

Management of Mandibular Second Premolar with Three Canals: Case Reports

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Abstract

The long-term success of endodontic treatment. Mandibular premolars exhibit a greater variation in their internal morphology due to the occurrence of additional roots and root canals. A review of the literature reveals that the presence of third canal in all types of premolars has very low incidence of 0.5%. Diagnostic means such as pre-operative radiographs and examination of the pulp chamber floor aid the location of root canal orifices. The diagnostic and therapeutic problems concerning premolars with unusual anatomy are described on the basis of a clinical example. This case report describes the successful treatment of mandibular second premolar with three root canals.

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I. Introduction

Root canal treatment requires a thorough knowledge and understanding of root canal system and its varying morphology which in turn will increase the long- term success level of the treatment.[1]

Mandibular premolars with their pulpal space having an unusual anatomical variation at a high rate lead to many difficulties in treating these teeth.[1- 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- 9] The occurrence of three canals has been reported by Vertucci and Zillich et al. to be 0.5% and 0.4%, respectively.[8,9]

According to Weine, the major causes of endodontic treatment failure are incorrect canal instrumentation, incomplete obturation and untreated major canals. Failure to recognize the presence of an additional root canal may result in unsuccessful treatment and may be the origin of acute flare ups during and after treatment.[10]

Occurrence of three canals with three separate apices (type V , Vertucci) in mandibular premolars is very rare.[9]

In a classic anatomical study, Zillich and Dowson[8] showed the occurrence of three canals in mandibular second premolars to be 0.4%, while Vertucci [11] reported it as zero %. Clinically reported cases showing the presence of three separate roots for the same tooth are very few and far between.

This case report presents a successful, nonsurgical endodontic management of mandibular left second premolar.

II. Case Report

A 24-year-old male patient reported to the Aesthetic Dental Clinic , Athens, Greece; with chief complaint of pain in lower left back region since 1 month. Medical history was noncontributory. Clinical examination revealed a deep carious lesion on the left second mandibular premolar. There was no mobility, and periodontal probing did not reveal any periodontal pocket. However, the tooth was sensitive to percussion. Vitality tests (cold, electric pulp test) of the involved tooth showed no response indicating that pulpal necrosis had occurred. IOPAR revealed loss of lamina dura suggesting of apical periodontitis (Fig.1). The radiograph also revealed a complex root canal system, evidenced by apical separation of the root and a sudden change in radiographic density of the root canal space at the middle and apical portion. On the basis of the clinical and radiographic findings, a diagnosis of pulpal necrosis with symptomatic apical periodontitis of mandibular left second premolar was made.

The tooth was anaesthetized using 1.8ml of 2% Lidocaine HCl and 1:100,000 epinephrine. Under rubber dam isolation, access cavity was prepared. Initially only two orifices were located i.e. buccal and lingual. A third canal was suspected buccally which was covered by projection of cervical dentin. After troughing with ultrasonic tips third canal was detected. The orifices were enlarged with Gates Glidden drills. Working length was estimated with an apex locator which was confirmed using radiograph (Fig.2). All three canals were instrumented using rotary Ni-Ti file. During instrumentation, copious irrigation was performed with 3% sodium hypochlorite. After completion of the chemomechanical preparation, root canals were dried with sterile paper points, filled with calcium hydroxide and coronally sealed with temporary filling.

A week later, the canals were obturated with AH plus sealer and guttapercha using lateral condensation technique. A postoperative radiograph was taken to assess the quality of obturation (Fig.3) and patient was reappointed for post endodontic restoration. The patient was recalled 1 year postoperatively for clinical and radiographic control (Fig.4) and was found to be symptom free.

III. Discussion

The complex nature of the root and root canal morphology of the mandibular premolars has been underestimated.[12]

Since 1979, Slowey [13] reported that root canals are frequently left untreated because clinicians often fail to identify their presence, particularly in teeth that have anatomical variations or additional root canals, before root canal treatment is performed. Therefore, clinicians should be aware of the configuration of pulp space of the tooth is to be treated.[13,14,15,16]

Studies of morphologic difference with respect to ethnicity have also been reported. Trope et al. [2,17] compared the number of roots and canals in mandibular premolars between African American and Caucasian patients. They reported their results by the number of patients rather than by the total number of teeth. The incidence of two or more roots in mandibular second premolar tooth was 4.8% of the time in African American compared to 1.5% in the white patient group.[12,13]

Seema Yadav in her case report of endodontic management of mandibular premolar with two roots emphasized the importance of magnification for management of branched canal configuration.[18]

Ekim Onur Orhan et al. carried out a study on endodontic outcomes in mandibular second premolars with complex apical branching. Twenty-six mandibular second premolars with complex apical branching were selected. They concluded that the outcome of endodontic treatment may be influenced by the treatment type.[12,13,19]

Bertand Sahn Gyoon Kim in his case report of endodontic treatment of a C shaped mandibular second premolar with four root canals and three apical foramina stated that C shaped premolar requires careful instrument strategy due to the difficulty in disinfecting canals owing to the thin root area. Also in the same patient an incidental finding of C shaped root canal morphology of all mandibular premolars on CBCT scan was seen.[13,20]

In a mandibular second premolar, a single apical foramen may be found in more than nine out of ten cases, however two or more foramina might occur approximately 8.2% of the time. Contrastingly the incidence of two or more foramen in first mandibular premolar is 21.1%. [12,8,21]

In the present case, the radiographic features suggested the possibility of three canals. However, because of the superimposition of roots, radiographic diagnosis of three canals is not always possible in all cases. Several clinical indications may be useful in the detection of a third canal in mandibular second premolars. In some situations, a third canal may exist clinically when the pulp chamber doesn't appear to be aligned in its usual buccolingual relationship. Furthermore, if the pulp chamber appears to deviate from normal configuration and seems to be either triangular in shape or overly large in the mesiodistal direction, more than one canal should be suspected.¹⁵ In the present case, Gates-Glidden drills were used to improve visualization, which helped to locate third canal. Tactile examination of all the walls of the major canal with a small, precurved K file tip is recommended, in order to probe for a catch which may indicate the orifice of an additional canal.[1,2]

Microscopes are commonly used to explore the pulp chamber in order to find orifices. The advantages of using a microscope for conventional endodontics include better visualization of pulp chamber and walls that prevents inadvertent missing of orifices. In this case, microscope was found to be useful as an adjunctive to find extra canal.[1,2]

In addition to obtaining multiple pretreatment radiographs, examining the pulp chamber floor with a sharp explorer, troughing grooves with ultrasonic tips, staining the chamber floor with 1% methylene blue dye, performing the sodium hypochlorite "champagne bubble" test and visualizing canal bleeding points are various other methods to detect extra canal.[13]

In this case, unusual anatomy of the roots led to uncovering of additional canal. Proper disinfection and obturation of all three canals led to successful root canal treatment of the involved tooth.[1,2,4,12,13]

IV. Conclusion

Successful nonsurgical endodontic management of a mandibular second premolar with three root canals has been presented. It could be established that the presence of extra roots and root canals in these teeth may occur far more than one can expect.



Fig. 1. Preoperative radiograph



Fig. 2 Working length determination.



Fig. 3 Immediate postoperative radiograph.



Fig. 4 Recall radiograph 1 year postoperatively

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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