

The Hidden Labyrinth: Clinical and CBCT Findings of a Mandibular First Molar with Six Canals-A Case Report

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Abstract: A favourable endodontic outcome depends on complete cleaning, shaping and sealing of the entire root canal system. Variations in the internal anatomy of mandibular molars can create considerable challenges, and undetected accessory canals may allow residual infection to persist and negatively influence treatment outcomes. Occurrence of both middle mesial and middle distal canals resulting in a six-canal configuration is an uncommon anatomical variation.

Keywords: Mandibular Molar; Six Canals; Mid Mesial Canal; Mid Distal Canal; CBCT.

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I. INTRODUCTION

Success of endodontically treated tooth needs comprehensive understanding of internal tooth anatomy, awareness of possible anatomical variations. Lower first molars generally exhibit three or four canals, uncommon varieties of additional canals have also been documented.^{1,2,13} The presence of additional mesial and distal canals together forming a six-canal pattern is regarded as an uncommon finding.⁹ Such anatomical complexity leads to the possibility of undetected canals if not identified appropriately. Careful assessment aided by magnification can improve identification of atypical canal morphology.^{11,12} This scenario depicts the treatment of 36 with six canals, with further confirmation through CBCT evaluation.

II. CASE REPORT

A Male Patient came to the Department with complaint of pain. The pain was intermittent, aggravated by thermal stimuli, and persisted even after removal of the stimulus, had no relevant medical history. On evaluation it revealed occlusal caries involving the mandibular first molar 36. Tender on percussion was positive, while no noticeable periodontal probing depths. Pulp vitality test elicited an exaggerated and lingering response. Preoperative intraoral periapical radiography demonstrated deep carious involvement approximating the pulp space without any evident periapical radiolucency. Based on radiograph and clinical findings, a diagnosis of acute irreversible pulpitis with acute apical periodontitis was made, endotherapy was planned.

After administration of LA and rubber dam isolation was done, an endodontic access cavity was prepared under 5×

magnification dental loupes which revealed the conventional mesiobuccal, mesiolingual, distobuccal, and distolingual canal orifices. Further inspection of the canals led to the identification of an additional middle mesial canal. Similarly, careful exploration of the groove connecting the distal canal orifices revealed a middle distal canal. Thus, six distinct canal orifices were identified. An electronic apex locator and Canal negotiation and patency were achieved using sizes 8, 10, and 15 K-files. Working length was taken with an apex locator and the same was confirmed with radiograph.

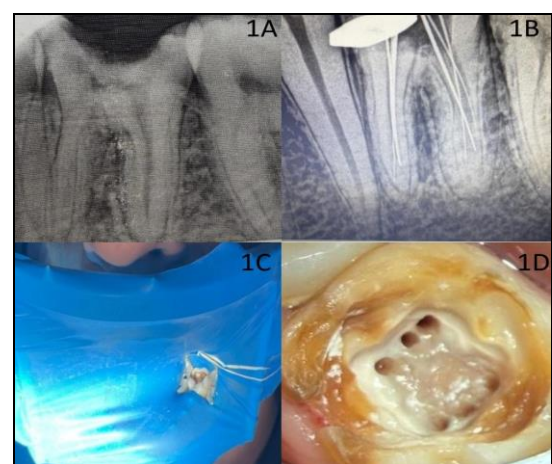


Fig 1 Composite Clinical and Radiographic Images. (A) Preoperative Intraoral periapical Radiograph Showing Deep Carious Involvement of Tooth 36. (B) Working Length Determination Radiograph Demonstrating all Identified Canals. (C) Rubber Dam Isolation Prior to Endodontic Treatment. (D) Access Cavity Showing Six Canal Orifices Including Middle Mesial and Middle Distal Canals.

All canals were cleaned and shaped subsequently using the ProTaper Gold files. Copious irrigation was carried out using NaOCl and 17% EDTA and a final rinse with normal saline. Following completion of biomechanical preparation, the canals were dried with paper points and obturated using GP cones and a bioceramic sealer employing the single-cone obturation technique. A postoperative radiograph demonstrated satisfactory obturation of all six canals. To further evaluate the canal morphology, CBCT was performed after obturation. Axial, coronal, and sagittal CBCT sections showed the presence of six distinct canals, thereby validating the complex canal anatomy. A permanent coronal restoration was done. On follow up he was asymptomatic.

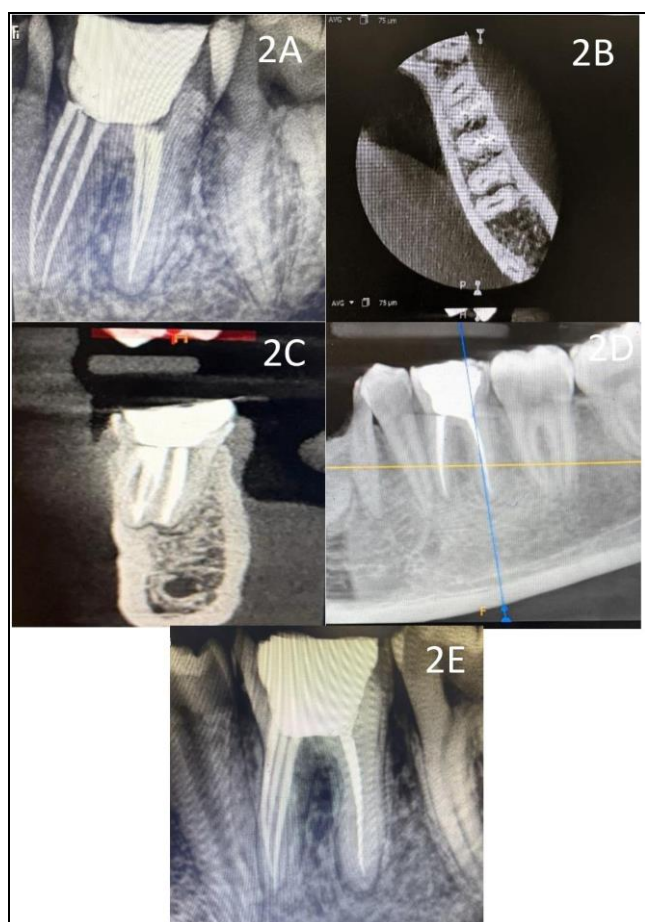


Fig 2 Composite Images Demonstrating Treatment Outcome and CBCT Evaluation. (A) Post-Obturation Radiograph Showing Satisfactory Obturation of All Six Canals. (B) Axial CBCT Section Confirming the Presence of Middle Mesial and Middle Distal Canals. (C) Coronal CBCT Section Illustrating the Root Canal Configuration. (D) Sagittal CBCT Section Demonstrating the Course and Spatial Relationship of the Canals. (E) Post Endodontic Coronal Restoration.

III. DISCUSSION

Discussion: Failure to identify additional canals can leave infected tissues untreated and may eventually contribute to treatment failure. Mandibular first molars most commonly present with three or four canals; however, several studies have reported variations in their internal anatomy.^{1,2} Middle mesial canal has already been widely discussed in the literature

and is usually located within the developmental groove.^{4,5,6} In contrast, the occurrence of third distal canal is relatively uncommon and has only occasionally been described in previous reports.¹⁴

The simultaneous presence of both additional canals resulting in six separate canals represents an unusual anatomic presentation.⁹ Advancements in magnification and illumination have improved clinicians' ability to identify accessory canals during endotherapy. In this case, the 5× magnification loupes enabled detailed assessment of the developmental grooves and facilitated identification of additional canals that might otherwise have remained undetected.¹⁰ CBCT imaging has become an important adjunctive tool in endodontics because it permits three-dimensional visualization of root canal morphology. Compared with conventional radiography, CBCT provides superior assessment of complex canal anatomy and can assist in confirmation of unusual canal configurations.^{11,12} In this case, CBCT evaluation verified the presence of six independent canals and supported the clinical findings.

As untreated canals remain a major factor contributing to endodontic failure, clinicians should carefully evaluate pulpal floor anatomy and remain aware of possible variations while treating mandibular molars. Appropriate access preparation, magnifying aids, and adjunctive imaging technique improves treatment outcomes.

IV. CONCLUSION

The case accentuates the priority of meticulous evaluation, modification and identifying unusual canal configurations. Awareness of such anatomical variations is essential for achieving predictable endodontic outcomes and preventing missed canals.

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