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ABSTRACT

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CASE REPORT

The micro-computed tomographic images represent unusual root canal anatomy in a maxillary second molar with two palatal roots and two buccal roots in a 53-year-old female (Figure 1A–F). The patient had no history of systemic disease; the maxillary second molar was extracted because of periodontal disease. Scanning was performed with an X-ray micro-computed tomography (micro-CT) system (SMX-90; Shimadzu, Kyoto, Japan). The tooth was imaged to reconstruct its structure.

The common root anatomy of maxillary second molars has been described as three roots with three canals [1]. However, the number of root canals and roots among teeth can vary. The prevalence of maxillary second molars with two palatal roots was only 0.4% in a radiographical survey of 1,200 teeth [2]. Although the incidence of maxillary molars with four roots is extremely low, this possibility should be taken into consideration during treatment.

DISCUSSION

Radiographs are one of the most important tools for detecting anatomical variations in clinical dentistry [3].

However, radiographs produce only two-dimensional images of a three-dimensional object, resulting in superposition of structures. Radiographic interpretation was confusing in this case because of the overlap of the buccal and secondary palatal roots, indicated by a white arrow in Figure 1D. Superposition of anatomical structures on X-ray images could result in failure to diagnose a distal palatal root canal, which, if left untreated, could result in failure of root canal treatment.

In recent years, significant noninvasive technological advances in dental imaging have been introduced, including digital radiography, densitometry, magnetic resonance imaging, ultrasound, and computed tomography [4]. In particular, micro-CT scan has been used to evaluate root canal anatomy because of its high resolution and non-destructive nature. The development of micro-CT scan is increasingly important in endodontic research because it offers a reproducible technique that can be applied quantitatively as well as qualitatively for the 3D assessment of the root canal system.

Figure 1: Three-dimensional reconstruction of a four-rooted maxillary second molar (A) Occlusal view, (B) Apical view, (C) Distal view, (D) Palatal view, (E) The external and internal structure, (F) Root canal morphology showing mesiobuccal (MB), mesiopalatal (MP), distobuccal (DB), and distopalatal (DP) roots.

Toshiko Inoue¹, Makoto Saito¹, Fumio Nishimura¹, Takashi Miyazaki¹

Affiliations: ¹DDS, PhD, Division of Biomaterials and Engineering, Department of Conservative Dentistry, Showa University School of Dentistry, Shinagawa-ku, Tokyo, Japan.

Corresponding Author: Toshiko Inoue, Division of Biomaterials and Engineering, Department of Conservative Dentistry, Showa University School of Dentistry, 1-5-8 Hatanodai, Shinagawa-ku, Tokyo 142-8555, Japan; Email: inoue@dent.showa-u.ac.jp

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The existence of extra roots in maxillary molars has clinical implications in endodontic treatment [5]. Its posterior location and the radiographic superimposition of anatomic structures are two important reasons for failure to diagnose a second palatal root canal [6]. Endodontic treatment can fail because of the presence of microorganisms remaining after insufficient canal obturation or the presence of untreated canals [7]. The main goal of endodontic therapy is to obtain 3D obturation of the root canal system after a sequence of cleaning, shaping, and filling procedures [8].

CONCLUSION

A thorough knowledge of root and root canal morphology and accurate anticipation of a tooth's possible morphological variations are essential for reducing endodontic failure caused by incomplete root canal preparation and obturation. Variations in the root and root canal morphology are a constant challenge for dentists. Dentists need to be familiar with the variations in root canal configurations for successful endodontic therapy. Micro-Computed tomography scan could be a useful tool for assessing root canal system anatomy in experimental endodontic studies.

Keywords: Micro-computed tomography, Molar, Root, Teeth

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The corresponding author is the guarantor of submission.

Conflict of Interest

Authors declare no conflict of interest.

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