

# Mandibular First Molar with Middle Distal Canal: A Case Report

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## ABSTRACT

Limited data reports the occurrence of three or more canals in distal roots of mandibular first permanent molars. This paper presents and discusses a clinical report of root canal therapy in a permanent mandibular first molar and emphasises on the utilisation of magnification for the assessment, and acquaintance of the possible canal configuration, along with the management of middle distal canal of permanent mandibular first molar.

**Keywords:** Middle distal canal, root canal therapy, dental operating microscope.

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## INTRODUCTION

Successful treatment in various areas of odontology requires precise study of the morphology of human teeth with the objective of providing better oral health and restoring stomatognathic functions (1). Permanent mandibular first molar are the first permanent posterior teeth to erupt in the oral cavity and most often suffer from caries, so are highly susceptible for root canal therapy (2). All teeth may have anatomically complex and highly variable canal configuration and mandibular first molars which normally have one mesial and one distal root with two mesial and one or two distal canals (2), may have the probability of having a fifth canal also. Various case reports and studies (3-9) have shown the presence of middle mesial canal or independent three canals with occurrence frequency of 1-15% (10), whereas few others have found the occurrence of even four canals in the mesial roots of permanent mandibular first molars (11,12). However, limited data reports the occurrence of three or more canals in distal roots of mandibular first permanent molars (13-15), with occurrence frequency of 0.2% in Senegalese population (16) and 0.7% in Burmese population (17) to 1.7% (18,19).

Vertucci (20) emphasised on the impor-

tance to visualise and to have the knowledge of internal anatomy relationships before undertaking root canal treatment. Hence, careful evaluation of two or more periapical radiographs at different cone angles with respect to target tooth before commencing the root canal therapy are vital to adequately reveal the morphologic characteristic of root canal system (21). This paper is intended to represent and discuss a clinical report of root canal therapy in a permanent mandibular first molar with a middle distal canal.

## CLINICAL REPORT

A 45 year old, non-smoker, Indian male patient with non-contributory medical history reported to the department of endodontics with the chief complaint of pain in right lower back region of the jaw for past 7 days. Pain was continuous and radiating in nature which aggravated on mastication. Clinical examination revealed a carious lesion on mesial side of right mandibular first molar (46) and an access cavity preparation in tooth 45. Detailed past dental history revealed that patient had undergone emergency access opening of mandibular right second premolar (45) by a general dental practitioner. Tooth 46 was sensitive to percussion. Radiograph showed deep carious lesion on mesial side

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of 46 which approximated the pulp. On vitality testing using electric pulp tester (Parkell Electronics Division, New York, USA), tooth 46 tested negative. Results were further verified by thermal tests. The condition was diagnosed as chronic irreversible pulpitis. Non-surgical endodontic therapy was planned for both 46 and 45.

After routine local anesthesia (2% Lignocaine with 1:200,000 epinephrine) and rubber dam isolation, access was gained to the pulp chamber and refined using a non-end cutting tapered fissure bur (Endo-Z, Dentsply Maillefer, Ballaigues, Switzerland). Careful investigation under operating dental microscope (Global) at 10x magnification using a ProFinder # 10 file (Dentsply Maillefer) revealed two canal orifices in mesial root and an extra middle distal canal in distal root between the distobuccal and distolingual canal orifices (Figure 1) and a single canal orifice in 45. After pulp extripation, working length was determined electronically using an apex locator (RootZX®-II, J. Morita, and Kyoto, Japan). To get a clearer picture and to differentiate superimposed distal canals in 46, additional radiographs from different angles were taken (Figure 2). Canals were prepared upto size F2 using ProTaper® system (Dentsply, Konstanz, Germany) and were constantly irrigated using 3% sodium hypochlorite during the treatment. Calcium hydroxide was used as inter-appointment intercanal medicament. The access was temporarily sealed with Cavit and patient was recalled.

After one week, the patient was asymptomatic and both teeth were obturated using the corresponding ProTaper gutta percha

points and AH plus sealer. The access cavity was sealed with interim restoration (Figure 3). On subsequent visit tooth was restored with silver amalgam permanent restoration in both 46 and 45, and the patient was advised a full-cast crown on 46. The patient remained asymptomatic 3 months after the treatment and continues to be under active follow-up.

**DISCUSSION**

The complicated and diverse root canal system poses a challenge to successful diagnosis and treatment. Although literature suggests the presence of multiple canals in distal root also (13, 19), however, three canals in a distal root or middle distal canal is very rare occurrence. Presented case report emphasises on the utilisation of magnification for the assessment, and acquaintance of the possible canal configuration, and their management, in middle distal canal of permanent mandibular first molar.

Clinical application of scrupulous knowledge of canal anatomy and meticulous attention to treatment detail are crucial to minimize endodontic failure and/or a subsequent need for retreatment (22). Moreover, the dentist should be aware and ready for any deviation from normal instead of having a fixed pre-conception of the anatomy of any tooth requiring endodontic treatment (23). Limited intracanal visualisation with naked eye (24) and limited two-dimensional diagnostic accuracy of conventional periapical radiograph in endodontics is an important source of root canal treatment failure. Nonetheless, care-

ful interpretation of the radiographs with mesial and distal angulation and correct evaluation of the periodontal ligament may often reveal the presence of a bi/trifurcation of the canal. In the recent past use of magnification and fibreoptic illumination has made discovery of the “hidden” and “extra” canals easier and more frequent (22). Occasionally, the use of dyes or “champagne effect” i.e. the bubbling action of sodium hypochlorite may help to unearth an additional canal orifice (22,25). Size and extension of access cavity may have to be modified to incorporate any aberrant root canal or root, for example, radix entomolaris in mandibular molar (1,22), extra mesiobuccal (Mb2) in maxillary first molar (22, 25, 26) and extra buccal canal in maxillary premolars (27). Isthmus houses pulpal tissue and is the frequent location for an aberrant canal. It should be eliminated if it is only in the coronal third, but if it extends from coronal to middle/ apical it should be cleaned, shaped and obturated as a separate canal. Round burs number 1, 2, ½, ¼; LN-burs, ultrasonic tips (CKTD1, CKTD2, Ball tips), Munce discovery burs can be used to trough the surface to remove calcifications specially when working deep in the chamber or root (25,27). Also, Stropko recommended the sequential application of 17% aqueous ethylenediamine tetra-acetic acid (EDTA) and 95% ethanol using the Stropko irrigator fitted with a 27-gauge notched irrigating needle for effective cleaning and drying of the pulp chamber floor before visual inspection of the canal system (28).

Although complicated anatomy is encountered, shaping outcomes with nickel-tita-



Figure 1: Pulpal floor showing three distal canal orifices

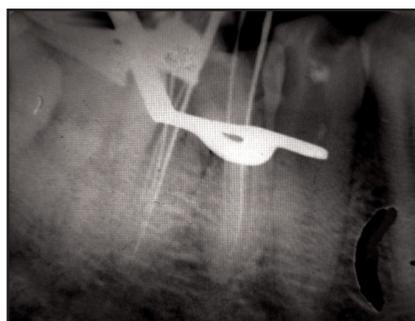


Figure 2: Intraoperative radiograph showing three canals in distal root of 46

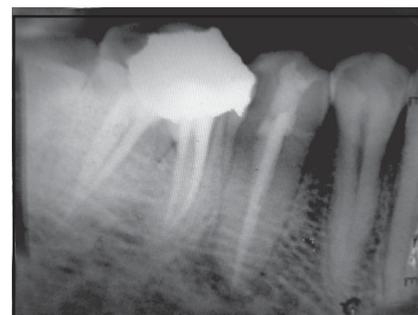


Figure 3: Postoperative radiograph showing obturated 45 and 46

nium instruments are mostly predictable

and it has been seen that careful use of rotary or hand Ni-Ti files prepares canals to a predetermined shape. Optimum instrumentation along with proper obturation technique like vertical compaction with apical backfilling has been suggested as it creates an effective apical plug and adaptation of backfilling to apical plug and canal walls (22).

Recent introduction of cone beam computed tomography (CBCT) imaging at reduced dose and cost as an alternative to multidetector CT imaging for the confirmatory diagnosis of canal morphologic aberrations (24) and operating dental microscope in the endodontic field have facilitated the clinician to explore the root canal system and to clean, shape, and obturate it more efficiently.

## CONCLUSION

The anatomy of root canal may be much more bizarre and complex as compared to the two dimensional picture seen on the radiographs, and literature is replete with studies, reviews and case reports about intricacies of this system. While some variations like second canal in distal root of mandibular first molar or MB2 are now not considered a rarity, but three canals in distal root of mandibular first molars finds very few references. The clinician should be prepared for these variations from normal and every effort should be made to detect, clean and seal them to achieve the goal of long-term and predictable endodontic treatment and advances in instrumentation and magnification help in achieving this target..

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