

Morphological Characterization of Root Canals in Permanent Teeth of a Colombian Sub-Population: An In Vivo Study with Cone Beam Computed Tomography.

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What are the main characteristics and morphological variations found in the root canal system of permanent teeth of a Colombian population evaluated by CBCT?

Introduction

Detailed understanding of the anatomy of the root canal system and its variations is crucial for success in endodontic therapy, as it prevents complications and ensures effective treatments. Factors such as the number, shape and length of the root canals determine the cleaning, shaping, irrigation and sealing protocols, which are essential to reduce the microbiological load. However, the high anatomical variability of the ducts makes complete disinfection difficult, and in Colombia professionals must rely on studies from other countries, which do not always reflect the specific characteristics of the Colombian population.

Methodology

An evaluation of 400 3D models designed from cone beam tomography of the upper first and second molars, lower first premolars and lower second molars was carried out, analyzing the number of roots, number of canals, Vertucci classification, root curvature and anatomical variations.

Results

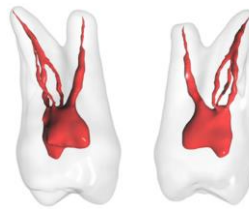
First maxilar molar



The maxillary molar presented a predominance of three roots in 98%. Regarding its root canal system, the presence of four canals predominated in 73%. In the number of canals for each root, in the mesial root there were two canals in 43%, distal root a single canal in 94%, palatine root a single canal with 94%. The most relevant anatomical variations were the 18% fused roots. The most relevant vertucci classification for each root was, mesial TYPE II in 43% followed by TYPE IV in 30%, distal root TYPE I in 94% and in the palatine root TYPE I in 94%. Regarding the level of curvature, a moderate classification was presented in the mesial root at 43%, in the distal root a moderate classification with 42% and in the palatine root a low classification with 67%.

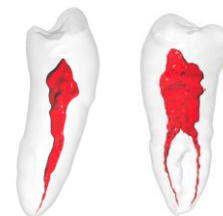
Results

Second maxilar molar



A prevalence of three roots was evident in 69%, two roots in 26% and a single root in 5%. The number of root canals present for the mesial root was one root canal in 68% and two root canals in 32%. In anatomical variations, 23% of teeth were found to have no distal root canals and 75% of teeth had a single root canal, and 96% of the palatine root had a single root canal. Vertucci's classification by root, the mesial root presented, 68% for the TYPE I, The Vertucci TYPE I was the most found in the case of the distal root at 75%. Regarding the palatine root, a lower variation in the Vertucci classification was observed, presenting 93% for the TYPE I.

First mandibular premolar



A predominance of premolars (97%) exhibited a single root, followed by 64% of premolars with a single root canal. Anatomical variations such as a 'C-shaped' canal were found in 7% of the samples, predominating in the middle third with Predominance of Vertucci Type I classification and Prevalence of bifurcations in 33% of the sample at an average of 6.6 mm from the ACU to the bifurcation.

Second Mandibular Molar



In the second mandibular molar, two roots were predominant (91%). Three root canals were present in 66% of cases, and the "C-shaped" canal was the most common anatomical variation at 29%, followed by fused C-shaped canals at 10%. Double-curved canals were also observed in 10% of cases. For the mesial root, C1 was the most common classification in the cervical and middle thirds (74% and 43%, respectively), while C4 predominated in the apical third (67%). Additionally, extra roots (RADIX) were found in 11% of cases, with 6% being RADIX PARAMOLARIS and 5% RADIX ENTOMOLARIS.

Conclusions

- *These findings demonstrate a significant anatomical diversity in the studied population, which differs in certain aspects from international descriptions.
- *Detailed knowledge of these variations is essential for successful endodontic treatment.