

## A Case Study on the Endodontic Treatment of Abberant Root Canal Morphology in the Maxillary First Molar with Seven Root Canals

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### Abstract

**Background:** This case study explains the peculiar shape of the first seven root canals of a maxillary molar. On the second appointment, the seven canals (MB1, MB2, and MB3, 2 Palatal, and DB1 and DB2) could be clearly seen at high magnification under an operating microscope in the young male patient's maxillary right first molar. The patient had endodontic treatment. The canals were obturated and instrumented thereafter. Every molar tooth has more than the customary three canals, which should be noted. Under a strong magnification, the position of root canals should be marked with a microscope. Finding any potentially missing canals requires a careful radiographic re-examination of the fillings.

**Case presentation:** The main complaint received by the department of endodontics concerned a 24-year-old male patient who was experiencing pain in his right upper back tooth. The discomfort did not go away and was worse in the heat. The patient also mentioned experiencing soreness at night. The patient's medical history was irrelevant. Clinical examination revealed a deep, pressure-sensitive carious lesion in the first tooth of the maxillary right. The electric pulp test revealed inflammatory pulpal changes early on. During the radiographic examination, a radiolucent lesion that reached the pulp on the distal part of the crown was found. There was root canal treatment.

**Conclusion:** Root varieties are rare, but that doesn't mean their importance should be minimised. Reviewing radiographs and the internal structure of teeth in detail is essential.

**Keywords:** Root Canals, Extra canals, Root Morphology.

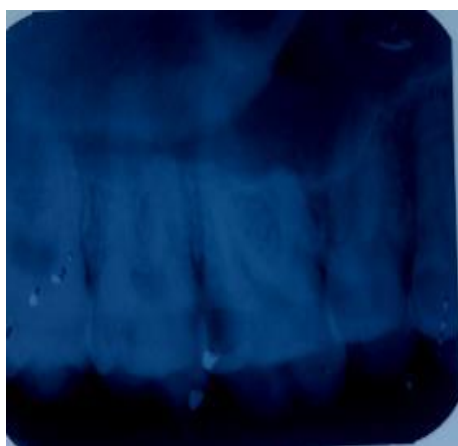
### Background

Determining the existence of root canal morphology, its changes, the presence of extra roots, and atypical root canal morphology requires in-depth understanding since it affects how well endodontic therapy works [1]. Access, clean, and obturate every canal in order to determine the long-term prognosis of root canal therapy. However, successful endodontic therapy is always hampered by the anatomic variances and difficulties [2]. Numerous investigations have reportedly been conducted to determine the morphology of the maxillary first molar, according to published reports. The maxillary first molar typically has three canals and three roots. Between 50.4% and 95% of instances contain a fourth canal [3–7], 2.25% have a fifth canal [8], and some writers have even documented cases with six canals [9–10]. It is less common; 3.6% of maxillary molars have been observed to have two canals in the distobuccal root [4, 10, 11]. Christie et al. [8–12] reported the endodontic treatment of maxillary molars with two palatal roots and categorised these teeth as types I, II, and III based on the root degree of divergence. This formed the basis for palatal root canal variants. A case of a maxillary first molar with two canals in each of the three roots was reported by

others [9–12]. With the use of an operating microscope, the clinical findings were verified, and the endodontic treatment was completed effectively.

## Case presentation

A 24-year-old male patient complained of pain in his right upper back tooth, which was the department of endodontics' major complaint. The pain persisted and became worse when heated. Additionally, the patient reported having pain at night. The patient had no relevant medical history. Upon clinical examination, the right maxillary first tooth was found to have a deep carious lesion that was sensitive to pressure. An early response from the electric pulp test indicated inflammatory pulpal alterations. A radiolucent lesion that extended to the pulp on the distal portion of the crown was discovered during the radiographic evaluation (Figure 1(a)). Following the clinical and radiographic evaluation, the patient was advised to undergo endodontic treatment after it was determined that the left maxillary first molar had irreversible pulpitis. Following rubber dam isolation, the tooth was anaesthetized with 1.8 mL of 2% lidocaine containing 1: 80,000 epinephrine (Lignox 2%, Indoco Remedies Ltd., Mumbai, India). A cavity for endodontic access was prepared. Mesio Buccal (MB), distobuccal (DB), and palatal are the three main root canal systems that were identified after a clinical assessment of the internal anatomy. Using an endodontic explorer (DG 16), little hemorrhagic spots were observed 2 mm palatal to the MB and DB canals following probing. A second palatal canal was discovered after the removal of the dentin obstructing the palatal canal's opening. Through the use of a surgical operating microscope, this was further assessed and confirmed. In contrast to mesio Buccal, which had three different orifices, distobuccal and palatal appeared to have two unique orifices (Figure 1(b)). To seal the access cavity, a sterile cotton pellet and a temporary Cavit repair (3 M Espe, Seefeld, Germany) were inserted into the pulp chamber. The two palatal canals united in the middle third of the root to follow as a single canal (Vertucci's type II), the mesio Buccal 1 and 2 canals combined, while the mesio Buccal 3 canal remained separate from the orifice joining at the apex. The working lengths of every canal were measured using an electronic apex locator (Propex II, Dentsply) and verified with a radiograph at the subsequent appointment. Dentsply Maillefer, Switzerland's ProTaper Gold nickel-titanium rotary instruments were used for the cleaning and shaping. An irrigation solution consisting of 2.5% sodium hypochlorite solution and 17% EDTA was used in between each instrument. Following the drying of the canals, obturation was carried out using a resin-based sealapex sealer and cold lateral compaction of gutta-percha (Dentsply Maillefer) (Figure 1(c)). After that, a composite resin core was used to reconstruct the tooth.



**Fig-1(a):** Preoperative radiograph showing carious lesion on distal aspect of maxillary 1<sup>st</sup> molar



**Fig-1(b):** Clinical photographs showing 3 mesial canals, 2 distal canals and 2 palatal canals in maxillary 1<sup>st</sup> molar



**Fig-1(c):** Post-operative radiograph showing 3 mesial canals merging, 2 separate distal canals and 2 palatal canals merging in maxillary 1<sup>st</sup> molar

## Discussion

In maxillary first molars, anatomical abnormalities ranging from one to seven canals are frequently found [4]. The maxillary first molar is widely believed to have three roots and three canals, with the presence of a fourth canal (MB2) in 50.4–91% of cases [3-6]. It is uncommon to find the twin canal system in all of a maxillary molar's roots at the same time [8, 9, 14, 15]. The case study demonstrates the unique structure of the maxillary first molar, which has two canals in the palatal, distal, and mesial regions. The secret to successfully recognising and navigating the unique anatomy of root canals is to properly open the access and alter its shape to approach all orifices. To enhance access to the extra canals, the traditional triangle access was changed to a trapezoidal form in the case reports shown here [14]. Finding root orifices can be aided by diagnostic procedures like taking multiple preoperative radiographs, using a sharp explorer to examine the pulp floor, troughing grooves with ultrasonic tips, staining the chamber floor with 1% methylene blue dye, conducting the hypochlorite champagne bubble test, and observing canal bleeding points [17]. The investigation of haemorrhagic sites using the DG16 and examination of the pulpal floor to follow the dentinal map in the cases that were reported were the first signs that suggested the existence of additional orifices and canals. The Surgical Operating Microscope is a valuable tool for root canal location (SOM). It improves illumination and visibility, making even the smallest details visible.

Research has shown that the SOM's lighting and magnification significantly improved the identification of MB2 canals [3,18–20]. Verifying the existence of morphologic differences is made easier with the use of magnification.

A radiographic examination is a crucial part of treating endodontic issues. However, they only create a 2D image of a 3D object, which leads to image superimposition [21]. For the purpose of accurately identifying teeth and assessing their internal morphology, computed tomography (CBCT) is a useful technique [22–25].

Even while traditional CT scans yield a high degree of detail, it is crucial to maintain the lowest feasible radiation exposure.

Notably, all four roots of the maxillary first molar have two distobuccal canals and two palatal canals in addition to three mesiobuccal canals in one tooth. These are unique findings. As a result, it's critical to recognise deviations from the norm and to make use of all the tools at hand to find and treat the complete root canal system.

## Conclusion

Even though root variants are uncommon, their significance shouldn't be undervalued. It is crucial to carefully review radiographs and the internal structure of teeth. The current cases validate the need for a thorough inspection of the pulpal floor under adequate lighting conditions at a high magnification. Under the operating microscope's illumination and stress the value of more recent imaging methods like CBCT in preoperative evaluation.

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