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ORIGINAL ARTICLE

Lingual nerve injury during extraction of mandibular third molars: Are we extracting correctly?

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A B S T R A C T

Introduction: Neurological injuries including lingual nerve damage are among the most devastating complications of mandibular third molar extraction. Various causes of lingual nerve damage have been proposed in literature including the surgical technique.

Objective: This study aims to assess the adverse outcomes of the removal of mandibular third molars in terms of the frequency of lingual nerve injury (LNI).

Methodology: This prospective case series was carried out at Maroof International Hospital, Islamabad. Surgical extraction was performed after raising both lingual and buccal mucoperiosteal flaps for surgical access. Ostectomy and tooth sectioning was performed while protecting the lingual flap with a passively placed periosteal elevator. Patients were recalled for the assessment of lingual nerve status, one week postoperatively.

Results: Out of the total of 1487 teeth extracted temporary lingual nerve injury was observed in just two cases (0.13%) both of which were extracted because of recurrent pericoronitis. None of the patients had a permanent neurological deficit.

Conclusion: For improving civility in nursing college, insight into incivility among students and faculty members is to be developed and policies to be in place to address unacceptable behaviors in a timely and effective manner. A surgical technique using careful lingual flap elevation and passive retraction results in the prevention of iatrogenic lingual nerve injury.

Keywords: *Mandibular third molar, Lingual nerve, mucoperiosteal flap, ostectomy*

Introduction

Mandibular third molar (wisdom tooth) extraction is one of the most common procedures performed in oral surgery practice. Various complications of surgical extraction of mandibular third molars have been reported but neurological injuries account for the most disabling complications that also have severe medicolegal considerations.

Inferior alveolar and lingual nerves are the most common nerves affected as far as neurological complications of third molar extractions are concerned.[1] Lingual nerve injury (LNI), although relatively less common is most disturbing for the patient as it not only causes loss of sensory sensation but also loss of special sensation i.e., taste on an affected side of the tongue. Unlike lingual nerve various imaging techniques including orthopantomography and cone beam computed tomogram (CBCT) can be used to assess the position of the inferior alveolar nerve and then plan the surgical procedure accordingly. Moreover, the lingual nerve has a considerable variable position in soft tissues on the lingual aspect of the lingual cortical plate and lingual crest in the mandibular third molar region.[2] In an extensive literature review, it has been proposed that the average horizontal distance from the mandibular third molar lingual alveolar wall to the lingual nerve is 3.05 ±

0.48mm while the vertical distance from the lingual nerve to the alveolar ridge in the third molar area is 7.24 ± 0.95mm.[3]

In literature, various risk factors for lingual nerve injury have been identified, whereas iatrogenic injury during surgical extraction of the mandibular third molar is considered the most common cause of lingual nerve injury.[1] Furthermore, various modifications of surgical techniques for wisdom teeth extraction have been published but no significant evidence is available supporting any single surgical technique.[4] this study aimed to determine the incidence of lingual nerve injury using a standard surgical technique (as described below) by an experienced oral and maxillofacial surgeon. Whereas the secondary objective was to describe various factors contributing to the lingual nerve injury while performing extraction of mandibular third molars.

Methodology

This prospective case series was conducted at the Dental outpatient department of Maroof International Hospital Islamabad, Pakistan from Jan 2016 to Dec 2020. A consecutive non-probability sampling technique was used. After taking informed consent all patients who required the extraction of mandibular third molars were included in this study. All patients were operated on by a consultant-level oral and maxillofacial surgeon having more than 20 years of experience. The exclusion criteria were patients with preexisting neurological conditions, a preexisting neurological deficit of lingual nerve due to orthognathic surgery or trauma, and patients with psychological or psychiatric disorders.

The surgical procedure was carried out under local anesthesia (2% lignocaine with epinephrine 1:100000) either alone or supplemented by intravenous sedation with midazolam (3mg). Halstead's Inferior alveolar nerve block technique along with buccal infiltration techniques was used to anesthetize the inferior alveolar, lingual, and buccal nerve.[5] Inferior alveolar nerve block was administered using 27G long needles (45mm) in self-aspirating dental cartridge syringes (Figure 1a).

The initial attempt was made to luxate and extract the tooth by closed technique. In cases of inability to perform extraction by closed means following, steps were employed to perform the surgical extraction.

The standard buccal envelope mucoperiosteal flap was raised by making an incision in the gingival sulcus and the distal extension incision was made in the buccal vestibule, lateral to the external oblique ridge (Figure 1b). Then after the exposure of the external oblique ridge, the distolingual mucoperiosteal flap was raised carefully using Mitchell's trimmer (Figure 1c). This flap is particularly helpful for the extraction of disto-angular third molars and facilitates safe distal cutting of bone and tooth sectioning. This disto-lingual flap should be of appropriate size for adequate access to the area distal to the tooth. To avoid excessive traction on the lingual flap and soft tissue the authors recommend passively placing the blunt end of a molt-type periosteal elevator between the flap and lingual cortex for appropriate retraction and protection of lingual tissues.

Ostectomy or bone removal was done to expose the impacted tooth. Bone removal was done with a surgical handpiece (rotary instruments) and straight fissure carbide bur under copious irrigation of saline. Ostectomy was performed by moving the bur around the tooth from disto-lingual to mesiobuccal direction in brush-like strokes for better control of rotary instruments and to lessen the chances of injury to the lingual tissues (Figure 1d).

Then the tooth was luxated with the help of Coupland's straight elevators. The authors recommend opting for tooth sectioning in case of hindrance in luxation and delivery of the tooth or when the angulation of the tooth or root configuration requires so. Tooth sectioning was performed with rotary instruments under copious irrigation in such a way that only two third of the buccolingual dimension of dental tissue was cut with handpiece and bur to avoid perforation of lingual cortex and injury to lingual soft tissues (Figure 1e). Finally, the tooth was delivered with the help of straight elevators, curved artery clip, or forceps.

The suturing was performed after copious irrigation of the socket and flap. 3/0 polyglactin suture using the reverse cutting or round body needle. The authors recommend extreme caution while suturing and propose small superficial bite from lingual soft tissues to avoid injury to the lingual nerve (Figure 1f). Then the patients were given routine postoperative instructions and were advised tab. Diclofenac potassium 50mg twice a day for three days to manage postoperative pain.

The patients were advised reappointed one week postoperatively for the removal of sutures and examination of the neurological status of the lingual nerve. The lingual nerve sensation was examined by subjective and objective testing (fine touch with a cotton wisp and pinprick testing). All patients having compromised lingual nerve function were called every week to assess the lingual nerve function until full recovery is achieved. Patients showing no recovery of lingual nerve function till 6 months were considered to have a permanent deficit of neural function. Data were analyzed by calculating descriptive statistics i.e., frequency and percentage for categorical variables and mean± SD for the continuous variables. using SPSS 25.

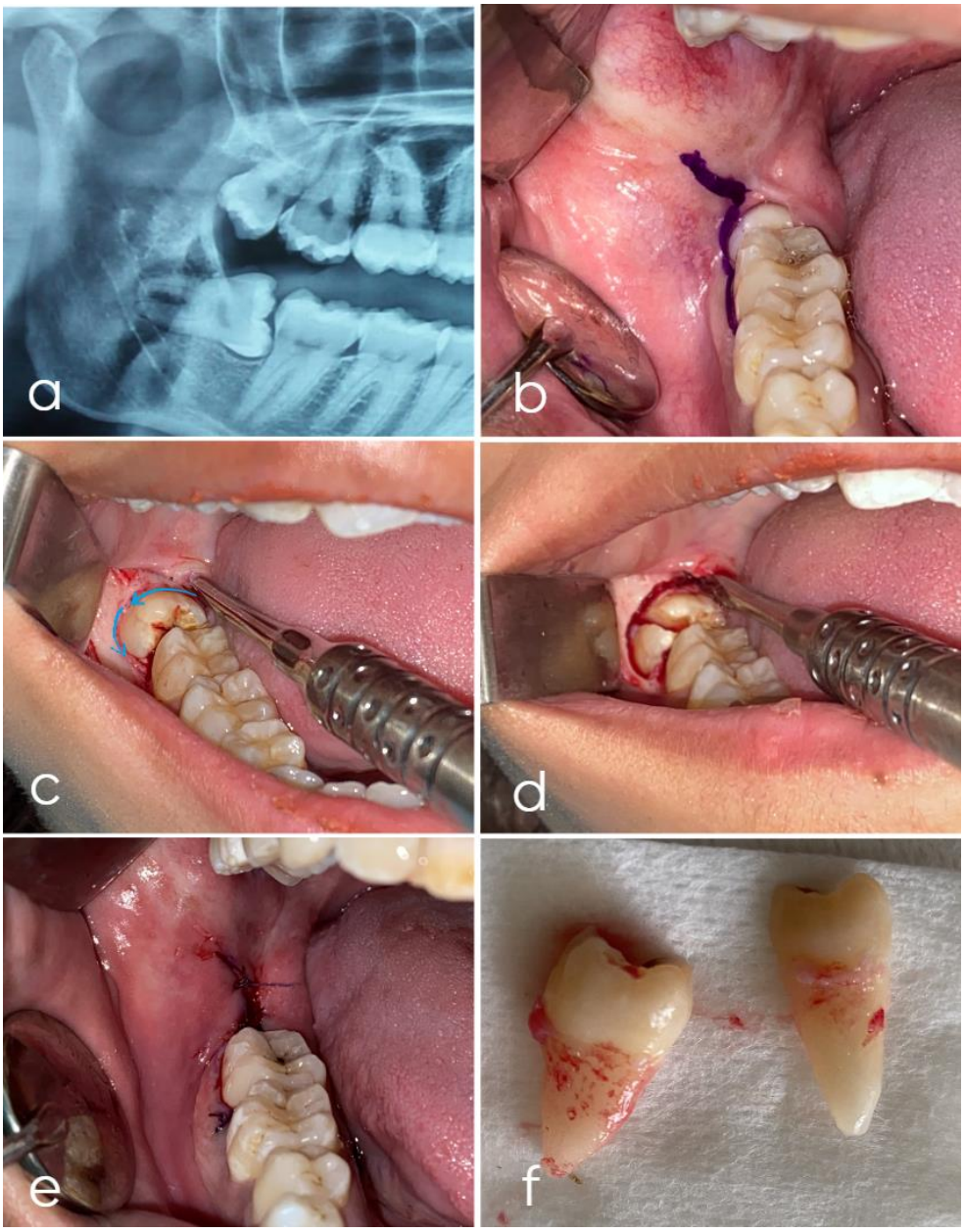

Figure 1: a) Preoperative OPG showing horizontal impaction b) Marking of envelope flap with distal extension c) Buccal and lingual mucoperiosteal flaps raised and retracted (blue arrows showing the direction in which rotary instruments are used for osteotomy d) buccal ostectomy and tooth sectioning performed e) suturing of flaps f) tooth delivered in sections

Results

Twelve hundred patients who met the inclusion criteria were initially included in this study and 15 of them dropped out as they did not report back for the follow-up. A total of 1487 lower third molars were extracted in 1185 patients that were studied, among which 451 (38.1%) were male while 734 (61.9%) were female patients. The mean age was 30.82 ± 8.07 years.

Extractions of 854 (72.1%) patients were performed under local anesthesia while in 331 (27.9%) patients' IV sedation was used along with local anesthesia. Mandibular right third molars were extracted in 468 (39.50%) patients, left third molars were extracted in 415 (35%) cases while in 302 (25.50%) cases extraction was performed on both sides. In 585 (39.34%) patients surgical extraction was required while in other 902 (60.66%) patients mandibular third molars were extracted by closed technique.

Chronic recurrent pain (n=968, 65.11%) was the most common cause of extraction, followed by pericoronitis (n=173, 11.63%), orthodontic treatment (n=172, 11.57%), extensive caries (n=141, 9.48%), prophylactic extractions (n=18, 1.21%), cystic lesions (n=9, 0.61%) and root resorption (n=3, 0.2%) Figure 2.

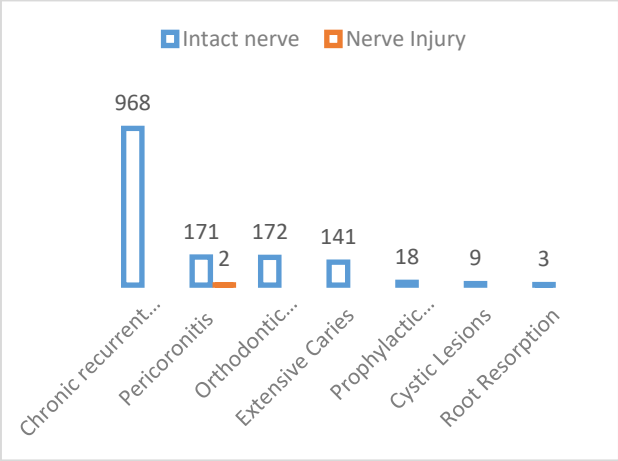

Figure 2: Distribution of the Causes of Extraction of Mandibular Third Molar

Out of the total of 1487 teeth extracted; LNI was observed in just two cases (0.13%) Table 1. The reason for extraction in both these cases was recurrent pericoronitis associated with the impacted wisdom tooth and the surgical extraction procedure was required on both occasions. The neurological deficit in both these patients was of temporary nature as the recovery of lingual nerve function was observed within 6 weeks of surgery.

Table 1: Incidence of Lingual Nerve Injury

Procedure	Intact Nerve (n)	Nerve Injury (n)	Total
Closed Extraction	902(100%)	-	902(60.66%)
Surgical Extraction	583(99.66%)	2(0.34%)	585(39.34%)
Total Extractions	1485(99.87%)	2(0.13%)	1487(100%)

Discussion

The lingual nerve along with the inferior alveolar nerve is at great risk of injury while performing surgery on mandibular third molars because of their close approximation to the surgical area.

Incidence of LNI is quite variable, as in a review of literature it has been described that temporary lingual paresthesia ranges from 0 to 37.5% while permanent lingual nerve injury was reported in 0 to 2% of patients after third molar surgery.[5] In the present study, there was no case of permanent lingual nerve injury while just two patients (0.13%) had temporary paresthesia of the lingual nerve which is a very small proportion considering the large sample of patients studied. Many causes of LNI have been described in the literature.[3] The authors have identified five factors that might have contributed to the iatrogenic injury of the lingual nerve i.e., local anesthesia procedure, incision & flap elevation/retraction, osteotomy procedure, suturing, and surgeon's experience.

Local anesthesia procedures can cause lingual nerve injury due to needle penetration and/or the potential neurotoxic effect of local anesthesia solution. Due to the anatomical variation in the position of the lingual nerve, not much can be done to prevent lingual nerve injury during local anesthesia procedures. Although few authors have advocated the use of the para-apical anesthesia technique having negligible chances of lingual nerve injury still Halsted's technique is mostly used as a local anesthesia technique for the extraction of mandibular wisdom teeth.[6] In a study Pogrel and colleagues have described that in 33% of cases lingual nerve is formed by a single fascicle in

contrast to the inferior alveolar nerve which has 7-39 fasciculi. Therefore, the lingual nerve is more prone to injury during needle penetration as compared to the inferior alveolar nerve.[7] Furthermore, the concentration and type of local anesthesia have also been proposed as the probable cause of nerve damage. Historically it has been suggested that there is a high possibility of nerve injury with 4% articaine as compared to 2% lignocaine.[8] In a retrospective study it was shown that most of the neural injuries due to local anesthesia were among patients in whom 4% of articaine was used.[9] But few recent studies and reviews are unable to propose 4% articaine as more neurotoxic than other local anesthetics due to insufficient evidence to support the hypothesis.[10, 11] Still it is advised to use local anesthesia of lesser concentration, select fine needles, and avoid multiple injections during local anesthesia procedures.[12] Therefore in the current study Halsted's inferior and lingual nerve block technique fine 27G needles and 2% lignocaine (with epinephrine 1:100000) was used to achieve local anesthesia of tissues to minimize the chances of nerve damage during local anesthesia injections.

Various techniques have been proposed for surgical access to the mandibular third molar including the buccal flap technique, the buccal and lingual flap technique, and the lingual split technique.[4, 13] But there is no consensus regarding the benefit of any surgical approach over the other. A recent review of the literature has concluded that lingual flap elevation and retraction along with the standard buccal flap results in a lesser incidence of permanent lingual nerve injury as compared to the only buccal flap approach (0.1% vs 0.49%).[14] On the other hand in a study by Ramadorai and colleagues employed the buccal flap-only technique and found just one case (0.078%) of lingual nerve injury in an audit of 1276 cases of mandibular surgical extractions.[15] In the current study surgical technique employing both buccal and lingual flaps was used for the surgical access of mandibular third molars. The lingual mucoperiosteal flap was reflected cleanly and retracted with the blunt end of the molt periosteal elevator which was passively placed to protect the lingual flap. It has also been proposed in the current study that gentle elevation and passive retraction of the lingual mucoperiosteal flap with a blunt molt elevator result in the protection of the lingual nerve and prevents its injury. In a systematic review, it has been concluded that retraction of the lingual flap with purpose-built retractors results in a lesser incidence of lingual nerve injury.[16] The authors of the current study propose that lingual flap elevation results in better access and visibility at the distal and distolingual area of the impacted tooth, the bone removal or osteotomy can be performed safely under direct vision of the operator which ultimately decreases the incidence of iatrogenic injury to the lingual nerve as depicted by the findings (0.13% incidence of injury) in this study.

Another important factor contributing to LNI during lower third molar extraction is tooth sectioning. A recent review of literature by Pippi R and colleagues has concluded that bone removal is more likely associated with LNI (p-value < 0.01) rather than tooth sectioning procedure (p-value 0.523).[3] In another study it was suggested that by performing tooth sectioning we can decrease the extent of bone removal or even avoid it thus contributing to better postoperative outcomes and lesser complications but the authors of the study could not establish any significant statistical association between tooth sectioning and LNI (P value > 0.05).[17] Furthermore, there is sufficient evidence supporting the fact that tooth sectioning during the removal of third molars having close proximity to the inferior alveolar canal minimizes the risk of injury to the inferior alveolar nerve (20% vs 6%).[18] Coronectomy as a sole procedure has also been proposed for the management of impacted teeth, as it has a lesser incidence (around 0.05%) of LNI, but it is also associated with higher failure rates.[19] In the present study, in case of unfavorable angulation, deeply impacted teeth, inferior alveolar nerve proximity, and failure to luxate the tooth by closed means, the operating surgeon performed minimal osteotomy and tooth sectioning to remove the tooth while avoiding excessive trauma to the surrounding soft tissues.

The surgeon's experience and surgical expertise are other important factors to consider while performing lower third molar surgery. In a study by Jain et.al comparatively very high incidence (13%) of LNI was observed as the surgical procedures were performed by a resident surgeon.[16] The authors proposed that less experience of the operating surgeon might have caused this higher incidence of lingual nerve injury. In another study, a higher incidence (4%) of lingual nerve injury was observed when the procedure was performed by 1st year fellows as

compared to the 3rd year fellows (incidence of 0.5%).[20, 21] In the current study all the surgical procedures were performed by an experienced consultant oral and maxillofacial surgeon to address this confounding factor.

In this study, a large cohort of patients was studied but there was a wide variety of mandibular third molars that were extracted ranging from fully erupted to deeply impacted teeth. And the extent of surgery and the time required to perform the extractions were also quite variable among cases. Therefore, future studies focusing on a more controlled cohort of patients can be conducted to provide more specific evidence of lingual nerve injury in a particular type of third molar extractions using a particular surgical technique.

Conclusion

The surgical technique using both buccal and lingual flap, and passive retraction of the lingual flap while performing osteotomy as described in this study results in the protection of the lingual nerve thus decreasing the incidence of lingual nerve injury. Moreover, tooth sectioning should be performed, whenever required, by cutting half to two-thirds of the buccolingual dimension of the crown using rotary instruments.

References

1. La Monaca G, Vozza I, Giardino R, Annibali S, Pranno N, Cristalli MP. Prevention of neurological injuries during mandibular third molar surgery: technical notes. Ann Stomatol (Roma). 2017; 8(2):45-52. DOI: https://doi.org/10.11138/ads/2017.8.2.053
2. Ghabriel M, Takezawa K, Townsend G. The lingual nerve: overview and new insights into anatomical variability based on fine dissection using human cadavers. Odontology. 2019; 107(1):1-9. DOI: https://doi.org/10.1007/s10266-018-0371-4.
3. Pippi R, Spota A, Santoro M. Prevention of Lingual Nerve Injury in Third Molar Surgery: Literature Review. J Oral Maxillofac Surg. 2017; 75(5):890-900. DOI: https://doi.org/10.1016/j.joms.2016.12.040
4. Bailey E, Kashbour W, Shah N, Worthington HV, Renton TF, Coulthard P. Surgical techniques for the removal of mandibular wisdom teeth. Cochrane Database Syst Rev. 2020; 7(7): CD004345. DOI: https://doi.org/10.1002/14651858.CD004345.pub2.
5. Malamed SF. Handbook of local anesthesia. 7th ed. St. Louis: Mosby; 2020. pp. 239-249
6. Sawadogo A, Coulibaly M, Quilodran C, Bationo R, Konsem T, Ella B. Success rate of first attempt 4% articaine para-apical anesthesia for the extraction of mandibular wisdom teeth. J Stomatol Oral Maxillofac Surg. 2018; 119(6):486-488. DOI: https://doi.org/10.1016/j.jormas.2018.06.005.
7. Pogrel MA, Schmidt BL, Sambajon V, Jordan RC. Lingual nerve damage due to inferior alveolar nerve blocks: a possible explanation. J Am Dent Assoc. 2003; 134(2):195-9. DOI: https://doi.org/10.14219/jada.archive.1995.0336
8. Kim C, Hwang KG, Park CJ. Local anesthesia for mandibular third molar extraction. J Dent Anesth Pain Med. 2018; 18(5):287-294. DOI: https://doi.org/10.17245/jdapm.2018.18.5.287.
9. Klazen Y, Van der Cruyssen F, Vranckx M, Van Vlierberghe M, Politis C, Renton T, et al. Iatrogenic trigeminal post-traumatic neuropathy: a retrospective two-year cohort study. Int J Oral Maxillofac Surg. 2018; 47(6):789-793. DOI: https://doi.org/10.1016/j.ijom.2018.02.004
10. Hopman AJ, Baart JA, Brand HS. Articaine and neurotoxicity–a review. Br Dent J. 2017; 223(7):501-6. DOI: https://doi.org/10.1038/sj.bdj.2017.782
11. Stirrup P, Crean S. Does articaine, rather than lidocaine, increase the risk of nerve damage when administered for inferior alveolar nerve blocks in patients undergoing local anesthesia for dental treatment? A mini systematic review of the literature. Br Dent J. 2019; 226, 213–223. DOI: https://doi.org/10.1038/sj.bdj.2019.98
12. Renton T, Adey-Viscuso D, Meechan JG, Yilmaz Z. Trigeminal nerve injuries about the local anesthesia in mandibular injections. Br Dent J. 2010; 209(9): E15. DOI: https://doi.org/10.1038/sj.bdj.2010.978.
13. Sushmitha M, Thangavelu A, Aravindraj. Lingual split bone technique – Revisited as a standard operating procedure for surgical removal of the third molar during the COVID pandemic. J Acad Dent Educ. 2021; 7(1):18-22. DOI: https://doi.org/10.25259/JADE_3_2021
14. Sprunk EA, LaSala KB, Wilson VL. Student incivility: Nursing faculty lived experience. J Nurs Educ Pract.2014; 4(9):1. DOI: https://doi.org/10.5430/jnep.v4n9p1
15. Petroni G, Passaretti A, Zaccheo F, Di Nardo D, Testarelli L, Cicconetti A. Lingual Flap Protection during Third Molar Surgery: A Literature Review. Eur J Dent. 2021; 15(4):776-781. DOI: https://doi.org/10.1055/s-0041-1730042.

16. Ramadorai A, Tay ABG, Vasanthakumar G, Lye WK. Nerve Injury After Surgical Excision of Mandibular Third Molars Under Local Anesthesia: An Audit. J Maxillofac Oral Surg. 2019; 18(2):307-313. DOI: https://doi.org/10.1007/s12663-018-1151-y.
17. Rapaport BHJ, Brown JS. A systematic review of lingual nerve retraction during surgical mandibular third molar extractions. Br J Oral Maxillofac Surg. 2020; 58(7):748-752. DOI: https://doi.org/10.1016/j.bjoms.2020.02.022.
18. Charan Babu HS, Reddy PB, Pattathan RK, Desai R, Shubha AB. Factors influencing lingual nerve paraesthesia following third molar surgery: a prospective clinical study. J Maxillofac Oral Surg. 2013; 12(2):168-72. DOI: https://doi.org/10.1007/s12663-012-0391-5.
19. Jain N, Thomas S, Prabhu S, Jain S, Pathak AD, Pillai A, et al. Influence of tooth sectioning technique and various risk factors in reducing the IAN injury following surgical removal of an impacted mandibular third molar. Oral Maxillofac Surg. 2016; 20(2):149-56. DOI: https://doi.org/10.1007/s10006-015-0540-3.
20. Dalle Carbonare M, Zavattini A, Duncan M, Williams M, Moody A. Injury to the inferior alveolar and lingual nerves in successful and failed coronectomies: systematic review. Br J Oral Maxillofac Surg. 2017; 55(9):892-898. DOI: https://doi.org/10.1016/j.bjoms.2017.09.006.
21. Valmaseda-Castellón E, Berini-Aytés L, Gay-Escoda C. Lingual nerve damage after third lower molar surgical extraction. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2000; 90(5):567-73. DOI: https://doi.org/10.1067/moe.2000.110034.