Root canal treatment of three rooted maxillary second premolar using cone beam computed tomography for diagnosis a case report

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Abstract

To report a case of identification and clinical management of maxillary second premolar having anatomical variations using cone-beam computed tomography (CBCT). It is very uncommon to see three canals and three separate roots in the second premolar even though it has variable root canal morphology. This article describes the diagnosis and clinical treatment of the second premolar with three canals and three separate roots, using CBCT. Clinicians should have the knowledge of anatomical variations in maxillary premolars and should be able to apply the knowledge in clinical and radiographic interpretation. Usage of CBCT should be considered by clinicians as an additional tool for confirmation of the complicated root canal anatomy.

Keywords: Anatomical variations, cone beam computed tomography, maxillary premolars, root anatomy

Introduction

The success in endodontic treatment currently is rated to be as high as 95%. Endodontic success is dependent mainly on three important things, the root canal system must be debrided, disinfected, and obturated.¹ And hence clinicians should understand the complexity of the root canal system and its possible variations in order to achieve a satisfactory outcome.² False assumptions about root and canal configuration may lead to incomplete debridement and obturation with eventual endodontic failure.³

In the maxillary second premolar, the incidence of three roots is 0.3-2%.⁴,⁵ As per the studies conducted, genetic factors influence the presence or absence of the third root canal. The three rooted premolars are very common in Caucasians.⁶

Case Reports

Root canal treatment

A middle-aged man with the chief complaint of pain in the upper left posterior region for a week was examined in our institute. On examination, a deep carious lesion was present on maxillary left second premolar and maxillary first molar. And it was diagnosed as irreversible pulpitis by electric pulp vitality test.

Preoperative radiograph of tooth #25, #26 revealed pulpal involvement. Root canal treatment was proposed for the both teeth, and the patient consented to it. Root canal treatment was completed with #26 and recalled for root canal of #25 [Figure 1]. Isolation was achieved by rubber dam application, and specific region was anaesthetized by 1% lignocaine with 1:100,000 epinephrine. Access cavity preparation was done using Endo access kit (Dentsply, Switzerland). Triangular form of the access cavity was dictated by the removal of the roof of the pulp chamber. Keen internal examination revealed the presence of three main root canal openings: Distobuccal (DB), mesiobuccal (MB), and palatal (P). Higher magnification of x3.5 and DG 16 endodontic explorer aided in determining the additional canals [Figure 2].

Mostly cervical dentine covers the buccal canals in three-rooted premolars and lies very close to each other. Thus Endo Access (BurDentsply Maillefer, Ballaigues, Switzerland) was used to modify the access opening in tooth 25, in order to make...
a triangular shape cavity with base at the buccal canals and canals were explored with sizes 8 and 10 k-files.

No conclusive diagnosis could be made using the conventional radiographs. Cone beam computed tomography (CBCT) of tooth #25 was performed to determine whether the orifices located were additional canals and morphology of the variations.

A closed dressing was given using IRM (Caulk, Dentsply, USA). With the exposure parameters of 120 kV and 5.0 mA a CBCT scan (Next Generation i-CAT, Imaging Sciences International, Hatfield, PA, USA) of the maxillary region was performed. The reconstruction was done using images of 0.2 mm thickness increments. CBCT images of tooth 25 confirmed the presence of three canals: One MB canal, one DB canal, and one palatal canal [Figure 3].

On the subsequent visit of the patient, additional canal were located, and the glide path was checked with K-flex #10 file. Apex locator (Root ZX, J Morita Mfg. Corp., Japan) was used to determine working length and confirmed by radiographs [Figure 4].

Gates-Glidden drills (numbers 1 and 2; Dentsply, Maillefer, Switzerland) were used for coronal flaring, and root canals were shaped and cleaned using wave one (Dentsply, Maillefer, Switzerland). 2.5% NaOCl was used for irrigation of the canals. Calcium hydroxide, (Meta Biomed Co. Ltd., Korea) intra canal medicament was placed in the canal and closed dressing with IRM, was placed, and the patient was asked to come after a week’s time. Patient became asymptomatic after 1 week, and the canals were obturated using the gutta-percha (Dentsply, Maillefer, Switzerland) and AH Plus resin as a sealer (Dentsply, Germany). Cold lateral compaction technique was used [Figure 5].

Resin composite was used to permanently restore access cavity.

**Conclusion**

Clinicians should have the knowledge of anatomical variations in maxillary premolars and should be able to apply the knowledge in clinical and radiographic interpretation. Usage of CBCT should be considered by clinicians as an additional tool for confirmation of the complicated root canal anatomy.

**Discussion**

Root canal treatment has shown that the pulp cavity is highly variable, making each treatment unique. In the treatment of three-rooted maxillary second premolars, the buccal orifices are close to each other and can be hard to locate. The cut at the buccal-proximo angle from entrance of the buccal canals to cavosurface angle[7] creates a helpful, T-shaped access outline. Correctly reaching all of the root canals, cleaning and shaping, followed by a hermetic filling, are necessary for successful root canal treatment. The anatomic configurations of maxillary
second premolars are documented except for the small incidence of maxillary premolars with three canals and three roots. Whenever there is an indication of the different anatomy, additional investigations like CBCT should be carried out. This should be followed by detailed examination of the radiographs.

Along with visualization and probing of the pulp chamber floor, preoperative radiographs can be used to confirm the presence of additional root canals. Indicators of likely aberrant anatomy are unusual location or size of canal openings, indistinct X-ray images and modified coronal access. Clinical investigations suspected further existence of extra canals. And, therefore, CBCT of tooth #25 was, therefore, performed to confirm the exact root and canal morphology.

The usage CBCT has facilitated three-dimensional imaging and visualization of complex anatomy and/or additional root canals that could be missed on routine radiographs.⁸⁻¹⁰

References

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