Case study

A rare case of three single rooted permanent second molars: A diagnosis with cone beam computed tomography (CBCT)

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ABSTRACT

The aim of this article is to present a case with an unusual morphology of maxillary second molars on both sides and a mandibular second molar on right side in the same patient which was observed during routine endodontic procedure. Three second permanent molars had single root, single canal and an accurate assessment of this unusual morphology was made with the help of radiographs and cone beam computed tomography (CBCT). This report extends the range of known possible anatomical variations to include teeth with lesser number of roots and canals.

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1. Introduction

The success of root canal treatment is predictably high, as long as the basic principles of endodontic treatment are followed. A thorough knowledge of root canal morphology and accomplishment of all treatment steps, especially the complete removal of bacteria and their by-products from the root canal system is of utmost importance.¹ One of the major causes of endodontic treatment failures has been attributed to a lack of understanding as well as underestimation of the root canal morphology.² Routine periapical radiographs helps us to assess the number, length, curvature and aberration of the canal system of the tooth.

The drawbacks of radiographic techniques are that they only provide 2-dimensional image of a 3-dimensional object. Other sophisticated techniques such as micro tomography, computerized tomography scan, etc. are not practical for a clinical setup. Slowey emphasized that root canal morphology is limitless in its variability and clinicians must be aware that anatomic variations constitute a formidable challenge to endodontic success.³ Maxillary second molar is similar to maxillary first molar and mandibular second molar is similar to mandibular first molar but are smaller in all parameters. Maxillary second molars usually have three roots and three canals of which two are buccal and one palatal corresponding to their roots while mandibular second molar have two roots (one mesial and one distal) and three canals (one distal and two mesial i.e. mesiobuccal and mesiolingual).⁴

Cases of maxillary second molars with two, four, five and even one root with variations in the number of canals has also been reported.⁴ The majority of studies are related to the maxillary first molars but variations of maxillary second molars are rare. Here is a case report that is rare, showing the presence of single root and single root canal in the maxillary second molars bilaterally and also in right mandibular second molar which is diagnosed by routine radiographs and CBCT.

2. Case report

A 17 year-old female patient visited to the Department of Paedodontics and Preventive Dentistry with a chief complain of pain in upper right back region of jaw since 2–3 months. Intraoral examination revealed amalgam restoration on occlusal surface and deep caries on the proximal surface of maxillary right second molar (17).

The tooth was tender on percussion. IOPA X-ray of 17 was advised and revealed radio-opacity on occlusal surface, radiolucency showing carious lesion on the mesial side of the tooth involving pulp and a single root which is an unusual finding (Fig. 1). Root canal treatment was planned in 17. Local anaesthesia was administered and access cavity was prepared under rubber dam isolation (Fig. 2a and b). Only a single orifice was located on the floor of the pulp chamber indicating single root canal, working length was determined by IOPA X-ray using SLOB technique thereby, interpreting a single root canal.

Further CBCT of maxilla was done to confirm single root and single canal i.r.t 17 and to rule out any other unusual morphological variation. The report confirmed that maxillary right second molar

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Fig. 1. IOPA X-ray showing preoperative image of 17.

(17) has single root and root canal (Fig. 3). Another finding was also noticed in maxillary left second molar (27) i.e. single root and root canal (Fig. 3). On observing the coronal (Figs. 3 and 4a and b), axial (Fig. 5) and sagittal sections (Fig. 6a and b) of CBCT images of maxillary teeth we concluded that both sides of maxillary second molars have single root and single root canal.

Cleaning and shaping of 17 was completed and obturation was done (Fig. 7). Patient was recalled after a week and PFM crown was fixed. An OPG (Orthopantomogram) was done to observe the full complement of teeth and to rule out any other aberrations present. OPG revealed another finding of a single root in right mandibular second permanent molar i.e. 47 (Fig. 8). Thus in all there was a presence of three (3) second permanent molars having single roots with single canal i.e. bilaterally in maxillary permanent second molars and unilaterally right mandibular permanent second molar. But CBCT of mandible was not advised keeping in mind the economic conditions of the patient.

Fig. 2. (a and b) Rubber dam isolation and access cavity preparation showing a single canal orifice.

Fig. 3. Showing coronal section of maxilla with single root and single canal in 17 and 27.

Fig. 4. (a) Maxillary right second molar is divided into 10 cross sections of thickness 0.60 mm revealing single root single canal. (b) Maxillary left second molar is divided into 10 cross section of thickness 0.60 mm revealing single root single canal.

Fig. 5. Axial section of maxilla showing single orifice i.r.t. 17 and 27.

3. Discussion

Dental anomalies are formative defects and may occur during any of the developmental stages of the tooth, which are manifested clinically in later life once the tooth is fully formed.⁵ Morphologic dental anomalies may involve a single tooth, a group of teeth, or the entire dentition.⁵ Failure to recognize variations in root or root canal anatomy can result in unsuccessful endodontic treatment. The maxillary and mandibular second molars have variants in its canal configurations. Permanent maxillary and mandibular second molars with a single root and root canal have been reported with variations,

most commonly in mandibular molars.¹ Manning et al. (1990) reported a high frequency of single rooted mandibular second molars in Asians. Going a step further, C mili et al. (2005) using spiral computed tomographic imaging, documented the prevalence of C-shaped canals in single rooted mandibular molars as 8% in Asian population.²

The present case had three second permanent molars having single root and single root canal, the diagnosis of which was confirmed by CBCT. Moreover, it corresponded to type 1 Vertucci's classification of root canal morphology. The Vertucci's classification⁷ (1984) is as follows:

- **Type I:** Single canal extends from the pulp chamber to the apex (1–1).
- **Type II:** Two separate canals leave the pulp chamber and join short of the apex to form one canal (2–1).
- **Type III:** One canal leaves the pulp chamber and divides into two in the root; the two then merge to exit as one canal (1–2–1).
- **Type IV:** Two separate distinct canals extend from the pulp chamber to the apex (2–2).
- **Type V:** One canal leaves the pulp chamber and divides short of the apex into two separate distinct canals with separate apical foramina (1–2).
- **Type VI:** Two separate canals leave the pulp chamber, merge in the body of the root, and redivide short of the apex to exit as two distinct canals (2–1–2).
- **Type VII:** One canal leaves the pulp chamber, divides and then rejoins in the body of the root, and finally redivides into two distinct canals short of the apex (1–2–1–2).
- **Type VIII:** Three separate distinct canals extend from the pulp chamber to the apex (3–3).

Conventional IOPA X-rays are an important diagnostic tool in endodontics for assessing the root morphology and canal

Fig. 6. (a) Sagittal section of right side of maxilla showing single root with single canal i.r.t. 17. (b) Sagittal section of left side of maxilla showing single root with single canal i.r.t. 27.

Fig. 7. Obturation of 17.

Fig. 8. OPG image after obturation and PFM i.r.t. 17 showing single root in right and left maxillary second molars and right mandibular second molar.

secondly, a newer diagnostic aid CBCT has emerged as a powerful tool for evaluation of root canal morphology.

Our case partially corresponds with Fava et al.,⁵ since he has encountered four second molars of both upper and lower jaws with single root and single canal, compared to our case study where this feature was found only on bilateral maxillary second molars and only one mandibular second molar (right side). Although the incidence of single root and single canal in second permanent molars is not high, for this reason, it is important to consider these variations during root canal treatment of second permanent molars in order to ensure success.⁴

4. Conclusion

- To prevent and minimize the endodontic failures, the clinician should be aware of all the anatomical variants and aberrant canal configurations.
- CBCT a new diagnostic aid can be used as an adjunct to traditional radiographs for the assessment of morphology and root anatomy of molars.

Conflict of interest

The authors have none to declare.

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configuration. Newer diagnostic methods such as CT (computed tomography), SCT (spiral computed tomography)⁶ and CBCT overcome the disadvantages of radiographs by producing a three dimensional image.^{8,9} CBCT is a relatively new method to visualize an individual tooth or dentition in relation to surrounding skeletal tissues in a three-dimensional image (Cotton et al., 2007; Patel, 2009) that offers the possibility to view an individual tooth in different views and at various cross sections.¹⁰

During the discussion of this presentation, there are two important aspects to be considered. Firstly, there is the presence of an unusual morphology in the bilateral maxillary second molars and unilaterally in the right mandibular second molar and