

Endodontic Treatment of Mandibular First Premolar with Type IV Wiene's Root Canal: A case report

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Abstract

Mandibular premolars on multiple occasions are considered to be the most challenging teeth to be treated endodontically, especially when they present with multiple roots and canals. The success of endodontic treatment depends on thorough knowledge of the root canal anatomy, cleaning and shaping and obturation of the entire root canal system. This case report describes endodontic treatment of mandibular first premolar with Wiene's type IV root canal morphology.

Keywords: Canal morphology, Mandibular first premolar, Two roots, Weine type IV.

Introduction

The success of nonsurgical endodontic treatment is dependent on a thorough knowledge of the root and root canal morphology in order to locate all canals and

properly clean, shape and obturate the canal in three dimensions.^[1,2,3] Mandibular premolars, often called as "endodontist enigma", may present the greatest difficulty of all teeth to perform a successful endodontic treatment.^[4] According to a study at the University of Washington, 1955 mandibular first premolars had the highest failure rate at 11.45%.^[5] The possible reasons for the failure include the numerous variations in root canal morphology and difficult access to additional canal systems when present.^[6] The root and root canal morphology of teeth are highly variable and can be extremely complex. A higher incidence of two canals in mandibular first premolars was reported in several populations, upto 50% in Indian populations.^[7,8] They are more prone to bifurcation of canals (23-30%) and terminating in multiple apical foramina (15-20%).^[9] The presence of two distinct roots in

mandibular first premolars is quite rare and has been reported to be only 1.8%.^[10] According to Weine a root canal can be present in four types: Type I—single canal from pulp chamber to apex; Type II—two canals leaving the chamber and merging to form a single canal short of the apex; Type III—two separate and distinct canals from chamber to apex; Type IV—one canal leaving the chamber and dividing into two separate apical foramina.^[11] In mandibular premolar the canal is usually wider buccolingually than mesiodistally. In Weine type IV canal configuration, direct access to the buccal canal is usually possible, whereas the lingual canal may be very difficult to find. The lingual canal tends to diverge from the main canal at a sharp angle. In addition, the lingual inclination of the crown tends to direct files buccally, making location of a lingual canal orifice more difficult.^[12] This case report describes the successful diagnosis and treatment of mandibular first premolar with Wiene's type IV root canal morphology.

Case Report

A 31 year old female patient visited the department of Conservative dentistry & Endodontics with a chief complaint of dull aching pain in her lower left back tooth since 10 days. Medical history was non-contributory. Clinical examination revealed deep disto-occlusal caries with tooth 34, mild tenderness on percussion was positive with 34. Pulp vitality testing revealed delayed pulpal response with 34. Investigation for swelling, sinus tract, periodontal involvement, mobility were negative. Preoperative radiograph revealed severe distoocclusal caries approaching pulp. A single root canal was seen to be bifurcating at the junction of middle and apical third of the root. Ill defined radiolucency was seen at the periapical area with 34. A diagnosis of chronic symptomatic irreversible pulpitis with apical periodontitis with Weine's Type IV canal configuration was made with

tooth 34. (Figure.1A) Anaesthesia was obtained using 2% lidocaine with 1:80,000 adrenaline (Lignox 2%-Warren-Navi Mumbai, India). Under rubber dam isolation access cavity was prepared using Endo Access bur (Dentsply, Maillefer). In the floor of the pulp chamber only one oval orifice was found. On exploration of the access cavity no other canal orifice was found. K Flex file size 10 (MANI INC, Tochigi, Japan) were used to negotiate the canals. As the single canal was bifurcating at the junction of apical and middle third it was very challenging to gain access to both the canals. After several unsuccessful attempts, it was finally possible to gain access to the buccal canal. A second K Flex file size 10 was severely precurved in the apical portion and was placed alongside of the first file and was carefully maneuvered in a watch winding motion to gain access to the lingual canal. A confirmatory radiograph was taken to check the placement of the files in both the canals. Working length was determined using apex locator (J Morita Root Zx Mini Apex locator) and confirmed on radiographs. (Figure.1B) Since the lingual canal was difficult to gain access it was decided to first do hand instrumentation till size 20 K file. With the K file size 10 still in place in the buccal canal, lingual canal was instrumented till size 20 K file under copious irrigation using 5.25% sodium hypochlorite (Vishal Dentocare, India). Subsequently the buccal canal was instrumented under copious irrigation till size 20 K file by keeping size 15 K file in the lingual canal in order to prevent the blockage of the lingual canal. Both the canals were thoroughly irrigated and apical patency was checked. This was followed by rotary instrumentation using ProTaper Gold files (Dentsply Sirona) till F2 with 5.25% sodium hypochlorite. Recapitulation was done using size 15 K file during the instrumentation. After final preparation the canals were irrigated using 5.25% sodium hypochlorite, saline. The smear layer removal was done using 17%

EDTA (DentWash Prime Dental Products India) solution for 1 minute. The canals were dried using absorbent paper points. Intracanal medicament of calcium hydroxide (Avue Cal Dental Avenue India Pvt Ltd) was placed and the access cavity was sealed with temporary restoration (Tmp - Rs Prime Dental). At the next visit 1 week later, under rubber isolation the temporary restoration was removed. Canals were irrigated using sodium hypochlorite and intracanal medicament was removed by manual agitation. A final rinse of 17% EDTA was done. The canals were dried using absorbent paper points. Master cone fit radiograph was taken. (Figure.1C) During obturation size 15 K file was placed in the buccal canal, apical tug back of the gutta percha in the lingual canal was confirmed and was obturated. With a heated hand plugger the gutta percha was sheared off at the level of the bifurcation. After this the buccal canal was obturated using single cone technique. Cold lateral condensation was done coronal to the bifurcation area. The sealer used was Sealapex (Kerr Sybron Endo). The tooth was restored with composite resin restoration. (Figure.1D) 6 months follow up radiographs showed healing of periapical lesion. (Figure.1E).

Discussion

The majority of mandibular first premolar teeth have a single canal but there is a relatively high incidence, or one-quarter of mandibular premolars, that have two or more canals (24.2%).^[6] Vertucci (1978) reported that mandibular premolars have Type I canal in 70% of the cases, Type II canal in 4% of the cases, Type III canal in 1.5 % of the cases and Type IV canal in 24% of the cases.^[5] Unless there is constant vigilance in locating two or more canal systems when performing root canal therapy in the mandibular first premolar, the additional canals may be missed, resulting in a greater failure rate. Accurate pre-operative radiographs and their careful examination are

essential to detect root canal morphology and anatomy. The clinician should carefully trace the exterior and interior outlines of the tooth in radiograph with adequate magnification.^[13] The interpretation of the periodontal ligament space may suggest the presence of an extra root or canal.^[14] A study of Yoshioka et al. showed that sudden narrowing of the main canal on the parallel radiograph was a good criterion to judge root canal multiplicity.^[6] Presence of more than one canal in the apical third increases the challenges in successfully treating the tooth because of lack of direct vision. Proper access into pulp chamber is necessary as it is relatively small with reduced visualization in premolars.^[14] In the present case; the crucial step in finding the split canal was tactile examination of main canal with a small, precurved K-file tip.^[15] So then only after locating the canals, access could be widened and the most critical and important phase i.e. cleaning and shaping could be performed. Before access opening, utilizing the advanced technology like CBCT makes easier for clinician to treat and identify the missed canals. The advanced modes of radiographic imaging and analysis have allowed for in depth knowledge of pulp space anatomy in 3D and allowed for identification of rare aberrations. Piezoelectric ultrasonics in conjunction with innovative new CPR, ultrasonic instruments provides a breakthrough for exploring and identifying missed canals. Micro openers are flexible stainless steel instruments which makes it easier to locate canals.^[8] Because of the complexity in the root canal configuration of the mandibular first premolars clinician should consider using various diagnostic methods in diagnosing and successfully treating these teeth.

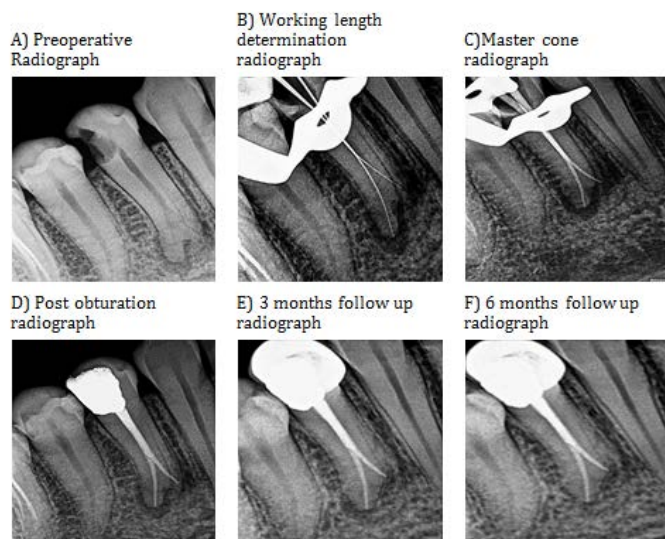


Figure 1

Conclusion

Mandibular premolars, often called as “endodontist enigma”, may present the greatest difficulty of all teeth to perform a successful endodontic treatment. Therefore accurate knowledge about the anatomy of each tooth as well as the possibility of variations, to identify the presence of unusual number of roots and their morphology is very crucial. For a successful root canal treatment it is essential to carefully interpret the preoperative radiographs. A close clinical inspection of the floor of the chamber and proper modification of the access opening, the position and angulation of the file in the canal also hints about the presence of extra canal. Therefore the clinician has to be vigilant when performing root canal therapy in the mandibular first premolar, otherwise the additional canals may be missed which can result in a greater failure rate.

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