

Commonly Uncommon-An Endodontic Challenge in Treating of Aberrant Root Canal Morphology of a Mandibular Second Premolar: A Case Report

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ABSTRACT

Background: Consistently high levels of success in endodontic treatment require an understanding of root canal anatomy and morphology. To achieve endodontic success, the entire root canal system must be three dimensionally cleaned, shaped and obturated. The clinician must have a thorough understanding of normal anatomy and of its variations from the norm. Presence of root curvatures, extra roots and canals should be considered before initiation of root canal treatment for the success of endodontic treatment. Mandibular second premolars are thought of as having a single root and canal. Studies have stated that the prevalence of three canals with three orifices in this tooth is 0.4%. The mandibular second premolar is particularly difficult to treat owing to the fact that a wide variation in the number, location and curvature of the roots and canals exist. Added to this is the fact that the access opening is restricted and location of the lingually placed orifices is difficult. This case report presents nonsurgical endodontic treatment of mandibular second premolar with three canals.

Keywords: Mandibular second Premolar, anatomic variations, mandibular second premolar, root canal treatment, Vertucci's class VIII.

INTRODUCTION

Every tooth may have variations in relation to the size, number, length, and configuration of the roots and the root canals. The main objective of endodontic therapy is thorough cleaning and shaping of all canal spaces and its complete obturation with an inert filling material. A wide morphologic divergence of the canal system has been shown to exist. The varying number of canals in different teeth, their anatomy and anastomoses have been reported and studied by various authors

over the years. Ingle has reported that the most significant cause of endodontic failures was incomplete canal instrumentation followed by inadequate obturation.^[1]

Mandibular premolars with their pulpal space having an unusual anatomical variation at a high rate lead to many difficulties in treating these teeth.^{[2],[3],[4],[5]} Several reports have shown that the incidence of one root canal system in mandibular first premolar varied from 69.3% to 86% and two canals varied from 14% to 25.5%.^{[6],[7],[8],[9]} The

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occurrence of three canals has been reported by Vertucci and Zillich et al. to be 0.5% and 0.4%, respectively.^{[9],[10]} Inability to identify and treat these canal variations would lead to the origin of flare ups during or after root canal treatment or endodontic failure demanding retreatment.

This case report is about the endodontic treatment of mandibular second premolar (45) having a Vertucci's Type VIII canal configuration.

CASE REPORT

A 43 year old male patient with a non contributory medical history was referred to the department of conservative dentistry and endodontics, Bharati Vidyapeeth dental college and hospital, Navi Mumbai, with a chief complaint of pain in lower right back tooth region since 2 weeks. Clinical examination revealed deep occlusal caries in tooth #45. Vitality tests showed positive response to cold and electric pulp test (EPT) and no pain on percussion. Radiographic examination showed normal periodontium and aberrant root canal anatomy. A pulpal diagnosis of Symptomatic irreversible pulpitis and a periradicular diagnosis of Normal Apical Tissues was made. ^[11]



Fig 1: Pre-operative radiograph.

Local anesthesia was administered with 2% lidocaine with 1:100,000 epinephrine and rubber dam isolation was done. Complete caries excavation and access opening was done with #4 round bur(Mani) and modified with Ex-24 bur(Mani). Three different canals orifices were located after access opening. Working length was checked with

#10 k-file radiographically and confirmed with Apex locator (Root ZX, J Morita Inc, USA).



Fig 2: Intraoral Photograph after access opening and locating 3 canal orifices.

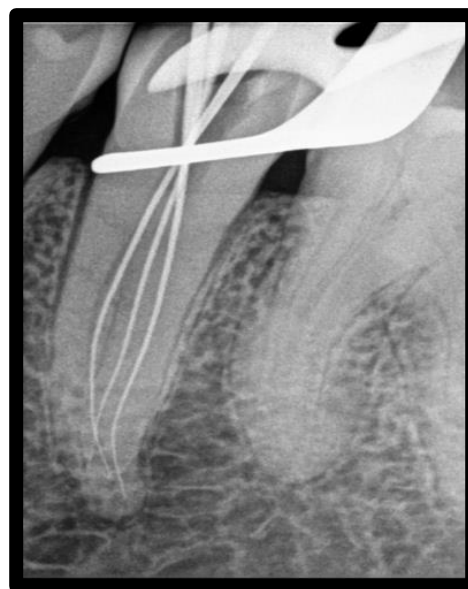


Fig 3: Working Length radiograph.

The canals were cleaned and shaped sequentially till #25 0.04 (Hyflex CM, Coltene). Each canal was irrigated using 5ml of 3% sodium hypochlorite. Before obturation, the canals were irrigated with 1ml of 17% EDTA solution and finally flushed with saline.

The canals were dried with paper points (Dentsply, Maillefer, USA). The canals were obturated with #25 4% gutta-percha cones (Dentsply, Maillefer, USA) using AH Plus sealer (Dentsply, Maillefer, USA) by Cold lateral condensation technique.



Fig 4: Master cone radiograph.

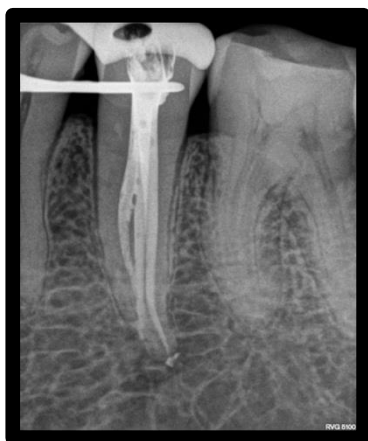


Fig 5: Post-obturation radiograph.



Fig 6: Post operative radiograph

Coronal restoration was done with packable Composite (3M™ ESPE™ Filtek™ Z350 XT) and a final radiograph was taken.

DISCUSSION

Adequate root canal therapy requires locating, cleaning, shaping, and obturating all root canals. Therefore, failure of any of these principles can lead to posttreatment disease, pain, and/or complications of treated tooth. [10] [12]

Mandibular second premolar is one of the most difficult teeth for endodontic treatment due to wide variations in the morphology of its root canal system. [13] Meticulous radiographic evaluation using straight tube angulation and changes in horizontal angulation will help exactly diagnose the number of roots and canals in premolar teeth. A “fast break” of the canal on parallel radiographs might be an indication of the presence of more than one canal. [14] Martinez-Lozano et al [15] reported that a change of 40° in the horizontal x-ray tube angulation can contribute to the identification of an extra canal in mandibular second premolars.

In the present case, before the initiation of the treatment, the tooth was determined to have three different canals on the radiograph with direct tube angulation; however, a change in the horizontal angulation of the x-ray tube revealed three separate roots. Use of magnification with the help of a loupe or a microscope and visual enhancement with the use of fiber optics, use of sodium hypochlorite bubble technique and staining might help locate additional canals. [16]

In this case, a surgical microscope was used to enhance visualization, champagne bubble test and the anatomic map of the pulp chamber floor was used to locate canal orifices. Previous studies have shown the presence of one orifice on the lingual aspect and two orifices on the buccal aspect. [17] In the present case, one canal orifice was on the lingual aspect, one canal orifice was on the buccal aspect, and the third orifice was located mesial and central to the two other orifices.

After working lengths were determined using an apex locator, they were confirmed by radiography to achieve more reliable treatment results. Hyflex CM rotary file system was used in this case because of its higher centering ability and as it caused the least apical transportation. [18],[19],[20] All the three canals were obturated using lateral condensation technique.

Since the prevalence and significance of canal variations is well known, unless otherwise proven, each tooth should be suspected of having additional canals. Every attempt should be made to explore the canal system for atypical variations during endodontic treatment. In this regard, apart from clinical knowledge and skill, the use of good preoperative radiographs (both straight and angled), Radiovisiography (RVG), Magnifying loupes, operating microscopes additional lighting (Fibre optic transillumination) and CBCT would be beneficial. [21], [22]

CONCLUSION

Studies have reported the incidence of multiple canals from 0% to 95% for certain roots. The clinician must have a thorough knowledge of the number, incidence, location and the variability of the canal systems to increase the chances of finding these additional canals. It is imperative for the clinician to be aware of these additional canals as overlooking them will result in failure.

Failure to identify the aberrations in the canal configuration of mandibular premolars can affect the outcome of endodontic treatment. Apart from anatomical knowledge and expertise, a thorough clinical examination and radiographic evaluation along with the use of newer technologies would be useful in the detection and adequate obturation of atypical canal variations.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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