Journal of Chitwan Medical College 2022;12(39):98-101
Available online at: www.jcmc.com.np

ORIGINAL RESEARCH ARTICLE

LINGUAL NERVE IN RELATION TO MANDIBULAR THIRD MOLAR REGION: A CADAVERIC STUDY

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Received: 02 Feb, 2022
Accepted: 08 Mar, 2022
Published: 15 Mar, 2022

Key words: Horizontal dimension; Vertical dimension; Lingual nerve; Third molar.

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*DOI:*https://doi.org/10.54530/jcmc.659

Citation

Chalise U, Kharbuja R, Dhungel S, Bimb K. Lingual nerve in relation to mandibular third molar region: a cadaveric study. Journal of Chitwan Medical College. 2022;12(39):98-101.

ABSTRACT

Background: The lingual nerve is the terminal branch of the mandibular division of trigeminal nerve. The spatial relationship of lingual nerve to the mandibular alveolar crest varies widely. This variation can be among the gender, age, dental status and between the right and left side of the same sample. This study was aimed to determine the relationship of lingual nerve to mandibular third molar region.

Methods: An observational study was carried out from January 2021 to December 2021.The study sample was 15 cadavers including both right and left sides. The lingual nerve was exposed by dissecting the infra temporal region following the standard procedures of Cunninghams Manual of Dissection. The diameter of the lingual nerve, vertical and horizontal distance were measured. The results of all these measurements were tabulated and mean standard deviation were calculated using SPSS version 16.

Results: Out of 30 lingual nerves examined, the mean horizontal distance was 3.99 ± 0.96 mm, the mean vertical distance was 12.67 ± 1.76 mm while the diameter of the lingual nerve was 2.46 ± 0.54 mm.

Conclusions: The lingual nerve always lies in close proximity of alveolar bone and surgeons operating in this region need to be aware during any surgical interventions or any procedures in this region. A thorough apprehension of the spatial location of the lingual nerve enable to lessen the lingual nerve injury.

INTRODUCTION

The lingual nerve is one of the branches of posterior division of trigeminal nerve that provides general somatic sensation to the anterior two-thirds of the tongue and gingiva towards the lingual side of the mandibular teeth.[1] The lingual nerve presents the fibers of chorda tympani nerve, a branch of facial nerve, responsible for the special sense of the anterior two third of the tongue and for the parasympathetic innervations of the sublingual and submandibular salivary glands.[2]

Various studies have shown the anatomic proximity and variation of the lingual nerve to the mandibular third molar region.[1-8] This region also has clinical significance during third molar extraction, any other surgical interventions, as well as periodontal procedures, mandibular trauma management and excision of neoplastic lesions. There are chances of injury to the lingual nerve during third molar extraction, trauma to the mandibular region and its management and excision of neoplastic lesions.[9,10] Even the periodontal procedures to the mandibular posterior region cause damage to the lingual nerve. In addition, there is existence of variation of branching pattern and abnormal communication among all the branches of posterior division of mandibular nerve.[11,12] Therefore it is important for the operating surgeons to be aware of these variations, by which surgical interventions can be carried out carefully minimizing the iatrogenic injury to the lingual nerve. However, so far such cadaveric study has not been performed in Nepal. Hence this study was aimed to determine the relationship of lingual nerve to mandibular third molar region.

METHODS

An observational study was conducted to determine the relationship of lingual nerve to mandibular third molar region. Altogether fifteen male cadavers were studied both on right and left side of the face. The cadavers utilized for routine dissection and previously dissected cadaveric specimens were utilized in the study available in the department of Human Anatomy, Nepal Medical College and Teaching Hospital. The cadaver with both side of the face preserved and having the mandibular second and third molar teeth were included in the study. While the cadaver with observable gross anomalies of the face and damage to the area or surrounding structures

(particularly the submandibular gland), those that had lost genioglossal attachment to the superior mental spine and those that had resection or reconstructive operations in the area. The cadaver in which lingual nerve was exposed and difficult to measure the details, were excluded from the study.

The lingual nerve (Figure 1) was exposed by dissecting the infra temporal region (According to the standard procedures of Cunningham's manual of dissection volume III).[13] All dissections were carried out on the cadaver placed in supine position on a dissection table with the neck in neutral position, using the dissecting instruments. In order to avoid missing the exact location of the lingual nerve, the lingual aspect of third molar gingiva was marked by 2 clips. A small incision was given in order to expose the nerve in the area which was marked earlier. The diameter and the distance between the lateral edge of the sheath of lingual nerve and adjacent lingual plate of the alveolar process (Horizontal distance) was measured with a digital Vernier caliper (Figure 2). Careful attention was given to prevent lingual nerve distortion. Then the distance between the superior edge of the nerve sheath and the lingual crest of the alveolar process (Vertical distance) was measured in the same manner. The lingual nerve was observed during routine dissection in the Department of Anatomy, from January 2021 to December 2021. The ethical approval was obtained from NMC- IRC (Ref no - 046-077/078). The results of all these measurements were tabulated and mean standard deviation was calculated using SPSS version 16.

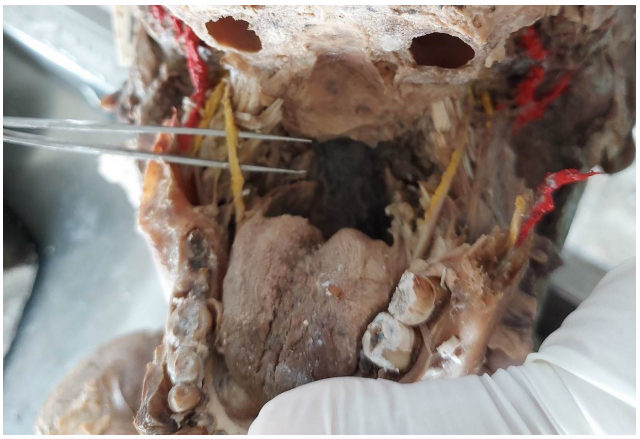

Figure 1: Right lingual nerve in relation to right third molar tooth

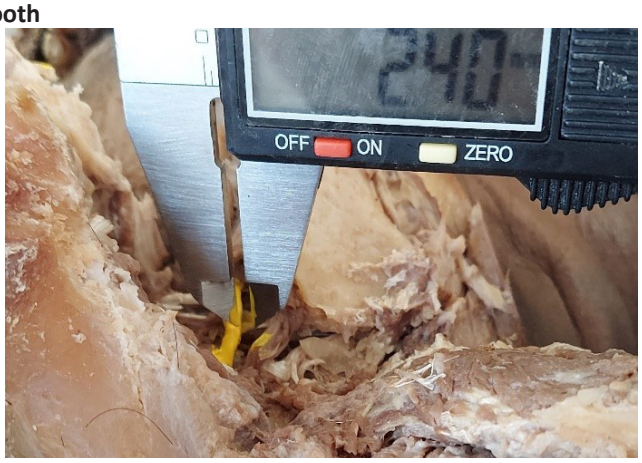

Figure 2: Measurement of diameter

RESULTS

Thirty lingual nerves were examined in 15 male cadavers, the mean horizontal distance between the lingual nerve from the lingual plate of the alveolar process to the lateral edge of the sheath of lingual nerve was 3.99 ± 0.96 mm (Figure 3), the mean vertical distance between the superior edge of the nerve sheath and the lingual crest of the alveolar process was 12.67 ± 1.76 mm while the diameter of the lingual nerve was 2.46 ± 0.54 mm (Table 1).

Table 1: Measurements of lingual nerve (mm)

Measurements	No of samples	Mean ± SD (mm)
Vertical	30	12.67 ± 1.76
Horizontal	30	3.99 ± 0.96
Diameter	30	2.46 ± 0.54

Figure 3: Horizontal measurement of left lingual nerve

DISCUSSION

The trigeminal nerve is the mixed nerve which contains three divisions among which the mandibular division contains both sensory and motor fibers while the other two; maxillary and ophthalmic division contains only the sensory fibers. The mandibular division, in turn gives rise to anterior and posterior branches upon its exit from the foramen ovale. The posterior division gives rise to lingual nerve, inferior alveolar nerve and auriculotemporal nerve.[1] The lingual nerve is one of the branches of posterior division that provides general somatic sensation to the anterior two-thirds of the tongue and gingiva towards the lingual side of the mandibular teeth.[1]

Frequent observations have shown that the close spatial relationship of lingual nerve to the mandibular third molar regions lead injury to the lingual nerve. Another reason of lingual nerve injury is during extraction of mandibular third molars, surgical interventions of mandibular bone fractures and even injection of local anesthesia.[1,2,14] In addition, in recent years there has been increase in trends of putting dental implants in mandibular posterior region which has also led to damage of lingual nerve causing paresthesia of tongue[9,15,16] and altered sensation.[17,18]

Various authors had described the spatial variation of lingual

nerve[5,7,8,19-21] and abnormal communication of lingual nerve with auriculotemporal nerve[11,12] and inferior alveolar nerve.[22,23] Variations also exist on the level of trifurcation of lingual nerve, inferior alveolar nerve and auriculotemporal nerve.[24]

Most of these studies have been performed in cadavers. Behnia et al. had reported the varying location of lingual nerve and the mandibule in 669 fresh cadavers.[25] In another cadaveric study utilizing atrophied mandibular crest, Holzle et al[26] reported varying location of lingual nerve and suggested statistically significant relationship between atrophy of mandibular crest and location of lingual nerve. The lingual nerve have also been visualized using ultrasound. This method also showed varying in the location of lingual nerve.[27] Studies have also shown differences in diameter of lingual nerve between cadaveric study[2] and imaging study.[6,28]

In present study, the diameter of the lingual nerve (figurer-2) in relation to the mandibular third molar region was observed to be 2.46 ± 0.54. In a study conducted by Zur et al, it was shown that the diameter of the main trunk of the lingual nerve as 3.5 mm.

In present study it was observed that the vertical distance of the lingual nerve was 12.67 ± 1.76 and the mean horizontal distance nerve was 3.99 ± 0.96 mm.

Studies performed so far have shown slight similarity and discrepancies in the measurement between the distance of the lingual nerve and the alveolar bone. Study performed in Germany among 10 whole head and 1 sagittally hemisectioned head, the mean vertical and horizontal distance of the nerve to the lingual cresta and lingual plate of the mandible were 9.5± 5.2 mm and 4.1± 1.9 mm.[29] The horizontal distance was similar to the present study but the vertical distance was greater in the present study. In a study Bebnia et al reported the mean horizontal and vertical distance of the lingual nerve to the lingual crest was 2.06±1.10 and 3.01±0.42 mm. There was greater variation in the mean vertical distance observed.[25] This variation can be explained by the fact that in the study conducted by Bebnia et al the sample size was higher. In another study performed on University of Alabama in 28 hemisected cadaveric skulls, the vertical measurement was 7 mm.[20] This study measured the vertical distance at the second molar region while the measurement of this study was taken at the third molar region. The difference in the measurement can also be explained by the fact that the third molar crest lies lateral to the second molar and is at the higher level.

Marcello Breno et al in their study conducted on 24 human corps half head sample in Brazil showed that the horizontal measurement was 4.4 ± 2.2mm and vertical measurement was 16.8 ±5.7 mm in relation to third molar socket.[30] The horizontal measurement was similar to the present study but the vertical measurement was slightly higher. A different measurement was reported from a group in Ege University, Turkey which concluded that the vertical measurement in relation to the third molar as 7.06±1.3 mm and horizontal measurement as 9.3±2.1mm. The findings were inconsistent to the present study.[31] Similar type of discrepancies were also reported by Pogrel et al. Among 20 cadavers the mean vertical and horizontal dimensions were measured as 8.32 and 3.45 mm.[14] Holzle et al in their study concluded that the level of the lingual nerve was at or above the level of the mandibular alveolar crest. Their study also revealed that in the horizontal plane, in 57.4% of the specimens the nerve was in contact with the lingual plate of the third molar.[26]

The limitation of the current study was that, the study was conducted in small sample size. The study was conducted only in the male cadavers available in Human Anatomy department of Nepal Medical College. Therefore, the results thus obtained cannot be generalized.

CONCLUSION

This study elucidates the proximity of the lingual nerve to the alveolar bone and higher chances of injury to the lingual nerve during surgical procedure in third molar region. As variety of dental procedures are performed in and around this area, the dental practitioners and oral and maxillofacial surgeons need to be aware during surgical intervention.

ACKNOWLEDGEMENT

The authors would like to thank all the faculties and staffs of Department of Anatomy, NMCTH for their valuable support to complete the study.

CONFLICT OF INTEREST: None

FINANCIAL DISCLOSURE: None

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