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Case Report **Endodontics**

Endodontic Management of Maxillary First Premolar with Three Root Canals

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Abstract

Recognizing the variations in root canal morphology is essential for dentists to achieve successful endodontic therapy. Maxillary first premolars typically have two roots, but three root canals can occasionally develop, necessitating proper identification and documentation to avoid missed diagnoses. This study details the diagnostic approach and clinical management of maxillary first premolars with three root canals, as observed in a clinical setting.

Keywords: Root canal morphology, Maxillary first premolars, Endodontic therapy, Three root canals, Diagnostic treatment, Anatomical variations, Cone-beam computed tomography (CBCT), Endodontic retreatment.

INTRODUCTION

A thorough understanding of the clinical differences in root canal morphology is essential for dentists to provide effective and successful endodontic therapy to their patients. The maxillary first premolars normally contain two roots; nevertheless, the development of three root canals has been observed on exceptional cases in this tooth structure. The existence of such differences should be addressed and documented in order to ensure that they are managed properly and that they are not missed. In this paper, we demonstrate the diagnostic and clinical treatment of three root-canaled maxillary first premolars that were presented in a dental office.

The prime objective of root canal therapy is to eradicate infection and to secure the tooth from further microbial invasion. Proper canal sealing, followed by accurate cleaning, shape, and filling, will aid in the effectiveness of therapy. Understanding the morphology of the root canal is identified as crucial for successful endodontic therapy [1].

Two root canals are the most regularly observed anatomical configuration for maxillary first premolars, notwithstanding assertions that this configuration deviates from generally accepted anatomical norms [2, 3]. Three roots with three root canals is the most prevalent anatomical variant in these teeth [4]. Supernumerary roots and supplementary root canals may occur if the Hertwig epithelial sheath is disrupted or folded during dental development [5]. The total prevalence of three-rooted maxillary first premolars has been estimated to be between 0.4 and 9.2 percent, with an average of 1.7 percent [4]. Numerous variables impact morphological research, including age, sex, study design, and technique, as well as ethnicity [4, 6]. Atieh and Al-Nazhan *et al.*, found an incidence of 1.2 percent and 2.4 percent, respectively, among the Saudi Arabian population [7, 8].

Three-rooted maxillary premolars have been defined according to their exterior morphologies [9], but were later renamed into four categories based on cone-beam computed tomography (CBCT) imaging of their internal and external morphologies [10]. Additionally, several terms such as radiculuos premolars, mini-molars, and small three-canalled maxillary molars have been proposed [11-13].

Variations in the number of roots and canals in the maxillary first premolar provide significant endodontic treatment challenges [11, 14]. Additionally, understanding such differences is critical for effective clinical care, a satisfying technical outcome, and reducing the potential of oversight [7]. Inadequate

endodontic therapy will result in untreated root canal spaces, which act as pathways between the tooth pulp and the periodontium. Following that, such spaces may promote bacterial growth, resulting in the development of periapical inflammations, casting doubt on the root canal treatment's success [7, 15]. Nearly 42% of endodontic failures were related to missing canals [16], which result in root canal treatment failure owing to leakage 17]. Thus, a thorough understanding of root canal morphology, as well as the use of modern procedures and technology such as magnification instruments and cone beam computed tomography, can aid in increasing treatment quality and minimizing such mishaps [4].

The purpose of this case report is to demonstrate the identification and effective nonsurgical endodontic retreatment of root canal systems in a maxillary first premolar with three root canals.

CASE REPORT

A 44-year-old Saudi male with no history of any systemic diseases was referred to the Department of Endodontics at Prince Abdulrahman Advanced Dental Institute for endodontic treatment of his right maxillary first premolar #14. The patient was prepared for prosthetic rehabilitation and his dentist needs to evaluate the endodontic treatment of his right maxillary first premolar.

Clinically, tooth #14 was treated with a deficient temporary restoration a long time ago. Tenderness to percussion was found in the tooth, but no additional abnormalities in palpation, probing depth, or mobility were detected. Radiographic examination indicated normal apical status for tooth #14 with lamia dura discontinuity. Additionally, the morphology of three root canals was shown radiographically and on CBCT with a limited field of view (Figure 1) and (Figure 2), respectively. The tooth was identified as previously treated pulp therapy with symptomatic apical periodontitis. A plan of nonsurgical root canal retreatment was decided accordingly.

Local anesthetic was provided using 2% lidocaine and 1:100,000 epinephrine, and the rubber dam was inserted. Under a dental operating microscope (Möller-Wedel International Microscopes, Germany), a thorough inspection of the pulp chambers is performed. Chloroform and ProTaper retreatment rotary files were used to remove the root canal filling (DENTSPLY Maillefer, Ballaigues, Switzerland). The acess cavity was adjusted by cutting from the buccal canal entry to the cavosurface angle at the bucco-proximo angle, resulting in a cavity with a T-shaped contour as reported by Balleri *et al.*, (Figure 3) [18]. Three orifices were visible under magnification. The distobuccal canal was not readily negotiated to its whole length.

The working length was re-established and radiographically verified using Root ZX II (J. Morita, Tokyo, Japan).

The radiograph revealed three distinct canals, MB, DB, and P, each with its own pathway to the apex.

Instrumentation was performed using a Profile 0.04 rotary system (Dentsply Maillefer, Ballaigues, Switzerland) up to size 35 for the P canal and 30 for the MB and DB canals, with 5.25 percent NaOCl irrigation. The final rinse consisted of 17.5% EDTA followed by 5.25 percent NaOCl. Obturation was performed using the continuous wave compaction technique in conjunction with gutta-percha and AHplus sealer (Dentsply Maillefer, Ballaigues, Switzerland), Finally, Cavit (Dent-a-Cav, Barmstedt, Germany) and resin-modified glass ionomer filling (ChemFil, DENTSPLY DeTrey, Germany) were used to seal the access cavity [Figure 4]. The patient was referred back to the prosthodontics department for final restoration fabrication. On follow-up after 12 months, the patient was asymptomatic and the periapical radiograph was normal (Figure 5).

Figure 1

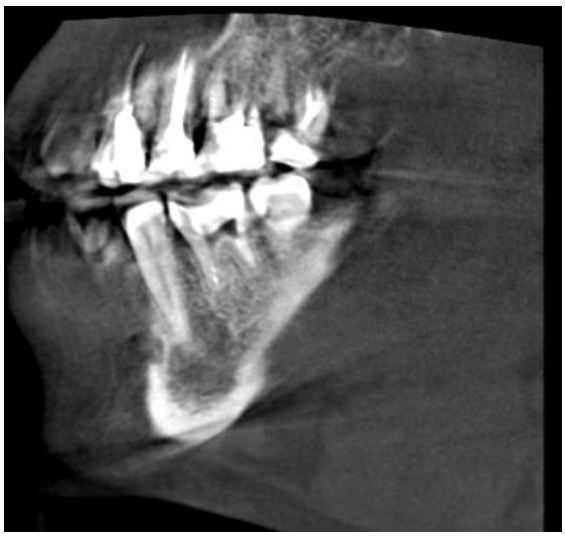

Figure 2

Figure 3

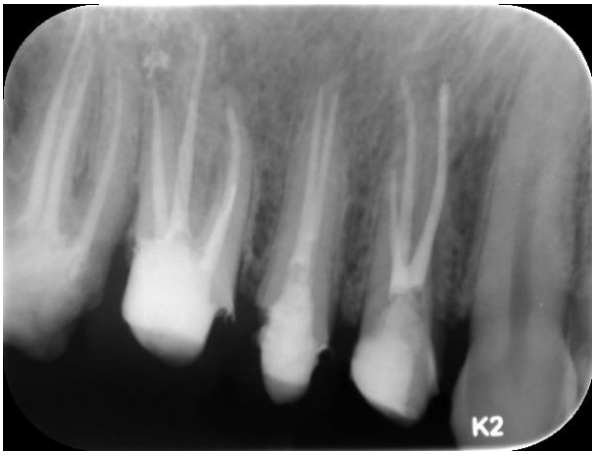

Figure 4

Figure 5

Figure 6

DISCUSSION

The use of suitable biomechanical equipment and the obturation of the whole canal space in three-dimensional perspectives are required for effective root canal treatment. The most common cause of endodontic treatment failure is missing canals, which occur as a result of a lack of understanding or disregard of the internal anatomy of the teeth [1, 19]. It was reported in this case report that nonsurgical root canal retreatments were performed on a maxillary first premolar with three canals, one of which had been missing during the previous treatment. As a result, every effort should be taken by the clinician to identify and treat such a tooth utilizing the most appropriate armamentaria that are now accessible.

Some researchers advocate taking multiple angulated periapical radiographs in order to discover morphological variation in the teeth. Techniques such as root sectioning, staining, and cleaning have been employed [20, 21]. The use of CBCT pictures is a highly beneficial tool for detecting morphological variations in the teeth [22]. It was employed in the current case to detect the possible accessory canals of the treated teeth that were thought to be present.

Sieraski and colleagues have proposed a broad criteria for the radiographic detection of three-rooted maxillary premolars in the early stages of development. It is most likely that the tooth has three roots when straight periapical radiographs are taken and show the mesiodistal width of the mid-root image equal to or larger than the mesiodistal width of the crown image [11]. When viewing the direct periapical exposure radiograph, a rapid narrowing or disappearance of the canal provides an indication that the canal is splitting at this stage [3]. Furthermore, it would be beneficial to trace the path of each specific root periodontal ligament area [23].

For the purpose of seeing and detecting the whole pulp chamber floor, it is critical that the tooth access cavity be prepared and designed properly. Therefore, under the observation of a dental operating microscope, the access cavities of the concerned tooth were changed. A T-shaped cavity was created in this instance by cutting from the buccal canal entry to the cavosurface angle at the bucco-proximo angle, as previously reported by Balleri and colleagues [18]. An additional benefit of a thorough examination of the pulp-chamber flooring under the correct magnification and lighting was the enhanced likelihood of finding and treating the whole pulp and canal system [22, 24].

According to Sabala *et al*., bilateral incidence of variants accounts for 60% of all occurrences of variations [25]. In this particular case report, radiographs of the opposing side revealed the existence of a three-rooted maxillary first premolar on the opposite side (Figure 6). Whenever possible, the dental history of previously treated teeth should be examined and evaluated with care. In the same way as people who have previously had an anatomical abrasion may call attention to the possibility of the same variation in the contralateral tooth now being evaluated for treatment.

Three canals in the maxillary first premolar were observed by Atieh and Al-Nazhan *et al.*, in a subpopulation of Saudis, according to the researchers. They reported that 1.2 percent and 2.4 percent of the population, respectively [7, 8], Recognized worldwide researchers have evaluated Ahmad and Alenezi's The 26 root morphology investigations included a total of 6878 teeth from a total of 26 root morphology studies. 41.7 percent of maxillary first premolars had just one root, but 56.6 percent of maxillary first premolars had two roots, according to the study. Three roots were identified in 1.7 percent of maxillary first premolars [4], which is a small percentage.

The American Association of Endodontists and the American Academy of Oral and Maxillofacial Radiology (AAE and AAOMR) Joint Position Statement recommends the use of cone beam (CBCT) when there is a suspicion of extra canal and complicated morphology [26]. CBCT, on the other hand, should only be explored when the traditional periapical radiographs have failed to provide adequate information to the clinician. In this particular instance, it was used to aid in the understanding of the root canal anatomy. In such endodontic retreatments, the use of cone beam computed tomography (CBCT) can aid in the exact finding of missing canals and the completion of therapy. Nonetheless, while selecting which diagnostic modality to use, the risks and benefits should always be assessed and taken into consideration [27].

CONCLUSION

The treatment of a Saudi patient who came with the unusual morphology of three root-canaled maxillary first premolars is discussed in this case report. All endodontic treated cases should be given the clinician's entire attention. The use of an operation dental microscope, CBCT, and well selected obturation materials will ensure a satisfactory result.

REFERENCES

1. Vertucci, F. J. (2005). Root canal morphology and its relationship to endodontic procedures. *Endodontic topics*, *10*(1), 3-29.
2. Bellizzi, R., & Hartwell, G. (1985). Radiographic evaluation of root canal anatomy of in vivo endodontically treated maxillary premolars. *Journal of Endodontics*, *11*(1), 37-39.
3. Vertucci, F. J. (1984). Root canal anatomy of the human permanent teeth. *Oral surgery, oral medicine, oral pathology*, *58*(5), 589-599.
4. Ahmad, I. A., & Alenezi, M. A. (2016). Root and root canal morphology of maxillary first premolars: a literature review and clinical considerations. *Journal of endodontics*, *42*(6), 861-872.
5. Orban, B., & Mueller, E. (1929). The development of the bifurcation of multirooted teeth. *The Journal of the American Dental Association (1922)*, *16*(2), 297-319.
6. Awawdeh, L., Abdullah, H., & Al-Qudah, A. (2008). Root form and canal morphology of Jordanian maxillary first premolars. *Journal of Endodontics*, *34*(8), 956-961.
7. Atieh, M. A. (2008). Root and canal morphology of maxillary first premolars in a Saudi population. *J Contemp Dent Pract*, *9*(1), 46-53.
8. Al-Nazhan, S., Al-Daafas, A., & Al-Maflehi, N. (2012). Radiographic investigation of in vivo endodontically treated maxillary premolars in a Saudi Arabian sub-population. *Saudi Endodontic Journal*, *2*(1), 1-5.
9. Bellizzi, R., & Hartwell, G. (1981). Evaluating the maxillary premolar with three canals for endodontic therapy. *Journal of Endodontics*, *7*(11), 521-527.
10. Beltes, P., Kalaitzoglou, M. E., Kantilieraki, E., Beltes, C., & Angelopoulos, C. (2017). 3-rooted maxillary first premolars: an ex vivo study of external and internal morphologies. *Journal of Endodontics*, *43*(8), 1267-1272.
11. Sieraski, S. M., Taylor, G. N., & Kohn, R. A. (1989). Identification and endodontic management of three-canalled maxillary premolars. *Journal of endodontics*, *15*(1), 29-32.
12. Maibaum, W. W. (1989). Endodontic treatment of a" ridiculous" maxillary premolar: a case report. *General Dentistry*, *37*(4), 340-341.
13. Goon, W. W. (1993). The" radiculous" maxillary premolar: recognition, diagnosis, and case report of surgical intervention. *Northwest dentistry*, *72*(2), 31-33.
14. Pécora, J. D., Saquy, P. C., Sousa Neto, M. D., & Woelfel, J. B. (1992). Root form and canal anatomy of maxillary first premolars. *Braz Dent J*, *2*(2), 87-94.
15. Różyło, T. K., Miazek, M., Różyło-Kalinowska, I., & Burdan, F. (2008). Morphology of root canals in

adult premolar teeth. *Folia morphologica*, *67*(4), 280-285.
16. Hoen, M. M., & Pink, F. E. (2002). Contemporary endodontic retreatments: an analysis based on clinical treatment findings. *Journal of endodontics*, *28*(12), 834-836.
17. Song, M., Kim, H. C., Lee, W., & Kim, E. (2011). Analysis of the cause of failure in nonsurgical endodontic treatment by microscopic inspection during endodontic microsurgery. *Journal of endodontics*, *37*(11), 1516-1519.
18. Balleri, P., Gesi, A., & Ferrari, M. (1997). Primer premolar superior com tres raices. *Endod Pract*, 3, 13-15.
19. Cantatore, G., Berutti, E., & Castellucci, A. (2006). Missed anatomy: frequency and clinical impact. *Endodontic Topics*, *15*(1), 3-31.
20. Slowey, R. R. (1974). Radiographic aids in the detection of extra root canals. *Oral Surgery, Oral Medicine, Oral Pathology*, *37*(5), 762-772.
21. Fava, L. R. G., & Dummer, P. M. H. (1997). Periapical radiographic techniques during endodontic diagnosis and treatment. *International Endodontic Journal*, *30*(4), 250-261.
22. Patel, S. (2009). New dimensions in endodontic imaging: Part 2. Cone beam computed tomography. *International endodontic journal*, *42*(6), 463-475.
23. Alenezi, M. A., Tarish, M. A., & Al-Nazhan, S. (2016). Cone-beam computed tomography of bilateral radiculous maxillary first premolars. *Saudi Endodontic Journal*, *6*(3), 153-156.
24. Görduysus, M. Ö., Görduysus, M., & Friedman, S. (2001). Operating microscope improves negotiation of second mesiobuccal canals in maxillary molars. *Journal of endodontics*, *27*(11), 683-686.
25. Sabala, C. L., Benenati, F. W., & Neas, B. R. (1994). Bilateral root or root canal aberrations in a dental school patient population. *Journal of endodontics*, *20*(1), 38-42.
26. American Association of Endodontists, American Academy of Oral and Maxillofacial Radiology. (2011). Use of cone-beam computed tomography in endodontics joint position statement of the American Association of Endodontists and the American Academy of Oral and Maxillofacial Radiology. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*, 111, 234-237.
27. Ball, R. L., Barbizam, J. V., & Cohenca, N. (2013). Intraoperative endodontic applications of cone-beam computed tomography. *Journal of endodontics*, *39*(4), 548-557.