present study was to evaluate the incidence of neurosensory disturbance and the recovery following mandibular third molar surgery.

II. Materials and Methods

The current research was performed at the Mashhad Dental School (Oral and Maxillofacial Clinic). The study protocol was approved by Ethical Committee of Mashhad University of Medical Sciences and patients signed the detailed informed consent.

2.1 Patients Population:

417 patients with 589 impacted mandibular third molars participated in this study between June 2010 and February 2014. To be included in this study, patients had to be American Society of Anesthesiologists physical status score of I or II.

The exclusion criteria were taking medications affecting sensory system, previous neurosensory disturbance of lower lip and chin, and having periapical lesion in panoramic radiograph.

2.2 Surgery Procedure:

A single surgeon performed all surgeries under local anesthesia using 2% lidocaine plus 1:80,000 epinephrine cartridge. After applying povidone iodine solution periorally, mucoperiosteal envelope flap created and the tooth sectioning (if needed) and bone removal was performed using handpiece under sufficient irrigation. The flap was sutured with 3-0 silk sutures and a regimen of Acetaminophen (500 mg, every 8 h, in case of pain) was prescribed.

2.3 Neurosensory Sensory Evaluation

In order to determine the incidence of neurosensory complications, self reported (subjective) sensory changes were recorded. Patients were instructed to attend a follow up appointment 1 week after surgery in order to evaluate the sensory changes and wound healing. Patients with neurosensory changes were re-evaluated after 3 months, 6 months, and 1 year in order to record the neurosensory recovery.

2.4 Data Collection:

The main variable was IAN neurosensory changes. In addition, age and gender were recorded as background variables. In addition, the Difficulty level of surgery was evaluated according to the Pederson scale (based on sum value of spatial tooth direction, impaction depth, and relationship with mandibular ramus on the panoramic radiograph [9]).

2.5 Statistical Analysis:

Data were reported descriptively and analyzed using t-test and chi-square tests with 95% confidence interval in SPSS version 11.5 software.

III. Results

589 (217 male and 372 female) mandibular third molars were surgically extracted. IAN disturbance was occurred after 29 surgeries with the incidence of 4.92%.

Table 1 shows the distribution of patients based on demographic variables and surgery difficulty. Based on t-test, no significant difference was found in the mean age of patients with and without IAN injury (Table 1). In addition, no significant association was found between gender and IAN disturbance according to Chi-square test (Table 1). However, surgeries with higher difficulty level had significantly more incidence of neurosensory disturbance following mandibular third molar surgery as the incidence of IAN injury following easy, moderate, and hard surgeries were 2.7%, 4.55%, and 11.47%, respectively (Table 1).

Among the IAN injuries, 23 (79.31%) were resolved after three months. However, out of 6 unresolved damages at 3-month appointment only 2 cases had permanent injury (remained after 6 months) and the other damages were healed at 6-month follow up.

IV. Discussion

The aim of the current study was to evaluate the incidence of IAN nerve damage after mandibular third molar surgery. The incidence of IAN injury was 4.92% which were mostly transient and resolved within three months.

We observed that higher difficulty level of impacted tooth based on Pederson scale (consisting spatial direction, impaction depth, and relationship with ramus) lead to significant increase in the IAN injury rate. In consistence with our results, Kipp et al [11] and Carmichael and McGowan [10] found that horizontally impacted third molar and bony impaction lead to higher rate of IAN injury. Higher difficulty level and impaction depth decreases accessibility of impacted tooth. In this case, extraction of impacted third molar demands further bone removal and surgical manipulation of the region during third molar extraction which results in higher risk of IAN injury [3].

One of the risk factors in IAN damage after mandibular third molar surgery is age [12]. Bruce et al [12] found significantly higher rate of injury in patients older than 35 years in comparison to 14-24 years old age group. Black [13] recommended to remove third molars before 20 years of age to decrease the risk of IAN injury. While the mean age of patients with IAN injury was higher in the present study, no significant relationship was found between age and IAN injury. In consistence with our study, Yadav et al [7] and Cheung et al [2] found no significant difference in the mean of age cases with IAN damage and other patients.

In addition to age, gender had no significant association with neurosensory disturbance after third molar surgery. Similar to our results, Cheung et al [2] and Valmaseda-Castellón et al [8] observed no association between gender and IAN injury.

Recovery of neurosensory damage occurred in 93.1% (27 out of 29) of cases with IAN injury after 6 months. In accordance with our study, Jerjes et al [14], Kipp et al [11], Cheung et al [2], and Yadav et al [7] reported similar pattern in the recovery of IAN damages in which most of the damages resolved within the first six postoperative months of third molar surgery.

In the present study, panoramic radiograph was used to evaluate the difficulty of the surgery. Panoramic radiography is the most common type of imaging technique for evaluation of impacted third molars. While three dimensional techniques including CBCT imaging provide more precise data regarding spatial relationship of impacted third molar with IAN, higher cost and radiation dosage decreases the use of three dimensional imaging. As the incidence of IAN injury was significantly higher in cases with higher difficulty

level, it may be recommended to perform three dimensional imaging in these cases to understand precise relationship of third molar with IAN [15].

It has been reported that the experience of clinician has significant impact on the rate of IAN injury following third molar surgery. Sisk et al [16] observed that the risk of nerve damage increases when the operator has lesser experience. Valmaseda-Castellon et al [17] reported higher rate of nerve injury among first year residents in comparison to the third year residents. In the current study all surgeries were performed by a single experienced oral and maxillofacial surgeon.

V. Conclusion

Based on the findings of the present study, neurosensory disturbance of IAN had relatively low incidence after mandibular third molar surgery; most of which were transient and resolved after three months. Few cases faced permanent sensory deficit which lasted longer than 6 months. IAN injury had no significant association with demographic variables including age and gender. However, the difficulty of surgery had significant association with IAN damages during third molar surgery.

VI. Figures and Tables

Table 1: Distribution of IAN injury based on study variables

Variable	IAN injury		P-value
	Yes	No	
Number	29 (4.92%)	560 (95.08%)	-
Gender	Male: 10 Female: 19	Male: 209 Female: 353	0.769*
Age	24.84 ± 5.19	25.44 ± 6.76	0.108**
Difficulty Level	Easy: 3 Moderate: 19 Hard: 7	Easy: 108 Moderate: 398 Hard: 54	0.032*

* Based on Chi-square test

** Based on t-test

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