International Journal of Contemporary Research and Review
Received 19-06-2023 | Revised 23-07-2023 | Accepted 28-07-2023 | Published Online 31-07-2023

DOI: https://doi.org/10.52845/rrijcrr/2023/14-7-1
IJCRR 14 (07), 20245-20250 (2023)

ISSN (O) 0976-4852

Dental science

Maxillary First Molar with Seven Root Canals: A Case Report

Reem Almalki | Faisal Alomran

College of Dentistry, King Saud bin Abdulaziz University for Health and Sciences

Abstract:

The maxillary first molar exhibit unpredictable root canal morphology and different number of root canals has been reported in the literature. Thus, precise knowledge of the root canal configuration and its variation is important during root canal treatment. Moreover, detection and proper disinfection of all canals is essential to yield favorable therapy outcome. The purpose of this article is to report a case of a young Saudi female with an anatomical variation. The patient underwent Cone-beam computed tomography (CBCT) examination, and CBCT scan slices revealed seven canals: three mesiobuccal (MB1, MB2, and MB3), two distobuccal (DB1 and DB2), and two palatal (P1 and P2). All canals were successfully cleaned and filled with a single cone obturation. Recognition of such anatomic variation can be challenging. Nevertheless, CBCT examination is an excellent tool for identifying and managing complex root canal systems. In addition, utilization of dental operating microscopes can be also helpful.

Introduction:

Successful root canal therapy requires a thorough knowledge of the root canal morphology; to ensure complete mechanical and chemical debridement of the entire root-canal system and its complete obturation with an inert filling material.[1] An important factor in determining the eventual success of the case is the ability to locate all the canals in this system.[2] If a canal is not explored, it cannot be cleaned and filled, and therefore is a potential cause of failure of the endodontic treatment.[2] Evidently, the root canal morphology of teeth is often extremely complex and highly variable.[1] With respect to the frequency of occurrence of the number of canals in each root, the number of roots, and incidence of fusion; there is a wide range of variation in the literature.[1,3,4] Such variations may result because of age, gender, and ethnic background of the population studied.[1,3,4] In maxillary molars, there are many variations regarding canals number and configuration.[3,4] The morphology of the root canals of maxillary first molar was described as the most intricate among the maxillary molar teeth by Vertucci.[5] Hence, it is crucial to be familiar with such variations and characteristic features.[4] Such knowledge can aid in location, negotiation, and proper management of the root canal system. Consequently, increase the success rate of the treatment.[4]

The morphology of the permanent maxillary first molar in a Saudi Arabian subpopulation was studied by Al-Nazhan and Al-Fouzan et al. using conventional radiographs (in vivo) and cone-beam computed tomography (CBCT) (in vitro).[5] Most teeth (99.7%) had three roots: 94% were separated, consistent with the previous CBCT findings in Indian, Chinese, Korean, North American, and Brazilian populations.[5] In terms of the number of canals, four canals per tooth was noted in 55.6% of teeth, the fourth canal usually located in the mesiobuccal (MB) root which ranges from 18.6% to 96.1%. Five canals (0.3%) were observed less frequently. Hartwell and Bellizzi found five canals in 0.2% of cases.[5-9] Despite that, additional canals were reported in the distobuccal (DB) and palatal (P) roots.

In the present case, a maxillary first molar with three roots and seven located canals successfully managed. The canal morphology was confirmed with CBCT.

Case Report:

A 13-year-old Saudi female was referred from advanced general dentistry clinics (AGD) to the Endodontics residents' clinic, King Fahad National Guard Hospital for a root canal treatment of the right maxillary first molar (#16). The patient's medical history was noncontributory.The patient revealed that they had received dental care a month ago. During the intraoral examination, Glass Ionomer Cement (GIC) was identified within the right maxillary first molar (16), did not exhibit any tenderness upon percussion nor palpation. An Intraoral Periapical (IOPA) radiograph of the tooth exhibited the presence radiolucency around the apex of MB root (Figure 1). IOPA of the tooth indicated the existence of a distinctive and complex root structure, characterized by overlapping roots. Through clinical and radiographic examination, a diagnosis of previously initiated therapy with asymptomatic apical periodontitis was made. A nonsurgical root canal treatment was suggested and accepted by the patient. The CBCT images confirmed the presence of seven canals; three MB, two DB, and two palatal canals (Figure 2).

The tooth was anesthetized with 1.8 ml 2% lidocaine containing 1:100,000 epinephrine. Temporary restoration was removed, and access cavity was refined under rubber dam isolation. The internal anatomy was evaluated using a dental operating microscope Carl Zeiss Meditec AG, Oberkochen, Germany) with the aid of DG-16 endodontic explorer and ultrasonic tips (Start-X #3, Dentsply Maillefer, Ballaigues, Switzerland), which revealed three (MB1, MB2, and MB3) canals, two (DB1 and DB2) canals, and two P canals.

Working length was determined using electronic apex locator (Root ZX; Morita, Tokyo, Japan) and confirmed with radiograph (Figure 3). The cleaning and shaping were performed using ProTaperNext (Dentsply Maillefer, Ballaigues, Switzerland) nickel-titanium rotary instruments with copious irrigation with 5.25% sodium hypochlorite (NaOCl) solution. The canals were dried with paper points and dressed with calcium hydroxide intracanal medication. The access was sealed with cotton pellet, Cavit, and (GIC) as a temporary restoration.

After 1 week and under rubber dam isolation, the temporary restoration and calcium hydroxide were removed. The canals were irrigated with 5.25% NaOCl along with manual and ultrasonic activation, dried with paper points, and obturation was performed using hydraulic condensation of Gutta-percha and Total Fill Bioceramic sealer (FKG Dentaire, La Chaux-des-Fonds, Switzerland). The tooth was temporized with a cotton pellet, Cavit, and GIC (Figure 4). The patient was then referred to a AGD resident to proceed with the permanent restoration.

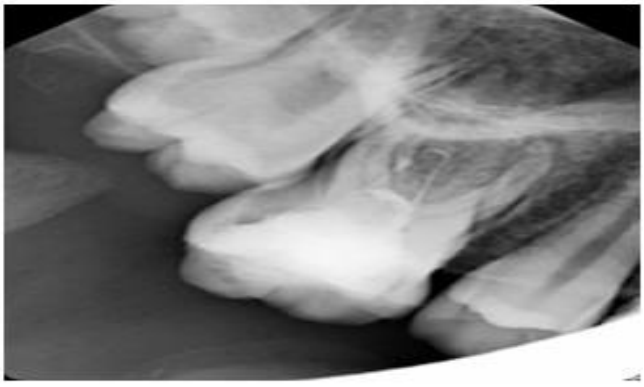

Figure 1: Pre-operative radiograph of tooth #16.

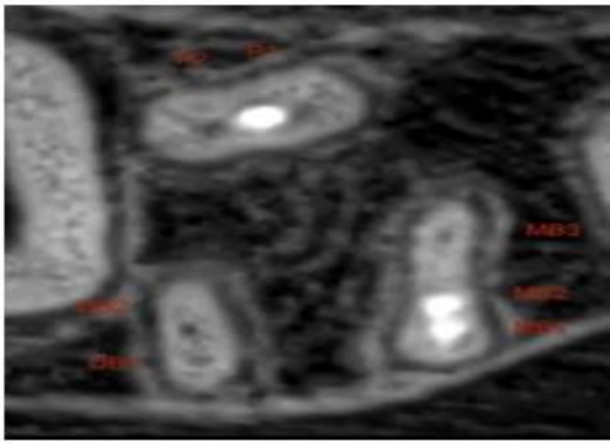

Figure 2: Axial cone-beam computed tomography section.

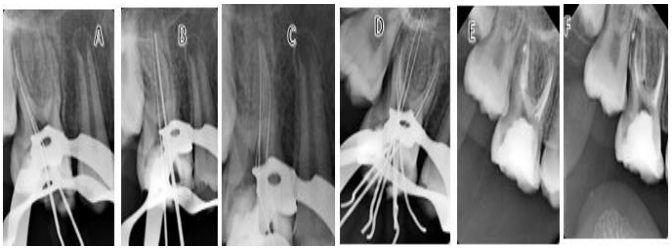

Figure 3: A: Working length radiograph for the distobuccal canals, B: Working length radiograph for the palatal canals, C: Working length radiograph for the mesiobuccal canals, D: Working length radiograph for all canals, E: Angled postoperative radiograph, F: Straight postoperative radiograph.

Discussion:

Being the earliest permanent tooth to appear in the oral cavity, the first molar is exposed for decay and is often in need for endodontic treatment.[10] Considering the vast individual, genetic and ethnic variations, anatomic variations are not uncommon in maxillary first molars.[10] Even though three roots and four canals are generally the accepted and most common form of the permanent maxillary first molar, additional canals in the distobuccal and palatal roots have been reported in the literature; however, case reports with more than 6 canals are not usual and only few cases have been previously published.[11-19] Exploration and thorough cleansing of the entire root canal system are keenly correlated to the success of the endodontic therapy.[2,10] It is important to detect each canal inside the roots for this goal to be achieved.[2,10] Any undetected root canals pose a major threat to the success of the endodontic treatment.[2,10]

When additional canals are studied with two-dimensional (2D) projection radiographs, such as periapical radiographs; detailed morphological information are more frequently missed than with three-dimensional (3D) sectional views.[20-22] In the present case, after identifying an unusual anatomy through clinical examination, the patient underwent CBCT examination. CBCT has been used in several areas of dentistry and is considered a powerful diagnostic tool in teeth morphology assessment; since it precisely reveals anatomic details in a 3D view, as well as it offers clear structural images with high contrast. [20-22] It was first introduced in the field of endodontics in 1990 by Tachibana and Matsumoto and was also recommended by the American Academy of Oral and Maxillofacial Radiology, the American Association of Endodontics, and the European Society of Endodontology for assessing the complexity of the root canal system.[23-25] CBCT imaging confirmed the presence of three mesiobuccal and two distobuccal canals, observed during clinical examination and also identified two palatal canals, not observed clinically.

Only Kottoor et al. reported a maxillary first molar with three roots and seven root canals, which had three MB, two DB, and two P canals, among the different case studies of maxillary first molars in dental literature. According to in vitro, clinical, and CBCT results, the incidence of second canals in the MB root was reported to be 92.85%, 95.63%, and 95.45%, respectively, while the corresponding figures for the DB root (DB2) were 1.15%, 3.75%, and 2.05%, respectively, and for the P root, the incidence of second canals was 0.62%, clinical, and 4.55%, respectively.[11,12] Most of the *in vitro* studies about the anatomy of MB root have not reported the presence of a third canal in the MB root.[26,27]

In this instance, CBCT scanning was used to gain a deeper comprehension of the internal root canal anatomy. Over the past two decades, the use of CBCT in dentistry has expanded significantly.[28,29] The present study utilized (CBCT) axial imaging

in order to confirm the presence of three roots and seven root canals, specifically including the mesiobuccal (MB1, MB2, and MB3), distobuccal (DB1 and DB2), mesiopalatal (MP), and distopalatal (DP) canals. The axial images obtained through the utilization of (CBCT) indicate that the P and DB roots exhibit a Vertucci type III canal configuration. The present study identified distinct variations in the root canal morphology of the maxillary molars. Specifically, the palatal root canal exhibited a Type IIII canal configuration, while the mesiobuccal root canal was characterized by a Type III canal configuration. Additionally, MB3 exhibited Type I canal configuration. These findings are visually demonstrated in Figure 2C and D.Therefore, CBCT scanning played a crucial role in the identification of this atypical root canal structure and contributed significantly to the effective endodontic treatment of the affected area.

Conclusion:

In addition to careful interpretation of angled radiographs, detailed exploration of the interior of the tooth under magnification, and utilization of CBCT, clinicians should be aware of the complex root canal anatomy to avoid leaving any remaining necrotic tissue, toxic products, or microorganisms in undetected canals; for a successful treatment outcome.

References:

1. Cleghorn BM, Christie WH, Dong CC. Root and root canal morphology of the human permanent maxillary first molar: a literature review. Journal of endodontics. 2006 Sep 1;32(9):813-21.
2. Buhrley LJ, Barrows MJ, BeGole EA, Wenckus CS. Effect of magnification on locating the MB2 canal in maxillary molars. Journal of endodontics. 2002 Apr 1;28(4):324-7.
3. Elhejazi A, Alanazi AA, Alanazi K, Alqahtani F, Shabi YM, Alqahtani AA. The morphological difference between maxillary posterior teeth in Saudi population. Annals of Dental Specialty. 2021 Apr;9(2):58-61.
4. Al-Fouzan KS, Ounis HF, Merdad K, Al-Hezaimi K. Incidence of canal systems in the mesio-buccal roots of maxillary first and second molars in Saudi Arabian population. Australian Endodontic Journal. 2013 Dec;39(3):98-101.
5. Al-Shehri S, Al-Nazhan S, Shoukry S, Al-Shwaimi E, Al-Shemmery B. Root and canal configuration of the maxillary first molar in a Saudi subpopulation: a cone-beam computed tomography study. Saudi Endodontic Journal. 2017 May 1;7(2):69.
6. Baratto Filho F, Zaitter S, Haragushiku GA, de Campos EA, Abuabara A, Correr GM. Analysis of the internal anatomy of maxillary first molars by using different methods. Journal of endodontics. 2009 Mar 1;35(3):337-42.
7. Thomas RP, Moule AJ, Bryant R. Root canal morphology of maxillary permanent first molar teeth at various ages. International endodontic journal. 1993 Sep;26(5):257-67.
8. Hartwell G, Bellizzi R. Clinical investigation of in vivo endodontically treated mandibular and maxillary molars. Journal of endodontics. 1982 Dec 1;8(12):555-7.
9. Kulid JC, Peters DD. Incidence and configuration of canal systems in the mesiobuccal root of maxillary first and second molars. Journal of endodontics. 1990 Jul 1;16(7):311-7.
10. Alrahabi M, Zafar MS. Evaluation of root canal morphology of maxillary molars using cone beam computed tomography. Pakistan journal of medical sciences. 2015 Mar;31(2):426.
11. Kottoor J, Velmurugan N, Sudha R, Hemamalathi S. Maxillary first molar with seven root canals diagnosed with cone-beam computed tomography scanning: a case report. *J Endod* 2010;36:915-921.
12. Kottoor J, Velmurugan N, Surendran S. Endodontic management of a maxillary first molar with eight root canal systems evaluated using cone-beam computed

tomography scanning: a case report. *J Endod* 2011;37: 715-719.

13. Badole GP, Warhadpande MM, Shenoi PR, Lachure C, Badole SG. A rare root canal configuration of bilateral maxillary first molar with 7 root canals diagnosed using cone-beam computed tomographic scanning: a case report. *J Endod* 2014;40:296-301.
14. Raghavendra SS, Hindlekar AN, Desai NN, Vyavahare NK, Napte BD. Endodontic management of maxillary first molar with seven root canals diagnosed using cone beam computed tomography scanning. *Indian J Dent* 2014;5:152-156.
15. Martins JN. Endodontic treatment of a maxillary first molar with seven root canals confirmed with cone beam computer tomography - case report. *J Clin Diagn Res* 2014;8:ZD13-ZD15.
16. Kumar R. Report of a rare case: a maxillary first molar with seven canals confirmed with cone-beam computed tomography. *Iran Endod J* 2014;9:153-157.
17. Almeida G, Machado R, Sanches Cunha R, Vansan LP, Neelakantan P. Maxillary first molar with 8 root canals detected by CBCT scanning: a case report. *Gen Dent* 2015;63:68-70.
18. Nayak G, Singh KK, Shekhar R. Endodontic management of a maxillary first molar with three roots and seven root canals with the aid of cone-beam computed tomography. *Restor Dent Endod* 2015;40:241-248.
19. Munavalli A, Kambale S, Bandekar S, Ajgaonkar N. Maxillary first molar with seven root canals diagnosed with cone-beam computed tomography scanning. *Indian J Dent Res* 2015;26:82-85.
20. Patel S, Dawood A, Whaites E, Pitt Ford T. New dimensions in endodontic imaging: Part 1. Conventional and alternative radiographic systems. Int Endod J 2009;42:447-62.
21. Nair MK, Nair UP. Digital and advanced imaging in endodontics: A review. J Endod 2007;33:1-6.
22. Al-Habboubi TM, Al-Wasi KA. Maxillary first molars with six canals confirmed with the aid of cone-beam computed tomography. Saudi Endodontic Journal. 2016 Sep 1;6(3):136.
23. Zheng QH, Wang Y, Zhou XD, Wang Q, Zheng GN, Huang DM. A cone-beam computed tomography study of maxillary first permanent molar root and canal morphology in a Chinese population. Journal of endodontics. 2010 Sep 1;36(9):1480-4.
24. Patel S, Durack C, Abella F, Roig M, Shemesh H, Lambrechts P, Lemberg K. European Society of Endodontology position statement: the use of CBCT in endodontics. International endodontic journal. 2014 Jun;47(6):502-4.
25. Fayad MI, Nair M, Levin MD, Benavides E, Rubinstein RA, Barghan S, Hirschberg CS, Ruprecht A. AAE and AAOMR joint position statement: use of cone beam computed tomography in endodontics 2015 update. Oral surgery, oral medicine, oral pathology and oral radiology. 2015 Oct 1;120(4):508-12.
26. Park JW, Lee JK, Ha BH, Choi JH, Perinpanayagam H. Three-dimensional analysis of maxillary first molar mesiobuccal root canal configuration and curvature using micro–computed tomography. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2009;108(3):437–42.
27. Eder A, Kantor M, Nell A, Moser T, Gahleitner A, Schedle A, Sperr W. Root canal system in the mesiobuccal root of the maxillary first molar: an in vitro comparison study of computed tomography and histology. Dentomaxillofac Radiol. 2006;35(3):175–7.
28. Sert S, Bayirli GS. Evaluation of the root canal configurations of the mandibular and

maxillary permanent teeth by gender in the Turkish population. Journal of endodontics. 2004 Jun 1;30(6):391-8.

29. Cleghorn BM, Christie WH, Dong CC. Root and root canal morphology of the human permanent maxillary first molar: a literature review. Journal of endodontics. 2006 Sep 1;32(9):813-21.

How to cite this article: Almalki, R., & Alomran , F. (2023). Maxillary First Molar with Seven Root Canals: A Case Report . International Journal of Contemporary Research and Review, 14(07), 20245–20250. Retrieved from https://ijcrr.info/index.php/ijcrr/article/view/1012