

# Management of mandibular first molar with three mesial canals and three distal canals—Two case reports.

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## Abstract

For the success of endodontic treatment, it is very critical for a clinician to have thorough knowledge of root canal morphology. There are a number of cases in literature wherein unusual anatomy have been discovered in mandibular first molars. Although the most common configuration is two roots and three root canals, mandibular molars might have many different combinations. There have been fewer reports regarding three mesial canals, three distal canals in mandibular first molars. The possibility of additional root canals should be considered even in teeth with a low frequency of abnormal root canal anatomy. This paper describes exploring of the unexplored, unusual anatomy of three mesial canals and three distal canals in mandibular first molars.

**Keywords:** Middle mesial canal, Three distal canal, Mandibular first molar, Extra canal, Distal root, Mesial root

## Introduction

The success of root canal treatment depends on number of factors such as proper diagnosis, assessment of prognosis, complete debridement and obturation of the canals. If any of these protocols are not followed then it results in endodontic failures. These failures can result because of persistent infection, iatrogenic errors such as perforations, ledge formations, missed canals etc. In order to prevent such errors, it is very essential to understand the root canal morphology.

Mandibular first molars have different variations in the aspect of size, shape, number of roots/ canals and growth alterations. This paper describes about mandibular molars with three mesial canals and three distal canals [1].

### Case 1

An 18 year old female patient reported with a chief complaint of pain in lower left back tooth region since 1 month. The pain aggravated on chewing food and during night. Clinical examination revealed a deep carious lesion and the tooth was tender to percussion. The tooth had no response to the vitality tests. The diagnosis was made as pulp necrosis with symptomatic apical periodontitis and endodontic treatment was planned. A 2% local anaesthesia was administered and access cavity was prepared under rubber dam isolation. During access opening a third canal was discovered between the mesiobuccal and the mesiolingual canals (Figure 1 and Figure 2). Working length determination was done using apex locator (NSK). Radiograph confirmed the presence of three mesial canals (mesiobuccal, mesiolingual and middle mesial) and two distal canals (Figure 3). Orifice enlargement was done using GG drills (MANI) and apical preparation up to 20 no

K file (2%) was carried out in the mesial and distal canals. Cleaning and shaping was continued with Protaper gold files (Dentsply Maillefer) in crown down technique in mesiobuccal, mesiolingual and distal canals with lubricant. As the middle mesial canal was narrow, Hyflex 4% (Coltene) was used for cleaning and shaping. Irrigation was carried out using normal saline and 3% sodium hypochlorite. After drying the canals with paper points (Dentsply, India), master cones (Dentsply, India) were placed and radiograph was taken (Figure 4). The canals were obturated using AH Plus (DeTrey/Dentsply, Germany) sealer by warm lateral compaction technique (Figure 5 and Figure 6). Follow was done upto 1 year.

### Case 2

A 20 year old male patient reported with a chief complaint of pain in lower right back tooth region since 2 years. The patient gave history of root canal treatment 2 years back and was experiencing pain since then. Clinical examination revealed a fractured restoration and the tooth was tender to percussion. The tooth had no response to the vitality tests. The diagnosis was made as persistent symptomatic apical periodontitis and endodontic retreatment was planned. A 2% local anaesthesia was administered and previous restoration was removed rubber dam isolation. During modification of access cavity, a third canal was discovered in the distal root, which was missed and unobturated (Figure 7). Working length determination was done using apex locator (NSK). Radiograph confirmed the presence of three distal canals and two mesial canals (Figure 8). Orifice enlargement was done using GG drills (MANI) and apical preparation up to 20 no K file (2%) was carried out in the mesial and distal canals. Cleaning and shaping was continued with Protaper gold files (Dentsply Maillefer)

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in crown down technique in distobuccal, distolingual and mesial canals with lubricant. As the third distal canal was narrow, Hyflex 4% (Coltene) was used for cleaning and shaping. Irrigation was carried out using normal saline and 3% sodium hypochlorite. After drying the canals with

paper points (Dentsply, India), master cones (Dentsply, India) were placed and radiograph was taken (Figures 9 and Figure 10). The canals were obturated using AH Plus (DeTrey/Dentsply, Germany) sealer by warm lateral compaction technique (Figure 11).



**Figure 1:** Preoperative radiograph.



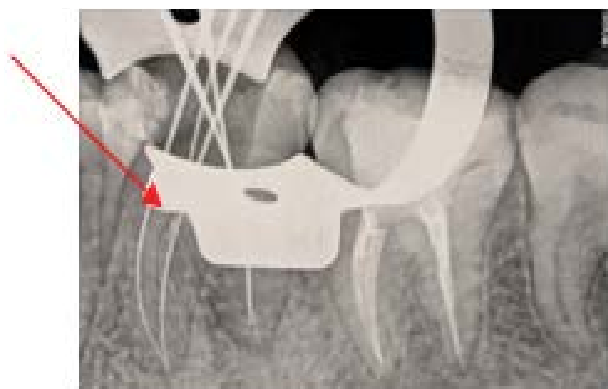
**Figure 5:** Completed root canal treatment.



**Figure 2:** Access opening.



**Figure 6:** Preoperative radiograph.



**Figure 3:** Working length.



**Figure 7:** Access opening.

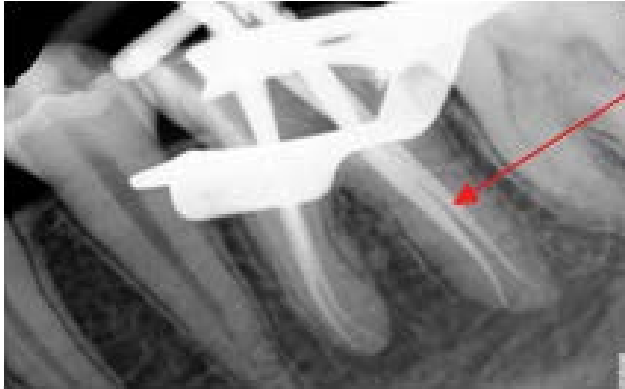


**Figure 4:** Master cone.

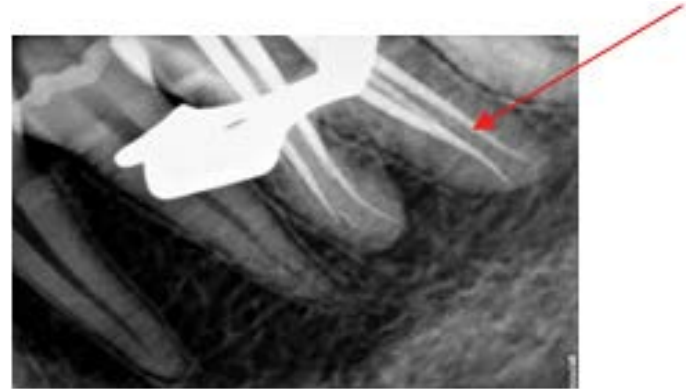


**Figure 8:** Working length.

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**Figure 9:** Master cone (Mesial).



**Figure 10:** Master cone (Distal).



**Figure 11:** Completed root canal treatment.

**Table 1:** Prevalence of configuration types of middle mesial canal.

Author	Year	MMC (%)	Independent (%)	Fin (%)	Confluent (%)
Barker et al	1969	1	1		
Vertucci and Williams	1974	1	1		
Pomeranz et al	1981	12	1 (I),1(II)	5(I),3(II)	1(I),1(II)
Walker	1988	1	1		
Fabra Campos et al	1989	2.6	0.1		2
Goel et al	1991	15	6.6		8.3
Caliskan et al	1995	3	3		
Gulabivala et al	2001	10.8	1		9
Wasti et al	2001	3	3		
Gulabivala et al	2002	6.7	0.7		6
Sert et al	2004	1.5	1.5		
Villegas et al	2004	5	5		
Peiris et al	2007	4.52	1.2		3.3
Shahi et al	2008	0.95			0.95
Chen et al	2009	6	6		
Gu et al	2009	0.82	0.82		
Karapinar	2010	20			0
Kazandag et al, Mukhaimer	2014	3.1	0	0	3.1
Azim et al	2015	46.2	9.5	12	78.5
Nosrat et al	2015	20	20	33.3	46.7
Chavda and Garg	2016	50	0	0	96

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**Table 2: Incidence of three distal canals in the mandibular first molars.**

Investigator	Year	Teeth	Method	Incidence (%)	Population Group
Caliskan et al	1995	100	Extracted	1.7	Turkish
Goel et al	1996	60	Extracted	1.7	Indian
Sperber	1998	480	Extracted	0.2	Senegalese
Gulabivala et al	2001	139	Extracted	0.7	Burmese
Gulabivala et al	2002	118	Extracted	1.6	Thai
Sert et al	2004	20	Extracted	1	Turkish
Ahmed et al	2007	100	Extracted	3	Sudanese
Al-qudah and Awawdeh	2009	330	Extracted	0.3	Jordanian

## Discussion

Most of the times clinicians usually perceive that a particular tooth will have a predetermined number of roots and root canals. Extra roots/canals are those that show up more than average in different populations. Complicated and diverse root canal systems pose a challenge to successful diagnosis and treatment [1,2]. The most common root canal morphology of mandibular first molars is the presence of 2 roots with either 3 or 4 root canals. The presence of a third canal in the mesial root is known as the middle mesial canal, which is found more towards mesiobuccal canal than the mesiolingual canal. Baugh and Wallace in a review, reported that the prevalence of a third canal in the mesial root of mandibular first molars was about 1-15%, but the existence of three canals in the distal root of mandibular first molars is uncommon [3].

Nosrat et al and Versiani et al found significant differences in the incidence of MMC between White (12.2%) and non-White (29.4%) patients. Table 1 shows the prevalence of configuration types of middle mesial canal [3]

Pomeranz et al. in their study of 100 molars (61 first and 39 second molars) reported 12 cases of middle mesial canals. They classified middle mesial canal into three categories: (1) fin, when at any stage of debridement the instrument could pass freely between mesiobuccal or mesiolingual canal and the middle mesial canal, (2) confluent, when the prepared canal originated as a separate orifice but apically joined the mesiobuccal or mesiolingual canal, and (3) independent, when the prepared canal originated as a separate orifice and terminated as a separate foramen [4,5].

The incidence of a third canal in distal root is a rare occurrence with a prevalence rate of 0.2% to 3% in different ethnic groups [6-10].

There are only few comprehensive studies reporting the incidence of three distal canals in the mandibular first molars which have been summarized in Table 2 [2].

## Conclusion

It is very essential to understand when to suspect abnormality. An extra cusp (tuberculum paramolare), prominent occlusal distal/distal lingual lobe, cervical prominence, may indicate the presence of an additional root/canal. Additional off-angle radiographs, pulpal "footprint" can help to locate canals.

Other aids such as micro-openers, magnification tools, red line test, white line test, perio probing can be used. The traditional "champagne bubble test," still remains the gold standard for locating the root canal orifices. Additionally, CBCT and micro CT provide adequate information regarding the root canal morphology and are more superior to conventional radiographs.

As there is an axiom that states "You can treat, what you can see" [1] it is very essential for the clinician to carefully inspect the pulp chamber floor to locate possible accessory canal orifices. A thorough understanding of root canal morphology, angulated radiographs and exploring the root canals under magnification tools are the prerequisites for a successful treatment outcome [7-9].

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