

INTRICATE CASE REPORTS OF ENDODONTIC MANAGEMENT IN MANDIBULAR PREMOLARS

Endodontics

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ABSTRACT

Root canal morphology unique for each tooth. Variations in the root canal is always recorded in the literature. Among them mandibular premolars is significant in this aspect. This always poses a challenge to the endodontists treating them. If these anatomical variations are missed out, it may result in microbial invasion and endodontic failure. Hence, proper identification of root canals and treating them becomes necessary. In this article, intricate case reports of endodontic management in mandibular premolars are discussed.

KEYWORDS

mandibular premolar, three canals, endodontic management

INTRODUCTION

Road map to success of endodontic treatment depends on through knowledge of root canal morphology, shaping, cleaning and 3 dimensional obturation of the root canal system. Slowey et al [1] stated that the mandibular premolars are 'endodontist enigma'. Failure to identify anatomical variations in root canal morphology will lead to endodontic flare up and failures.[2] A study conducted in Washington has reported that mandibular premolar had the highest failure rate (11.45%).[1, 2]

Variations in canal morphology are related to various factors like ethnicity, age, gender and genetic pattern and the history of trauma. Vertucci [3] and Zillech et al [4] identified 24.2% of mandibular 1st premolar having 2 or more root canals. Tzanetakis et al. [5] in his study reported that 1.2 to 34% of mandibular second premolars showed two or more canals.

Careful clinical and radiographic evaluation by SLOB technique helps in identifying undetected canals, whereas more accurate interpretation can be achieved using Cone Beam Computed Tomography. This article discusses the diagnosis and management of mandibular premolars with 3 canals where the main canal trifurcates at the middle third exiting in separate apices.

CASE REPORTS:

Case-1

A 32 year old South Indian female patient reported with a complaint of pain in mandibular left second premolar for past 2 week. Medical history was non-contributory. Clinical examinations revealed class-2 disto-occlusal caries in 35 with tenderness on percussion.

Pre-operative radiographs revealed the presence of an additional root bifurcating in middle third.(Fig 1A) An abrupt loss of radiolucency in the main canal suggested the presence of extra canal in the same root. A diagnosis of irreversible pulpitis was made in mandibular left second premolar (35). Multiple visit non-surgical endodontic treatment was planned in 35 using CaOH as intracanal medicament.

Local anaesthesia (2% lignocaine with 1:1,00,000 epinephrine) was administered. An access cavity was prepared. Single orifice was detected which split into three different canal at mid root level. Periapical radiograph at Clarks technique confirms presence of two roots and three canals. The canals were identified as Buccal, mesiolingual and distolingual canals. To obtain a straight line access the main canal orifice was enlarged using gates glidden drill in crown down fashion till level of Canal division. Working length determined using apex locator (Fig 1B) (Root ZX Mini, J. Morita), cleaning and shaping done using hand K files by crown down technique. Irrigation was performed using sodium hypochlorite, 17% EDTA and saline. Saline was used as the final rinse. The canals were dried with absorbant paper points and obturation was done using 2% guttapercha points and sealapex by lateral condensation technique.(Fig 1C)

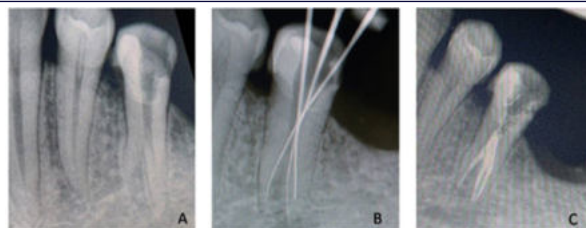


Figure 1. (A) Preoperative radiograph showing bifurcation of root in middle third. (B) Working length radiograph. (C) obturation completed in Buccal, mesiolingual and distolingual canals using 2%GP and sealapex sealer.

Case-2

A 38 year old South Indian male patient reported with a complaint of pain in mandibular right second premolar for past 1 week. Medical history was non-contributory. Clinical examinations revealed class-2 disto-occlusal caries in tooth number 44 and 45 with tenderness on percussion in tooth number 45. Pre-operative radiographs(Fig 2A) revealed the presence of an additional root bifurcating in middle third suggesting the presence of extra canals in the same root. A diagnosis of irreversible pulpitis was made in mandibular right first premolar (tooth number 28). Multiple visit non-surgical endodontic treatment was planned in 28 using CaOH as intracanal medicament. Endodontic treatment was carried out similar to case 1. Working length determined using apex locator (Fig 2B) (Root ZX Mini, J. Morita), cleaning and shaping done using hand K files by crown down technique. Irrigation was performed using sodium hypochlorite, 17% EDTA and saline. Saline was used as the final rinse. Mastercone selected for 3 canals.(Fig 2C).The canals were dried with absorbant paper points and obturation was done using 2% guttapercha points and sealapex by lateral condensation technique.(Fig 2D)

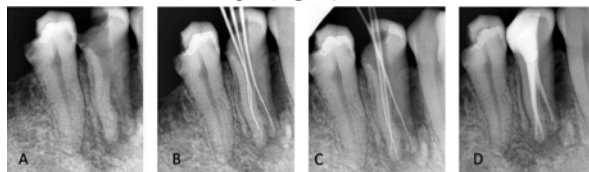


Figure 2. (A) Preoperative radiograph showing bifurcation of root in middle third. (B) Working length radiograph. (C) Master Cones selected for the 3 canals (D) obturation completed in Buccal, mesiolingual and distolingual canals using 2%GP and sealapex sealer

DISCUSSION

The incidence of 3 canals with 3 separate foramina in mandibular premolars is very rare. Vertucci [3] and Zillech et al [4] in their studies reported the incidence of 3 canals in mandibular 1st premolars was 0.5% and 0.4% respectively and 2nd premolars was 0.0% and 0.4%

respectively. In this case reports Case 1 shows presence of 3 canals in second premolar and case 2 shows presence of 3 canals in first premolar.

An insight into the root development explains the formation of canal complexities. The Hertwig's Epithelial Root Sheath (HERS) determines the number of roots in a tooth. If the HERS diaphragm is collar shaped a single root is formed. Whereas if 2 or 3 tongues of epithelium grow towards each other from this collar, to bridge the gap, it results in the formation of 2 or 3 independent diaphragms leading to development of either fused roots, single root with multiple canals or distinct multiple roots. [6]

Studies have also shown a high degree of bilateral symmetry between contralateral premolars in length, width of canal and dentinal thickness, but variations were seen in apical portion of contra lateral pairs.[7-9] Serman and Hasselgren [10] reported that more women exhibited multiple roots/ canals in mandibular first premolars whereas men exhibited more canals in mandibular 2nd premolars. In this case reports Case 1 shows presence of 2 roots with 3 canals in female patient and case 2 shows presence of 2 roots with 3 canals in male patient.

According to literature the level of canal division in mandibular premolars to be 8.6% in cervical 1/3rd, 70-80% in middle 1/3rd and 13% in apical 1/3rd. In this case reports both Case 1 and case 2 shows canals division in middle third.

The occurrence of two roots in mandibular premolars are as low as 2.63%.[6] The African-American and Kuwaiti population showed higher incidences of two roots 16.2% and 15% respectively.[11,12] Presence of three or more roots recorded are very rare, studies report only 3% French and 0.2% Indian populations respectively.[13,14] Trope et al [15] showed as many as 4 of 10 black patients had at least one mandibular premolar with 2 or more canals. . In this case reports both patients were of Indian origin.

Accurate preoperative radiographs serve as important clues in identifying the number of root canals present in the tooth. Break or transition of main root canal space halfway through the roots suggest the presence of an extra root or canal.[16] Off-centering of file on a radiograph indicates the likelihood of a second canal. [17] According to Bedford et al [18] plain radiographs were not accurate in identifying extra root canals. So, various diagnostic aids such as Sodium hypochlorite-champagne bubble test, examining the floor of the pulp chamber with a sharp DG16 explorer, ultrasonic tips and staining with 1% methylene blue dye can also be used.[19] CBCT (Cone-Beam Computed Tomographic) imaging provides precise, high-quality 3-dimensional representation of dental hard tissues, ensuring a more accurate diagnosis of extra canals. The use of magnification and fiber optic illumination offers remarkable enhancement in locating and treating extra canals.[20] Stropko et al [21] illustrated magnifications using Dental loupes or DOM(Dental operating Microscope) impose the clinicians ability to visualise & access the canals, and are idea requisite for successful endodontic management of aberrant root canals.

Adequate enlargement of the access cavity is extremely essential to obtain straight line access to all the canals. This can be achieved by using Gates-Glidden drills sizes #4, #3, and #2 in a crown down fashion. Gates-Glidden drills should be brushed against the canal walls and away from the root concavities.[21] Straight line access reduces stress concentration on the files and minimizes the risk of instrument separation and canal transportation. [22]

After adequate shaping of canals, they are dried with paper points and obturated. Literature recorded cases with three mandibular premolars.[23].Studies shows that obturation by lateral condensation and thermoplastic techniques are more effective in providing a 3-dimensional seal. Venturi et al [24] reported that vertical compaction of gutta percha with apical backfilling technique provides an effective apical plug and good adaptation of gutta percha to the root canals. However, in these 2 cases lateral condensation was done and GP was severed with heated plugger individually for each canal at the level of division of the canals. The main canal space was then considered as pulp chamber and restored with composite resin.

CONCLUSION

Identification of root canal morphology is very essential for successful endodontic treatment. Currently root canal variations can be identified more precisely in 3-dimensions with the help of cone beam CT.

Clinically proper illumination and magnification using magnifying loupes and dental operating microscope helps in complete debridement and proper obturation of entire root canal system.

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