

Endodontic Treatment Of Upper First Premolar With 3 Canals- Case Report

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Abstract

A comprehensive understanding of the root structure is important for the successful outcome of endodontic procedures. Lack of knowledge of the anatomic variations in root canal morphology can contribute to the failure of root canal therapy. One of the most anatomically diverse tooth groups is the upper first premolar. The incidence of two root canals is the most predominant anatomy observed for maxillary first premolar however some anatomical variations are also observed. The most frequent anatomical variation in these teeth is the existence of three roots with three canals. The objective of this study is to report a similar case of maxillary first premolar having three roots with separate 3 canals. Endodontic success requires a thorough understanding of root canal anatomy. The variation in the number of roots, canals, root direction, longitudinal depressions of the roots, the various shapes of the pulp cavity and the problems in visualizing the apical limit by radiographs make the endodontic procedure of these teeth quite challenging.

Keywords: maxillary first premolar, three root canals.

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1. Introduction

Endodontic treatment is an important element of comprehensive, quality dental care. The prognosis of endodontic treatment is closely related to proper cleaning and shaping of the root canal, three-dimensional sealing of the canals and coronal restorations with good marginal seal. Thorough knowledge of the variations in root canal anatomy is necessary for the successful outcome of the endodontic procedure. Failure of this will affect the prognosis of the treatment as there are chances of missing the canals and leaving them uncleaned.¹ Almost 42% of endodontic failures were attributed to missed canals that cause a failure of root canal therapy due to leakage.² Therefore, complete knowledge of root canal anatomy and its variations is necessary for the successful outcome of endodontic therapy.¹

One of the most anatomically diverse tooth groups is the upper first premolars, which can contain all possible types of canals according to the Vertucci classification.³ The incidence of two root canals is the most predominant anatomy observed for maxillary first premolar however some anatomical variations are also observed. The most frequent anatomical variation in these teeth is the existence of three roots with three root canals. An overall incidence of three-rooted maxillary first premolar has been addressed to range between 0.4% and 9.2% with an average of 1.7%.²

Researchers found out that maxillary first premolar in the majority of the cases have 2 canals (73.3- 92%), even though teeth with 1 or 3 root canals frequently occur (8-26.2% and 0-6%, respectively).⁴

Due to their anatomical similarities to maxillary molars, three-rooted maxillary premolars are occasionally referred to as little molars or as ridiculous.⁵ This variety makes it more difficult to design access cavities and localize, refine, and form endodontic therapy methods.⁶ The variations in the number of roots and canals pose difficulty in endodontic therapy.² Furthermore, being aware of these discrepancies is crucial for correct clinical management, an acceptable technical result, and averting overlooking.⁷ Inadequate endodontic care will leave the root canal system's empty gaps unfilled. The development of periapical inflammation as a result of such spaces may raise concerns about the effectiveness of root canal therapy.⁸

This study aimed to report a clinical case with a unique anatomical modification of the maxillary first premolar illustrated by having 3 root canals.

2. Case Presentation

The 34-year-old patient presented to the operative and endodontics department of Islamic International Dental Hospital for specialized endodontic treatment of tooth #14.

History revealed that the patient had sharp, continuous pain which occurs on taking hot food and is relieved on taking over-the-counter NSAIDs. Pain radiates to the lower jaw and the temporal region and it aggravates at night.

The medical history of the patient was non-contributory. No remarkable findings were noted during the extra-oral examination. Clinical Intra-oral examination revealed a carious tooth #14. Vitality testing was positive and the response in the respective tooth was spontaneous and lingering as compared to the control tooth #24. The gingiva around tooth #14 was inflamed. No other abnormalities of palpation, probing depth, or mobility were detected. No swelling or sinus tract was present.

A radiographic examination revealed that tooth #14 had complicated anatomy. Pulmonary involvement of caries was present. Slight periapical radiolucency around the roots or pdl widening was evident on the radiograph. The Lamina dura surrounding the root was also intact. The case was diagnosed as symptomatic irreversible pulpitis with normal apical tissues. Root canal treatment was planned as a definitive treatment.

The patient was fully informed about the treatment steps, and written informed consent was obtained before starting the treatment.

After local anaesthesia administration (2% lidocaine with 1:100,000 epinephrine) and rubber dam isolation, the access cavity was refined. The pulp chamber floor revealed three distinct orifices. Initial apical files were placed in all the canals. Working length was calculated using an apex locator attached to a 15 K file. The working length radiograph showed files in three separate canals, mesiobuccal (MB) distobuccal (DB) and palatal from orifice to apex (fig 1).



Figure 1: Showing the working length of the canals



Figure 2: Shows the final X-ray after Obturation.

Initial canal patency 0.5mm beyond the working length was established using a 10k file. Cleaning and shaping of all three canals were performed using 10K and 15K hand files. The files were introduced with an in-out pecking motion to gradually advance the file apically. Canal preparation is further increased using larger size hand files with the master apical file (MAF) being #35. A 10 K file was used between the instrumentation cycles to ensure canal patency. During root canal preparation, 17% ethylenediaminetetraacetic acid was used as a chelating agent and copious irrigation was performed using 2.5% sodium hypochlorite solution. After completion of cleaning and shaping, canals were dried with absorbent paper points (Dentsply Maillefer).



Figure 3: Post an op-clinical picture

Master gutta-percha cone size 35 was selected. Cold lateral compaction technique was used for obturation

using AH Plus sealer (Dentsply Maillefer, North America). After the procedure, a post-obturation X-ray was taken which showed homogeneous filling of the canals (fig 2) and finally core buildup of the tooth was done using composite material.



Figure 4:

4. Discussion

For endodontic treatment to be successful correct identification of the root canal anatomy is required.⁹ Therefore, when planning the tooth treatment, it is crucial to take the evidence in the literature of variation in anatomy into consideration.¹⁰ According to several researches,^{10,11} the prevalence of maxillary first premolar with three root canals ranges from 1.5% to 5% of cases. In investigations on the Turkish population, Bulut et al.¹² and Ok et al.¹³ revealed that the incidence of three roots and canals in maxillary first premolar teeth was 1% and 1.2%, respectively. Even though this sort of clinical event occurs infrequently, the professional needs to be ready to diagnose it and provide effective therapy.^{10,11} Numerous case studies on the endodontic treatment of upper first premolars with three roots have shown that, regardless of the biomechanical preparation and filling approach employed, it is critical to make an early diagnosis of anatomical differences for a successful treatment outcome.^{14,15}

Additional radiographs with different angulations can be taken to confirm any uncommon anatomical features when a preoperative radiograph reveals an irregular contour and shape of the tooth.¹⁶ An abrupt straightening or loss of a radiolucent channel in the pulp cavity might be suggestive of an additional canal in the same or a separate root.¹⁶ In premolars, the existence of an eccentric orifice that is not in its normal place raises the possibility that there may be an additional canal.¹⁷ The root canal system needs to be cleaned for endodontic treatment to be successful. During endodontic treatment,

anatomical variances can be found using magnifying loupes and radiographs taken from various angles. However, because the generated scans are only two dimensional they might not give accurate information of the actual anatomy. After the recent invention of CBCT and its use in endodontic therapy, it is now simple to identify canals which were missed on periapical radiographs taken from different angulations.¹⁸

For proper access and effective clinical treatment, the floor of the pulp chamber must be carefully inspected. (19) Eccentric canal orifice is a sign of other canals that the dentist should check for in addition to the primary canal. When the third canal is suspected, the pulp chamber floor of the maxillary premolar should be aligned in the buccopalatal relationship.²⁰ If the presence of anatomical variation is early predicted using access cavity modification and proper canal identification, good and easy management is possible.

According to Balleri et al., the access should be extended mesiodistally along the buccal aspect to create a "T"-shaped access cavity.²¹ This modified preparation outline which was followed in all of the aforementioned cases encourages proper access to each of the two buccal canals in the maxillary premolar with an additional third canal. Applying the principles of symmetry by Krasner and Rankow helped locate the second buccal canal and confirm its existence when atypical anatomy was anticipated.²² In the 56 three-rooted maxillary first premolars which were investigated recently, Beltes et al. reported that none of the teeth despite initially all having two orifices, showed three separated orifices.²³

5. Conclusion

Thorough knowledge of anatomic variations of the root canal system, careful interpretation of the angled radiographs and adequate access cavity preparation and exploration of the canals are required for successful endodontic therapy. The variation in the number of roots, canals, root direction, longitudinal depressions of the roots, the various shapes of the pulp cavity and the problems in visualizing the apical limit by radiographs make the endodontic procedure of maxillary first premolars quite challenging.

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