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Multivariate assessment of site of lingual nerve

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Abstract

Injury to the lingual nerve can cause debilitating symptoms. The nerve lies in the retromolar region and its anatomical site can vary within patients and according to sex, age, and dentate status. To our knowledge, no previous studies have recorded its course from multiple bony landmarks and examined the association between age, dentate status, and sex, in the same sample. We dissected 30 white cadavers and took primary and secondary reference points from the internal oblique ridge. We measured the distance to the lingual nerve in sagittal, vertical, and horizontal planes, and recorded the position where the nerve was closest to the lingual plate. We dissected 46 hemimandibles (23 male, mean age 79 years, range 52–100) of which 26 were from the left side. Mean (SD) sagittal, vertical, and horizontal distances from the primary reference point were 9.29 (3.41) mm, 9.15 (3.87) mm, and 0.57 (0.56) mm, respectively. Mean (SD) vertical and horizontal distances from the secondary point were 7.79 (5.45) mm and 0.59 (0.64) mm, respectively. The proximity of the nerve to the lingual plate varied widely (range −13.00 to 15.17 mm from the primary reference point). Dentate status was significant for the sagittal measurement from the primary point, and the vertical measurement from the secondary point. Differences in age, sex, or site of the contralateral nerve were not significant ($n = 16$ pairs). Our findings suggest that the site of the nerve is consistent between and within subjects for sex and age, but not for dentate status. The association between the nerve and the lingual plate varied, which suggests that care must be taken when operating in the area.

Keywords: Lingual nerve; Cadaver; Anatomy; Morphology; Oral surgery

Introduction

The lingual nerve can be injured when wisdom teeth are extracted, the jaw resected, when grafting the alveolar crest, operating on the salivary glands, inserting implants, and excising tumours.[1–6] Injury can occur when a lingual flap is raised,[7] when a nerve is retracted, and during intubation. It can also result from physical trauma or neurotoxicity of local anaesthesia,[8,9] and when a burr is used to remove bone because of the increased likelihood of perforating the lingual plate.[1] The incidence of such complications varies from 0.04% to 22%.[3,4,6] Nerves that lie on or above the alveolar ridge and those with variable branches can also be damaged,[1–5,9–11] but this can be prevented if lingually extended incisions are avoided. Incisions made in the superior-lateral direction along the external oblique ridge are said to be among the safest.[2,9]

Severed nerves have little chance of healing.[12] Damage can result in hypoaesthesia, hyperaesthesia, anaesthesia, and dysaesthesia of the anterior two-thirds of the tongue,[4,13] and taste can be affected because the chorda tympani nerve runs within the sheath of the lingual nerve.[1,3–5] In most cases the effects are temporary (the risk of permanent damage is

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around 1:2 million).[3] An extensive knowledge of the position of the nerve in the mandibular third molar region is therefore essential to avoid iatrogenic injury.

Studies suggest that the actual distance from the lingual nerve to the mandible varies widely:[10,14] mean horizontal distances of the nerve from the lingual plate range from 0.59 mm to 4.19 mm, and mean vertical distances to the lingual crest range from 0.52 mm to 15.5 mm below.[1–3,5,14] The nerve is also described variously as having symmetry or not having symmetry within people,[1,2] and it is suggested that sex has no effect on its site.[2]

However, it is difficult to interpret and compare previous studies. Bony landmarks used for measurements are inconsistent and uncontrolled. Measurements are taken in many different directions, and to our knowledge, ethnicity is mentioned in few but assessed in none,[9,10] In others, radiographic divergence is not given,[5] and some studies have very small sample sizes.[14] Dentate status is mentioned in few and analysed, to our knowledge, in only 2 despite the many studies that use cadavers of elderly people.[1,3] We know of only one that examined the effect of sex on the site of the nerve,[2] and none that have recorded its course from multiple bony landmarks and examined the association between age, dentate status, and sex in the same sample. Our study aims to provide comprehensive details of the anatomical site of the nerve and to provide information that may minimise the potential for iatrogenic damage during oral operations.

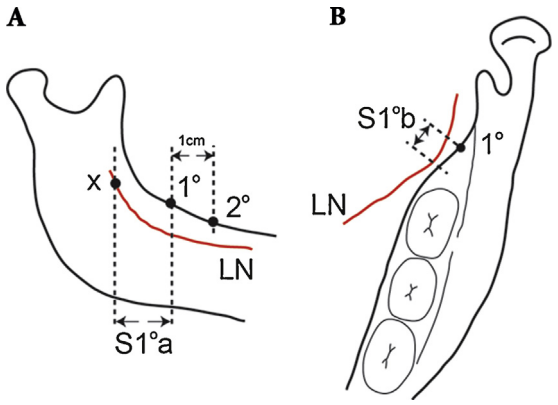

Fig. 1. Medial view (A) and occusal view (B) of a left hemimandible showing landmarks and measurement details (1° = primary reference point; 2° = secondary reference point; LN = lingual nerve; X = emergence of lingual nerve below the lateral pterygoid muscle).

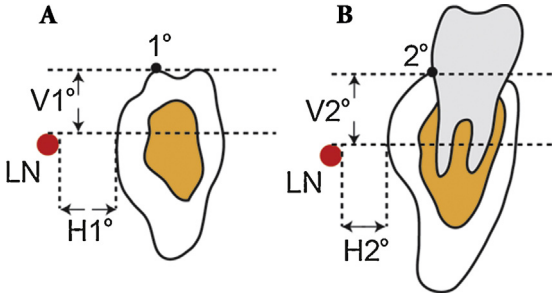

Fig. 2. Coronal section through the mandible at primary (A) and secondary (B) reference points showing measurement points (1° = primary reference point; 2° = secondary reference point; LN = lingual nerve).

Method

We divided 30 heads from elderly white cadavers (embalmed with a commercially available embalming mix) in the sagittal plane. The study followed the Declaration of Helsinki on medical protocol and ethics, and met the requirements of the University of Otago. Cadavers were donated in accordance with the New Zealand Human Tissue Act (2008). We excluded those with disease or damage to the area or the surrounding structures (particularly the submandibular gland), those that had lost genioglossal attachment to the superior mental spine, and those that had had resection or reconstructive operations in the area. A total of 46 hemimandibles remained.

The deep primary incision began at the lingual aspect of the body of the mandible (in the region of the lower canine) along the mucogingival junction posteriorly and superiorly to the inferior part of the coronoid process. We made a superficial secondary incision in the mucosa that continued from the primary incision medially to meet the palatoglossal arch then made an incision inferiorly to the lateral border of the tongue that extended to the lower canine. This created a mucosal flap attached at the lingual sulcus in the lower canine region. We carefully removed the flap using blunt dissection so as not to displace any tissues. The nerve was exposed but not dissected to maintain its anatomical association with adjacent structures. We then raised the periosteum over the mandibular alveolar ridge.

Measurements from 2 hard-tissue reference points were taken with digital callipers. The primary reference point (1°) (Fig. 1A) was the position of transition from the horizontal to the vertical on the internal oblique line (deepest point of the internal oblique line). Horizontal measurements were based on the occlusal plane; vertical measurements were perpendicular to the horizontal. Sagittal measurements were based on the plane of the mandibular ramus. The secondary reference point (2°) (Fig. 1A) was 1 cm anterior to 1° in the sagittal plane on the alveolar ridge. The 6 measurements are shown in Table 1.

All measurements were taken by all 3 operators and final values were agreed by consensus. Data were recorded on a spreadsheet. Pearson's correlation coefficient was used to assess association with age, and multiple and paired *t* tests were done to assess for symmetry. Statistical analyses were done using STATA statistical software (StataCorp LP, College Station, USA). Probabilities of less than 0.05 were considered significant.