

## Original Research Article

**ENDODONTIC TREATMENT OF MANDIBULAR FIRST MOLAR HAVING MIDDLE MESIAL CANAL: AN ANATOMICAL CHALLENGE**<sup>1</sup>Varnika Yadav, <sup>2</sup>Praveen Singh Samant<sup>1</sup>MDS, Department of Conservative Dentistry and Endodontics, Saraswati Dental College and Hospital, Lucknow, India<sup>2</sup>Professor & Head, Department of Conservative Dentistry and Endodontics, Saraswati Dental College and Hospital, Lucknow, India

Received: 24-01-2022 / Revised: 28-02-2022 / Accepted: 20-03-2022

Corresponding author: Varnika Yadav

Conflict of interest: Nil

**Abstract**

Mandibular molars are frequently affected by dental caries. They exhibit variation in their internal anatomy, thus mandatory to understand in detail about their complex anatomy. Middle mesial canal is the third canal located between mesiolingual and mesiobuccal. Its detection and negotiation is an important practical issue in endodontics. Accordingly, the uses of magnifying aids are indicated to enhance the long-term favorable outcome of endodontic treatment. This case series defines two cases encountered for endodontic management during routine endodontic procedure.

**Keywords:** mandibular first molar, middle mesial canal, root canal treatment. This is an Open Access article that uses a fund-ing model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

**Introduction**

Successful root canal therapy can be attained by accomplishing complete negotiating, shaping, cleaning and obturation to the entire root canal space.<sup>1</sup> The chamber of pulp should be uncontaminated and obturated with the help of inert obturating material for the successful result of endodontic therapy. Thus, the main objective of endodontic therapy is to obtain and maintain the hermetic seal of the root canal space. For clinicians, the biggest challenges are to face the complexity of the root canal morphology. Thus, in-depth knowledge of the pulp chamber is required.<sup>2</sup> In literature, it is mentioned that there are many studies that were carried out to study the mandibular molars morphology, still there

is limited facts about internal anatomy of middle mesial canal.<sup>3</sup> The variations are as follows; a C-shaped root canal anatomy, radix entamolaris, isthmus (ribbon-shaped communication) between mesiolingual and mesiobuccal canal and third canal (middle mesial canal) first mentioned by Vertucci<sup>4</sup>. As per reports of different studies, the prevalence of middle mesial canal was shown to have a range between 0-46%.<sup>3</sup> An identification of the topographic location of the additional canals is the matter of prime importance for the dentists. To detect and treat the entire root canal space, it is extremely important to use all armamentarium by the dentist. Additional diagnostic aids like

CBCT, magnifying loupes, micro CT, dental operating microscope and so forth can also be used to locate and negotiate the middle mesial canal.<sup>5</sup>

The following reports describe the successful endodontic treatment of three mandibular first molars having middle mesial canal.

### Case Report 1

A 35 year old female patient presented with a history of pain since 7 months on the buccal side in the lower left molar area. The mandibular left first molar was tender on vertical percussion. A radiograph revealed a deep carious lesion in mesial proximal area approaching the pulp space and a mindful radiolucency present in apical region of mesial root [Fig.1a]. A diagnosis of chronic periapical abscess was made for the mandibular left first molar #36 and root canal therapy was planned.

Local anesthesia (2% lidocaine with 1:40,000 adrenaline) was administered. Under rubber dam, all carious tissue was removed. An adequate access cavity was prepared [Fig.1b] under a 3.5X magnifying loupe. Using a DG-

16 Endodontic explorer (Hu-Friedy, USA), the extra middle mesial canal was located. The working length was determined by an apex locator (Denta Port; J.Morita Mfg Corp, Kyoto, Japan) [Fig.1c]. All canals were cleaned with protaper NiTi rotary instruments (Dentsply-Maillefer, Ballaigues, Switzerland). Irrigation with 5.25% sodium hypochlorite, 17% EDTA (Prime Dental Products Pvt Ltd, Mumbai India) and saline was performed. Canals were dried with sterile paper point and temporized with calcium hydroxide (Pulpdent, USA).

At the second appointment after a week, tooth was asymptomatic. All the canals were irrigated, dried with paper points and mastercone radiograph was taken [Fig.1d]. The canals were obturated with cold lateral condensation of gutta-percha using resin sealer (Dentsply Tulsa). The tooth #36 was restored with miracle mix. A post operative radiograph [Fig.1e] was taken showing the confluent type, and during the follow-up period patient was asymptomatic.

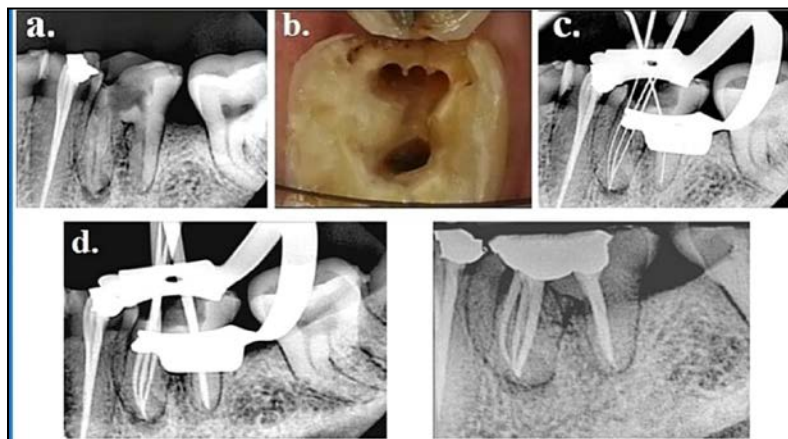


Figure 1

Figure 1b- Pulp Chamber floor of tooth 36 showing three already instrumented root canals in mesial root (mesiobuccal, mesiolingual and, mesiolingual).

Figure 1c- Working length radiograph #36.

Figure 1d- Master cone radiograph #36.

Figure 1e- Postoperative radiograph of tooth 36 showing confluent type middle mesial canal.

## Case Report 2

A 28-year-old female patient presented with symptoms of noticeable spontaneous pain in left mandibular region. On intraoral clinical examination, a deep cavity was observed in the distal proximal region (tooth 36). The tooth gave positive response on percussion test. Clinical diagnosis of acute apical periodontitis #36 was established.

After administering anaesthesia locally in left mandibular tooth back region, the tooth was isolated under a rubber dam and all carious tissue. An access cavity was prepared. Ultrasonic tip ET-20D (Satelec) was used to remove the dentin covering the interconnecting groove of mesial canals. An endodontic probe DG-16 (Hu-Friedy), C-Pilot File (VDW), and a magnifying loupe were helpful for careful examination of the pulpal

chamber in tooth 36 and negotiate the anatomy/

After determination of working length using electronic apex locator (Denta Port; J.Morita Mfg Corp, Kyoto, Japan)[Fig.2a], a complete cleaning and shaping of all root canals was performed using protaper NiTi rotary instruments (Dentsply-Maillefer, Ballaigues, Switzerland) and then root canals were irrigated with sodium hypochlorite solution (Chloraxid 5.25%, Cerkamed) and 17% EDTA. Afterwards, absorbent paper points were used to dry the canals. Radiograph was taken with master cones in all canals [Fig.2b]. Finally, the canals were obturated in the same appointment by cold lateral condensation of gutta-percha with resin sealer. Cavity was sealed with IRM cement [Fig.2c]. Then the post endodontic restoration was performed in subsequent appointments to ensure adequate coronal seal.

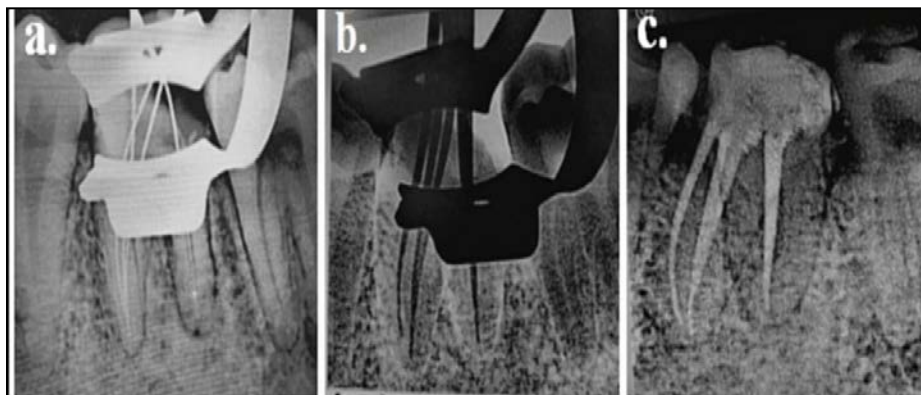


Figure 2

Figure 2a- Working length, three mesial canals and one distal canal #36.

Figure 2b- Master cone (inverted) radiograph #36 .

Figure 2c- Postoperative radiograph of tooth 36.

## Discussion

Proper knowledge of root canal anatomy variations helps in the success of multi-step process i.e. root canal treatment. Missing canals is one of the most common reasons for the root canal failure.<sup>3</sup> Unprepared and unrevealed portion of root canal might

contain bacteria which lead to unhealed periapical lesions and chronic symptoms.<sup>1</sup>

As per previous studies missing canal decreases the long-term success of the endodontic treatment.<sup>4</sup> Due to missed canal there were 42% of fail endodontic cases. In north India, presence of MM canal is quite high.<sup>6</sup>

In younger patients the incidence of middle mesial canal is higher as compared to old aged patients. Patients who are less than 20 years showed 32.1% incidence of negotiating canals.<sup>4</sup>

Pomeran et al. classified MM canal into 3 configurations: fine, confluent and independent.<sup>7</sup> (i) Fin: in between main canal (mesiobuccal or mesiolingual) and middle mesial canal file passes freely, (ii) confluent: MM canal joins mesiolingual or mesiobuccal canal apical but originates separately, and (iii) independent: MM canal originates and terminates separately. In previous studies it has been observed that confluent canal configuration was found more than other two.<sup>3</sup>

Fabra et al. observed that percentage of presence of three canals in mesial root canal of molars is 2.6%, in apical third 1.7% of extra canal (middle mesial) canal joined mesiobuccal canal, and 0.13% are independent canal, and converged with mesiolingual canal by 1.6%.<sup>8</sup>

MM canal may be present deep into isthmus and have small orifices, thus need troughing to widen isthmus along with developmental grooves exploration which increases the chances of canal detection. It has been observed that in mandibular first molar, after troughing incidence of presence of extra canal increases by 12.4%. Troughing is not required more than 2mm.<sup>2</sup> Sometimes the MM canal orifices are located at the center of mesiolingual and mesiobuccal canal and generally, the orifices is located more towards the mesiolingual canal.<sup>6</sup>

Missed canal anatomy prevention can be done with good preoperative radiographs. Radiographs with two different angles with cautious interpretation can help in detection of hidden canals.<sup>5</sup>

Champagne bubble test, use of different dyes, bleeding spots in chamber and pulpal floor inspected with explorer are some

conventional techniques for the noticing of root canal orifices when there is no magnification aid available.<sup>4</sup>

Loupes and dental operating microscope provide excellent illumination and magnification which improves the visualization of canal orifices in the operating field.<sup>4</sup> In the presented case series, we were equipped with magnification device, magnifying loupes which helped in managing the cases. Dental operating microscope, 3-dimensional radiographic technique is a major boom in locating the extra or missed canals. Micro-CT shows its high definition and accurate details of scans.<sup>6</sup> Acar et al. compared micro-CT and CBCT to detect accessory canals and stated that the micro-CT shows the high resolution and details than CBCT.<sup>9</sup>

Morphology of endodontic system is quite complicated, thus a better understanding of root canal anatomy is essential. A thorough knowledge of complex anatomy would be more useful to detect the extra canal orifices using magnification.<sup>10</sup>

### Conclusion

The significance of looking for middle mesial canal is a high clinical relevance, though it has low incidence. The additional third canal (middle mesial canal) is located between the mesio-lingual and mesio-buccal root canal of mandibular first molars. The user of periapical radiographs in two different horizontal projections and modified endodontic access, use of magnification aids are advisable to amplify the long-term favorable end result of the endodontic treatment.

### References

1. Wang L, Hong L. Clinical management of mandibular second molar with three mesial canals: A case study. *AJCRMH* 2018;1(1):1-7.

2. Chavda SM, Garg SA. Advanced methods for identification of middle mesial canal in mandibular molar: An in vitro study. *Endodontology*. 2016;28:92-6.
3. Alashiry MK, Zeitoun R, Elashiry MM. Prevalence of middle mesial and middle distal canals in mandibular molars in an Egyptian sub population using micro-computed tomography. *Niger J Clin Pract*. 2020;23:534-8.
4. Penukonda R, Saraf PA, Patil TN, Vanaki SS. A clinical approach to the successful management of variations of middle mesial canals: A case series. *Saudi Endod J* 2018;8:139-43.
5. Mittal R, Singh R, Thareja P. A rare case of three mesial and two distal independent canals in mandibular first molar. *Ann Prosthodont Restor Dent* 2016;2(2):42-45.
6. Sherwani OA, Kumar A, Tiwari RK, Mishra SK, Andrabi SM, Alam S. Frequency of middle mesial canals in mandibular first molars in North Indian population- An in vitro study. *Saudi Endod J* 2016;6:66-70.
7. Pomeranz HH, Eidelman DL, Goldberg MG. Treatment considerations of middle mesial canal of mandibular first and second molars. *J Endod* 1981;7:565-568.
8. Fabra-Canpos H. Three canals in mesial root of mandibular molar: a clinical study. *Int. Endod J*.1989;22:39-43.
9. Acar B, Kamburoglu K, Tatar I, Arıkan V, Celik HH, Yuksel S, ET AL. Comparison of micro-computerized tomography and cone-beam computerized tomography in the detection of accessory canals in primary molars. *Imaging Sci Dent* 2015;45(4):205-211.
10. Karapinar-Kazandag M, Basrani BR, Friedman S. The operating microscope enhances detection and negotiation of accessory canals in mandibular molars. *J Endod*, 2010;36(8):1289-1294.