CASE REPORT

# Management of Mandibular First Molar with Middle Distal Canal: An Important Morphological and Clinical Aspect—A Case Report

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*Received on:* 01 July 2024; *Accepted on:* 09 August 2024; *Published on:* 20 December 2024

## Abstract

To perform a successful root canal treatment, one must acquire sufficient access to all root canals, ensure proper mechanical preparation and disinfection, and place a three-dimensional hermetic filling. Practitioners must exercise caution while identifying the root canals in the mandibular first molar teeth, as they exhibit a diverse range of root canal variants. Additionally, being the first permanent tooth to emerge in the mouth, it often needs endodontic treatment. This case report describes the endodontic treatment of a permanent mandibular first molar with two roots, with two mesial canals and three distal canals that merge into a single apical canal (Sert and Bayirli type XVIII). By employing magnification, such as through the use of microscopes or loupes, the likelihood of identifying supplementary canals is improving. Cone-beam computed tomography can assist in the diagnosis of root canal morphology by enabling the accurate detection, search, and decontamination of the root canal system. Managing additional canals can present difficulties, but it is essential to accurately identify and manage these canals in order to prevent postoperative complications.

**Keywords:** Case report, Cone-beam computed tomography, Mandibular first molar, Middle distal canal, Root canal therapy.

*Journal of Dentistry and Bio-Allied Health Sciences* (2024): 10.5005/jdbahs-11017-0011

## Introduction

Effective endodontic therapy necessitates a meticulous examination of the anatomy of human teeth in order to enhance oral health and restore tooth functionality.[1] Failure to find and properly treat a root canal might result in the development of post-treatment disease.[2] Different types of root canal morphology, particularly in teeth with multiple roots, present a continuous difficulty in accurately diagnosing and effectively treating the condition. Therefore, it is essential to have a comprehensive knowledge of the structure and shape of the root canals in human teeth in order to achieve optimal root canal treatment.[2,3] While all teeth are practically intricate, mandibular first molars are particularly the initial permanent posterior teeth that emerge and thus are more susceptible to caries, making them especially prone to necessitating endodontic treatment.[4] The teeth display significant morphological variety and anomalies in terms of the quantity of roots and canals that exist. As there are several reports on abnormal canal structure, clinicians must be knowledgeable about this diverse architecture.[5] Several case reports and studies have demonstrated the existence of a middle mesial canal or three independent canals within the mesial roots of permanent mandibular first molars, often ranging from 1 to 15%. Additionally, a few studies have reported the presence of four canals in the mesial roots of these molars. However, there is a scarcity of data about the presence of multiple canals in the distal roots of mandibular first permanent molars.[6,7]

The dental professional should be attentive of the intricate anatomical structure that may be present in that specific kind of tooth. This case report aimed to document the effective nonsurgical endodontic therapy of a left permanent mandibular first molar comprising two roots with three distal canals and two mesial canals employing cone-beam computed tomography (CBCT).

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**How to cite this article:** Zarekar MS, Satpute AS, Zarekar MS, *et al*. Management of Mandibular First Molar with Middle Distal Canal: An Important Morphological and Clinical Aspect—A Case Report. J Dent Bio-Allied Health Sci 2024;1(2):56–59.

**Source of support:** Nil

**Conflict of interest:** None

**Patient consent statement:** The author(s) have obtained written informed consent from the patient for publication of the case report details and related images.

## Case Presentation

A 40-year-old female patient visited our office with the main concern of severe pain in her left lower molar. During the clinical examination, significant deep occlusal caries was observed in the mandibular left first permanent molar (tooth 36), and it was sensitive to percussion test. The patient did not provide any

relevant previous medical information. The tooth was stable and the periodontal probing was within normal range. The application of electric pulp testing (Parkel Electronics Division, USA) resulted in a delayed response. The preoperative radiograph revealed a radiolucency located in the occlusal region, in close proximity to the pulp chamber. Additionally, there was an increase in the periodontal ligament space and loss of lamina dura around the tip of the distal root (Fig. 1). The radiographic assessment of the tooth revealed a typical root canal structure. Upon meticulous examination of the radiograph, it was observed that the distal root had indistinct lines, indicating the presence of an extra canal. It was recommended to perform a preoperative CBCT scan to ascertain the canal morphology and identify any additional canals. Axial CBCT pictures revealed the presence of three separate root canals in the coronal (Fig. 2A) and middle sections (Fig. 2B) of the distal root, but only one canal was observed in the apical axial image (Fig. 2C). The coronal slice of the distal aspect similarly revealed three distinct entrances in the chamber (Fig. 2D), which then merged into a single canal at the apical third (Sert and Bayirli Type XVIII). Tooth 36 was diagnosed as symptomatic irreversible pulpitis and symptomatic apical periodontitis based on clinical and radiological evidence. Following the explanation of the treatment to the patient and after getting their informed consent, the root canal therapy was initiated.

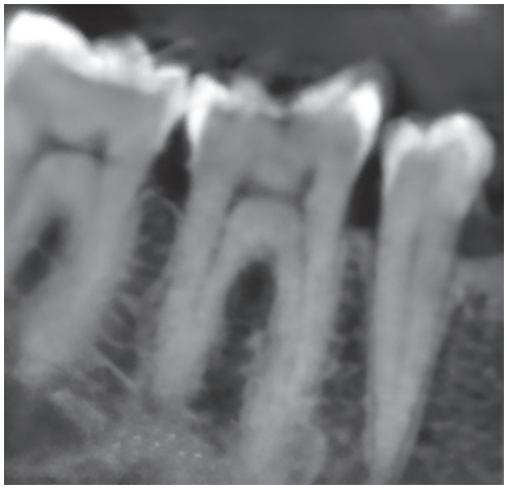
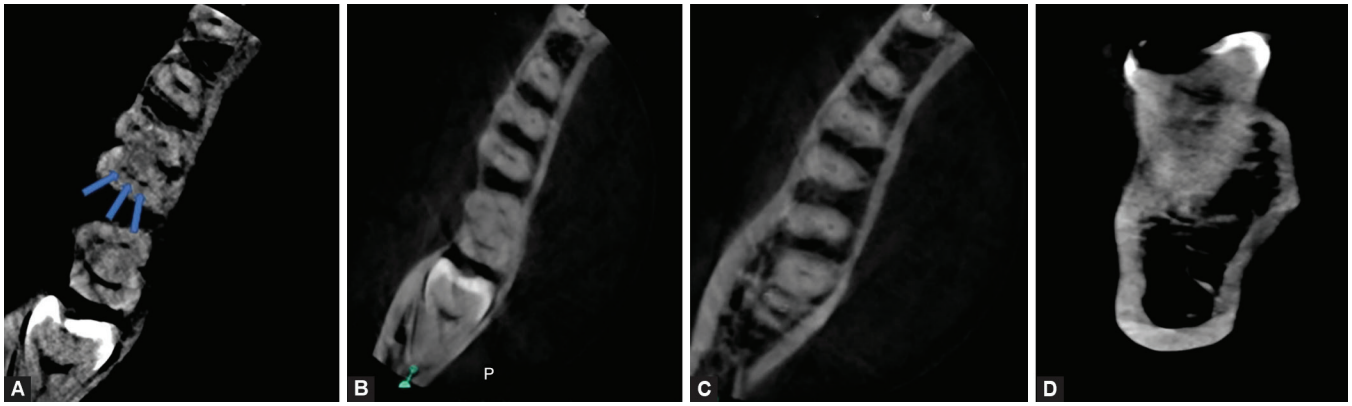
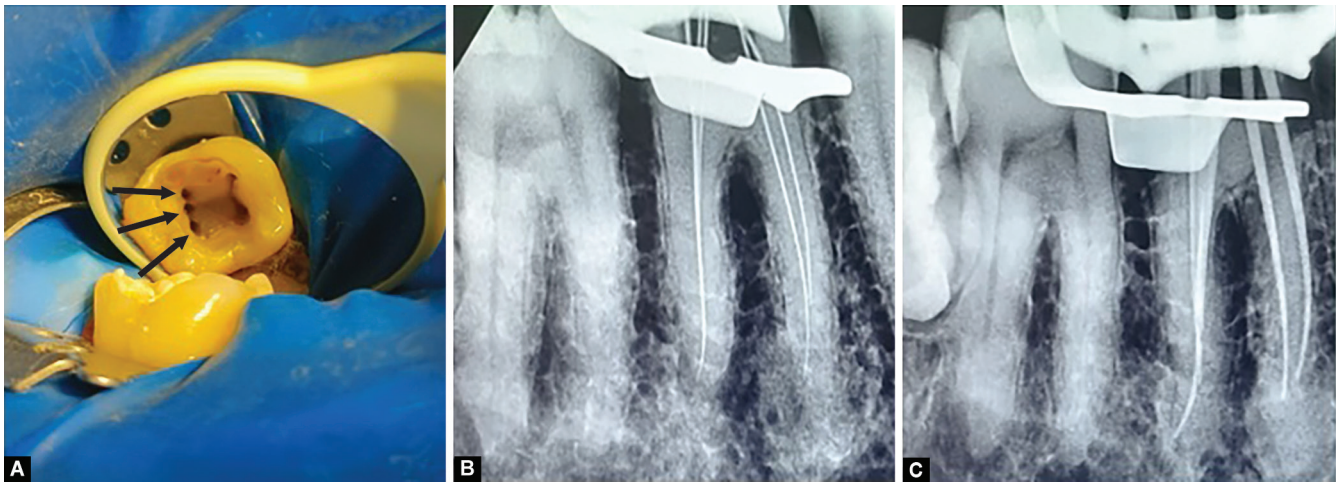


**Fig. 1:** Preoperative radiograph

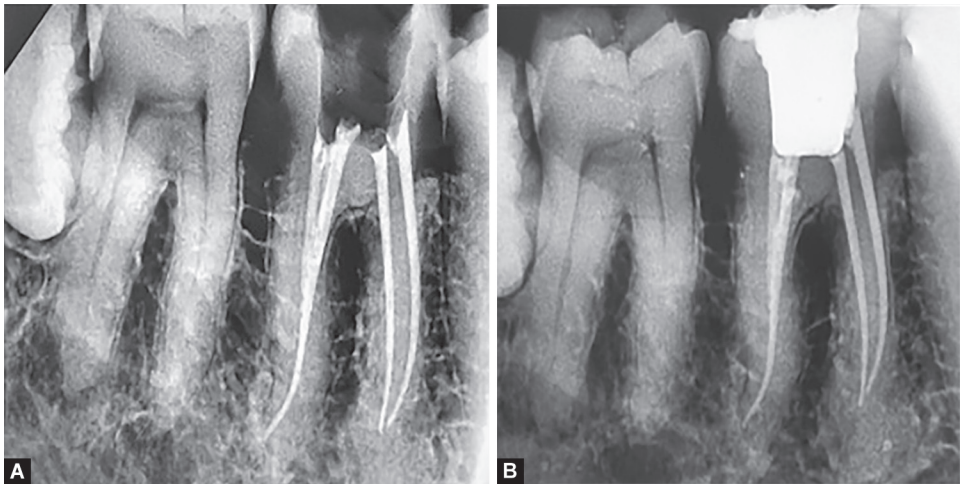
After administering local anesthesia using 2% lignocaine with 1:2,00,000 epinephrine (Xylocaine; AstraZeneca Pharma Ind Ltd.), access cavity was made in tooth 36 for endodontic treatment. The procedure was performed with the tooth isolated using a rubber dam. Upon inspection using a DG-16 endodontic explorer (Hu-Friedy, USA), it was observed that the pulp chamber included




**Figs 2A to D:** Axial sections of CBCT of mandibular 1st molar showing. (A) Coronal third; (B) Middle third; (C) Apical third; and (D) Coronal slice of distal aspect of mandibular first molar




**Figs 3A to C:** (A) Intraoral photograph showing three canal orifices at distal end and two orifices at mesial end; (B) Working length radiograph; and (C) Master-cone radiograph




**Figs 4A and B:** (A) Post-obturation radiograph; and (B) Follow-up radiograph at 6 months

four canals, namely the mesiobuccal, mesiolingual, distobuccal, and distolingual canals. Upon examination with a magnifying loupe (×2.5 magnification) (Heine, Germany), an additional canal was identified in the distant part of the root, located between the previously detected distobuccal and distolingual canals (Fig. 3A). We negotiated the canals with a #10 K-file (Dentsply-Maillefer). Using an electronic apex locater (Root ZX, J. Morita, Japan), the working length of every canal was measured and radiographically verified (Fig. 3B). The radiograph indicated the presence of three separate canals located toward the end of the tooth, which then converted into a single canal at the apical third. The root canals were prepared with RaCe NiTi rotary instrumentation in a crown-down approach with a size of 20/6%. Irrigation was performed between each instrumentation with saline, a solution of 3% sodium hypochlorite (NaOCl), and 17% EDTA and CBCT images were obtained with the patient's informed consent to verify the existence of the third distal canal. After performing the biomechanical preparations of the canals, the canals were dried with sterile paper points and sealed securely with appropriate Gutta-percha master cones (Fig. 3C) and MTA-Fillapex (Angelus, Brazil) sealer (Fig. 4A). Then coronal restoration was carried out utilizing composite resin (Tetric-N-Ceram, Ivoclar Vivadent). Further follow-up radiograph was recorded after 6 months (Fig. 4B).

## Discussion

The objective of endodontic therapy is to reinstate the functionality and esthetics of the affected tooth. This includes the process of cleaning, shaping, and disinfecting, which enables the complete filling of the root canal in three dimensions.[8] A comprehensive understanding of both the typical anatomy of the root canal structure and possible variations in the root canal is essential to achieve a favorable outcome of endodontic treatment.[9] Vertucci stated that a considerable proportion of root canal failures may be attributed to changes in the apical anatomy, such as the existence of apical deltas, fins, isthmuses, and additional canals. Hence, the significance of identifying all the canals and thoroughly removing any debris before sealing them cannot be overstated.[10] Typically, the first mandibular molar possesses two distinct roots, the mesial root and the distal root. The distal root often possesses a circular or more commonly oval canal, while the mesial root contains two canals.[11] The tooth typically possesses a mesial root with two canals, found in 94.4% of cases. Additionally, there is a third canal, known as the middle mesial canal, which occurs in 2.3% of cases. The distal root of the tooth has either one canal (62.7% of cases) or two canals (37.3% of cases). The occurrence rate of a third canal in the distal root of the mandibular molars is approximately 0.6%, significantly lower than that in the mesial root.[10–12] Radiographs taken in various directions can be used to identify anatomical differences in the system of root canals in the first mandibular molars. Traditional two-dimensional techniques used to examine the structure of the pulp space are being substituted by three-dimensional models such as CBCT. These advanced models allow for more accurate identification of variations in the pulp space.[13] In this case report, the working length of each canal was determined and then each canal was examined separately using K-files. However, after the file was placed in the distobuccal canal, the files in the middle distal and distolingual canals were short of the complete working length. Thus, it was concluded that all three of the distal canals merged in the apical portion of the distal root.

Various studies have highlighted that alterations in the root canal system are linked to age, since older patients tend to have a reduced number of canals because of dentinal metamorphosis.[14] As a person gets older, it is likely that their teeth may experience several types of injury, such as dental decay, wear, and erosion. This can result in the calcification of the opening or entire canal of the tooth. Prior to achieving a satisfactory treatment outcome, having a comprehensive knowledge of tooth morphology, utilizing angulated radiographs, inspecting the root canal with surgical operating microscopy, and conducting a thorough examination of the internal structure of the tooth are all essential.[15]

## Conclusion

This case report presents the endodontic treatment for a mandibular first molar with a middle distal canal. Dental practitioners must be conscious of the diverse root canal structure in the distal roots of mandibular first molars. Each case should undergo meticulous clinical and radiographic examination to identify any anatomical irregularities. The utilization of magnification facilitated the identification and localization of supplementary root canal. Furthermore, utilization of three-dimensional CBCT pictures enabled us to accurately assess the anatomy of the distal root. Understanding both typical and atypical anatomical structures has a significant impact on the factors that determine the outcome of endodontic treatment.

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## References

1. Ahmed HA, Abu-Bakr NH, Yahia NA, et al. Root and canal morphology of permanent mandibular molars in a Sudanese population. Int Endod J 2007;40(10):766–771. DOI: 10.1111/j.1365-2591.2007.1283.x.
2. Kottoor J, Sudha R, Velmurugan N. Middle distal canal of the mandibular first molar: A case report and literature review. Int Endod J 2010;43(8):714–722. DOI: 10.1111/j.1365-2591.2010.01737.x.
3. Barletta FB, Dotto SR, Reis MD, et al. Mandibular molar with five root canals. Aust Endod J 2008;34(3):129–132. DOI: 10.1111/j.1747-4477.2007.00089.x.
4. Berman LH, Hargreaves KM. Cohen's pathways of the pulp expert consult. Elsevier Health Sciences; 2015 Oct 2.
5. Rotstein I, Ingle JI, editors. Ingle's endodontics. 2019;7th ed. PMPH USA.
6. Weine FS. Case report: Three canals in the mesial root of a mandibular first molar(?) J Endod 1982;8:517–520. DOI: 10.1016/S0099-2399(82)80080-0.
7. Jacobsen EL, Dick K, Bodell R. Mandibular first molars with multiple mesial canals. J Endod 1994;20:610–613. DOI: 10.1016/S0099-2399(06)80088-9.
8. Chourasia HR, Meshram GK, Warhadpande M, et al. Root canal morphology of mandibular first permanent molars in an Indian population. Int J Dent 2012;2012:745152. DOI: 10.1155/2012/745152.
9. Ramachandran VS, Vidhya Shankari S, Rathakrishnan M, et al. Management of three rooted mandibular first molar with six canals: A case report Cureus 2019;11(12):e6280. DOI: 10.7759/cureus.6280.
10. Venumuddala VR, Sridhar M, Rajasekaran M, Poorni S, et al. Endodontic management of mandibular first molar with middle distal canal: A case report. Case Rep in Dent 2012;2012:458079. DOI: 10.1155/2012/458079.
11. Ballullaya SV, Vemuri S, Kumar PR. Variable permanent mandibular first molar: Review of literature. J Conserv Dent 2013;16(2):99–110. DOI: 10.4103/0972-0707.108176.
12. Maniglia-Ferreira C, de Almeida Gomes F, et al. Management of six root canals in mandibular first molar. Case Rep Med 2015;2015:827070. DOI: 10.1155/2015/827070.
13. Agarwal M, Trivedi HP, Gupta M, et al. Endodontic management of mandibular first molar with three distal root canals. Endodontology 2012;24(2):116–119.
14. Pattanshetti N, Gaidhane M, Al Kandari AM. Root and canal morphology of the mesiobuccal and distal roots of permanent first molars in a Kuwait population–a clinical study. Int Endod J 2008;41(9):755–762. DOI: 10.1111/j.1365-2591.2008.01427.x.
15. Alnassar F, Aldahman Y, Altuwalah A, et al. Assessment of the prevalence and configuration of middle distal canals in the mandibular molars in a Saudi subpopulation using Cone-Beam computed tomography. Saudi Dent J 2022;34(2):150–154. DOI: 10.1016/j.sdentj.2021.12.004.