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ORIGINAL ARTICLE

# Pre-operative assessment of relationship between inferior dental nerve canal and mandibular impacted third molar in Saudi population



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## KEYWORDS

Inferior alveolar nerve;  
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Relationship

**Abstract Objective:** To study the correlation between the position of the inferior dental (ID) nerve canal and the angulation of impacted mandibular third molars using dental cone beam computed tomography (CBCT).

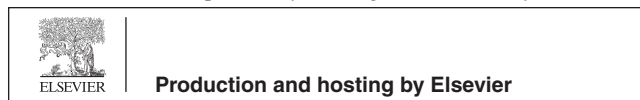
**Materials and methods:** The study considered 100 impactions in 85 patients (60 males, 25 females), for whom an initial panoramic radiographic assessment had revealed that the ID canal and the lower 3rd molar were in close proximity. A CBCT scan of each patient was carried out to assess how the ID nerve canal position influenced the class and position of impaction, angulation of impaction, and bone contact.

**Results:** Class I position B impactions were found in the majority of cases, where the position of the ID canal was approximate to the lingual plate and inferior to the 3rd molar (85.7%). The results were statistically significant ( $p = 0.001$ ). 96% of the ID canals showed bone contact. Of these, 77.1% of ID canals exhibited lingual bone contact, inferior to impaction. The results were statistically significant ( $p = 0.001$ ). Horizontally angulated impactions were most common in the mandible, and significantly associated with lingual and inferior positioning of the ID canal (76.2%).

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*Conclusions:* Our sample population most commonly exhibited horizontally angulated class I position B impactions of the mandible. The position of the ID canal significantly influenced the type of impaction and bone contact.

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## 1. Introduction

The extraction of an impacted or erupted third molar is regarded to be the most common dentoalveolar procedure performed in oral and maxillofacial surgery (Grossi et al., 2007; Leung and Cheung, 2009). The principal teeth that present as impactions are either third molars or canines. The prevalence of impacted teeth varies among different populations depending on the age group, assessment method, and diversity within the sample population (Chu et al., 2003). Mandibular third molars are considered to be the most commonly impacted teeth.

Before planning extraction of an impacted mandibular third molar, the proximity between the mandibular canal and the impacted molar should be assessed to minimize the risk of inferior alveolar nerve damage (Sedaghatfar et al., 2005). Trauma to the inferior alveolar nerve during surgical extraction of a deeply impacted third molar is a well-known complication (Rood and Shehab, 1990) and continues to be frequently reported (Hillerup, 2007).

Conventional two dimensional (2-D) radiographic images, such as panoramic radiographs, are most commonly used to assess the relationship between the inferior dental (ID) nerve canal and mandibular third molar (Dalili et al., 2011). However, three dimensional (3-D) radiographic modalities such as computed tomography and CBCT provide more accurate information with less distortion compared to the 2-D images. In addition, 3-D imaging modalities provide cross-sectional (buccolingual), axial, sagittal, coronal and panoramic views that can be used to assess in detail the relationship between the ID nerve canal and the mandibular third molar.

To avoid nerve injury, CBCT is recommended in cases where there is radiographic evidence of close proximity between the ID canal and mandibular third molar (Flygare and Ohman, 2008; SEDENTEXCT, 2009). Detailed guidelines for the clinical application of CBCT were elaborated by the SEDENTEXCT project (SEDENTEXCT, 2009). According to these guidelines, a CBCT scan should be performed following a decision to extract an impacted mandibular third molar when a radiographic investigation shows that the molar is in close proximity to the inferior alveolar nerve canal (SEDENTEXCT, 2009). Ongoing review of these guidelines is necessary to take into account new evidence.

The present study is the first, to our knowledge, that uses dental CBCT to investigate the correlation between the position of the ID canal and the angulation of the impacted mandibular third molar among the population of the Eastern region of Saudi Arabia.

## 2. Materials and methods

The study was retrospective in design; therefore, no ethical approval was required. The sample consisted of 85 patients (60 males, 25 females; Age range: 20–39 years), exhibiting a

total of 100 impactions where an initial panoramic radiographic assessment demonstrated overlap and/or close proximity between the mandibular 3rd molar and ID canal. A CBCT scan (120 kV, 5 mA, I-CATTM, 3-D imaging system, Imaging Sciences International Inc., Hatfield, PA, USA) was carried out in all cases, at a clinically standard resolution (0.3 mm voxel, 8.9 s).

ICAT vision software (Q version 1.8.1.10, Imaging Science International, Hatfield, PA, USA) was used to identify the relationship of the ID nerve canal to the mandibular 3rd molar. Using a cross sectional view, and adjusting the position in panoramic view, provided an outline of the ID nerve canal and allowed its buccolingual position to be determined (Fig. 1a and b). All the scans were assessed by one radiologist and one specialist in oral and maxillofacial surgery.

The impactions were categorized based on Winter's classification of 3rd molar impaction (Winter, 1926) as well as the Pell–Gregory classification in relation to ramus of the mandible (class I, II and III) and position of 3rd molar in relation to occlusal surface of 2nd molar (A, B and C) (Alling and Alling, 1993).

## 3. Statistical analyses

Data was analyzed by utilizing the Statistical Package for the Social Sciences (SPSS-19.0) software package (IBM, Chicago, USA). Values of the ID canal position, impaction class, bone contact and angulation of impaction were sorted according to their frequency and percentage. Pearson's chi-square test was applied to evaluate the correlation between impaction, nerve positioning, bone contact and impaction angulation. Results with  $p < 0.05$  were considered statistically significant.

## 4. Results

The position of the ID nerve canal in relation to the impacted mandibular third molar typically fell into one of the following 3 categories: buccal and inferior, lingual and inferior, or middle (apex of roots) and inferior (Maegawa et al., 2003). In all the cases, the ID nerve canal was found to be inferior to the impacted mandibular third molar.

Table 1 illustrates that lingual and inferior positioning of the ID nerve canal is significantly associated with IIIB (100%), IIC (100%) and IB (85.7%) impactions. Middle and inferior positioning of the nerve was significantly associated with IA impactions (42.9%), whereas buccal and inferior positioning of the nerve showed significant association with IC impactions (25%). The association between the ID canal position and the impaction class and position was statistically significant ( $p = 0.049$ ).

According to Table 2, lingual and inferior positioning of the ID nerve canal was significantly associated with bone contact (77.1%), whereas middle and inferior positioning of the canal was significantly associated with the absence of bone contact (100%). In both cases the value of  $p$  was 0.001.

Table 3 illustrates the position of the ID canal and its correlation with the angulation of mandibular third molar impaction, according to Winter's classification. Horizontal, mesioangular, and vertical

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