Case report: Middle mesial canal
Siju Jacob shows why it pays to be aware of the possibility of a third mesial canal when treating mandibular molars

Abstract
Failure to recognise and treat aberrant canal anatomy can affect the prognosis of endodontic therapy. This case report shows a variation in conventional anatomy in mandibular first molars. A third mesial canal may be present between the Mesio-lingual and Mesio-buccal canal in Mandibular molars. A clinician should be aware of the possibility of this extra anatomy when treating mandibular molars.

Introduction
A comprehensive knowledge of canal anatomy and its variations is essential to ensure consistency in endodontic therapy. Variations from conventional anatomy are encountered occasionally in all teeth. Inability to recognise, detect and treat this additional anatomy can lead to failure of endodontic therapy1.

In mandibular first molars, the normal anatomical pattern consists of two mesial canals and one or two distal canals2. However, a third mesial canal may be occasionally present between the mesio-buccal and the mesio-lingual canals. A clinician should be aware of the possibility of this additional anatomy when treating mandibular molars.

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>No. of teeth</th>
<th>Method</th>
<th>Three Canals (%)</th>
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<td>Skidmore and Bjornsdal</td>
<td>1971</td>
<td>45</td>
<td>Vitro</td>
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<td>Pineda and Kuttler</td>
<td>1972</td>
<td>500</td>
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<td>Vertucci</td>
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<td>100</td>
<td>Vitro</td>
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<td>Pomeranz</td>
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<td>Vivo</td>
<td>12</td>
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<td>Martinez-Berna and Badanelli</td>
<td>1985</td>
<td>1418</td>
<td>Vivo</td>
<td>1.5</td>
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<td>Fabra-Campos</td>
<td>1985</td>
<td>145</td>
<td>Vivo</td>
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<td>Fabra-Campos</td>
<td>1989</td>
<td>760</td>
<td>Vivo</td>
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<td>Goel</td>
<td>1991</td>
<td>60</td>
<td>Vivo</td>
<td>15</td>
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</table>

Table 1: Prevalence of a third canal in the mesial root of Mandibular Molars according to different authors. (Courtesy Navarro et al.)

Fig. 1
Fig. 2
Fig. 3
Fig. 4
Fig. 5
Fig. 6
Fig. 7
Fig. 8
Case report

A 27-year-old male patient reported to the clinic with chief complaint of food impaction in the right mandibular posterior tooth for the past four months. There was no history of pain. His past medical history was non-contributory.

Clinical examination revealed a large carious lesion in the right mandibular first molar tooth (see Fig. 1). The tooth was not tender to percussion and probing depths were within normal limits. Radiographic examination revealed a large radiolucent lesion in relation to the first molar (see Fig. 2). A diagnosis of chronic apical periodontitis was made. Treatment options were discussed with the patient and Endodontic therapy was the treatment of choice.

After local anesthesia and rubber dam application, an access cavity was prepared. Initial access revealed two mesial canals and one distal canal (see Fig. 5). On closer examination with a surgical microscope (Zeiss, Germany) a ledge of dentin was found between the mesio-buccal and mesio-lingual canals (see Fig. 3). On closer examination with a surgical microscope (Microsonics) (see Fig. 6), Troughing of this isthmus revealed an isthmus (see Fig. 7).

All canals were cleaned and shaped (see Fig. 8) using Pro-taper (Dentsply Maillefer, Switzerland) and hand files. The Middle mesial canal was confluent with the Mesio-buccal canal. Canals were irrigated with 2.5 per cent sodium hypochlorite, 17 per cent EDTA and two per cent Chlorhexidine. Canals were dried using paper points and a calcium hydroxide paste (Apexcal, Ivolac Vivadent, Switzerland) was placed in the canals (see Figs. 9a and 9b). The access cavity was sealed with a layer of Gaviit (5M ESPE, Germany) followed by glass ionomer cement (Fuji VII, GC, Japan).

The patient was recalled two weeks later. The calcium hydroxide was removed (see Fig. 10). The canals were obturated using gutta percha and AH plus sealer (Dentsply De Trey, Germany) in warm vertical condensation. The access cavity was sealed and the core buildup done using a dual cured resin (Luxacore, DMG, Germany) (see Figs. 11 to 15).

Discussion

The biologic objectives of endodontic therapy include removal of all potential irritants from the root canal space and the control of infection and periapical inflammation. Complex root canal anatomy can prevent achievement of endodontic goals. It is important to debride, disinfect and obturate as much anatomy as possible. A missed canal can lead to failure of Endodontic therapy 1. Therefore every effort must be made to locate additional canals if any.

An extra mesial canal known as the middle-mesial canal has been documented by numerous researchers 15. The percentage varies from one to 15 per cent 16. The majority of middle mesial canals will merge with either the mesio-buccal or mesio-lingual canals. Rarely, they may have a separate apical portal of exit.

Numerous techniques enable the clinician to look for the middle mesial canal. It is important to have an adequately flared access cavity to visualise the anatomy of the chamber. Constricted access can lead to missed anatomy 18.

The use of the surgical operating microscope has vastly enhanced the quality of Endodontic therapy 19,20. Magnification coupled with coaxial lighting greatly enhances visualisation and the potential to discover additional anatomy. The use of ultrasonic tips for precise cutting has gained favour among clinicians in the last decade. Ultrasonics in conjunction with the surgical microscope (Microsonics) greatly enhances the clinician’s ability to locate extra canals 17.

Conclusion

Variations in conventional root canal anatomy can occur in any tooth. The middle mesial canal in Mandibular molars is one such variation. Knowledge of anatomical variations and the techniques to discover and manage these variations will significantly enhance the prognosis of Endodontic therapy.

References available on request.

About the author

Dr Siju Jacob BDS MDS maintains a private practice limited to Endodontics in Bangalore, India. In addition, he conducts hands-on courses in Endodontics and Microscopes for general practitioners and Endodontists at his center at Bangalore. He can be reached at dsiju@gmail.com or through his website, www.root-canalclinic.com.
E
vidence shows that the number of sessions used to perform a successful root canal treatment does not differ between one or multiple sessions. The only possible postoperative complications with single session root canal treatments are:

1. Post-operative pain.
2. Flare up.

For a better understanding of successful single visit endodontic therapy the following factors are key:

1. Adequate working length control (using electric measurement devices and if necessary x-ray)
2. Mechanical root canal preparation (best results will combine the use of hand and rotary files)
3. Chemical root canal disinfection (using irrigants – advanced devices and technologies)
4. An optical root canal obturation to avoid apical leakage.
5. Coronal sealing to prevent coronal leakage.

Each one of this key factors are determined by other factors. Determinant factors for an adequate working length control:

1. Straight line access
2. Establishing glide path
3. Use of adequate file to correctly bind.

Determinant factors for adequate mechanical root canal preparation:

1. Straight line access
2. Establishing glide path
3. Hand file reshaping to size 25 or 20
4. Determination of the “first file to bind” – “Master apically file”
5. Shaping of the so called “apical capture zone”
6. Adequate use of sequential files protocol either hand or rotary
7. Adequate irrigation and smear layer removal protocol while mechanical shaping.
8. Determinant factors for adequate chemical root canal disinfection:
9. 1. Coronal isolation (rubber dam)
10. Adequate coronal access
11. Adequate shaping protocol
12. Use of irrigation solutions in optimised sequences
13. Optimized irrigant delivery
14. Adequate energising of the irrigants
15. Satisfactory irrigant evacuation.

Determinant factors for inadequate root canal obturation (either under filling or incomplete filling):

1. Canals not dry prior to obturation
2. Inadequate straight-line access
3. Inadequate irrigation protocol
4. Excessive enlargement of a curved canal
5. Packing of debris in the apical portion of the canal
6. Skipping of sequential file sizes
7. Inadequate tug back
8. Inadequate master cone selection
9. Inadequate condensation procedures
10. Coronal seal.

Conclusion

A trained and experienced operator who follows a strict treatment protocol can manage to perform root canal treatments in one visit alone having in mind the management of postoperative complications. The author needs to acknowledge that not all root canal treatments can be executed as single session.

Useful reading:


About the author

Dr. med. dent. Liviu Steier is a visiting professor at the School of Dental Medicine in Florence, visiting professor at Tufts School of Dental Medicine on its endodontic postgraduate programme; and an honorary clinical associate professor at Warwick Medical School. He is also a registered specialist in endodontics (GDC) and Specialist fuer Prothetik (www.dgzpw.de).

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The patient was a 44-year-old female with non-con-