Management of mandibular second premolar with two roots and three canals – A case report

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Abstract

For the success of a root canal treatment, an in-depth knowledge of pulpal anatomy and its variations are essential. Failure to perform thorough debridement and improper obturation will lead to reinfection of the root canal, which will adversely affect the treatment outcome. Mandibular premolars normally have a single canal, but it is considered as an enigma among endodontists due to its aberrant canal anatomy. A 42-year-old male patient reported with pain in lower left back tooth region. Clinical examination revealed composite restored tooth with tender on vertical percussion in relation to 35 and radiograph revealed widening of periodontal ligament space. This case presents the diagnosis and clinical management of a mandibular second premolar with two roots and three canals.

Key words: Mandibular second premolar, three root canals, root canal treatment

Introduction

A successful endodontic treatment depends on the clinicians’ skill to explore, debride and three dimensionally obturate the root canal spaces with an inert filling material. For this, one must have a thorough knowledge of the normal configuration of the pulp chamber and its variations. Ingle has reported that the most significant cause for an endodontic failure is an incomplete canal instrumentation, followed by incorrect canal obturation. Another reason for failure could be untreated root canal system. Factors which contribute to morphological variations of root canal in permanent teeth include ethnic background, age, and gender of population. Mandibular premolars exhibit a high frequency of complex and variable root canal morphology and for this reason they are one of the most complicated tooth to be treated endodontically.4

There are many reports on different patterns in root canal anatomy of premolars. According to Vertucci et al. one root canal at the apex in the mandibular second premolar has an incidence of 97.5 percent and those with two canals is only 2.5 percent of the teeth but three root canal patterns is very rare. Zillich reported 11.7 percent occurrence of two canals and 0.4 percent of three canals and Ingle reported 12 percent chance of second canal and 0.4 percent of a third canal in mandibular second premolar.

Case report

A 42-year-old male patient reported to the department of Conservative dentistry and Endodontics, Kannur Dental College Hospital with the chief complaint of pain in lower left back tooth region. Medical history was non-contributory and clinical examination revealed composite restored left mandibular second premolar tooth (numbered 35). Tooth was tender on vertical percussion. Intra oral periapical radiograph (IOPA) revealed widening
of the apical periodontal ligament space in relation to 35 (Figure 1). Tooth was diagnosed with apical periodontitis. The treatment plan was explained to the patient and after obtaining his consent, the tooth was anaesthetized with two percent lidocaine (Easycainne 2% adrenaline1:200000 Aesmira) solution by inferior alveolar nerve block. Subsequently, tooth was isolated with rubber dam. Endodontic access cavity was prepared with a round abrasive diamond point using a high-speed hand piece. After deroofing, three canal orifices were found at the mid root level i.e., mesiobuccal, disto buccal and lingual canal. Canal patency was confirmed with No 10 K file (Mani). No 15 and 20 hand K files (Mani) were used conventionally. Then Protaper Sx (Dentsply Mailfer) rotary files were used to enlarge the orifices for a straight-line access to all these canals. Irrigation was done using 5.25 percent sodium hypochlorite (NaOCl) (VIP). Working length was established using apex locator (J. Morita Root Zx mini) and confirmed with radiovisiograph (RVG) using 20 K files (Mani) (Figure 2). Cleaning and shaping of all canals were done using rotary Protaper files (Dentsply Mailfer). Master apical file F2 was selected and irrigation was done using 5.25 percent NaOCl. Canals were then dried with sterilized paper points (Diadent) and calcium hydroxide dressing was given in the canals and the access was closed with Cavit. Patient was recalled after one week.

On recall visit temporary restoration was removed and irrigation was done using saline and 5.25 percent NaOCl. Canals were dried with paper points. An apical tug back was achieved with protaper F2 gutta-percha points and selected as master cone. RVG was taken for confirming the master cone length (Figure 3). Canals were coated with Endomethasone N sealer (septodont), and obturation done with cold lateral compaction technique. After obturation access cavity was sealed with intermediate restorative material (IRM) and radiographs were taken (Figure 4).

**Discussion**

Mandibular second premolars may present with greatest difficulty for endodontic treatment due to its variations in the internal morphology, extra root canals, lateral canals, and apical delta. According to the Washington study, the rate of failures in endodontic therapy of mandibular second premolars is 4.54 percent. This is due to the tremendous variations in morphology of root canal. For better diagnosis and proper management of extra root canals in mandibular second premolars, clinicians should have good clinical skills and a thorough knowledge of the internal anatomy of the root canal system. Careful clinical examination and high quality pre-operative
radiographs provide important information about root canal morphology.\textsuperscript{10} Gulabivala reported that multiple canals and intracanal ramifications are much more expected to occur in broad and flat roots.\textsuperscript{11,12} Horizontal angulations of 15 to 20 degrees from mesial or distal are mandatory to diagnose the variations in premolar teeth. Martinez-Lozano et al. recommended a horizontal angulation of 40 degree to identify the additional canals.\textsuperscript{13} Yoshioka et al. have shown that interpreting a sudden narrowing or disappearance of a canal system on a parallel radiograph suggests sign of division in canal.\textsuperscript{14} On radiograph, if the working length file appears off center, chances of an additional canal exist. Imprecise definition of root canal anatomy on multiple radiographs possibly indicates a second root or even a third.\textsuperscript{15}

Use of magnification has improved the clinician’s ability to visualize and access the canals. 3D imaging such as Cone Beam Computed Tomography (CBCT) and tuned aperture computed tomography would be very beneficial for evaluation of rare root canal morphology, as this enhance visualization of the area of interest. Its routine use is limited due to high cost, accessibility and extra radiation as compared to standard radiographic methods.\textsuperscript{16}

In the present case, the radiographic features suggested the possibility of 3 canals. When the buccolingual relationship of the pulp chamber does not appear to be aligned, there are chances of existence of a third canal clinically. Furthermore, there is probability of more than one canal if the pulp chamber deviates from normal anatomy to either triangular or overly large in mesio-distal direction.\textsuperscript{17, 18, 19}

For more reliable working length determination, we used apex locator in combination with radiographs. We accomplished obturation of all three canals contemporaneously with lateral compaction technique for better result.

**Conclusion**

Thorough knowledge of normal anatomy and variation of root canal morphology is of utmost important for the successful endodontic treatment. Careful clinical examination and interpretation of the radiographs taken from different angulations are necessary to detect the additional roots and root canals. Chances for endodontic failures are high if clinician missed to identify the additional root canals.

This case report enhances the need for increased awareness of clinician on variations in root canal morphology of mandibular second premolar for a successful treatment outcome.

**References**


