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Is the angulation of mandibular third molars associated with the thickness of lingual bone?

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Abstract

To find out whether the angulation of mandibular third molars is associated with the thickness of the bone at the site of impaction, and if so, which particular angulation affects the protective mechanism of the nerve, we retrospectively studied the thickness of lingual bone at the sites of impaction of 200 mandibular third molars in 149 patients using coronal, sagittal, and axial slices of cone-beam computed tomograms (CT). We measured the bone at the cementoenamel junction of the mandibular second molar, at the mid-root of the third molar, and at the apex of the root. Bone less than 1 mm thick was defined as "thinning". We correlated these measurements with the angulation of the tooth based on the position of the second molar and the occlusal plane in 3 dimensions: vertical, mesiobuccal, and buccolingual. The primary outcome was the thickness of the bone around the third molar. A total of 102 teeth were on the left (51%), and 125 were angulated with an occlusal plane of <85° (63%). The mean (SD) thickness of bone at the cementoenamel junction of the second molar was 1.40 (0.87) mm, at mid-root 1.07 (1.03) mm, and at the apex 1.07 (1.30) mm. When the horizontal and mesioangular angulations of teeth were <85°, the thickness of bone at the mid-root differed significantly from that when the vertical and distoangular angulations were 85° or more ($p < 0.001$). Correlations between the thickness of the bone and the buccolingual angulations were significantly associated with perforation of the bone at mid-root and apex ($p < 0.003$). The bone around horizontal and mesioangular impactions was 3.6 times more likely to be "thin" than that at mid-root of vertical and distoangular third molars. A buccolingual angulation was also associated with perforation of the lingual cortex ($p < 0.003$). As the bone was thinner at the mid-root of horizontally and mesioangularly impacted teeth, it seemed to compromise the integrity of the lingual plate, which is the natural protective barrier of the lingual nerve. These findings could be of prognostic value.

Keywords: lingual bone; third molar; angulation; thickness; lingual nerve

Introduction

The extraction of mandibular third molars can injure the lingual nerve. The overall risk has been reported to range from 0.5% to 2.6%,[1–5] though some have reported it to be up to 4%[6]

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and even 6.6%.[7] Most report that temporary loss of sensation resolved within 6 months.[1,2,6,8,9]

Risk factors for injury to the nerve are the age of the patient,[6] experience of the operator,[3,5,8] difficulty and duration of the procedure,[5,6] and depth of impaction.[6] Others are retraction of a lingual flap,[1,6,8,10,11] removal of bone (ostectomy or buccal trough),[1,4,10] sectioning of the tooth,[1,4,8,10] perforation of the lingual plate,[5] intraoperative exposure of the nerve,[5] and a longer operating time.[1] When the lingual bone in the retromolar area is deficient (the only hard tissue barrier that separates the impacted tooth from the nerve) the nerve is vulnerable.[12–17]

Some authors have proposed the use of magnetic resonance imaging (MRI)[18] or ultrasonography[19,20] for the preoperative assessment of the anatomy of the lingual nerve. Cone-beam computed tomography (CT) is used mainly for the preoperative evaluation of the inferior alveolar nerve. Emes et al[21] used cone-beam CT to evaluate the distance between third molars and the lingual nerve. They showed that the apices of impacted teeth can be close to the lingual plate, and the nerve can be damaged if the roots are displaced through perforation of the plate.

We used cone-beam CT to investigate the association between the angulation of mandibular third molars and the thickness of lingual bone, the thinning of the lingual plate, and its perforation by third molar teeth.

Material and methods

Study design and sample

We retrospectively studied the thickness of lingual bone at the site of mandibular third molars in patients who were referred to the Dental Imaging Center in San Francisco, USA for cone-beam CT of the mandible. Scans were done for various reasons such as extraction of third molars, implants, and root canal treatment. We used a Planmeca ProMax 3D Max CBCT machine (Planmeca Oy, Helsinki, Finland).

Partially impacted third molars were included but those that were fully erupted or completely impacted, were excluded. Patients with missing second or first molars, those whose mandibular third molars had associated periapical or large pericoronal lesions, and those with dentoalveolar deformities of the mandible, were also excluded.

We used axial, sagittal, and coronal (cross-sectional) images on Invivo 5 software (Anatomage, San Jose, CA) to measure the thickness of bone around partially impacted teeth. Measurements were taken at the cementoenamel junction of the mandibular second molar at its most distolingual portion closest to the partially impacted third molar (Fig. 1), at the mid-root of the third molar (the root closest to the lingual cortical plate) (Fig. 2), and at the apex of the root (Fig. 3). Bone that was less than 1 mm thick was defined as "thinning". Fenestration or dehiscence of the lingual plate that caused lingual soft tissue to be exposed (and possibly the lingual nerve) was also noted.

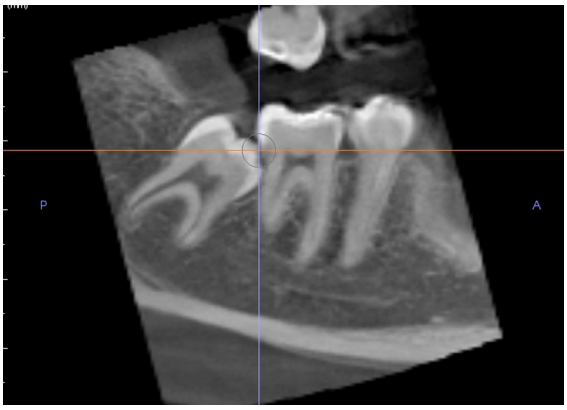

Fig. 1. Cone-beam computed tomogram of an impacted third molar showing thickness of the lingual bone at the cementoenamel junction of the mandibular second molar next to the impacted third molar.

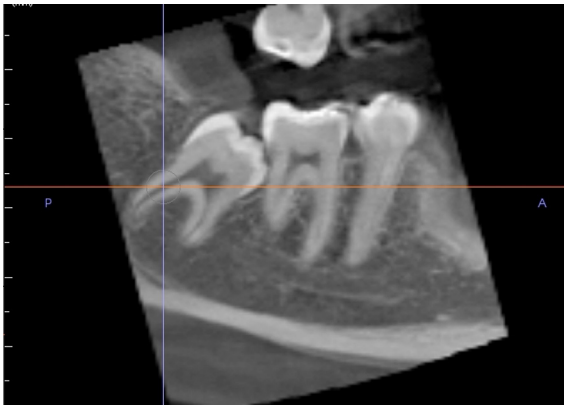

Fig. 2. Cone-beam computed tomogram of an impacted third molar showing the thickness of the lingual plate at the mid-root of the third molar (the root closest to the lingual cortical plate).

We correlated the mesiodistal and buccolingual angulations of third molars with the thickness of the bone, and

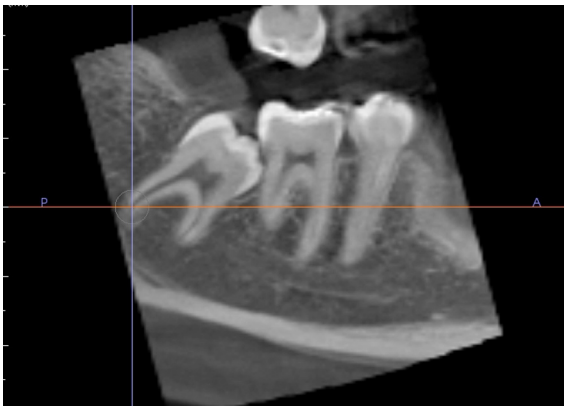

Fig. 3. Cone-beam computed tomogram of the impacted third molar showing thickness of the lingual plate at the apex of the root (the root closest to the lingual cortical plate).