



SUCCESSFUL ENDODONTIC MANAGEMENT OF A COMPLEX MANDIBULAR SECOND PREMOLAR WITH THREE ROOTS AND THREE ROOT CANALS USING CBCT: A CASE REPORT

Endodontics

Dr. Mohd Abdul Sattar	3rd Year Post Graduate, Department of Conservative Dentistry and Endodontics, HKE'S S.N Institute of Dental Science, Gulbarga.
Dr Ratnakar P*	Professor and Head of The Department, Department of Conservative Dentistry and Endodontics, HKE'S S.N Institute of Dental Science, Gulbarga. *Corresponding Author.
Dr Veerendra S Patil	Professor, Department of Conservative Dentistry and Endodontics, HKE'S S.N Institute of Dental Science, Gulbarga.
Dr Surabhi G Rairam	Reader, Department of Conservative Dentistry and Endodontics, HKE'S S.N Institute of Dental Science, Gulbarga.
Dr Supriya Patil	Reader, Department of Conservative Dentistry and Endodontics, HKE'S S.N Institute of Dental Science, Gulbarga.
Dr Mirza Osman Baig	Senior Lecturer, Department of Conservative Dentistry and Endodontics, HKE'S S.N Institute of Dental Science, Gulbarga.
Dr Fouzia Kousar H.N	2nd Year Post Graduate, Department of Prosthodontics and Crown & Bridge, HKE'S S.N Institute of Dental Science, Gulbarga

ABSTRACT

Aim: To present a unique case of mandibular second premolar with three roots and three root canals with the aid of Cone beam computed tomography (CBCT).

Case description: Mandibular second premolars usually have a single root and a single canal. The occurrence of three roots with three separate root canals is extremely rare. The use of CBCT in this rare case greatly helped towards making a confirmatory diagnosis and successful endodontic management is presented here.

Conclusion: For a successful endodontic treatment outcome in mandibular second premolars with three roots and three root canals, it is essential to understand the root canal anatomy and its variations, careful interpretation of peri-apical radiographs and close clinical inspection of the floor of the pulp chamber. In the case's where radiographic images are not helpful to clearly view root canal anatomy and aberrations, Cone Beam Computed Tomography (CBCT) are recommended.

Clinical significance: The complex tooth anatomy must be considered for planning endodontic treatment using latest diagnostic equipment to increase the success rate.

KEYWORDS

Mandibular second premolar, Cone beam computed tomography, Root canal morphologic variations.

Introduction:

To achieve a successful endodontic treatment, a thorough knowledge of root and root canal morphology as well as possible variation in anatomy of the root canal system is of utmost importance. This is followed by negotiation, cleaning, shaping, and obturation of the entire canal system in three dimensions. Failure to recognize the presence of an additional root canal may result in unsuccessful treatment and may be the origin of acute flare ups during and after treatment.

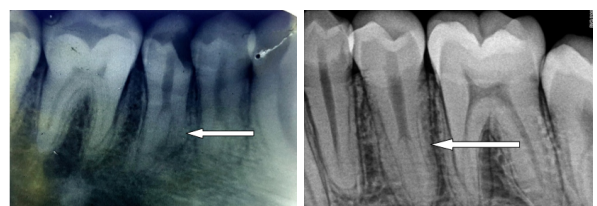
According to Green the highest incidence (47%) of accessory foramina was observed in mandibular second premolars.¹ Rahimi et al. also reported high incidence of lateral canals (38.7%) and apical delta (4.38%) in mandibular second premolars.²

Vertucci et al. reported that the mandibular second premolar had one root canal at the apex in 97.5% and two canals in only 2.5% of the teeth; however, three root canals were scarce.³ Zillich and Dowson found the incidence of three canals in mandibular second premolars to be 0.4%, which emphasizes the occurrence as being scarce.⁴ In spite of the scarce prevalence, the clinician should be aware of these variations, their clinical and radiographic anatomy, and the location of orifices. Vertucci has classified root canal anatomy into 8 types. Sert and Bayirli in their study encountered fourteen new root canal configurations which were not included in the classification given by Vertucci or other classification systems.⁵ According to Sert and Bayirli's classification, Type IX has a single canal leaving the pulp chamber which separates into three distinct canals in the middle third region of root, with separate apical foramens within the same root. This case is a modification of Type IX of Sert and Bayirli's classification, i.e. A single canal leaves the pulp chamber and separates into three distinct

canals in three separate roots at the middle third region of root, with separate apical foramens. The purpose of this case report is to discuss the treatment and diagnostic recommendations for an unusual occurrence of three canals in mandibular second premolar.

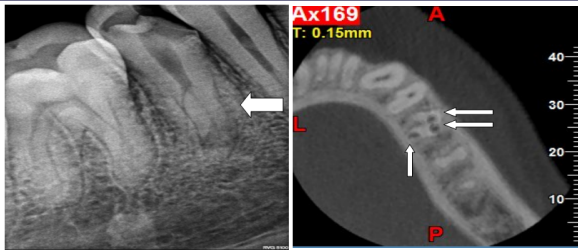
Case report:

A 17-year-old male patient with no significant systemic history had come to the department of conservative dentistry and endodontics, HKE'S S.N Institute of dental science. The chief complaint of the patient was pain in the right lower back region since 1 week. Patient reported that the pain was sharp, piercing and continuous in nature, exacerbated while its sleeping, subsided for 2-3 hours on applying ice and taking pain killers. Clinical examination revealed deep carious lesions in 45 which had a deep mesio-occlusal cavity and was tender on vertical percussion. There was no evidence of swelling or sinus tract in relation to 45. No anatomic variations were seen in adjacent teeth of 45. The crown of mandibular second premolar on contralateral side, showed no unusual anatomy in terms of number of cusps and dimensions.

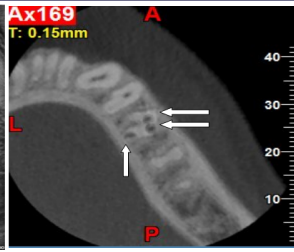


(Fig 1: Pre Operative IOPAR of 45, 44)

(Fig 2: RVG image of 35,34)



(Fig 3: Pre Operative RVG Image of 45,46)

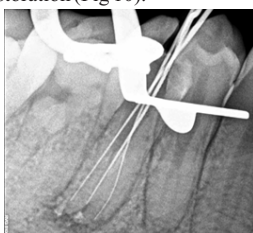


(Fig 4: Pre operative CBCT image of 45)

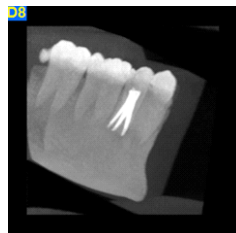
Intra oral periapical radiograph(IOPAR) revealed slight widening of the periodontal ligament space, thickening of lamina dura, with deep mesio occlusal cavity and radiolucency reaching the pulp space area (Fig. 1). On careful evaluation of the diagnostic radiograph, it was seen that a single canal was present from the orifice till mid root region and from their bifurcating into two or more canals till the apex of premolar in 45. A similar kind of unusual root canal anatomy was observed in the adjacent premolar i.e 44(Fig 1) and periapical radiograph on the contralateral side also showed a similar unusual anatomy of root canals in both the premolars i.e 34 and 35(Fig 2). 46 also showed an extra root suggesting radix entomolaris (Fig 3). Based on clinical and radiographic evidences, a diagnosis of irreversible pulpitis was made with 45.

But suspicious root canal anatomy was still in question. CBCT was advised to the patient to clearly view the anatomy of roots and root canals. CBCT images confirmed that there was a single root from coronal 3rd to mid-root region, trifurcating into 3 roots with 3 canals in 45(Fig 4). Nonsurgical endodontic treatment was planned for 45. Pre endodontic procedures which included administration of local anesthesia (2% lidocaine with 1:80, 000 adrenaline), proximal buildup of mesial wall, and rubber dam application were done. Keeping in mind the unusual root canal morphology of 45, access was gained into the pulp chamber using endo access burr # 2. Access cavity was widened. CBCT diagnosis of main canal trifurcating into three different canals at the midroot level was confirmed after access opening. Mesiobuccal, distobuccal and lingual canals were identified. Gates glidden drills were used in a crown down method to enlarge the main orifice to the level of trifurcation for a straight-line access to all the three canals.

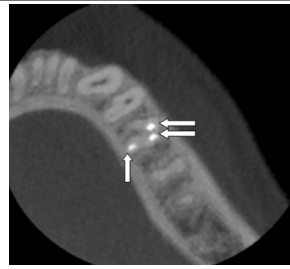
Working length was established with the use of an apex locator (Root ZX, J Morita) and confirmed with a radiograph (Fig 5). Cleaning and shaping was performed using rotary ProTaper Next File system (Dentsply-Maillefer, Ballaigues, Switzerland) in a crown-down manner. 2.5% solution of sodium hypochlorite and glyde(10% carbamide peroxide, 15% EDTA) were used alternatively as irrigants at every change of instrument. The apical preparation was done till X2 file size for mesiobuccal, distobuccal and lingual canal. After final rinse with 17% EDTA solution, canals were dried and obturated with corresponding GP cones and AH+(Dentspy Detrey) sealer by vertical compaction technique. Heated plugger was used to compact and seal the GP in all the 3 canals at the trifurcation level. Remaining canal was backfilled using thermoplasticized injectable gutta percha technique with the help of Obtura II (Obtura Spartan, Fenton, MO) A confirmatory post obturation radiograph was taken, to confirm all the canals were obturated 3 dimensionally and were further confirmed with CBCT(Fig 5,6 and 7). Post obturation restoration was done with hybrid composite (Te Econom Plus, Ivoclar). This was followed by PFM crown to restore the function of tooth(Fig 9). Patient was recalled for 3, 6, and 12 months follow up. 1year follow up IOPA showed no periapical lesion, patient was asymptomatic and comfortable with the restoration (Fig 10).



(Fig 5: working length radiograph)



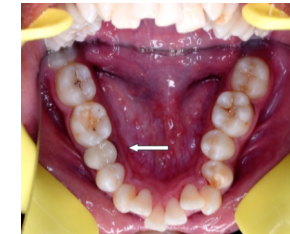
(Fig 6: CBCT image after obturation)



(Fig 7: CBCT image showing obturation in horizontal axis)



(Fig 8: Post obturation radiograph)



(Fig 9: PFM crown given after postobturationrestoration with hybrid composite)



(Fig 10: 1 year follow up IOPA)

Discussion:

The complex nature of roots and root canal morphology of mandibular second premolar should not be underestimated.⁶ Inability to identify and treat these additional root canals may cause treatment failures. Primary step in root canal treatment is the identification of the internal morphology of root canal as precisely as possible. Additional root canals may not be evident distinctively in conventional radiographs and for such cases CBCT is strongly recommended. Good quality radiographs and CBCT images are very helpful in providing clues about the number of root and root canals a tooth can have.

The root canals may not be evident radiographically, there may be a sudden narrowing of the canal space as it divides further. Careful interpretation of the PDL space helps in finding extra roots or canals. In cases where aberrant root anatomy and chances of finding additional canals is evident radiographically, CBCT is recommended in such cases.

An optimum access cavity is absolutely necessary. No 6, 8, 10 files are initially used to negotiate the canal which follow the pathway either buccally, lingually, mesially or distally according to the path of canal. A good tactile sense is also important, and the files can be precurved appropriately before negotiating the canals.⁷

Additional canal should be suspected whenever a file demonstrates an eccentric direction on deeper penetration into the canal, or if the working length file appears off centered in the radiograph.⁸

Efforts should be made to locate the point where the root or the canals divides, bifurcates or trifurcates. The more apically a root canal divides, the more difficult is the case. During obturation of this type of root canal system it is highly important the canals remain patent with a file or with a spreader of suitable taper while each canal is being obturated.

Conclusion:

A thorough knowledge of root canal anatomy and its variations, careful interpretation of peri-apical radiographs, close clinical inspection of the floor of the pulp chamber, all are essential for successful treatment outcome. In the case where radiographic images are not helpful to clarify root canal anatomy and aberrations, CBCT images are recommended. CBCT would be very beneficial and should be used in such rare cases for effective evaluation of root canal morphology, as this may facilitate and enhance visualization of the area of interest. However, the high cost, accessibility and availability of the CBCT equipment and extra radiation to the patient as compared to standard radiographic methods limits its routine use.

References:

- Green D. Stereomicroscopic study of 700 root apices of maxillary and mandibular posterior teeth. *Oral Surg Oral Med Oral Pathol.* 1960;13:728-33.
- Rahimi S1, Shahi S, Yavari HR, Reyhani MF, Ebrahimi ME, Rajabi E. A stereomicroscopy study of root apices of human maxillary central incisors and mandibular second premolars in an Iranian population. *J Oral Sci.* 2009;51(3):411-5.

3. Vertucci FJ. Root canal morphology of mandibular premolars. *J Am Den Assoc* 1978; 97:47-50.
4. Zillich R, Dowson J. Root canal morphology of mandibular first and second premolars. *Oral Surg Oral Med Oral Pathol* 1973; 36:738-44.
5. Sert S, Bayirli. Evaluation of the Root Canal Configurations of the Mandibular and Maxillary Permanent Teeth by Gender in the Turkish Population. *J Endod* 2004; 30(6), 391-398
6. Mittal N, Arora S. Endodontic treatment of mandibular second premolar with three root canals using dental operating microscope. *Endodontology* 2009;2:80-3.
7. Hariharavel VP, Kumar AA, Ganesh C. Root Canal Treatment of Mandibular Second Premolar with Three Separate Roots and Canals Using Spiral Computed Tomographic. *Case Rep Dent* 2014, 816576
8. Albuquerque D, Kottoor J, Hammo M. Endodontic and Clinical Considerations in the Management of Variable Anatomy in Mandibular Premolars: A Literature Review. *Biomed Res Int*.2014;512574
9. Scarfe W C, Levin M D, Gane D .Use of Cone Beam Computed Tomography in Endodontics. *Int J Dent*. 2009; 634567
10. Hoen MM, Pink FE. Contemporary endodontic retreatments: An analysis based on clinical treatment findings. *J Endod* 2002; 28:834-6.
11. Slowey RR. Root canal anatomy: road map to successful endodontics. *Dent Clin North Am* 1979; 23:555-73.
12. Rodig, Hulsmann M. Diagnosis and root canal treatment of a mandibular second premolar with three root canals. *Int Endod j* 2003; 36:912-9.