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CASE REPORT

ENDODONTIC MANAGEMENT OF PERMANENT MANDIBULAR FIRST MOLAR WITH FOUR DISTAL ROOT CANALS: A CASE REPORTNagaraj NJ^{1*}, Pallavi S², ArvindKumar A³, Manoj KT⁴

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ABSTRACT

Endodontic therapy of mandibular molars is complicated due to the varied configuration of roots and canals. There are numerous cases in the literature describing the distinctive anatomy of mandibular first molars. An interesting illustration of anatomical variance in a mandibular first molar with more than four canals, particularly when four of these canals are found in distal roots. A mandibular first molar with six canals—two mesial and four distal canals in two distal roots—is the main focus of this report. A thorough grasp of anatomical variances, preoperative awareness, and intraoperative attention to detect both typical and distinctive anatomy of the root canal system can help to raise the rate of therapeutic success.

Keywords: Anatomical variation, Distal root, Endodontic treatment, Mandibular molar

INTRODUCTION

The tooth that most frequently needs Endodontic therapy is the mandibular first molar, which is the first posterior tooth to erupt.¹ With one or two canals in the distal roots and two or three canals in the mesial root, this tooth often has two roots, but it can also have anatomical variations on occasion.² Although MB and ML are the typical mesial canals, the developing groove may occasionally contain a middle mesial canal. One canal (the distal canal) or two canals (the DL and DB) make up the distal root, but occasionally a third distal canal is located in the middle.³ The work of Hess, who created vulcanite casts to replicate the architecture of pulp cavities, is the foundation for the present understanding of the root canal morphology of mandibular first molars. He discovered that 0.3% of 512 first and second mandibular molars had one canal, 17.7% had two, 78.0% had three, and 4.0% had four.⁴

Ghoddusi et al. reported on the treatment of a mandibular first molar with four distal canals in two distinct distal roots.⁵ Another case study by Ujariya et al., reported a mandibular first molar with four distal canals, including a vertucci 4-3-2-1 canal configuration.⁶ The number of canals and the anatomical variations in the distal roots of mandibular first molars have not been extensively researched in the literature.

This case report describes the effective, non-surgical endodontic therapy of a mandibular first molar with four canals in the distal root.

CASE REPORT

A 35-year-old male patient experienced pain in his lower left back tooth for the past week. The patient's medical history was non-contributory. A clinical examination revealed a deep disto-occlusal carious lesion on the right mandibular first molar. The tooth was tender to vertical percussion. Thermal and electric pulp tests yielded negative results. Physiologic mobility and a probing depth of less than 3 mm indicated a normal periodontal status. A preoperative radiograph showed radiolucency around the pulp cavity and widened periodontal ligament space (Figure 1A). A Confirmatory diagnosis of necrotic pulp with symptomatic apical periodontitis was made. The patient was informed about the treatment plan, and informed consent was acquired for endodontic treatment of the affected tooth.

The patient was administered to anaesthesia with 2% lidocaine and 1:80,000 epinephrine. A non-end cutting tapered fissure bur was used to refine the pulp chamber after access was obtained. A thorough examination utilizing a ProFinder # 10 file (Dentsply Maillefer, Switzerland) and operating dental loupes (Zumax SLE binocular loupes) at 2.5x magnification showed two canal orifices in the mesial root and two distal canals in the distal root. Exploration with DG-16 and ultrasonics helped in locating two additional canals in the distal roots. Totally Six different root canal orifices were found

in the pulp chamber; two were found mesially (Mesio-buccal and Mesio-lingual) and four distally (Distobuccal 1, Distobuccal 2, Middle distal and distolingual) (Figure 1B). The working length was determined with a #10 K-file, coupled to apex locator (J. Morita, Irvine, CA, USA). Using the crown-down method, root canal preparation was carried out using rotary files till 30 4% (Hanudent Topflex Rotary Files, India) in all the canals. During instrumentation, 3% sodium hypochlorite (Hyposol, Prevest Denpro Ltd, India) was used for irrigation, followed by 17% EDTA (MD Cleanser, MetaBiomed, Europe, GmbH, Germany). Then, the master-cone-confirmation radiograph was taken (Figure 1C). Following the final rinse with normal saline, the canals were dried with paperpoints and obturated using warm vertical compaction technique with 30 4% gutta-percha (Dentsply Maillefer, Switzerland) and Bioceramic sealer (Edge Bioceramic Thermal Flow, LLC, USA) (Figure 1D). Later, a crown restoration referral was made for the patient.

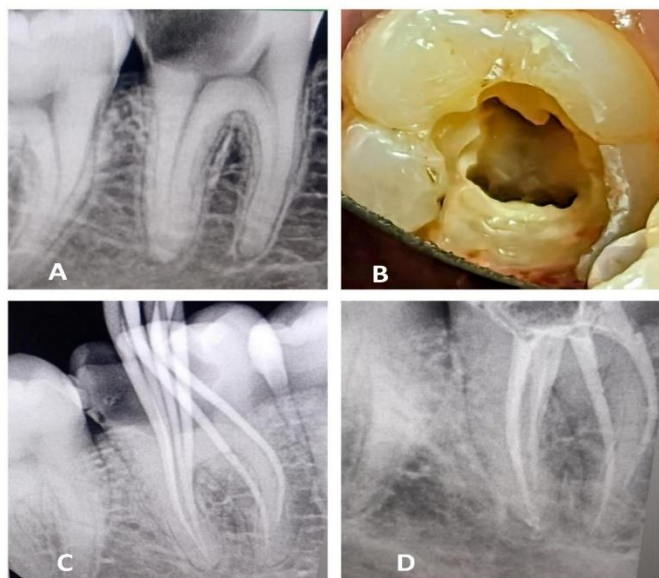


Figure 1: Endodontic management of Mandibular First Molar; **1A:** Pre-Operative radiograph; **1B:** Access opening showing 4 distal canals and 2 mesial canals; **1C:** Mastercone radiograph; **1D:** Obturation radiograph

DISCUSSION

Diagnosing and treating complex and varied root canal systems can be difficult. Two roots with three or four root canals are the most typical root canal morphology found in mandibular first molars. Accurate detection of extra canals is crucial to avoid complications during endodontic therapy.⁷ This case highlights a mandibular first molar with two mesial and four distal canals. Previous studies have shown that mandibular first molars typically have three mesial canals and two distal canals, but few have documented more than two distal canals. Ghodussi et al. originally reported the existence of four distal canals in mandibular first molars in 2007.⁵ Arora et al. and Sinha et al. later discovered four distal root canals in a Mandibular First Molar with two roots.^{8,9} There have also been numerous studies in the literature

that present the root canal configurations of distal roots utilizing various techniques.

The pulpal footprint refers to the lines and shadows on the pulp chamber floor that direct us to areas where more canals may exist. Furthermore, there are numerous concepts, armamentaria, and tools that might help to find such unusual canals.¹⁰ These include using micro-openers, ultrasonics, looking for symmetry rules, performing the sodium hypochlorite "champagne bubble test," as well as observing canal bleeding spots.¹¹ In this case, early radiography revealed the presence of more than one canal, and tactile examination assisted in locating extra distal canals.

Here, the apical foramen is shared by all the distal canals. The canal that has direct access to the apex is prepared and obturated to its entire working length, while the other canals are expected to be filled up to their junction sites. In this case, hand files were used before the nickel-titanium rotary instruments to prevent buckling and instrument separation.

CONCLUSION

Increasing studies of morphological variations in mandibular molars highlight the importance of clinician to inspect the pulp chamber floor for locating accessory canal orifices. A comprehensive knowledge of tooth and root canal anatomy, angulated radiographs, and root canal exploration with endodontic instruments are necessary for effective treatment outcomes.

DECLARATION

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare no conflict of interest.

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