Signature: © Pol J Radiol, 2016; 81: 15-16
DOI: 10.12659/PJR.895694

Polish Journal of Radiology
www.PolRadiol.com
ORIGINAL ARTICLE

Received: 2015.08.18
Accepted: 2015.08.30
Published: 2016.01.13

Authors' Contribution:
A Study Design
B Data Collection
C Statistical Analysis
D Data Interpretation
E Manuscript Preparation
F Literature Search
G Funds Collection

Morphology of Mandibular Incisors: A Study on CBCT

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Summary

Background: The aim of the study was to identify the number of root canals and examine root canal morphology of permanent mandibular incisors in an Indian sub-population of Pune, Maharashtra, India using cone-beam computed tomography (CBCT).

Material/Methods: This study was conducted at Elite CBCT & Dental Diagnostics, Pune. One hundred mandibular incisors were evaluated for the number of root, root canals and root morphology.

Results: In the present study, amongst 102 mandibular incisors, all had one root, 36% of them had a second canal, and Vertucci Type I was the most common type.

Conclusions: CBCT imaging is an excellent method for detection of different canal configurations of mandibular incisors.

MeSH Keywords: Fused Teeth • Tooth Diseases • Tooth, Nonvital

PDF file: http://www.polradiol.com/abstract/index/idArt/895694

Background

For successful endodontic treatment, thorough knowledge of root canal morphology along with its variation is mandatory.

It was first believed that mandibular incisors generally have only one root canal [1]. However, studies have revealed a high variation of root canal morphology among mandibular anterior teeth [2]. The study carried out by Rankine et al. in 1965 showed high prevalence of two canals in the mandibular incisors [3], which stimulated further research studies on the canal configuration of other teeth, particularly those with a relatively low endodontic success rate. These studies, carried out on different populations with different methods, showed that the root canal morphology varies with race, sex, and age [4].

The literature review found that CBCT studies on the root canal morphology of permanent mandibular incisors were conducted mainly in China [5], while the information on the Indian population was scarce. The present study was conducted to investigate the internal anatomy of mandibular incisors and in an Indian sub-population

Material and Methods

This study was conducted at Elite CBCT & Dental Diagnostics, Pune. The present study investigated the root canal morphology of mandibular incisors using CBCT images referred by dental practitioners for the diagnosis and treatment planning.

The roots and root canals of permanent incisors were observed in sagittal and cross sections by two investigators using image-analysis software, which is included in a CBCT image acquisition program (NEWTOM CBCT, ITALY). For the present study, the canal configuration classification was made according to the Vertucci's method (Table 1).

The following observations were recorded:
1. The number of roots;
2. The number of canals and;
3. Canal configuration.

We observed a total of 102 mandibular incisors. Out of 102, 52 (50.98%) were central incisors and 50 (49.02%) were lateral incisors. All of them had a single root (100%). Amongst 102 teeth, 83 (81.37%) teeth had a single canal and 29 (28.43%) teeth had two canals. As per Vertucci's

Table 1. Vertucci in 1974 classified the canal configuration of mandibular incisors into four types.

Type	Description
Type I	Single canal is present from the pulp chamber to the apex
Type II	Two separate canal leaves the pulp chamber, but join short of the apex to form one canal
Type III	One canal leaves the pulp chamber, but it divides into two within the body of the root, the canals merge again to exist as one canal
Type IV	Two separate and distinct canals are present from the pulp chamber to apex

classification, sixty-six (64.71%) were type 1. Twenty-four (23.53%) were type II. Nine (8.82%) were type III, and three (2.94%) were type IV (Table 2).

For statistical analysis, the Chi-square test was used.

Discussion

In clinical practice, the primary reason for failure in endodontic treatment of permanent mandibular incisors is the inability to locate a second canal. The reported incidence of the second canal in mandibular incisors was between 45% and 11.5% [7].

In the study conducted by Gediz Geduk, Yeşim Deniz, Ayşe Zeynep Zengin, Erol Eroglu [8] according to gender, the incidence of the second canal in permanent mandibular incisors was relatively high in females, in contrast to the Liu et al. [9] study, which reported that a slightly higher occurrence of the second canal was found in males than in females.

Table 2. Distribution of morphology of mandibular incisors in the present study as per Vertucci's classification.

Type	Number of teeth	Percentage
Type I	66	64.71%
Type II	24	23.53%
Type III	09	8.82%
Type IV	03	2.94%

In the study conducted by Gediz Geduk, Yeşim Deniz, Ayşe Zeynep Zengin, Erol Eroglu [8], all types of Vertucci canal configurations [6] were seen in mandibular incisors. Type 1 Vertucci configuration was the most prevalent one, which was in accordance with previous studies [7,9]. However, they reported that type 5 canal configuration was the least prevalent one, while type 4 was the least prevalent one in our study.

Conclusions

In our study, 81.37% of teeth had a single canal and 28.43% of teeth had two canals. Type 1 Vertucci configuration was the most prevalent one, and type 4 was the least prevalent. We found CBCT imaging to be an excellent method for detection of different canal configurations of mandibular incisors.

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