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## Neurosensory defects after mandibular third molar surgery: A prospective study

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### Abstract

**Introduction:** The most common surgical procedure performed in the oral cavity is extraction of the mandibular third molar, and it has also some complications which include postoperative neurosensory deficits. The incidence of various neurosensory deficits after lower third molar removal has been reported from studies from various countries. For example, inferior alveolar nerve (IAN) injury, which manifests itself as paresthesia or complete loss of sensation of the lower lip and buccal mucosa on the damaged side, has a reported incidence of 0.26-8.4%

**Materials and Methods:** This was a prospective clinical study of all lower third molar surgeries performed in the Department of Oral & Maxillofacial Surgery Govt. Dental College & Hospital. A total of 500 Patients were included in the study. Patients were excluded if they presented with conditions that were associated with the lower third molars, such as cysts and tumors, or with any preexisting neurosensory deficit related to the IAN and LN. The following data were recorded in a set of questionnaires. The preoperative data recorded were: sex, age, type of impaction (mesioangular, horizontal, distoangular or vertical), depth of impaction (by measuring the winter's lines) and state of eruption of the lower third molars.

### Results:

**Incidence of Neurosensory Deficits:** 5 extractions (1%) resulted in IAN related neurosensory deficits and 10 (2%) resulted in LN-related neurosensory deficits.

**Type and Depth of Impaction:** Although the incidence of IAN deficit for each type of impaction ranged from 0.2% for vertical to 0.8% for distoangular. The incidence of LN deficit by type of impaction ranged from 0.4% each for mesioangular and horizontal to 1.6% for distoangular

**Raising of Lingual Flap and Lingual Nerve Protection:** Of the operations involving a raised lingual flap, 5% (7/140) led to postoperative LN deficits.

**Tooth Sectioning:** Of the 500 disimpactions, 445 (89%) required tooth sectioning. The incidences of IAN deficit in groups with and without tooth sectioning were 1.12% (5/445) and 0% respectively.

**Keywords:** Oral cavity, mandibular third molar, neurosensory deficits, IAN and LN

### Introduction

The most common surgical procedure performed in the oral cavity is extraction of the mandibular third molar, and it has also some complications which include postoperative neurosensory deficits. The incidence of various neurosensory deficits after lower third molar removal has been reported from studies from various countries [1-22, 25-41].

For example, inferior alveolar nerve (IAN) injury, which manifests itself as paresthesia or complete loss of sensation of the lower lip and buccal mucosa on the damaged side, has a reported incidence of 0.26-8.4% [4, 6-8, 12-15, 22].

Lingual nerve (LN) deficiency, which commonly presents as insensibility of the ipsilateral anterior two-thirds of the tongue and taste disruption, has a reported incidence of 0.1-22% [4, 12, 13], these disruptions have severe damaging effects on the lifestyle of the affected individual [18].

Researchers have been making continuous efforts to investigate the risk factors associated with nerve injuries in lower third molar surgery. Factors associated with an increased risk of IAN injury include age of the patient, depth of tooth impaction, proximity of the roots to the IAN and surgical technique [4, 6-8, 26, 28-30, 32, 37].

In addition, perforation of the lingual plate and the lingual bone split technique has been proposed to be related to LN damage. However, whether elevation of the lingual flap and an attempt to protect the LN by an instrument increases the risk of LN

Damage still remains unknown [4, 12, 28-30, 32, 37].

The objectives of this prospective study were to determine the incidences of IAN and LN deficit after extraction for impacted lower third molars at Govt, Dental College & Hospital Srinagar; to evaluate the risk factors contributing to these postoperative neurosensory deficits; and to examine the pattern of recovery of these neurosensory deficits in affected patients.

### Materials and methods

This was a prospective clinical study of all lower third molar surgeries performed in the Department of Oral & Maxillofacial Surgery Govt. Dental College & Hospital. The study was approved by Ethics Committee and patients gave written informed consent. A total of 500 Patients were included in the study. Patients were excluded if they presented with conditions that were associated with the lower third molars, such as cysts and tumors, or with any preexisting neurosensory deficit related to the IAN and LN. The following data were recorded in a set of questionnaires. The preoperative data recorded were: sex, age, type of impaction (mesioangular, horizontal, distoangular or vertical), depth of impaction (by measuring the winter's lines) and state of eruption of the lower third molars. The intraoperative data recorded were: raising of the lingual flap, use of a periosteal elevator to protect the LN, removal of distolingual cortex, tooth sectioning and any intraoperative complications.

### Results

#### Incidence of neurosensory deficits

A total of 500 patients were enrolled in this study; 58% were male and 42% were female. Their ages ranged from 19 to 54 years (mean 24 years). Of the 500 impacted mandibular third molars that were surgically extracted, 84% (420) had partially erupted, 12% (60) were unerupted and the remainder 4% (20) had erupted. The most common type of impaction was mesioangular (58%) and the mean depth of impaction of all types ranged from 3.0 to 5.8 mm. 5 extractions (1%) resulted in IAN related neurosensory deficits and 10 (2%) resulted in LN-related neurosensory deficits. The remaining 485 (97%) extractions did not present with any neurosensory complications.

#### Risk factors of neurosensory deficits

##### Sex and age

The incidence of IAN deficit in males and females was 0.68% (2/290) and 1.42% (3/210), respectively. The incidence of LN deficit in males and females was 0.84% (4/290) and 0.60% (6/210), respectively.

##### Type and depth of impaction

Although the incidence of IAN deficit for each type of impaction ranged from 0.2% for vertical to 0.8% for distoangular. The incidence of LN deficit by type of impaction ranged from 0.4% each for mesioangular and horizontal to 1.6% for distoangular. The mean depth of impaction was greater among lower third molar extraction cases leading to IAN deficit than among those that did not lead to IAN deficit (6.9 mm versus 3.8mm) Mean impaction depth among extractions leading to LN deficit and those that

did not (5.7 mm and 4.0 mm).

#### Raising of lingual flap and lingual nerve protection

A lingual flap was raised during 28% (140/500) of surgeries, and an attempt was made to protect lingual tissue with a periosteal elevator during 80% (400/500) of surgeries. Of the operations involving a raised lingual flap, 5% (7/140) led to postoperative LN deficits. 2.14% (3/140) extraction cases of postoperative LN deficit were reported among the operations in which a lingual flap was not raise.

#### Removal of distolingual cortex

In about 18% (90/500) of extractions, the distolingual cortex was removed by bone guttering. LN deficit occurred in 1.1% (1/90) of the surgeries with distolingual cortex removed.

#### Tooth sectioning

Of the 500 disimpactions, 445 (89%) required tooth sectioning. The incidences of IAN deficit in groups with and without tooth sectioning were 1.12% (5/445) and 0% respectively. The incidences of LN deficit in groups with tooth sectioning were 2.24% (10/445) and 0% respectively

#### Recovery patterns

##### Inferior alveolar nerve

The 5 patients with unilateral IAN deficit after lower third molar surgery were reviewed postoperatively at 1 week and at 1, 3, 6, months or beyond until resolution of the symptoms. 1 patient dropped out during the follow-up period, which lasted upto 9months. By the end of follow-up, 3 of the 5 patients (60%) were deemed to have experienced total recovery. The 1 patient who presented with incomplete recovery or persistent numbness beyond the 9 months.

##### Lingual nerve

All patients with lingual nerve injury showed up for the follow up. The drop-out rate was 0%. The follow-up duration ranged up to (9 months). Total recovery from the LN deficit was achieved in patients (90%; 9/10) one patient presented with incomplete recovery or persistent numbness at or beyond the 9 month review.

#### Discussion

Many studies have shown that age is associated with an increased risk of nerve damage in third molar surgeries.

Bruce *et al.* [13] noted that for patients aged 35 years or older, the risk of IAN damage was remarkably higher as compared to that for those aged 14–24 years.

Black [8] concluded that there was a strong association between age and IAN deficit, and recommended that the lower molars should be removed before 20 years of age. Increasing age has also been shown to be related to an increasing risk of LN injury [15]. Some authors have proposed that in order to reduce the risk of nerve damage, gummectomy should be done during adolescence [15, 16].

Some studies have revealed that there is no correlation between age and risk of nerve injury [12, 17, 29, 31]. This study does not support the idea that increasing age is a potential risk factor of IAN and LN deficits after mandibular third molar removal third

In concordance with most studies in the literature, the authors found no association between a patient's gender and the risk of IAN and LN deficits.

Kipp *et al.* [28] reported that there's an increased risk of neurosensory deficits after extraction of horizontally impacted

lower third as compared to other types of impaction.

Carmichael and McGowan<sup>[14]</sup> reported a similar finding and concluded that a considerable lower risk of LN and IAN deficit is associated with vertically impacted third molars.

This study found an association between the impaction pattern and incidence of LN (but not IAN) deficit, with highest risk of deficit being prevalent in disto-angular impactions as it is more closer to the lingual nerve that may injure during reflection of flap, also more bone removal on distal side than any other impactions resulting in more chances of tear of lingual flap and lingual nerve also more retraction in distoangular may be one of the cause.

Another risk factor associated with nerve damage is the depth of impaction<sup>[9, 14, 39]</sup>. Kipp *et al.* and Carmichael and McGowan concluded that full bony impaction has the maximum risk of nerve damage<sup>[14, 28]</sup>, whereas others using the classification system of Pell and Gregory showed with increased depth the risk of IAN damage is higher<sup>[22]</sup>.

Our study was in concordance with various other studies which showed greater risk of nerve damage in impactions with greater depths which can be attributed to decreased vision and accessibility during the surgery and proximity of the neurovascular bundle to the impacted tooth

In 2001, Pichler and Beirne<sup>[34]</sup> concluded that there was a greater possibility of temporary nerve damage while using lingual tissue retractor than when a retractor was not used; the difference between the two groups in terms of permanent LN damage was not significant

Pogrel and Goldman<sup>[35]</sup> suggested lingual retraction to improve surgical access because their prospective study of 2004 found no increased risk of permanent LN damage when retraction was used.

Gomes *et al.*<sup>[20]</sup> confirmed in a split mouth RCT in 2005 that there was a significant risk of temporary LN injury by lingual retraction.

Several studies have reported that the recovery patterns from IAN and LN deficits after third molar surgery are similar. Generally, neurosensory deficits after third molar surgery spontaneously recover in the first 6 months postoperatively<sup>[2, 9, 27, 28]</sup>.

Hillerup noticed a significant improvement in 66% of IAN deficits associated with third molar surgery<sup>[23]</sup>. The authors found that more than 50% of patients with IAN or LN deficits achieved total recovery by the 6-month follow-up.

The incidence of sensory disturbance was seen in 5 cases and 10 cases for IAN and LN injury, respectively in which all cases recovered by the end of 9 months except for 1 case.

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