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 therapy.

In mandibular first molars, the normal anatomical pattern consists of two mesial canals and one or two distal canals. However, a third mesial canal may be occasionally present between the mesio-buccal and the mesio-lingual canals.

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.

Authors

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>No. of teeth</th>
<th>Method</th>
<th>Three Canals (%)</th>
</tr>
</thead>
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<tr>
<td>Skidmore and Bjornstad</td>
<td>1971</td>
<td>45</td>
<td>Vitro</td>
<td>0</td>
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<td>Pineda and Kuttler</td>
<td>1972</td>
<td>500</td>
<td>Vitro</td>
<td>0</td>
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<tr>
<td>Vertucci</td>
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<td>Vitro</td>
<td>1</td>
</tr>
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<td>Pomeranz</td>
<td>1981</td>
<td>100</td>
<td>Vivo</td>
<td>12</td>
</tr>
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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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<tr>
<td>Fabra-Campos</td>
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<td>145</td>
<td>Vivo</td>
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<td>Fabra-Campos</td>
<td>1989</td>
<td>760</td>
<td>Vivo</td>
<td>2.6</td>
</tr>
<tr>
<td>Goel</td>
<td>1991</td>
<td>60</td>
<td>Vivo</td>
<td>15</td>
</tr>
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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.)
mesio-lingual canal. This is referred to as the middle mesial canal. The middle mesial canal may be confluent or may have a separate portal of exit. The incidence of middle mesial canals varies from 1 to 15 per cent 3. (See Table 1).

This article will illustrate the clinical management of the middle mesial canal.

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 for the past four months. The patient was recalled two weeks later. The calculus 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).

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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 the access cavity and the core buildup done using a dual cured resin (Luxacore, DMG, Germany) (see Figs. 11 to 15).

An extra mesial canal was found between the mesio- buccal and mesio-lingual canals (see Fig. 4). The ledge was removed using ultrasonics (Proultra, Mühlefer, Switzerland) (see Fig. 5). Removal of the dentinal shelf revealed an isthmus (see Fig. 6). Troughing of this isthmus with ultrasonics under magnification revealed a middle mesial canal (see Fig. 7).

All canals were cleaned and shaped (see Fig. 8) using Pro taper (Dentsply Mühlefer, Switzerland) and hand files. The middle mesial canal was confluent with the Mesio buccal canal. Canals were irrigated with 2 per cent Chlorhexidine, 17 per cent EDTA and two per cent Chlorhexidine. Canals were dried using paper points and a calcium hydroxide paste (Apexcal, Ivoclar Vivadent, Switzerland) was placed in the canals (see Figs. 9 a and 9b). The access cavity was sealed with a layer of Gavi (SM ESPE, Germany) followed by glass ionomer cement (Fuji VII, GC, Japan).

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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.rootcanalclinik.com.
Evidence 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 post-operative 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).
4. An optical root canal obturation to avoid apical leakage.
5. Coronal sealing to prevent coronal leakage.

Each one of these 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 preshaping to size 25 or 30.
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 in protocol either hand or rotary.
7. Adequate irrigation and smear layer removal protocol while mechanical shaping.

Determinant factors for adequate chemical root canal disinfection:
1. Coronal isolation (rubber dam).
2. Adequate coronal access.
3. Adequate shaping protocol.
4. Use of irrigation solutions in optimised sequence.
5. Optimized irrigant delivery.
6. Adequate energising of the irrigants.
7. 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 procedure.
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 in its endodontic postgraduate programme; and an honorary clinical associate profes- sor at Warwick Medical School. He is a registered specialist in endo-dontics (GDC) and Specialist fuer Prothetik (www.dgzpw.de).
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One versus multiple session endodontic treatment
It is one of the most discussed topics in modern endodontics. Prof. Dr. Liviu Steier explains the key factors for success
Case report: Failure evaluation in endodontics

Dr Hank Willis and Dr Craig Barrington discuss how we can use failed treatments to help us learn from our mistakes

The patient was a 44-year-old female with non-conventional medical history. No known drug allergies and no current medications. She reported a dental phobia and was tearful during the exam. She hadn’t seen a dentist in three to four years and reported that her last dental visits have made her lose hope for her teeth.

Initial view of the lower second molar in the x-ray. Shrinkage of the root occurs during the clearing process and contrast the root canal therapy and condition. Note the endodontic filling.

Lower first molar in the x-ray. Note the striations in the dentin from the post. Compare and contrast the root canal therapy filled in the x-ray to what actually occurred in reality with the fill.

Image of the lower second molar with the root filling. Note the appearance of the root filling and compare it with the original x-ray image.

Side view of both roots. Note the “black” material on the root on the upper left corner of the picture. That is the post-endodontic lagunation. Note and compare the endodontic fill in the x-ray to what actually occurred in reality with the fill.

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Pulpitis, Periapical Periodontitis. Hypersensitive Dentine.

In endodontic therapy Ledermix Dental Paste can be used when periapical periodontitis is present. After pulp extraporation and during endodontic therapy, the canals may be filled with Ledermix Dental Paste (or a mix of Ledermix and calcium hydroxide). The cavity is closed with a cotton wool pledget and a temporary filling.

Ledermix Dental Cement

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INDICATIONS: Pulps, Periapical Periodontitis, Hypersensitive Dentine.

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