Canal anatomy
Siju Jacob says that if you don’t recognise and treat aberrant canal anatomy, it can affect the prognosis of endodontic therapy.

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.

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

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>No. of teeth</th>
<th>Method</th>
<th>Three Canals (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skidmore and Bjorndal</td>
<td>1971</td>
<td>45</td>
<td>Vitro</td>
<td>0</td>
</tr>
<tr>
<td>Pineda and Kuttler</td>
<td>1972</td>
<td>500</td>
<td>Vitro</td>
<td>0</td>
</tr>
<tr>
<td>Vertucci</td>
<td>1974</td>
<td>100</td>
<td>Vitro</td>
<td>1</td>
</tr>
<tr>
<td>Pomeranz</td>
<td>1981</td>
<td>100</td>
<td>Vivo</td>
<td>12</td>
</tr>
<tr>
<td>Martinez-Berna and Badanelli</td>
<td>1985</td>
<td>1448</td>
<td>Vivo</td>
<td>1.5</td>
</tr>
<tr>
<td>Fabra-Campos</td>
<td>1985</td>
<td>145</td>
<td>Vivo</td>
<td>2.1</td>
</tr>
<tr>
<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>
</tbody>
</table>

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.
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

The middle mesial canal has been documented by numerous researchers known as the middle-mesial canal (see Fig. 3). On closer examination with a surgical microscope (Zeiss Germany) (see Figs. 9a and 9b), the access cavity was sealed with a layer of Cavit V (3M 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 therapy1. 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 researchers13. The percentage varies from one to 15 per cent. 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 anatomy14.

The use of the surgical operating microscope has vastly enhanced the quality of Endodontic therapy15,16. 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 canals17.

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 drsiju@gmail.com or through his website, www.rootcanalclinic.com.

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) (see Figs. 9a and 9b), the access cavity was sealed with a layer of Cavit V (3M ESPE, Germany) followed by glass ionomer cement (Fuji VII, GC, Japan).

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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 post-operative complications with single session root canal treat-
ments 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 optic 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 pre shaping 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.

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 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


Dr. med. dent. Liviu Steier is a visiting professor at the School of Dental Medicine in Florence, visiting professor at Tulane School of Dental Medicine in the US, endodontic postgraduate programme; and an honorary clinical associate professor at Warwick Medical School. He is as a registered specialist in endodontics (GDC) and Specialist fuer Prothetik (www.dgzap.org). He can be reached at: Liviu@sunflexdental.co.uk

One source – one solution

Endo Tribune

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-conclusive 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 had made her lose hope for her teeth.

Please refer to the Summary of Product Characteristics before using Ledermix for Dental Use.

The Routemaster was once just as familiar a sight on London's streets as Ledermix is now on dentists' shelves. And the words, reliable, trusted, indispensable, can justifiably be applied to both. The Routemaster was unquestionably a leader. So we're rather tempted to rename our product Ledermix.

Ledermix Dental Paste
Ledermix Dental Paste is particularly useful in the emergency management of patients with irreversible pulpitis. Pain is reliably relieved until definitive root canal treatment can be performed. Ledermix Dental Paste contains one third more stearol than Ledermix Dental Cement. Consequently the paste is usually preferred in pulp exposure cases.

In endodontic therapy Ledermix Dental Paste can be used when periapical periodontitis is present. After pulp extrication 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
Ledermix Dental Cement may be used as a temporary sublining for deep cavities where no exposure has occurred if the dentine is hypersensitive. For small pulp exposures, Ledermix Dental Cement may be used as a pulp capping agent.

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