Factors Influencing Lingual Nerve Paraesthesia Following Third Molar Surgery: A Prospective Clinical Study

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Abstract

Background and Objectives The purpose of this prospective study was to evaluate the incidence and various risk factors influencing the sensory deficit in case of lingual nerve injury (LNI) in individuals whose impacted mandibular third molars are surgically removed under local anesthesia.

Materials and Methods The study was based on the data collected prospectively from a random group of 100 patients who underwent surgical removal of bony impacted lower third molar in a dental hospital. Details of the patient, reason for extraction, type of impaction, method of surgery and signs and symptoms of nerve injury are recorded. Neurosensory testing was done to evaluate the LNI at 1 week, 1 months, 3 months and 6 months interval.

Comparison was carried out using Chi square test. For all tests a $P < 0.05$ was considered significant.

Results The incidence of LNI was 4 % and of temporary in nature which recovered well within 6 months postoperatively. The age of the patient above 26 years, lingual flap retraction, depth of impaction (red line ≥ 10 mm) and duration of surgery above 30 min were the significant factors for causing LNI.

Conclusions The age of the patient, depth of impaction, lingual flap retraction and longer duration of surgery are significant risk factors for LNI during mandibular third molar surgery. Greater care should be taken to avoid the morbidity and patients should be informed well ahead about the probable complications.

Keywords Impaction · Third molar · Lingual nerve injury (LNI) · Neurosensory testing

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Introduction

The removal of impacted symptomatic third molars is the most common surgical procedure in dentistry and is one of the most common day case and in-patient surgical procedures in the National Health System [1]. The reasons for extraction of these teeth are; pain, infection, acute or chronic pericoronitis, presence of cysts or tumor, unrestorable caries/fracture, pulpal involvement and periodontal problems which require extensive treatment [2–5]. Most of the times, these problems are associated with mandibular third molars making their extraction mandatory. Often third molar surgery is accompanied by pain, swelling, trismus and general oral discomfort which require reassurance to the patient. The common complications are alveolitis, infection, hemorrhage and nerve injury, and most of these are temporary [3, 6].

Among the most serious and often discussed postoperative complications that arise from third molar surgery is trigeminal nerve injury, specifically, involvement of either the inferior alveolar or lingual nerve [3, 7–9]. Lingual nerve being main sensory nerve of tongue and tongue coordinating speech, mastication, swallowing, taste sensation, any disturbance in lingual sensation can affect patient functionally as well as psychologically. The reported incidence of sensory disturbance to lingual nerve during third molar removal is 0.2–23 % [8, 10, 11]. Most often sensory disturbances due to nerve injury undergo spontaneous regeneration and sensory recovery. Some injuries may lead to incomplete and altered nerve regeneration resulting in permanent or temporary paraesthesia, hypoesthesia and sometimes dysaesthesia causing mastication and speech disturbances affecting quality of patient's life [8]. Factors influencing these complications include age, health and habits of the patient, degree of impaction, the surgeon's experience, time taken for the procedure and the surgical technique used [2, 6, 9]. Hence this prospective clinical study was undertaken to evaluate the incidence and various risk factors influencing the sensory deficit in case of lingual nerve injury (LNI) in individuals who have undergone surgical extraction of impacted mandibular third molars under local anesthesia.

Methodology

This study is based on the data collected prospectively from a random group of patients who underwent surgical removal of bony impacted lower third molar under local anesthesia in a dental hospital. Patients undergoing surgical removal of mandibular third molar requiring bone cutting were included in the study. All impactions were radiologically assessed using a standard intraoral periapical (IOPA) radiograph and 100 impactions in 100 patients with Winter's red line [12, 13] not less than 2 mm were selected. This red line describes the depth of impacted tooth within the mandible [12].

Patients with a history of previous medical or neurological abnormalities of any kind, with severe infection posing difficulty in pre-surgical evaluation and who are getting operated under general anesthesia were excluded. Local Ethical Committee clearance was taken before starting the study.

All the participants were explained about the benefits and risks of the treatment procedure and a written consent was obtained. Details of the patient, reason for extraction, type of impaction were recorded. Then the patients were subjected for surgical removal of the impacted tooth using Moore/Gillbe collar technique [12, 13] by a single oral surgeon. This surgical technique involved placement of

Ward's incision [12] and reflection of mucoperiosteal flap exposing underlying bone. A rose-head bur was used to create a gutter around the tooth. The lingual soft tissues were protected with a periosteal elevator during the removal of distolingual bone if required. With the help of a bur a mesial point of application is created and a straight elevator is used to deliver the tooth. In cases requiring tooth sectioning a modified Ward's incision [12] was used for improved access. The bone was removed using bur to expose the crown, tooth was sectioned at crown root junction and removed separately. Postoperative antibiotics were prescribed to all the patients. The procedure was recorded in detail along with the type of impaction, type of intervention and time taken. Patients were then recalled 1 week after the surgery and evaluated for neurosensory deficit (NSD) by both subjective and objective methods [8, 10, 14].

Subjective symptoms were evaluated by asking the patient to answer the questions specific to lingual nerve disturbances (Table 1). Objective evaluation was done using mechanoreceptive tests which include two-point discrimination test (TPDT), static light touch test (SLTT) and brush directional stroke test (BDST) and nociceptive test like Pinprick test (PPT) [8, 10, 11, 14]. During the test the patient was seated in a quiet room comfortably. They were asked to keep eyes closed and indicate the stimulus detection to the examiner by raising a finger. Tongue was kept dry and care was taken to avoid prolonged mouth opening or tongue protrusion, because, the resultant discomfort might affect performance. The stimulus was applied at irregular intervals so that the patient could not anticipate it and give error in response. Areas where the patient was unable to perceive the stimulus were charted on printed tongue diagram along with details. The results of the tests were then compared with the contra-lateral (normal) side.

After the subjective and objective evaluation, the incidence was recorded. Four patients were affected and had lingual nerve paraesthesia. These patients were recalled at

Table 1 Questions on subjective symptoms of LNI to be answered by the patient

Touch	If you touch your tongue with your finger, can you feel your finger with your tongue?	Y/N
Taste	Is your sense of taste affected?	Y/N
Temperature	Can you tell the temperature of food and drink on that side of mouth?	Y/N
Teeth	If you rub your tongue, over your teeth, can you tell if they are clean or dirty?	Y/N
Trauma	Do you bite your tongue by accident?	Y/N
Tingling	Do you have any tingling of your tongue?	Y/N
Talk	Is your speech affected?	Y/N

intervals of 1st, 3rd and 6th months to repeat the tests and to follow the pattern and duration taken for the recovery. All the data obtained was recorded for further evaluation.

The data collected was analyzed by the Statistical Package for Social Sciences software version 17 for Windows (SPSS Inc., Chicago, IL, USA). Comparison was carried out using χ^2 test. For all tests a P value of 0.05 or less was considered to be of statistical significance.

Results

A total of 100 patients (69 male and 31 female) who fulfilled the criteria were included in the study. The incidence of temporary LNI was 4 % (4 out of 100 patients). Details of all those with LNI are given in Table 2.

All four patients with LNI were male, but this observation was not statistically significant ($\chi^2 = 1.87$, $P > 0.05$). The age of the patients varied from 17 to 65 years. LNI occurred in patients above 30 years of age. Statistical analysis revealed that increase in the age of the patient was a significant factor for LNI ($P < 0.05$) (Table 3). When the angulation of the tooth was considered, the percentage of incidence of LNI was more in distoangular and horizontal impactions (12.5 and 10 % respectively), but statistically this was not significant ($P > 0.05$) (Table 4). In the present study the red line varied from 2 to 17 mm. All of the LNI occurred in cases with red line ≥ 10 mm. Upon statistical analysis depth of impaction indicated by red line was found to be a significant factor for LNI ($P < 0.01$) (Table 5).

Lingual flap retraction was not done in 92 patients and there was one case of LNI (1.1 %). But in 8 patients, in whom lingual flap was retracted, there were 3 cases of LNI (37.5 %). LNI was significantly higher in cases where lingual flap retraction was done ($\chi^2 = 25.4$, $P < 0.01$). Odontectomy was done in 13 patients of which 1 patient had LNI (7.7 %) and not done in 87 patients, of which 3 patients had LNI (3.4 %). Statistically sectioning/non sectioning of tooth is not a significant factor in causing LNI ($\chi^2 = 0.53$, $P > 0.05$).

Table 6 shows the relation between duration of the procedure and LNI. When statistically analysed for

>30 min and <30 min category, duration of surgery >30 min was one of the significant factor for LNI ($P < 0.01$).

Table 3 Incidence of LNI and age of the patient

Age (years)	No. of patients	LNI (%)
16–25	49	–
26–35	36	2 (5.6)
36–45	9	2 (22.2)
46–55	4	–
55–65	2	–
Total (n)	100	4

$\chi^2 = 10.3$, $P < 0.05$, significant

Table 4 Comparison between angulation of impacted tooth and LNI

Angulation	No of patients	LNI (%)
Distoangular	8	1 (12.5)
Mesioangular	61	1 (1.6)
Horizontal	20	2 (10)
Vertical	11	0

$\chi^2 = 4.72$, $P > 0.05$, not significant

Table 5 Comparison between depth of impaction of tooth and LNI

Red line (mm)	N	LNI
≤ 5	72	0
>5 to <10	21	0
≥ 10	7	4 (57.1)

$\chi^2 = 35.2$, $P < 0.01$, highly significant

Table 6 Duration of Surgery and incidence of LNI

Duration	No. of patients	LNI (%)
<15 min	40	0
<30 min	37	0
<45 min	13	2 (15.4)
<1 h	7	1 (14.3)
>1 h	3	1 (33.3)

<30 min versus >30 min, $\chi^2 = 11.9$, $P < 0.01$, highly significant

Table 2 Details of the patients with LNI

Age/sex	Angulation	Red line (mm)	Lingual flap	Tooth section	Duration	Recovery
35 year/M	Horizontal	10	Retracted	N	30–45 min	1 month
32 year/M	Distoangular	12 mm	Retracted	N	>1 h	1 month
42 year/M	Mesioangular	17 mm	No	N	30–45 min	1 week
42 year/M	Horizontal	10 mm	Retracted	Y	45 min-h	3 month

BDST was the most sensitive test (detected four cases) and PPT was least sensitive (detected one case). Out of 4 cases 1 recovered within a month and other three by 3 months. All the four cases of LNI had normal neuro-sensory response to all the four tests conducted at the end of 6 months and the injury was found to be of neurapraxia type.

Over all analysis of individual factors reveals that sex of patient and odontectomy were not significantly related to LNI. Age >26 years, redline >10 mm, lingual flap retraction during procedure and duration >30 min were significant factors for LNI. Even though angulation of tooth was not statistically significant, more percentage of LNI was associated with horizontal and distoangular impactions.

Discussion

The important functions of upper aero-digestive tract like speech, mastication, swallowing, taste sensation and variety of other functions are well coordinated by tongue. The tongue has sensory and special sensory innervations by lingual and chorda tympani nerves respectively. LNI is most often encountered complication during surgical removal of lower third molars because of its close anatomical association [8, 11, 15, 16].

In the present prospective study the incidence of LNI was 4 % following extraction of impacted mandibular third molars and none of these were permanent. This observation is compared favorably with previously reviewed and reported rates [5, 6, 8, 17]. The reported frequency of temporary lingual nerve injuries during third molar removal is 0.2–23 and 0–2 % of permanent disturbance [6, 8, 17].

The LNI was found to be directly influenced by age in this study which is in accordance with few previous studies [17, 18]. Root completion, sclerosed bone, ankylosed tooth, presence of infection and loss of tissue elasticity are some of the age related changes of the jaw bones [2]. Therefore the age of the patient is a factor directly related to the surgical morbidity associated with removal of lower impacted third molars [17, 18]. With an increase in age there is an increase in health risk factors which may influence postoperative recovery [2]. All of the LNI occurred in men, which is in accordance with the results of Jerjes et al. [19], whereas some studies found that gender of the patient is not related to nerve injury [20].

Teeth with distoangular and horizontal pattern of impaction were associated with most of LNI cases in the present study. These findings go with the observations of previous studies [17, 19–21]. Distoangular impactions of lower third molars are generally the most difficult teeth to

remove owing to the path of delivery into the ascending ramus [12, 13]. Horizontal impactions can be better treated by tooth sectioning but comparatively more bone removal is required [12, 13].

Deeper the tooth within the bone more difficult will be its extraction as more bone removal is required. Extraction becomes three times more difficult with every millimeter of increase in depth [12]. In this study LNI occurred in cases with red line more than 10 mm and these observations are comparable to the results of a study by Mason [21].

Lingual flap retraction for lower molar removal improves the accessibility and simplifies the procedure [22]. But adjacent to lower third molar lingual nerve is covered with only a thin layer of soft tissue and mucosa increasing the chances of injury [8, 23]. Significantly higher LNI occurred in cases where lingual flap was retracted in the present study. Several studies have shown that raising and retraction of a lingual mucoperiosteal flap is associated with an increased frequency of lingual nerve damage [10, 21–24]. Few recent studies and a systematic review have concluded that retraction of lingual periosteal flap is not necessary and can be avoided during third molar surgery [25, 26].

The odontectomy of the tooth during surgical removal to overcome the obstruction in the path of removal is advisable. The amount of bone cutting is drastically reduced, especially in distal and distolingual part of the tooth [12]. Hence one can prevent damage to lingual nerve. Duration of surgery was considered as a measure of the degree of operation difficulty [12, 17, 21]. In the present study LNI occurred in cases which took longer time for the operation. This is in accordance with the observations of few previous studies [21, 23].

In conclusion age of the patient, depth of impaction, lingual flap retraction, longer duration of surgery, horizontal and distoangular pattern of impaction are significant risk factors for LNI. Assessment subsequent to diagnosis is a crucial stage in the process of treatment plan, which will render the patient symptom free and healthy, since prevention is always better than cure. Hence for all the patients undergoing surgical removal of lower third molars with probable significant factors, care should be taken to avoid LNI. Patients should be informed about the consequences and written consent must be obtained. The effective method of managing nerve injuries remains a combination of preoperative assessment of radiographs and discussion with patients about the benefits and risks of the treatment. Despite technical advances, informed consent regarding the incidence of nerve injury is imperative to prevent subsequent legal problems. Frequent follow ups should be done for the cases with nerve injury and absence of progressive sensory recovery by 3–4 months post injury is an indication for surgical intervention.

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