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Case Series

Endodontic management of canal variations in maxillary molars: Case series

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Abstract

These case reports highlight the complexity of maxillary molar morphologic variation and represent successful endodontic treatment of maxillary molars with single canal, with two palatal canals, and additional mesial canal, which is rarely discussed in literature. The clinician must be familiar with the morphology of the roots of all teeth and the associated intricate root canal anatomy in order to achieve proper access to the canals, effective debridement, and obturation for successful endodontic treatment.

Keywords: Maxillary first molar, Extra canals, Endodontic treatment.

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1. Introduction

Any tooth can have anatomical changes, and maxillary second molars are not immune to this risk.[1] To improve endodontic treatment outcomes, it is crucial to comprehend root canal anatomy and the presence of any anatomical abnormalities.[2] Although the shape of the maxillary second molar can vary, it typically has three roots and three different canals.[3] A second mesiobuccal canal (MB2) is present in 14–94% of instances.[4] According to reports, 0.5-0.6% of maxillary molars have a solitary canal.[5] According to H.M. Alamri et al.[6] CBCT-based study, 0.3% of the Saudi subpopulation had a maxillary second molar with a single root.[4] The majority of second maxillary molars, they concluded, are more likely to have three and two roots.[7]

They also discovered that whilst girls are more likely to have two roots, males are more likely to have three.[8] Over the course of 40 years of routine clinical practice, Christie et al.[9] reported 16 cases of maxillary molars with two palatal roots. These teeth were divided into types I, II, and III by the authors according to their morphology and the extent of root separation. Type I maxillary molars are often characterized by their extended and convoluted structure, with two widely divergent palatal roots.[10,11]

Two clinical case reports that show successful endodontic therapy for maxillary second molars with noticeable morphological abnormalities in root form and canals are described in this research. A single root with one canal is the subject of the first scenario, whereas a single root with two separate canals and separate exit terminals is the subject of the second. Although the root canal system in human teeth has been extensively studied, little is known about the root canals in permanent maxillary second molars that are single-rooted.

2. Case Presentation

2.1. Case 1

A 30-year-old woman came to our office primarily complaining of increased pain in her upper right posterior tooth. When biting and after consuming hot or cold food products, the pain gets worse. Additionally, the patient's medical history was ordinary when they first arrived. The upper right second tooth was found to have significant

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occlusal caries during the clinical evaluation. Additionally, periodontal probing was within the normal range, and the tooth remained still. The radiographic examination revealed extensive occlusal caries in tooth 17.

Consequently, root canal therapy was suggested for the impacted teeth. Additionally, radiographic evaluation of 17 revealed a significant anatomical alteration in its root structure, suggesting the presence of a single root and a single canal **Figure 1A**. Using a high speed aerotar, endodontic cavity was prepared manually, after 1ml of local anaesthesia containing 40 mg of articaine hydrochloride, 0.005 mg of epinephrine, and rubber dam isolation. This revealed a large single opening and a single wide root that extended from the buccal to the lingual side, reaching towards the root apex. The working length was measured using the Root ZX small apex locator and verified by the radiograph (**Figure 1B**). Initially, the canal was equipped with #15 no file.

After that, the intracanal calcium hydroxide paste medication (RC Cal; Prime Dental Products, India) was given. After one week, the patient was called for a follow-up consultation, and there were no symptoms associated with the tooth. In the following session, a 5.25% sodium hypochlorite solution was used to clean the root canals, and sterile paper points were used to dry them. The canals were then sealed using prime MTA bio ceramic sealer, obturated with single cone obturation technique. Using protaper gutta-percha and MTA Fillapex (**Figure 1C**). A resin composite restoration was then used to rebuild the tooth. An further radiograph was taken. **(Figure 1D)**

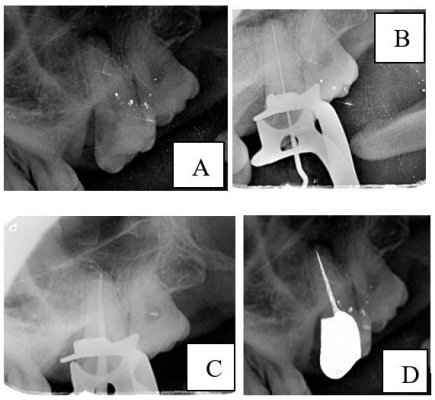

Figure 1: Case 1 A) Single root and a single canal, B)working length measured using the Root ZX small apex locator, C) uses of protaper gutta-percha and MTA Fillapex, D) A resin composite restoration used to rebuild the tooth.

2.2. Case 2

A 34-year-old male patient's main complaint when he arrived at our clinic was an unexpected pain in his left upper molar teeth. The tooth demonstrated sensitivity to warm, cold, and vertical percussion stimuli. There were more frequent episodes of pain during the night, which lasted for two to three hours with brief respites. An intraoral examination showed that tooth number 27 had proximal caries. The tooth had a single root, according to the radiographic examination, which also showed substantial proximal decay and noteworthy morphological diversity in the root structure (**Figure 2A**).

As a result, 40 mg of articaine hydrochloride was administered as a local anaesthetic to the patient, and 0.005 mg of epinephrine was used for the last flush. Calcium hydroxide was given intracanally as a medication after the root canals had dried. Initially, #15 nickel-titanium files (Dentsply Maillefer) were used to negotiate the canals. The morphology of the maxillary premolar was reflected in the discovery of two canal orifices, one buccally and one lingually.

RaCe NiTi (FKG Dentaire SA, Switzerland) rotary files and manual hand k-files (Dentsply, Maileffer, USA) were used to completely prepare the canals. Apical preparation was done up till 25/4% of the size was reached. After each use of the instruments, the root canals were cleaned with a 2.5% solution of sodium hypochlorite, and the last flush was performed using a 17% solution of ethylenediamine tetra acetic acid (EDTA). Calcium hydroxide was given intracanally as a medication after the root canals had dried.

An appointment with the patient was set for a week later. A week later, the patient was symptom-free. Using single cone obturation technique method, obturation was done with MTA fillapex using prime MTA bio ceramic sealer (**Figure 2B**). A final periapical radiograph was taken to confirm the root canal filling (**Figure 2C**). The patient was then brought back for his last composite repair. After eight months, a follow-up radiograph was taken (**Figure 2D).**

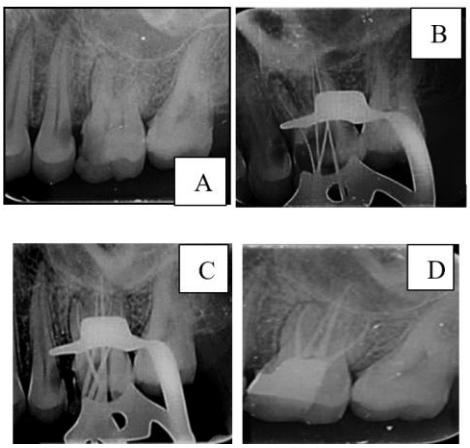

Figure 2: Case 2 A) tooth showing substantial proximal decay and noteworthy morphological diversity in the root structure, B) Obturation was done with MTA fill apex using prime MTA bioceramic sealer, C) Periapical radiograph showing the root canal filling, D) last composite repair after 8 months follow up.

2.3. Case 3

A 45-year-old male patient's appeared to the deptartment of conservative dentistry & endodontics, bareilly international

university complaint with pain in his left upper molar teeth. The tooth demonstrated sensitivity to warm, cold, and vertical percussion stimuli. There were more frequent episodes of pain during the night, which lasted for two to three hours with brief respites. An intraoral examination showed that tooth number 27 had proximal caries. The tooth had a single root, according to the radiographic examination, which also showed substantial proximal decay and noteworthy morphological diversity in the root structure (**Figure 3A**).

As a result, 40 mg of articaine hydrochloride and 0.005 mg of epinephrine were used in the patient's local anaesthetic for the last flush. After the root canals had dried, an intracanal medication containing calcium hydroxide was given.

Initially, #15 nickel-titanium files (Dentsply Maillefer) were used to negotiate the canals. The morphology of the maxillary premolar was reflected in the discovery of two canal orifices, one buccally and one lingually. RaCe NiTi (FKG Dentaire SA, Switzerland) rotary files and manual hand k-files (Dentsply, Maileffer, USA) were used to completely prepare the canals. Apical preparation was done up till 25/4% of the size was reached. Following each instrument use, the root canals were cleaned with a 2.5% solution of sodium hypochlorite, and the last flush was performed with a 17% solution of ethylenediamine tetraacetic acid (EDTA).

Calcium hydroxide was given intracanally as a medication after the root canals had dried. An appointment with the patient was set for a week later. A week later, the patient was symptom-free. Using prime MTA bioceramic sealer, MTA fillapex was put in the root canals by single cone obturation technique (**Figure 3B**). A final periapical radiograph was taken to confirm the root canal filling **(Figure 3C**). The patient was then brought back for his last composite repair. Four months later, a follow-up radiograph was taken (**Figure 3D**).

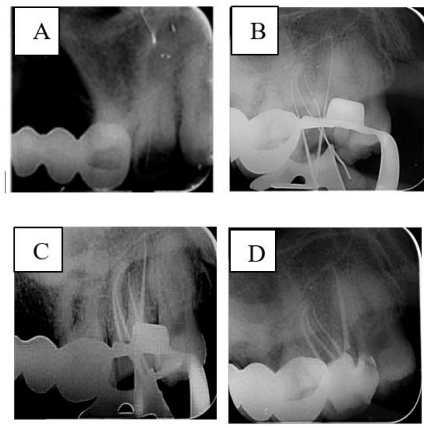

Figure 3: Case 3 A) Tooth showing substantial proximal decay and noteworthy morphological diversity in the root structure, B) Obturation was done with MTA fillapex using prime MTA bio ceramic sealer, C) Periapical radiograph showing the root canal filling, D) Last composite repair after 4 months follow up

3. Discussion

Several studies have shown complexity in the frequency and number of root canals simultaneously with the complexity in morphology of the pulp chamber.[11] Because one of the reasons endodontic therapy fails is the inability to accurately identify and thoroughly clean the entire root canal system, the second maxillary molar may occasionally have a complicated root canal system.[12] The form of root canals has been the subject of numerous investigations employing various research approaches. Maxillary second molars frequently have three separate roots and three matching root canals, giving them a tri-radicular shape.[13] A physician should be able to see the whole canal, from the orifice to the apical third, in the first periapical radiograph.[14] The two main methods used in clinical practice to evaluate tooth anatomy are operating microscopes and conventional radiography.

These days, CBCT imaging provides useful information about the root canal's characteristics. However, because of its increased cost and the requirement to individually justify the exposure to ionizing radiation, this procedure should not be used on a regular basis.[15,16] The diagnosis is aided by the use of surgical loupes or a dental microscope. These devices increase the surgical site's visibility, increasing the likelihood of finding concealed canals.[17,18] Single root and single canal second maxillary molars are quite rare, as are single root and two canal second maxillary molars. Radiographic imaging makes it easy to identify the many kinds of variances.

Nevertheless, care should be taken while comparing the root's location with the radiography image.[19] Sometimes morphologic variations on a radiograph can be difficult to interpret. As a result, using an electronic apex locator and an endodontic microscope should be given top priority.[20] According to the literature[11,21] currently in publication, maxillary second molars exhibit greater variability than first molars in terms of root numbers and morphology.[22] In terms of the study's clinical significance, the findings show a notable progress in harmonizing limited and standardized ideas related to the quantity of roots and canals. This is due to the fact that occasionally the incapacity to recognize hidden extra roots or root canals with unique morphology is the cause of endodontic failure.[23]

4. Conclusion

As seen in our example, the treatment of a maxillary second molar with a single root starts with a precise diagnostic and any necessary treatment plan modifications. This knowledge is essential for performing precise root canal therapy while taking into account any potential challenges brought on by the pulp space's architecture. As seen in our example, treating a single root starts with a precise diagnosis and any necessary treatment plan modifications.

5. Source of Funding

None.

6. Conflict of Interest

None.

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