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 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 insensitivity 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 raised.

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 up to 9 months. 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, germectomy 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 [14] 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 [9, 14, 39]. Kipp et al. and Carmichael and McGowan concluded that full bony impaction has the maximum risk of nerve damage [14, 20], whereas others using the classification system of Pell and Gregory showed with increased depth the risk of IAN damage is higher [32].

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 [34] 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 [51] 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. [20] 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 [2, 9, 27, 28].

Hillerup noticed a significant improvement in 66% of IAN deficits associated with third molar surgery [23]. 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.

References
1. Absi EG, Shepherd JP. A comparison of morbidity following the removal of lower third molars by the lingual split and surgical bur methods. Int J Oral Maxillofac Surg. 1993;22:149-153.
2. Alling 3rd CC. Dysesthesia of the lingual and inferior alveolar nerves following third molar surgery. J Oral Maxillofac Surg. 1986;44:454-457.
3. Appiah-Anane S, Appiah-Anane MG. Protection of the lingual nerve during operations on the mandibular third molar: a simple method. Br J Oral Maxillofac Surg. 1997;35:170-172.
4. Bataineh AB. Sensory nerve impairment following mandibular third molar surgery. J Oral Maxillofac Surg. 2001;59:1012-1017.
5. Bell CW. Use of dental panoramic tomographs to predict the relation between mandibular third molar teeth and the inferior alveolar nerve. Radiological and surgical findings, and clinical outcome. Br J Oral Maxillofac Surg. 2004;42:21-27.
6. Benediktsdottir IS, Wenzel A, Petersen JK, Hintze H. Mandibular third molar removal: risk indicators for extended operation time, postoperative pain, and complications. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2004;97:438-446.
7. Berge TI, Boe OE. Predictor evaluation of postoperative morbidity after surgical removal of mandibular third molars. Acta Odontol Scand. 1994;52:162-169.
8. Black CG. Sensory impairment following lower third molar surgery: a prospective study in New Zealand. N Z Dent J. 1997;93:68-71.
9. Blackburn CW, Bramley PA. Lingual nerve damage associated with the removal of lower third molars. Br Dent J. 1989;167:103-107.
10. Bloudeau F. Paresthesia: incidence following the extraction of 455 mandibular impacted third molars. J Can Dent Assoc. 1994;60:991-994.
11. Bloudeau F, Daniel NG. Extraction of impacted mandibular third molars: postoperative complications and their risk factors. J Can Dent Assoc. 2007;73:325.
12. Brann CR, Brickley MR, Shepherd JP. Factors influencing nerve damage during lower third molar surgery. Br Dent J. 1999;186:514-516.
13. Bruce RA, Frederickson GC, Small GS. Age of patients and morbidity associated with mandibular third molar surgery. J Am Dent Assoc. 1980;101:240-245.
14. Carmichael FA, McGowan DA. Incidence of nerve damage following third molar removal: a West of Scotland Oral Surgery Research Group study. Br J Oral Maxillofac Surg. 1992;30:78-82.
15. Chiapasco M, De Cicco L, Marrone G. Side effects and complications associated with third molar surgery. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 1993;76:412-420.
16. Chossegros C, Guyot L, Cheynet F, Belloni D, Blanc JL. Is lingual nerve protection necessary for lower third molar germectomy? A prospective study of 300 procedures. Int J Oral Maxillofac Surg. 2002;31:620-624.
17. Fielding AF, Rachiele DP, Frazier G. Lingual nerve paresthesia following third molar surgery: a retrospective clinical study. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 1997;84:345-348.
18. Gargallo-Albiol J, Buenecua-Imaz R, Gay-Escoda C. Lingual nerve protection during surgical removal of lower third molars. a prospective randomised study. Int J Oral Maxillofac Surg. 2000;29:268-271.
19. Goldberg MH, Nemariich AN, Marco 2nd WP. Complications after mandibular third molar surgery: a statistical analysis of 500 consecutive procedures in private practice. J Am Dent Assoc. 1985;111:277-279.
20. Gomes AC, Vasconcelos BC, de Oliveira e Silva ED, da Silva LC. Lingual nerve damage after mandibular third molar surgery: a randomized clinical trial. J Oral Maxillofac Surg. 2005;63:1443-1446.
21. Greenwood M, Langton SG, Rood JP. A comparison of broad and narrow retractors for lingual nerve protection during lower third molar surgery. Br J Oral Maxillofac Surg. 1994;32:114-117.
22. Gulicher D, Gerlach KL. Sensory impairment of the lingual and inferior alveolar nerves following removal of impacted mandibular third molars. Int J Oral Maxillofac Surg. 2001;30:306-312.
23. Hillerup S. Iatrogenic injury to the inferior alveolar
nerve: etiology, signs and symptoms, and observations on recovery. Int J Oral Maxillofac Surg. 2008;37:704-709.

24. Hillerup S, Stoltze K. Lingual nerve injury in third molar surgery I. Observations on recovery of sensation with spontaneous healing. Int J Oral Maxillofac Surg. 2007;36:884-889.

25. Hochwald DA, Davis WH, Martinoff J. Modified distolingual splitting technique for removal of impacted mandibular third molars: incidence of postoperative sequelae. Oral Surg Oral Med Oral Pathol. 1983;56:9-11.

26. Howe G, Poyton HG. Prevention of damage to the inferior dental nerve during the extraction of mandibular third molars. Br Dent J. 1960;355-363.

27. Jerjes W, Swinson B, Moles DR, El-Maayyah M, Banu B, Upile T, et al. Permanent sensory nerve impairment following third molar surgery: a prospective study. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2006;102:e1-7.

28. Kipp DP, Goldstein BH, Weiss Jr WW. Dysesthesia after mandibular third molar surgery: a retrospective study and analysis of 1,377 surgical procedures. J Am Dent Assoc. 1980;100:185-192.

29. Lopes V, Mumenya R, Feinmann C, Harris M. Third molar surgery: an audit of the indications for surgery, post-operative complaints and patient satisfaction. Br J Oral Maxillofac Surg. 1995;33:33-35.

30. Mason DA. Lingual nerve damage following lower third molar surgery. Int J Oral Maxillofac Surg. 1988;17:290-294.

31. Middlehurst RJ, Barker GR, Rood JP. Postoperative morbidity with mandibular third molar surgery: A comparison of two techniques. J Oral Maxillofac Surg. 1988;46:474-476.

32. Miura K, Kino K, Shibuya T, Hirata Y, Shibuya T, Sasaki E, et al. Nerve paralysis after third molar extraction. Kokubyo Gakkai Zasshi. 1998;65:1-5.

33. Obiechina AE. Paraesthesia after mandibular third molar extractions in Nigerians. Odontostomatol Trop. 1990;13:113-114.

34. Pichler JW, Beirne OR. Lingual flap retraction and prevention of lingual nerve damage associated with third molar surgery: a systematic review of the literature. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2001;91:395-401.

35. Pogrel MA, Goldman KE. Lingual flap retraction for third molar removal. J Oral Maxillofac Surg. 2004;62:1125-1130.

36. Queral-Godoy E, Figueiredo R, Valmaseda-Castellon E, Berini-Aytes L, Gay-Escoda C. Frequency and evolution of lingual nerve lesions following lower third molar extraction. J Oral Maxillofac Surg. 2006;64:402-407.

37. Queral-Godoy E, Valmaseda-Castellon E, Berini-Aytes L, Gay-Escoda C. Incidence and evolution of inferior alveolar nerve lesions following lower third molar extraction. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2005;99:259-264.

38. Rehman K, Webster K, Dover MS. Links between anaesthetic modality and nerve damage during lower third molar surgery. Br Dent J. 2002;193:43-45.

39. Renton T, McGurk M. Evaluation of factors predictive of lingual nerve injury in third molar surgery. Br J Oral Maxillofac Surg. 2001;39:423-428.

40. Robinson PP, Loescher AR, Smith KG. The effect of surgical technique on lingual nerve damage during lower 3rd molar removal by dental students. Eur J Dent Educ.