Brief communication

**Description of the root canal system of mandibular first premolars in a colombian population**

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The success of endodontic treatments depends largely on the knowledge of the morphology of the root canal system, allowing accurate location, for proper cleaning and disinfection for the subsequent three-dimensional obturation [1].

Various studies have indicated that mandibular first premolars have a single canal with different anatomical variations [2]. There have been several methods for studying anatomy of root canal, such as sectioning, conventional radiography, radiovisiography, diaphanization, computerized axial tomography and micro-computed tomography (CT). Although micro-CT may offer a simple and reproducible technique showing the finest details, we used the method of diaphanization [3], a reliable technique that is easy to perform.

The purpose of the present study was to examine the root canal system of the mandibular first premolar in a group of Colombians according to Vertucci’s classification [4].

1. Materials and methods

A descriptive anatomical study was performed using 401 healthy human mandibular first premolars of young patients. The teeth used in this study were extracted due to orthodontic reasons. All patients gave their consent to participate in this study. This study was approved by the ethics committee from the University of Santo Tomás, Bogotá, Colombia.

To verify the patency of the canal, we used K-file # 10. Then, the teeth were immersed in sodium hypochlorite 5.25% for 24 h to remove the pulp tissue.

The diaphanization began with decalcification, at room temperature using 5% nitric acid for 4 h. After washing with water, the samples were dehydrated with increasing concentrations of ethanol. The teeth were completely dried with hot air and cleared with methyl salicylate 99.9% for 30 min.

The pre-cleared specimens were then injected with Chinese ink using syringe irrigation with a 27-gauge needle from the pulp chamber, while negative suction was applied to the apical foramen. The canal system was analyzed by a trained operator using an operating binocular microscope with 10X magnification, recording the canal system configuration according to the classification of Vertucci as shown in Fig. 1, and anatomical variations of the root canal system [5] (Fig. 2). No images were captured and no software was used.

2. Results and discussion

Different reports showed that the first premolar has a complex root canal system with multiple anatomical variations, which may be influenced by characteristics such as age, gender, and race. In
the present study, 401 teeth were examined with diaphanization that allowed us to observe the configuration of complex root canal systems in a tridimensional form. To classify the configuration of the root canal system of the mandibular first premolar, we selected the classification of Vertucci [4].

The results demonstrated that the most frequent anatomical configuration was the Type I (269 teeth; 67.08% of 401 teeth). This highest frequency of Type I in the Colombian population is similar to those (72% and 70%) in an Indian population [1] and a Caucasian population [4], respectively. Type V was found in 84 teeth (21.11%). The second frequency of Type V is consistent with the results reported in a Caucasian population (24%). Type IV was found in 17 teeth (4.27%), which is different from other reports, 1.5% by Vertucci and 10% by Velmurugan.

Type III was found in 3.77%, which is similar to that reported by Vertucci (4%) and Velmurugan (3%). Type VII was only 1.51%, and Vertucci and Velmurugan did not report this Type. Type VIII was present in 5 teeth (1.26%). This is similar with those reported by Vertucci (0.5%), Type VI was found in 4 teeth (1.01%). We found only 1 tooth (0.25%) as Type II.

Regarding the anatomical variations, we found that 152 teeth had some anatomic variations. The most frequent was the collateral canals in 106 teeth (69.74%), followed by the apical delta in 34 teeth (22.32%), recurrent canal in 23 teeth (15.13%), intercanal in 23 teeth (15.13%), and less frequently the secondary canal in 13 teeth (8.35%), lateral canal in 11 teeth (7.24%), and reticular canal in 2 teeth (1.32%). Only one tooth showed accessory canal (0.66%), which is consistent with those reported by other authors [1,4].

Bifurcations were observed in 137 tooth cases, which can be divided into the middle third (88 teeth), apical third (35 teeth), and cervical third (14 teeth).

The knowledge that the first premolar in the Colombian population presents many anatomical variations was documented in this study. It compared the results of other studies, which allowed us to conclude and confirm that the mixture of phenotypes led to multiple anatomical variations. In this milieu, the varied anatomy and morphology in mandibular first premolar implies cleaning and shaping will be difficult. The clinician should consider this tooth group as complex and make use of microscopy, the radiography angle, opening, canal location, biomechanical preparations, and sealants.

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