Variations in canal anatomy: Two canals in mandibular premolars

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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)

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 linguually (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 patient.
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 retreat 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 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 5a-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.

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%.
When mandibular premolars present 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).

**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.

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**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.