

Case Report:

Maxillary second molar with two palatal canals diagnosed with cone beam computed tomography: a case report

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Abstract

A thorough knowledge of basic root canal anatomy and its variation is necessary for successful completion of endodontic treatment. Aberrations in root canal anatomy are common. An awareness and understanding of the unusual root canal morphology is essential as it determines the successful outcome of endodontic treatment. Cleaning, shaping and obturation of the entire root canal system “three dimensionally” is important and essential for successful endodontic therapy. This report points to the importance of looking for additional roots and canals because knowledge of their existence would enable clinician to treat a case successfully that otherwise might end in failure. This case report presents the endodontic management of a maxillary second molar with two palatal canals. The clinical detection of the canals was made using a surgical operating microscope and confirmed using cone-beam computed tomography (CBCT) scanning. Surgical operating microscope has heralded a new era in endodontics. Magnification helps to locate extra canals or missed canals. Cone beam computed tomography (CBCT) is a relatively new method to visualize an individual tooth or dentition and surrounding skeletal tissues. It creates three-dimensional images of the area to be examined.

Keywords : Cone beam computed tomography, maxillary second molar, two palatal root canals

Introduction

The complexity of the root canal system of maxillary molars presents a constant challenge which requires the endodontist to have a thorough knowledge of the root canal morphology. The root canal anatomy of maxillary second molars has been described as three roots with three canals, and the commonest variation is the presence of a second mesiobuccal canal. (1, 2). The purpose of the present clinical report is to describe the unusual root canal anatomy of maxillary second molar with 2 palatal canals merging to one at apical 3 mm confirmed with CBCT and the endodontic treatment procedures for the same tooth. The incidence of two root canals in the palatal root of maxillary molars has been reported to be 2% to 5.1% (3). CBCT is a 3 dimensional imaging method

that offers the possibility to view an individual tooth or teeth in 3 dimensionally, rather than predetermined ‘default’ views of 2D radiography. Help us to obturate teeth 3 dimensionally. Therefore, CBCT can be a powerful tool in endodontic diagnosis, treatment planning and follow up.

Case Report

A 41-year-old female patient with non-contributory medical history was presented to the Department of Conservative Dentistry and Endodontics, Govt. Dental College and Hospital, with the chief complaint of spontaneous toothache in her right posterior teeth since 5 days. The pain was intensified by thermal stimuli and on mastication. History revealed intermittent pain in the maxillary right second molar with hot and cold stimuli for the

past 2 month. A clinical examination revealed a carious maxillary right second molar (tooth #2), which was tender to percussion. Palpation of the buccal and palatal aspect of the tooth did not reveal any tenderness. The tooth was not mobile and periodontal probing around the tooth was within physiological limits. On examination there was absence of swelling and sinus. Vitality testing of the involved tooth with heated gutta-percha (Dentsply Maillefer, Ballaigues, Switzerland) and ice sticks caused an intense lingering pain, whereas electronic pulp stimulation (Parkel Electronics Division, Farmingdale, NY) caused a delayed response as compared to adjacent and contralateral teeth. A preoperative radiograph revealed mesio-occlusal radiolucency, approaching the pulp space with periodontal ligament space widening in relation to the mesiobuccal root (Fig. 1).



Figure 1

From the clinical and radiographic findings, a diagnosis of symptomatic irreversible pulpitis with symptomatic apical periodontitis was made and endodontic treatment was suggested to the patient. Radiographic evaluation of the involved tooth did not indicate any variation in the canal anatomy. The tooth was anesthetized with 1.8 mL (30 mg) 2% lignocaine containing 1:200,000 epinephrine (Ligno-Ad; Anhil Parenteral Pvt. Ltd, Patan, India.) followed by rubber dam isolation. An endodontic

access cavity was established. Clinical examination with a DG-16 endodontic explorer (Hu-Friedy, Chicago, IL) revealed two canal openings in palatal root.

During examination with a surgical operating microscope (Microteknik, Ambala, India), a fourth canal was located midway between the mesiobuccal and palatal orifices. Coronal enlargement was done with a nickel-titanium ProTaper series orificeshaper (Dentsply Maillefer, Ballaigues, Switzerland) to improve the straight-line access. The working length was determined with the help of an apex locator (Root ZX II; Morita, Tokyo, Japan) and confirmed with radiograph. Second palatal canal appeared to be merging with first canal in the working length radiograph (Fig. 2).

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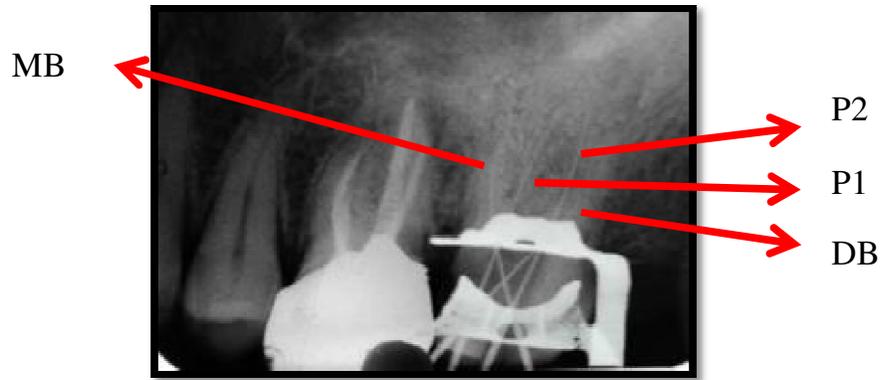


Figure 2

To confirm this unusual morphology, it was decided to perform CBCT imaging of the tooth. Access cavity was sealed with IRM cement (Dentsply De Trey GmbH, Konstanz, Germany). An informed consent was obtained from the patient, and a CBCT scan of the right side of maxilla was performed (Carestream CS9300, Snaap Imaging center, Ahmedabad, Gujarat) with a tube

voltage of 85 KV and a tube current of 10 mA. The involved tooth was focused, and the morphology was obtained in transverse, axial, and sagittal sections of 0.09-mm thickness. CBCT scan axial slices revealed five canals (two mesiobuccal, two palatal, and one distobuccal) in the right maxillary second molar (Fig. 3).

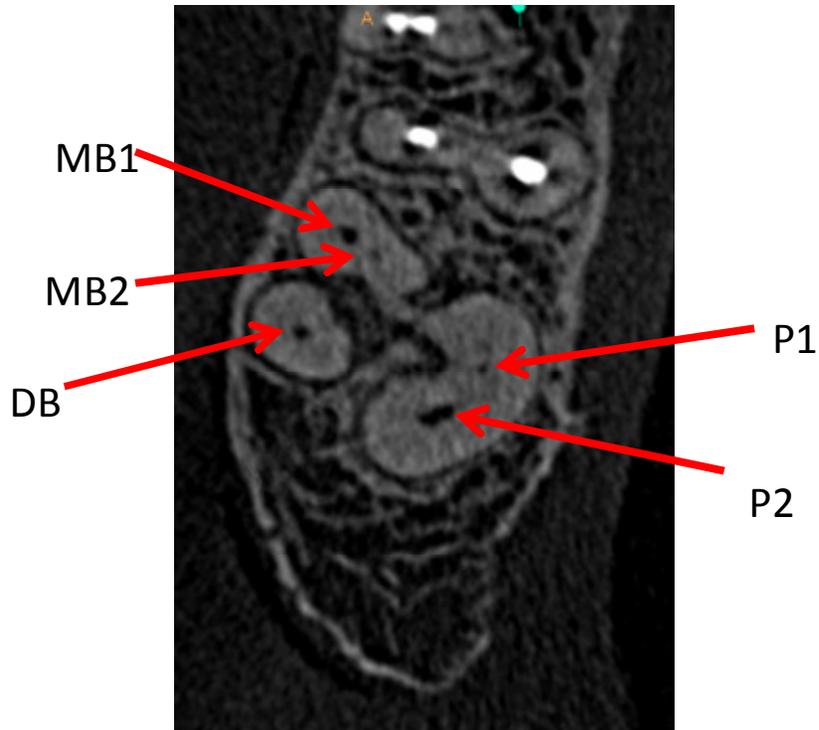


Figure 3

CBCT axial images showed that palatal root canals have Vertucci type II canal pattern. Two palatal canals were merging 3 mm above the apical foramen with C shaped configuration of root canal seen in axial slice of CBCT scan (Fig. 4).

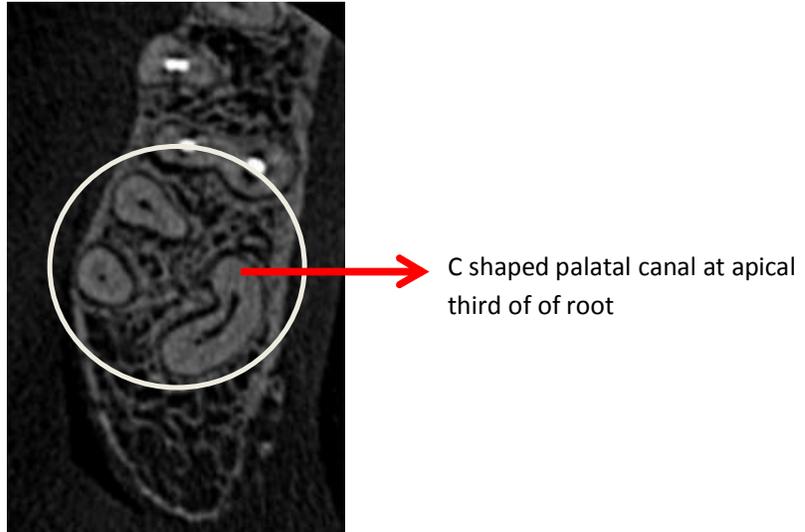


Figure 4

whereas the mesiobuccal root showed type III canal configuration with second mesiobuccal canal originating 1.5 mm below the first mesiobuccal canal and merging with the same at 4 mm above the apex of main mesiobuccal canal. CBCT images provided valuable information regarding the canal configuration and confirmed the five canals that were not clearly seen in the conventional radiograph. At the second appointment, the patient was asymptomatic. After administering 1.8 mL (36 mg) 2% lignocaine with 1:200,000 epinephrine (Xylocaine), cleaning and shaping was performed under rubber dam isolation using ProTaper nickel-

titanium rotary instruments (Dentsply Maillefer) with a crown down technique. Irrigation was performed using normal saline, 2.5% sodium hypochlorite solution to dissolve organic debris, and 17% EDTA was used as first and last irrigant to dissolve inorganic substances and remove smear layer; 2% chlorhexidine digluconate was used as the final irrigant. The canals were dried with absorbent points (Dentsply Maillefer), and obturation was performed using ThermoFlo, thermoplastic guttapercha obturation system (Equinox, Holland) and zinc oxide eugenol sealer (Fig. 5).

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Figure 5

The tooth was then restored with a posterior composite resin core (P60; 3M Dental Products, St Paul, MN). The patient was advised a full-coverage porcelain crown and was asymptomatic during the follow-up period of 2 months.

Discussion

Knowledge of the root canal morphology and its variations is essential to achieve success in an endodontic treatment (4). Radiographic examination is an essential component of the management of endodontic problems. The amount of information gained from conventional radiographs and digitally captured periapical radiographs is limited by the fact that the three-dimensional anatomy of the area being radiographed is compressed into a two-dimensional image (5). Use of CBCT scanning in identifying root canal systems and compared it with images obtained by using digital radiography. CBCT images always resulted in the identification of greater number of root canal systems than digital images (6).

The current study showed the presence of two palatal canals, with quite distance between both orifices located at the corner of pulp chamber. With the help of CBCT it was diagnosed that palatal canals are having Vertucci type II canal

configuration and merging 3 mm above the apical foramen giving C shaped canal configuration.

There a semicircular shaped communication between the 2 palatal canals in at apical third. Axial view of CBCT scan shows C shaped canal at apical third (fig. 4). Large access was required to locate the 2 palatal canals. The access cavity on maxillary molars exhibiting 2 palatal canals should be wider than usual on the palatal aspect. a modified trapezoidal access cavity was prepared to locate the 2 palatal canals and allow for their subsequent instrumentation. C configuration creates irregular areas that house soft-tissue remnants or infected debris that may escape regular cleaning and shaping procedures, necessitating supplementary efforts to accomplish a successful root canal treatment (7,8). Profuse irrigation with normal saline, 2.5% sodium hypochlorite solution was done to remove organic matter. 17% EDTA was used to remove inorganic substance and smear layer. EDTA open the dentinal tubule and demineralize the inorganic components of dentin by chelating calcium ions, which reduce the microhardness. 2% chlorhexidine digluconate was used as the final irrigant.

The connecting isthmus is usually a thin area and is susceptible to rupture during canal preparation,

resulting in a strip perforation (7). The CBCT images also provided valuable information regarding the critical remaining dentin thickness in the isthmus area of the palatal root canal system. Use of circumferential filing with profuse irrigation was used to thoroughly debride the narrow canal isthmus in the palatal root. Thermoplasticized gutta-percha by means of the ThermaFlo, system was used to allow for a more complete obturation of the complex root canal system.

Conclusion

A tooth with a straight root and single root canal is an exception rather than being normal. The

variation in root or root canal morphology, especially in multirooted teeth, is challenging for diagnosis and successful endodontic therapy. Knowledge of unknown variation like the case discussed is essential as non treatment of one additional root canal can lead to failure of endodontic treatment. The present report emphasizes the need for the endodontist to be familiar with this type of aberration and usefulness of newer diagnostic aids like CBCT to confirm the diagnosis.

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