

# ENDODONTIC MANAGEMENT OF A MANDIBULAR SECOND PREMOLAR WITH UNIQUE ROOT CANAL MORPHOLOGY – A CASE REPORT

Dr. Priya Sinha\*, Dr. Debaprasad Das\*\*  
Dr. Anirban Bhattacharyya\*\*\*, Dr. Asim Bikash Maity\*\*\*

## ABSTRACT

**Aim :** The aim of the present article is to report a case about the thorough examination, successful diagnosis, and clinical management of a two-rooted mandibular second premolar with three independent root canals.

**Background :** Presence of extra roots and canals should be considered before initiation of root canal treatment for the success of endodontic treatment. A mandibular second premolar with three separate root canals is very rare and its prevalence has been reported to be around 0.1-0.4%.

**Case Description :** This case report explains non-surgical endodontic treatment of a mandibular second premolar with two separate roots (mesial and distal) and three separate root canals : mesial, distobuccal, and distolingual root canals. Close attention to anatomic variations, radiographic examinations, cone beam computed tomography scan and thorough evaluation of the pulp chamber floor have been recommended for the success of endodontic treatment of mandibular second premolars with complicated root canal system anatomy.

## KEY WORDS

**Mandibular second premolar, Extra root canals, Vertucci classification**

## ABOUT THE AUTHORS

\*Second year Post Graduate Trainee

\*\*Head of the Department & Professor

\*\*\*Professor

Department of Conservative Dentistry & Endodontics  
Haldia Institute of Dental Sciences & Research.

## CORRESPONDING AUTHOR

**Dr. Priya Sinha**

Second year Post Graduate Trainee, Department of Conservative Dentistry & Endodontics, Haldia Institute of Dental Sciences & Research, Banbishnupur, Balughata Haldia, Purba Medinipur, Pin-721645 Mobile : 07980905522  
e-mail : [dr.psinha06@gmail.com](mailto:dr.psinha06@gmail.com)

## INTRODUCTION

Successful endodontic treatment requires an understanding of root canal anatomy and morphology. There is wide morphological divergence in the root canal system. Usually clinicians have a thorough understanding of normal anatomy and common variations. Clinicians should be able to identify teeth with different morphologies such as mandibular premolars. According to Green, the highest incidence (47%) of accessory foramina was observed in mandibular second premolars<sup>1</sup>. Rahimi et al. also reported high incidence of lateral canals (38.7%) and apical delta (4.38%) in mandibular second premolars<sup>2</sup>.

Mandibular second premolars (MSPs) have varied anatomy ranging from 1 to 3 roots and 1–5 canals. 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<sup>3</sup>. Zillich and Dowson found the incidence of three canals in mandibular second premolars to be 0.4%, which emphasizes the occurrence as being scarce<sup>4</sup>. There seems to be a racial difference for the presence of two or more canals in mandibular premolars. Incidence of mandibular premolars with more than one root canal has been significantly higher in Negroids (32.8%) than in Caucasians (13.7%)<sup>5</sup>. In one study<sup>6</sup>, there were mandibular premolars with two canals in 1.6% of Caucasians and 2.6% in Negroids. In spite of the scarce prevalence, the clinician should be aware of these variations, their clinical and radiographic anatomy, and the location of orifices.

The purpose of the present case report was to have thorough knowledge of internal anatomy of root canal system and detect presence of extra root canal in mandibular second premolar of a patient that contributes to the success of endodontic treatment.

## CASE REPORT

A 19-year-old male patient with no systemic history was referred to the Department of Conservative Dentistry & Endodontics of Haldia



Fig : 1 (Pre-operative radiograph of #35)

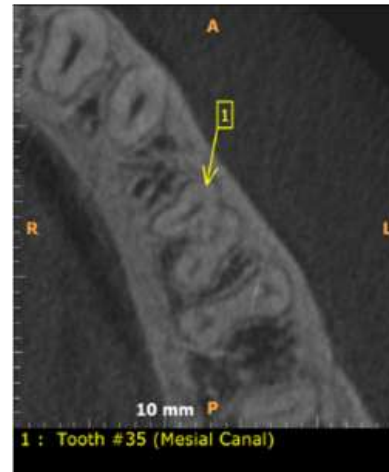


Fig : 2a (CBCT scan of #35)

CBCT - LEFT MANDIBLE		
JOY SEN	19/M	27/07/2019
<p><i>CBCT scan performed with CS 9300 scanner at resolution 0.09×0.09×0.09mm. 3D, Cross-sectional and panoramic images provided on PDF documents and films. Cross-Sectional Interval = 1mm.</i></p>		
<b><u>Tooth #35</u></b>		
<ul style="list-style-type: none"> <li>• The mandibular left second premolar has two roots (mesial and distal) and three root canals (mesial, DB and DL).</li> <li>• The tooth is a taurodont.</li> <li>• Deep disto-occlusal caries noted in this tooth.</li> <li>• The mesial root canal extends completely up to the apex to open into a single foramen (Vertucci's Type I).</li> <li>• The DB and DL root canals extend right up to the radiographic apex of the tooth, to open into two separate foramina (Vertucci's Type IV).</li> <li>• Periapical pathosis noted in association with the tooth.</li> <li>• There is no radiographic evidence of any fracture of the tooth.</li> </ul>		

Fig : 2b (CBCT report)

Institute of Dental Sciences & Research, Haldia.

The chief complaint of the patient was pain in the lower left back teeth region since 4 weeks. Clinical examination revealed disto-occlusal caries in tooth #35. Vitality tests on the tooth showed painful response to cold, heat and electric pulpal test (EPT) and normal response to percussion. Radiographic examination showed radiolucent area in the disto-occlusal surface of the coronal aspect of #35 involving enamel, dentin and very close to the pulp horn, normal periodontium and more than two root canals were suspected in this two-rooted premolar (Fig : 1).

A pulpal diagnosis of irreversible pulpitis and a periradicular diagnosis of normal were made.

A Cone Beam Computed Tomography scan was also performed pre-operatively in order to confirm the internal root canal morphology and to detect

location of the canals. The following box stated the report of the CBCT scan of the patient. (Fig : 2a & 2b)

Nonsurgical endodontic treatment was planned in #35 tooth in one visit. After the administration of the local anesthetic agent (2% lidocaine with 1: 100,000 epinephrine), under rubber dam isolation, #35 tooth was accessed.

Three main canal orifices were located: one mesially and the other two, distobuccally and distolingually. Working length was established with the use of an apex locator (CanalPro, Coltene Whaledent, Switzerland) and confirmed by a radiograph. The canals were cleaned and shaped with hand K-files (Maillefer Dentsply, Baillaigues, Switzerland) and Hyflex EDM NiTi rotary file in a crown down manner up to final canal size of 0.25/~in distolingual, distobuccal and mesial canals. The canals were irrigated with 5.25% sodium hypochlorite during instrumentation and 17% EDTA



**Fig : 3 (Working Length determination of #35)**



**Fig : 4 (Master Cone Selection of #35)**



**Fig : 5 (Obturation of #35)**

at the end of instrumentation. After final rinse with normal saline, canals were dried and obturated with gutta-percha and Sealapex (Kerr) using the lateral compaction method. (Fig :3-5) Tooth #35 was asymptomatic and had normal periapical condition

## DISCUSSION

Mandibular second premolar is one of the most difficult teeth for the endodontic treatment<sup>7</sup> because of the variations in internal morphology, extra root canals, apical deltas and lateral canals<sup>8,9</sup>.

Straight and angled preoperative radiographs using parallel technique are essential in providing insight into the number of existing root canals<sup>10</sup>. Generally, in mandibular premolars with three canals, the cervical half of the root is wider than usual, with little or no taper<sup>9</sup>. Root canals may not be evident in radiographs and may look unusual. Sudden change in radiographic density and sudden narrowing of root canal space usually indicates an additional canal<sup>11</sup>. Therefore, careful interpretation of the periodontal ligament space and angled views may suggest the presence of an extra root or canal. In the presented case, unusual root shape was observed in pre-treatment radiographs, which recommended the possibility of extra roots and canals.

Using magnifier loupe, fiberoptic illumination for observation of anatomical landmarks in the pulp chamber, sodium hypochlorite bubbling in the extra canals and dyes may be helpful in locating additional

canals<sup>12,13</sup>. For better visualization, a surgical operating microscope as well as staining with methylene blue, which could penetrate into the orifice to detect developmental grooves, are able to predict suspected location of canal orifices. In the pulp chamber floor of the mandibular premolars with three canals, many authors have reported one orifice in the lingual side and two in the buccal<sup>9,14,15</sup>.

For more reliable working length determination, we use apex locator in combination with radiographs<sup>3</sup>. Two canals in the distal root in our case had type IV configuration according to Vertucci classification, while the mesial root had type I configuration<sup>16</sup>.

We accomplished obturation of all three canals contemporaneously with lateral compaction technique for better results.

Although in vitro and in vivo studies<sup>17,18</sup> report low incidence of mandibular second premolars with three canals, each case should be analyzed individually through precise radiographic and clinical examination in order to find all root canals.

## CONCLUSION

It is strongly important to use all the available diagnostic tools to find and treat the full root canal system. Cautious interpretation of angled radiographs, good access preparation, proper inspection of pulpal floor, and a detailed examination

of the interior of the tooth perfectly under magnification and CBCT are important prerequisites for a successful treatment outcome.

## REFERENCES

1. Geen D. Stereomicroscopic study of 700 roots apices of maxillary and mandibular posterior teeth. *Oral Surg Oral Med Oral Pathol.* 1960;13:728–33.
2. Rahimi S, 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;51:411–5.
3. Vertucci FJ, Selig A, Gillis R. Root canal morphology of the human maxillary second premolar. *Oral Surgery, Oral Medicine, Oral Pathol.* 1974;38:456–64.
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. Trope M, Elfenbein L, Tronstad L. Mandibular premolars with more than one root canal in different race groups. *J Endod.* 1986;12:343–5.
6. Amos ER. Incidence of bifurcated root canals in mandibular bicuspid. *J Am Dent Assoc.* 1955;50:70–1.
7. Awawdeh LA, Al-Qudah AA. Root form and canal morphology of mandibular premolars in a Jordanian population. *IntEndod J.* 2008;41:240–8. Epub 2007 Dec 12.
8. De Moor RJ, Calberson FL. Root canal treatment in a mandibular second premolar with three root canals. *J Endod.* 2005;31:310–3.
9. Nallapati S. Three canal mandibular first and second premolars: a treatment approach. *J Endod.* 2005;31:474–6.
10. Silha RE. Paralleling long cone technic. *Dent RadiogrPhotogr.* 1968;41:3–19.
11. Slowey RR. Root canal anatomy. Road map to successful endodontics. *Dent Clin North Am.* 1979;23:555–73.
12. Carr GB. Microscopes in endodontics. *J Calif Dent Assoc.* 1992;20:55–61.
13. Nallapati S, Glassman G. Ophthalmic dyes for root canal location. *Endodontic practice.* 2004;7:21–6.
14. Chan K, Yew SC, Chao SY. Mandibular premolar with three root canals--two case reports. *IntEndod J.* 1992;25:261–4.
15. Rödiger T, Hülsmann M. Diagnosis and root canal treatment of a mandibular second premolar with three root canals. *IntEndod.* 2003;36:912–9.
16. Vertucci FJ. Root canal anatomy of the human permanent teeth. *Oral Surg Oral Med Oral Pathol.* 1984;58:589–99.
17. Al-Fouzan KS. The microscopic diagnosis and treatment of a mandibular second premolar with four canals. *IntEndod J.* 2001;34:406–10.
18. Macri E, Zmener O. Five canals in a mandibular second premolar. *J Endod.* 2000;26:304–5.