Variations in canal anatomy: Two canals in mandibular premolars

DR. SIJU JACOB

Mandibular premolars may present with wide morphological variations. The most common clinical scenario is that of a single canal. Variations include two or three canals. Presence of more than one canal in mandibular premolars might require altered clinical protocols. This article will discuss the clinical management of mandibular premolars with two canals.

CASE 1

A 55-year old male patient presented with severe continuous pain in the right mandibular premolar area. The referring dentist informed us that the right mandibular second premolar tooth had been prepared for a crown two weeks ago. The permanent crown had not been cemented because the patient was in pain ever since the tooth had been prepared and a temporary placed.

Clinical examination revealed pain and tenderness on percussion in the right mandibular second premolar. A diagnosis of acute irreversible pulpitis was made and endodontic therapy was planned on the tooth. A pre-operative intra oral peri apical radiograph suggested the presence of a canal bifurcation. **(Figure 1a** and **1b)**

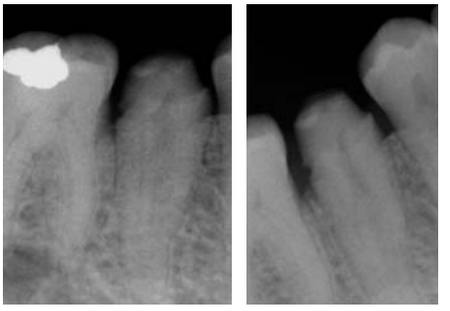

Fig 1A, 1B: Preoperative radiograph.
Note the radiolucent line coronally which disappears abruptly as it progresses down the root. This suggests the presence of a canal bifurcation.

After anesthesia and rubber dam application, an occlusal access was made using burs and ultrasonics under the surgical operating microscope **(Figure 2a)**. Initial examination revealed one canal. On further examination with the surgical microscope, a second canal was seen lingually **(Figure 2b)**. All canals were cleaned and shaped. The canal morphology was that of a single canal bifurcating into two and exiting as two separate canals (Vertucci Type V). Obturation was done in the same visit with Gutta percha and Ah plus sealer in warm vertical condensation technique **(Figures 2c, 2d** and **2e)**. A fiber- post was placed and the Access cavity was sealed with composite resin **(Figures 2f, 2g** and **2h)**

CASE 2

A 48-year old male patient presented with persistent pain in the Right lower back teeth. The referring dentist informed us that the right mandibular first and second premolar teeth had been prepared as abutments to receive a bridge two weeks ago. A temporary bridge was placed, but the patient continued to have pain and inability to chew on that side. The permanent bridge was not cemented because of the discomfort felt by the

FIG 2A: Access cavity leads to acutely inflamed pulp.

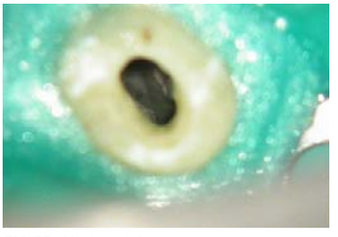

FIG 2B: Modified Access reveals two canals, Buccal and lingual

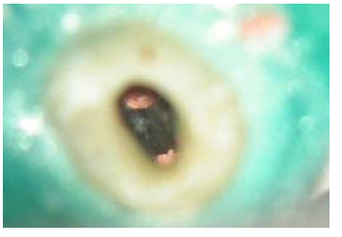

FIG 2C: Both canals obturated. With gutta percha in warm vertical condensation

FIG 2D: View of the obturated lingual canal

FIG 2E: View of the obturated buccal canal.

FIG 2F: Fiber-post placed

FIG 2G: Post cementation and build-up with dual cured composite resin.

FIG 2H: Post-obturation radiograph.

FIG 3: Pre-operative radiograph shows previously endodontically treated Mandibular premolars. Note the width of the roots and the lack of centricity of the existing Endodontic obturation suggesting missed canals.

FIG 4A: Mandibular first premolar re-accessed

FIG 4B: Modified access shows missed lingual canal.

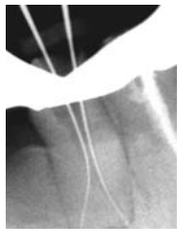

FIG 4C: Working length radiograph showing files in both canals

FIG 4D: Both canals cleaned and shaped

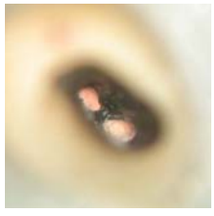

FIG 4E: Canals obturated with gutta percha in warm vertical condensation

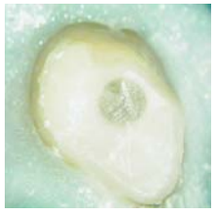

FIG 4F: Fiber-post placement and core build-up done with dual-cured composite resin

patient with the temporary bridge.

Clinical examination revealed pain and tenderness on percussion in the right mandibular first and second premolar teeth. An intra-oral peri-apical radiograph revealed endodontically treated mandibular first and second premolars **(Figure 3)**. The radiographs suggested the presence of a missed canal. A diagnosis of chronic apical periodontitis resulting from failed Endodontic therapy was made.

Treatment options were discussed with the patient and a decision was made to re-treat both teeth.

The second premolar was treated first.

After removal of the temporary crown, an occlusal access was made through the previous restoration. Refinement of the access with ultrasonics revealed the missed canal **(Figures 4a, 4b)**. The canal began as a single canal and bifurcated into two towards the apical one-third of the root, exiting as two separate canals (Vertucci Type V) **(Figure 4c)**

Gutta percha was removed from the filled canal and both the canals were cleaned and shaped **(Figure 4d)**. Calcium hydroxide was placed in both canals. After a gap of 10 days, the patient was recalled. The tooth was found to be asymptomatic. Obturation was done using gutta percha in warm vertical condensation technique. A fiberglass post was placed and the access cavity was sealed with dual-cured composite resin. **(Figures 4e** and **4f)**

The first premolar was treated along with the second premolar **(Figures 5 a-f)**. The clinical pattern was similar to the second premolar with minor variations. The morphology was similar (Vertucci Type V) but the bifurcation was more coronal, and therefore, easier to treat when compared with the Second premolar. The Bucco-lingual width of the canal was wider enabling the placement of two fiber-posts. The post-obturation radiograph showed all canals well obturated and restored **(Figures 6, 7)**

The patient was asymptomatic after obturation and referred back to the referring dentist for permanent cementation of the bridge.

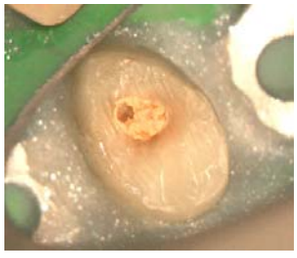

FIG 5A: Mandibular second premolar re-accessed

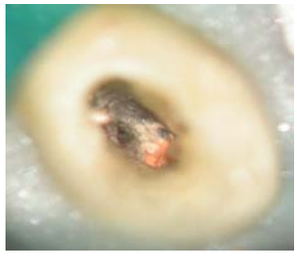

FIG 5B: Modified access shows filled canal and missed canal.

FIG 5C: Both canals cleaned and shaped

FIG 5D: Canals obturated with Gutta percha in warm vertical condensation up to the level of bifurcation

FIG 5E: Fiber-posts placed

FIG 5F: Fiber-post cementation and core build-up done with dual-cured composite resin

DISCUSSION

It is an established fact that untreated anatomy is the most common reason for failure of Endodontic therapy. The mandibular premolars are amongst the teeth that can have a moderate incidence of missed canals. The incidence of mandibular premolars having two canals can be as high as 16%.

Fig 6: Post obturation radiograph showing obturation and restoration

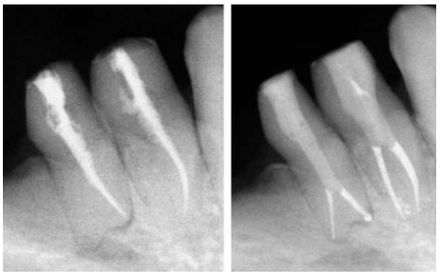

Fig 7: Preoperative and post-operative comparison

Fig 8A: Pre-operative radiograph of the Mandibular first premolar shows a radiolucent line depicting the canal coronally, which ends abruptly at the middle one-third of the root. This is a clue to canal bifurcation

Fig 8B: Post obturation radiograph confirms the presence of two roots

When mandibular premolars presents with more than one canal, the bifurcation makes treatment of these teeth a clinical challenge. The following are some suggested clinical protocols for management of these teeth.

Evaluate the pre-operative radiograph: A good pre-operative radiograph can help anticipate canal bifurcations. The presence of a dark line that disappears midway down the root is a sign of canal bifurcation **(Figures 8a, 8b)**.

Surgical Microscope: The surgical microscope is invaluable in deep bifurcation cases. Apart from magnification, coaxial lighting makes it easier to visualize and treat canal bifurcations.

Coronal straight line access: Straight line access till the bifurcation is critical in management of these cases. Ultrasonics is very useful in obtaining straight-line access.

Obturation: When fitting master cones, it is important to fit individual cones in each canal. At times, it may not be possible to insert gutta percha cones with greater taper. Fitting one cone with a greater taper might block the insertion of the second cone coronally. In these cases, it may be necessary to fit cones with reduced taper. If there is sufficient distance between the orifices of the two canals at the bifurcation, then one can down-pack each canal separately. If the orifices are too close to each other, there is a danger of one canal getting blocked during down-pack of the other. It might be a better protocol to fit cones in both canals and down pack both canals together. The down-pack can be then continued till the point of bifurcation and a radiograph taken to verify if both canals have been filled **(Figures 9a** and **9b)**.

Fig 9A: Master cones placed in both canals

Fig 9B: Down-pack done up to the level of bifurcation and then into each canal. A radiograph is taken to verify if both canals are obturated. The straight part of the canal up to the bifurcation can then either be back-filled or a fiber-post placed

Fiber-posts: In cases with deep bifurcation, significant coronal weakening can occur in an effort to obtain straight-line access. It is judicious to fill the bifurcation space with a fiber-post to strengthen the roots.

CONCLUSION

Mandibular premolars may have significant morphological variations. One of these variations is the presence of two canals. The operator should understand, learn to identify and manage these variations in order to improve the overall clinical predictability.

About the AUTHOR

Dr. Siju Jacob received his MDS in endodontics from The Tamilnadu MGR medical university, Chennai in 2001. Dr. Siju is the founder of "The Root Canal Clinic", South India's first exclusive endodontic practice. He pioneered microscopic endodontics in Bangalore and manages a center for endodontic training at Bangalore. In addition, he consults in Andaman and Nicobar islands.