



Endodontics

MANDIBULAR PREMOLAR – AN ENDODONTIST'S ENIGMA: A CASE REPORT

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ABSTRACT Each tooth in the permanent dentition presents with extensive variation in number of roots and root canals. Inability to locate all the canals leads to incomplete debridement and obturation of the root canal space eventually leading to endodontic failure. Mandibular premolars have been reputed to have an aberrant anatomy and are thus termed as an Endodontist's enigma. Anatomically, they are described as teeth with single root and single root canal but there are increased chances of additional roots and root canals being present. The occurrence of three canals with three separate foramina in mandibular second premolars is very rare. The present case report describes root canal treatment of three canals with separate foramina. Dental loupes were used for magnification to locate the canal orifices. After biomechanical preparation and obturation, post endodontic restoration was done using composite resin. The present report emphasizes on the importance of finding additional canals present to avoid endodontic failure.

KEYWORDS : Bicuspid, Anatomical variation, Root canal morphology, Endodontic management

INTRODUCTION

Thorough knowledge of the root canal anatomy and the possible variations are the key factors for a successful nonsurgical endodontic treatment. The main objective of endodontic therapy is thorough mechanical and chemical debridement of the entire root canal followed by a three-dimensional obturation with an inert filling material and a final coronal restoration, thereby preventing access to microorganisms⁷. The main reasons of endodontic failures are apical percolation and the presence of microorganisms caused by incomplete cleaning, insufficient canal obturation, and presence of untreated canals⁸.

Hoehn and Pink (2002) found a 42% incidence of missed roots or canals in the teeth that needed retreatment in their investigations³. Limited visualization with the naked eye may be one of the reasons for missed canals. The use of loupes, dental operating microscope and fiberoptic endoscope allows better visualization of root canal morphology⁹.

Vertucci divided the root canal morphology into eight types:

- 1) Type I: a single main canal starting from the pulp chamber to the root apex.
- 2) Type II: two separate canals leave the pulp chamber but join to form one canal to the apex.
- 3) Type III: one canal leaves the pulp chamber and divides into two smaller canals which later merge again to exit through one canal.
- 4) Type IV: two separate as well as completely distinct canals run from the pulp chamber to the root apex.
- 5) Type V: there is a single canal exiting the pulp chamber which divides into two canals with separate apical foramina.
- 6) Type VI: two separate canals join at the middle of the root to form one canal which extends till the apex, just short of the apex, and again divides into two.
- 7) Type VII: the canal starts as a single until the middle third of the root then divides into two separate canals that rejoin after some distance and then, near the apex, divides into two again.
- 8) Type VIII: the pulp chamber near the coronal portion divides into three separate canals extending till the apex

Mandibular second premolars usually have a single root and a single root canal. They have shown to exhibit variable and complex root canal morphology that may require skillful and special root canal preparation techniques. The occurrence of three canals with three separate (type VIII, Vertucci) foramina in mandibular premolars is very rare. Vertucci (1978)¹² and Zillich et al (1973)¹³ reported the occurrence of three canals in mandibular first premolars at 0.5% and 0.4% respectively and for second premolars at 0.0% and 0.4% respectively.

This case report describes the root canal treatment of a mandibular

second premolar having three independent root canals with separate foramina.

Case Report

A 42-year-old male patient with a noncontributory medical history reported to the Department of Conservative Dentistry and Endodontics, Pacific Dental College and Hospital, Udaipur with the complaint of pain in lower left back tooth region since last 10-15 days. The pain was mild and intermittent in nature which aggravated upon mastication.

Clinical examination revealed deep disto-proximal caries in mandibular left second premolar and mesio-proximal caries in the first molar. Both the affected teeth were tested for pulp vitality using Endofrost (Roeko, Coltene) and a negative response was received. The preoperative periapical radiograph (Fig. 1) showed radiolucency involving pulp irrt 35, 36 with the presence of multiple canals in second premolar. A diagnosis of pulpal necrosis was made and endodontic treatment in second premolar and first molar was planned.

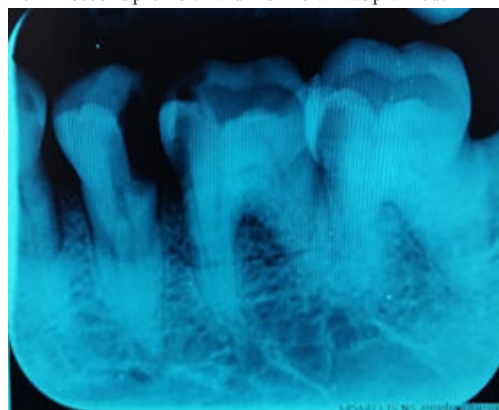


Fig 1: Pre-operative radiograph

Local anaesthesia was achieved by administration of inferior alveolar nerve block with 2% lidocaine with 1:80,000 adrenaline; the premolar was isolated under rubber dam (Coltene Whaledent). Following excavation of caries, a conventional access cavity was prepared with Endo Access bur (Dentsply Maillefer, Switzerland) under magnification using dental loupes 3.5x). Clinical examination with a DG 16 explorer revealed three orifices. The access cavity was modified to achieve straight line access. In order to obtain a glide path, No. 10 K file (Dentsply Maillefer) was lubricated using EDTA (Dentsply Maillefer, USA) and used in watch winding motion and three separate canals were negotiated (Fig. 2).



Fig 2: Access cavity with three canals

Working lengths (Fig. 3a) of all the three canals were initially determined with an apex locator (J. Morita) and later confirmed radiographically. Radiographs revealed three separate canals with three separate foramina.

All the three canals were initially prepared upto size 20 K file (Dentsply Maillefer) until the working length. Cleaning and shaping was done using NEOENDO FLEX rotary files till 20/ 0.04. The canals were irrigated using sodium hypochlorite and normal saline. Temporary restoration was done and the patient was recalled after 7 days. The patient was asymptomatic during the interappointment period. On second appointment the master cone was confirmed with a radiograph (Fig. 3b).

All the three canals were finally obturated using corresponding gutta-percha points (Dentsply Maillefer) and AH Plus sealer with single cone technique. Post endodontic restoration was done with composite resin (Fig. 3c).

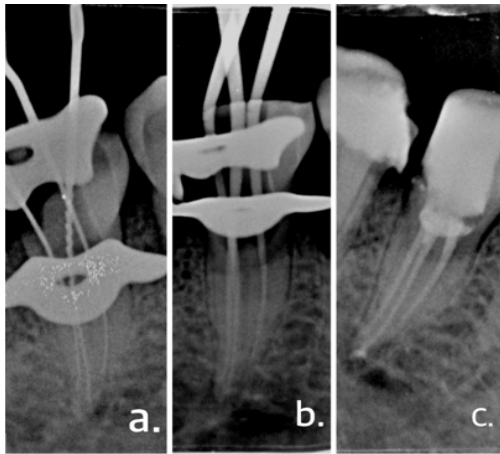


Fig 3 (a) working length, (b) master cone, (c) obturation with post endo restoration

Further endodontic treatment of the first molar was completed and the patient was referred to Department of Prosthodontics for prosthetic rehabilitation.

DISCUSSION

In this case, the mandibular second premolar with three root canals was treated successfully with non-surgical method. Teeth with extra roots/root canal pose a challenging task. The possibility of aberrant root canal morphology should be considered before instituting root canal treatment. Conventional intraoral periapical radiographs routinely employed to evaluate the root canal anatomy, represents a three-dimensional anatomy on a two-dimensional image. Careful interpretation of the root outline and the periodontal ligament space in preoperative radiographs may suggest the presence of an extra root or canal¹⁰. Interpretation can be enhanced by varying the horizontal cone angulation while taking radiographs. Observing anatomical landmarks in the pulp chamber floor may also help to identify or indicate supplementary root canals or root canal aberrations. Good illumination and magnification makes the treatment easier⁸. Application of CT scanning has become popular with clinicians in the past few years to

interpret such aberrations.

According to a literature review by Cleghorn et al. (2007)¹, mandibular second pre-molars can have two separate roots in 0.3% of cases and three separate roots in 0.1% of cases. Sert and Bayirli (2004) have reported an incidence of 0.4% of mandibular second premolars with three root canals¹¹. Rhodes (2001)⁶ and Macri and Zwemer (2000)⁵ have reported mandibular second premolars with four and five root canals respectively.

Considering the fact that so much of aberrations exist in these teeth, it becomes mandatory that when a patient comes with persistent pain or sensitivity to hot and cold after root canal treatment the clinician must suspect the presence of missed canals². After negotiating the canals, straight line access should be achieved to reduce the stress on the files to minimize the risk of instrument separation⁹. Proper cleaning and shaping of the root canals should be carried out followed by complete obturation of all the canals for successful treatment outcome.

CONCLUSION

Accurate knowledge of the variations in morphology of the root canal system is required for successful and predictable treatment outcome. The presence of extra canals should be considered in every tooth undergoing endodontic treatment. This would help in reducing endodontic failure due to missed canals and incomplete obturation. The success of this case could be attributed to the successful diagnosis, thorough chemo mechanical debridement, and complete obturation of all the three root canals.

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