

The Incidence of Four Canals in Maxillary First Molars Treated at Alnoor Specialist Dental Centre: Clinical Report

Hamza Alsharief^{1*}, Nizar Mohammed Ahmed¹, Feras Aalam¹, Adel Alharbi², Hiba Gari¹ and Mohammad Kamel Alhashmy³

¹Department of Restorative, Alnoor Specialist Hospital; Dental Centre, MOH, Saudi Arabia

²Department of Pedodontics, Alnoor Specialist Hospital; Dental Centre, MOH, Saudi Arabia

³Primary health care, Taif, MOH, Saudi Arabia

Abstract

Aim and Objectives: We conducted a clinical study to report the incidence of a second mesiobuccal (MB2) canal that was identified and treated in the maxillary first molar during eight months in our restorative department at Al Noor specialist hospital.

Material and Methods: The clinical study is retrospectively conducted to determine the number of root canals in maxillary first molars that were negotiated and treated—the data collected from the examination sheet of the patient's files. Four endodontic specialists (E1-E4) treated a total of 129 1st molar teeth. All cases were treated under routine clinical protocol, no special instruments or standard protocol for searching for MB2 canal either. Searching for an MB2 canal relies on the low-speed round burs only. One of the endodontists used a dental loupe without the light of 2.5X magnification. All other specialists did not use any magnification aid. The presence of MB2 was confirmed when it was negotiated, instrumented and obturated.

Results and Conclusion: The specialists treated 129 maxillary first permanent molars. Only 38 (29%) cases had a fourth root canal—all fourth canals were found in the mesiobuccal (MB) roots. Overall, 60% of MB2 had commonly apical exist with MB1, type II Vertucci canal configuration. 40% of MB2 had type IV Vertucci canal configuration. In the present clinical study, no microscope or ultrasonic devices have been used. One of the specialists used loupes of 2.5X magnifications. Simple magnification utilizing dental loupe with proper anatomical knowledge could increase the detection of MB2.

Keywords: Loupe • Root canal morphology • Maxillary first molar • MB2

Introduction

Inconsistency in the root canal anatomy is a commonly occurring phenomenon. Thorough knowledge of the primary root canal anatomy and its variations is necessary for the successful completion of the endodontic treatment [1]. The root canal treatment (RCT) of the maxillary first molars is challenging and has the highest failure rate [2]. Theoretically, the presence of an infected second canal in the mesiobuccal (MB) root is the reason. It reported that remnants of pulp tissue could be a reservoir for microorganisms, which may affect treatment outcomes [3].

Substantial studies have demonstrated different variations in the number and morphology of maxillary first molar root canal systems [4]. In general, the upper first molar has three roots and four root canals. The MB root usually has two root canals named mesiobuccal 1 (MB1) and mesiobuccal 2 (MB2), distal and palatal have one [2].

Such complex root canal anatomy system has been conventionally diagnosed with radiographs, using different angulations which provide sufficient information to the clinician [5]. Radiographic limitation, of the overlap between the roots and the superimpositions of the bony anatomical structures on the

tooth, the radiographs can sometimes prove inconclusive [6]. Furthermore, do not provide detailed information concerning the 3- dimensional image, which would help the clinician in making a confirmatory diagnosis [7].

For years, clinicians and researchers suggested Modifications in endodontic access opening and exploration techniques [8]. Advancements in illumination and magnification technology, have a significant impact on the location and treatment of the second MB canal of maxillary first molars [9,10].

Root canal morphology extensively studied since the mid-19th century [11]. With the development of the methodology of investigation of internal and external root canal morphology, the complexity becomes more evident and well documented [9].

The maxillary first molar is attracted to the utmost interest of researchers in the analysis of root canal morphology. In specific, The MB root morphology has been the focus of researchers where RCTs failure is expected in this root [12]. The mesial roots are broad buccolingual of oval or deep oval shape or even elliptical shape. In general, the maxillary first molar has three roots of different configurations [13].

The percentage of discovered MB2 increased with the advancement in tooth investigation methods. Kulild and Peter, in an *ex vivo* study, found that 96% of MB root has two canals and 71% of them have separate apical foramina [2]. The general dentist and even endodontist could struggle with identifying MB2 clinically without sacrificing tooth structure [14]. This could be the reason why less MB2 was detected clinically than histologically [15]. However, with the introduction of magnification and the availability of micro-tools in the dental office, clinicians can manage MB2 safely [9].

There is no question about the importance of magnification and illumination in the ability to detect MB2. Buhrlay, et al., in their clinical study, found no difference between dental loupes and microscopes where the frequency of detected MB2 was 62% and 71% respectively [16]. In comparison, Schwarze's study showed that operating microscope and histological analysis show the comparable result in detecting MB2, which is double the number of cases

*Address for Correspondence: Alsharief, Hamza, Department of Restorative, Alnoor Specialist Hospital; Dental Centre, MOH, Saudi Arabia, Tel: 966 566109535; E-mail: hamza976@hotmail.com

Copyright: © 2022 Alsharief H, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Received: 6 December, 2022; Manuscript No. jccr-22-82492; **Editor Assigned:** 8 December, 2022; PreQC No. P-82492; **Reviewed:** 17 December, 2022; QC No. Q-82492; **Revised:** 20 December, 2022, Manuscript No. R-82492; **Published:** 28 December, 2022, DOI: 10.37421/2165-7920.2022.12.1542

detected with magnification loupes of 2X power [17]. But no magnification is significantly lower in the frequency of detecting MB2 in comparison to the microscope, 17% and 71% respectively [16]. The percentage of detected MB2 could be reached in 93% of cases with an increase in the operator's experience and using micro-instruments, e.g. ultrasonic and orifice micro finder [9].

The significant variation in MB2 between studies may appear due to the ethnic and racial background of studied patients [18]. In a clinical study of the Indian population, the visual detection of MB2 is 64% and under a dental operating microscope (DOM) is 84% [19]. In comparison to the study on the Saudi population, visual detection was 23% and 51% under DOM [20,21].

In systemic review, Cleghorn and coworkers found that the overall presence of MB2 canals in the mesiobuccal root was higher *in vitro* studies (60.5%) compared to clinical studies (54.7%) [22].

Aims and Objectives

Our *in vivo* clinical study reports the incidence of fourth root canals in maxillary first molar managed in 8 months of the year 2014 Makkah Dental Centre – Al Noor Specialist Hospital.

Materials and Methods

The clinical study is retrospectively conducted to determine the number of root canals in maxillary first molars that were negotiated and treated—the data collected from the examination sheet of the patient's files. Four endodontic specialists (E1-E4) treated a total of 129 1st molar teeth. Every endodontist with at least three-year experience working at Makkah Dental Centre – Al Noor Specialist Hospital. The teeth allocated in the study indicated primary root canal treatment with no root resorption and closed apex. All cases are treated under routine clinical protocol, no special instruments nor standard protocol for searching for MB2 either. Searching for MB2 relies on the low-speed round burs only. One of the endodontists used a dental loupe without the light of 2.5X magnification. All other specialists did not use any magnification aid. The presence of MB2 was confirmed when it was negotiated, instrumented and obturated.

Results

The specialists treated 129 maxillary first permanent molars. Only 38 (29%) cases had a fourth root canal—all fourth canals were found in the mesiobuccal roots. Overall, 60% of MB2 had commonly apical exist with MB1, type II Vertucci canal configuration. 40% of MB2 had type IV Vertucci canal configuration.

Discussion

The maxillary first molar is the most massive tooth in volume with equal complexes in root and canal anatomy. The mesiobuccal root of the maxillary first molar contains a double root canal system more often a single canal, in most [22]. Magnification and better illumination are essential elements to consistently perform ideal access openings and identify any variation in pulp floor anatomy and extra orifices [23]. Microscopes afford unsurpassed lighting, magnification, optics, ergonomics, and the potential to add a variety of additional accessories, including documentation packages [24].

Sempira, et al. and Hartwell, et al. reported that the use of a microscope did not change the numbers of second mesiobuccal canals located in comparison to dental loupe, but using a microscope increased clinicians' confidence while attempting to find the fourth canal [10,25]. What is significant, the access cavity should expand toward the mesiobuccal line angle and mesial marginal ridge areas at the same time, to provide optimal straight-line access to the MB1 and MB2 root canal systems [9,10]. Proper access will free instruments from coronal tooth structure or restorative interferences [8]. In cost-free health service, as in our centre, most modern endodontic equipment's costly and not easy to available.

The goal of this clinical study was to report the incidence of maxillary first molars that have an extra root canal in Saudi patients in Makkah city. The treated cases were collected for 8 months from January 2014 to August 2014. The data was collected from patients' examination progress sheets where the full details of endodontic procedures were documented. The number of root canal treatments was recorded for each endodontist separately.

The overall percentage is 29% (38/129) of cases had fourth root-canal (MB2). The endodontist (E1) who use dental loupe of 2.5X magnification treated 18/35 patients with MB2 (51%). The second endodontist (E2) manages 9/30 cases (27%). The other two Endodontists (E3 and E4) treated 5/34 (14.7%) and 6/30 (20%), respectively. There are no clinical guidelines in searching for MB2 in this study. However, the clinician could use low-speed round bur size #2 mounted on the low-speed handpiece or endodontic micromotor (ENDOMATE DT) from NSK for searching for the extra-root canal. Endo micromotor of rotation speed 800/min with high setting torque may provide more conservative and convenient visualization than conventional low-speed handpiece.

The endodontists (E1 and E2) verify the presence or absence of an extra canal in every case, focusing primarily on the finding of MB2, as mentioned on the patient's record. At the same time, the other two endodontists (E3 and E4) did not mention any notice on MB2 if they did not find it. E3 and E4, are graduated before 2000, and this could be the reason why they did not believe in the importance of searching and discovering MB2 if not present on the pulp floor. Unfortunately, this study depends on clinical findings only, with radiographic evaluation. All endodontists did not mention radiographic findings to correlate them with clinical findings.

We can mention here two significant factors that make the difference in the result of the incidence of MB2 between our endodontists. E1 and E2 are of four years' experience since graduation from comparable postgraduate programmes. Except for the E1 using a loupe of x2.5 magnification and E2 not, the clinical setting is the same. The incidence of MB2 in related cases was 51% and 27% for E1 and E2 respectively.

E3 and E4 graduated before 2000, and both do not believe in the existence of MB2 in every case, and did not use any magnification. When MB2 is visible on the pulpal floor, they negotiated and treated it, if not consider MB2, not exist. The incidence of MB2 in related cases was 14.7% and 20% for E3 and E4 respectively.

Al-Nazhan, et al. evaluate the root canal anatomy of maxillary first molar in Saudi patients, clinically and by conventional radiograph. They found that the incidence of second mesiobuccal was 23% of the total of 353 maxillary first molar cases [20]. In a clinical study on Saudi patients, Al-Fouzan, et al. in 2013, reported that from a total of 308 maxillary first molars treated by postgraduate students, under strict supervision, 51% of mesiobuccal roots had a second canal (MB2) [21]. Similar findings with advanced Cone Beam Computed Tomography study where the prevalence is 56% [26].

The percentage of MB2 in our study is higher than Al-Nazhan, et al. finding and significantly lower than the clinical study conducted by Al-Fouzan, et al., where DOM and ultrasonic devices have been used. The combined use of magnification and ultrasonic significantly increased the detection of MB2 [23].

Conclusion

Within the limitation of this clinical observation; the contemporary knowledge of root canal anatomy and the dental loupe of low power (2.5X) could significantly increase the detection of MB2.

Conflict of Interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

1. Martins, Jorge NR, Duarte Marques, Emmanuel João Nogueira Leal Silva and

- João Caramês, et al. "Prevalence studies on root canal anatomy using cone-beam computed tomographic imaging: A systematic review." *J Endod* 45 (2019): 372-386.
2. Kulid, James C and Donald D. Peters. "Incidence and configuration of canal systems in the mesiobuccal root of maxillary first and second molars." *J Endod* 16 (1990): 311-317.
 3. Costa, FFNP, J Pacheco Yanes, JF Siqueira and ACS Oliveira, et al. "Association between missed canals and apical periodontitis." *Int Endod J* 52 (2019): 400-406.
 4. Martins, Jorge NR, Duarte Marques, Emmanuel João Nogueira Leal Silva and João Caramês, et al. "Second mesiobuccal root canal in maxillary molars-A systematic review and meta-analysis of prevalence studies using cone beam computed tomography." *Arch Oral Biol* 113 (2020): 104589.
 5. Durack, Conor and Shanon Patel. "Cone beam computed tomography in endodontics." *Braz Dent J* 23 (2012): 179-191.
 6. Pasqualini, Damiano, Caterina Chiara Bianchi, Davide Salvatore Paolino and Lucia Mancini, et al. "Computed micro-tomographic evaluation of glide path with nickel-titanium rotary PathFile in maxillary first molars curved canals." *J Endod* 38 (2012): 389-393.
 7. Reddy, Y. Pallavi, Kumaraguru Karpagavinayagam and CV Subbarao. "Management of dens invaginatus diagnosed by spiral computed tomography: A case report." *J Endod* 34 (2008): 1138-1142.
 8. Ruddle, Clifford J. "Nonsurgical endodontic retreatment." *CDA J* (2004): 1-14.
 9. Stropko, John J. "Canal morphology of maxillary molars: Clinical observations of canal configurations." *J Endod* 25 (1999): 446-450.
 10. Hartwell, Gary, Craig M Appelstein, William W Lyons and Mary E Guzek, et al. "The incidence of four canals in maxillary first molars: A clinical determination." *J Am Dent Assoc* 138 (2007): 1344-1346.
 11. Hartwell, Gary and Ralph Bellizzi. "Clinical investigation of *in vivo* endodontically treated mandibular and maxillary molars." *J Endod* 8 (1982): 555-557.
 12. Hasan, Muhammad and Farhan Raza Khan. "Determination of frequency of the second mesiobuccal canal in the permanent maxillary first molar teeth with magnification loupes (x3.5)." *Int J Biomed Sci* 10 (2014): 201.
 13. Weine, F. S, S Hayami, G Hata and T Toda, et al. "Canal configuration of the mesiobuccal root of the maxillary first molar of a Japanese sub-population." *Int Endod J* 32 (1999): 79-87.
 14. Görduysus, M. Ömer, Melahat Görduysus and Shimon Friedman. "Operating microscope improves negotiation of second mesiobuccal canals in maxillary molars." *J Endod* 27 (2001): 683-686.
 15. Schwarze, T, C Baethge, T Stecher and W Geurtsen, et al. "Identification of second canals in the mesiobuccal root of maxillary first and second molars using magnifying loupes or an operating microscope." *Aust Endod J* 28 (2002): 57-60.
 16. Buhrely, Louis J, Michael J Barrows, Ellen A BeGole and Christopher S Wenckus. "Effect of magnification on locating the MB2 canal in maxillary molars." *J Endod* 28 (2002): 324-327.
 17. Smadi, Leena, and Ameen Khraisat. "Detection of a second mesiobuccal canal in the mesiobuccal roots of maxillary first molar teeth." *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 103 (2007): e77-e81.
 18. Habib, Adnan Asaad. "Anatomical study of the mesiobuccal root in maxillary first molars." *J Taibah Univ Sci* 9 (2014): 123-125.
 19. Manigandan, Kuzhanchinathan, Periasamy Ravishankar, Krishnamoorthy Sridevi and Venkatesan Keerthi, et al. "Impact of dental operating microscope, selective dentin removal and cone beam computed tomography on detection of second mesiobuccal canal in maxillary molars: A clinical study." *Indian J Dent Res* 31 (2020): 526.
 20. Saad, Al Nazhan. "The prevalence of two canals in mesial root of endodontically treated maxillary first molars among a Saudi Arabian sub-population." (2005): 24-28.
 21. Al-Fouzan, Khalid S, Hani F Ounis, Khalid Merdad and Khalid Al-Hezaimi, et al. "Incidence of canal systems in the mesio-buccal roots of maxillary first and second molars in Saudi Arabian population." *Aust Endod J* 39 (2013): 98-101.
 22. Cleghorn, Blaine M, William H Christie and Cecilia CS Dong. "Root and root canal morphology of the human permanent maxillary first molar: A literature review." *J Endod* 32 (2006): 813-821.
 23. Castellucci, Arnaldo. "Magnification in endodontics: The use of the operating microscope." *Pract Proced Aesthet Dent*: PPAD 15 (2003): 377-386.
 24. Carr, Gary B. "Microscopes in endodontics." *J Calif Dent Assoc* 20 (1992): 55-61.
 25. Sempira, HN and GR Hartwell. "Frequency of second mesiobuccal canals in maxillary molars as determined by use of an operating microscope: A clinical study." *J Endod* 26 (2000): 673-674.
 26. Al-Shehri, Sultan, Saad Al-Nazhan, Shreen Shoukry and Emad Al-Shwaimi, et al. "Root and canal configuration of the maxillary first molar in a Saudi subpopulation: A cone-beam computed tomography study." *Saudi Endod J* 7 (2017): 69.

How to cite this article: Alsharief, Hamza, Nizar Mohammed Ahmed, Feras Aalam and Adel Alharbi, et al. "The Incidence of Four Canals in Maxillary First Molars Treated at Alnoor Specialist Dental Centre: Clinical Report." *Clin Case Rep* 12 (2022): 1542.