



## MANDIBULAR SECOND PREMOLAR WITH TWO SEPARATE ROOTS AND THREE CANALS: A CASE REPORT.

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### ABSTRACT

This case report presented here shows a rare, uncommon case of a mandibular second premolar with two separate roots and three canals. Even though such a finding is relatively uncommon, numerous case studies have been reported. A thorough knowledge of the anatomy of root canal systems, their aberrations, proper assessment of the pulp chamber floor, taking ideal radiographs and advanced diagnostic aids like CBCT can play a big role in managing such cases.

**KEYWORDS :** Mandibular second premolar , Two separate roots , Three canals , CBCT

Knowledge of a subject guarantees success or failure of the outcome. Variations from the normal is becoming the norm for any treatment. Such is the case with root canals and its anatomies<sup>(1)</sup>. Wider horizon to detect the tooth with anatomic irregularities or morphologic differences like accessory canals, help the operator to recognize their presence and prevent failure.

In literature mandibular premolars have been reported to exhibit numerous root canal variations<sup>(3,4)</sup>. Mandibular first premolar according to Vertucci (1978) exhibits 2.5% incidence of a second canal<sup>(5)</sup>. Two and three canal occurrence is 11.7% and 0.4% respectively according to Zilich and Dawson<sup>(6)</sup>. Ingle discovered a prevalence rate of 12% and 0.4% in mandibular second premolar of second and third canals.(table 1)

Recently, a diagnostic aid, cone-beam computed tomography (CBCT) scanning has made it possible to obtain images that have sufficient resolution to guide and conduct studies of root canal anatomy<sup>(7)</sup> hence increasing the chances for the success of the treatment.

This case report cites the root canal aberrations of mandibular second premolar with unique anatomy of having three separate canals within two roots, each having its own orifice and apical foramina.

**Table 1:-prevalence Rate Of One And More Root Canals In Mandibular Second Premolar.**

Reference	No of teeth in study, (Country)	One root	Two or more root
Sert and Bayirti (2004)	100, (Turkey)	100%	-
Zaatar et al. (1997)	64, (Kuwait)	95.6%	4.7%
Geider et al. (1989)	328, (France)	97.4%	0.4%

Vertucci (1978) <sup>9</sup>	400, (USA)	100%	-
Zillich and Dowson (1973) <sup>10</sup>	906, (USA)	96.5%	0.4%

### Case report

A 28-year-old male patient reported to the Department of Conservative Dentistry and Endodontics, Inderprastha Dental College and Hospital with the chief complaint of pain in his right lower back tooth for the past one week. On clinical examination mandibular right second bicuspid was found to be carious with severe pain on percussion. The pre-operative radiograph was taken and two separate roots were seen. The two roots were distinguished as mesial and distal (figure 1). The periodontal ligament was widened. The provisional diagnosis of symptomatic irreversible pulpitis with a chronic apical periodontitis was made. The patient's medical history was noncontributory and multiple visit non-surgical endodontic treatment was planned. After 2% lignocaine was administered, the concerned area was isolated with rubber dam. A conventional access cavity was prepared to expose the canal orifice. While searching for the extra canal orifice in the distal side of the tooth an inadvertent perforation was made in the tooth which was repaired by Glass ionomer cement. Examination of the chamber floor revealed three canal orifices (figure 2). The presence of three canals was confirmed with CBCT scan (figure 3 a,b-1,2,3). Patency was ascertained using a 10 K-file. The pulp tissue was removed and the working length of all three canals was measured using apex locator and later confirmed using radiographs (figure 4). The canal orifices were widened and later chemo-mechanical preparation was carried out using protaper gold rotary files (Dentsply Maillefer) till F1. The irrigation protocol was followed with 2ml of sodium hypochlorite (5.25 %) at 60°C and a second application and its activation was done by using a K file (08-10). This step had to be preceded by an abundant irrigation with distilled water in order to eliminate the first mixture present in the access cavity. Once the preparation of the canal had begun, Smear Clear (Sybron Endo, Orange,

CA) (17% EDTA cetrimide, and surfactants) was used in order to eliminate the smear layer before its thickening and condensing inside the canal systems, which would have closed the entrances of lateral and accessory canals.

Saline was used between each irrigating solution in order to prevent an acid/ base reaction, between sodium hypochlorite and EDTA, for a more efficient action of the chemicals on the tissues.

A maximum neutralization of all the chemical agents was done by the end of the preparation and before the fitting of the gutta-percha cones so that the master cone did not push any of the chemicals outside the canal that might have caused an inflammation.

The F1 protaper master cones (Dentsply Maillefer) were selected by tug back and radiographic confirmation (figure 5). After drying the canals with absorbent points, the canals were obturated using gutta-percha cones and Sealapex sealer (Sybronendo, Kerr). A radiograph was taken to confirm the obturation (figure 6) and the access cavity was sealed with the composite restoration.

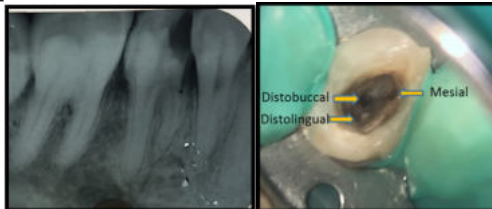
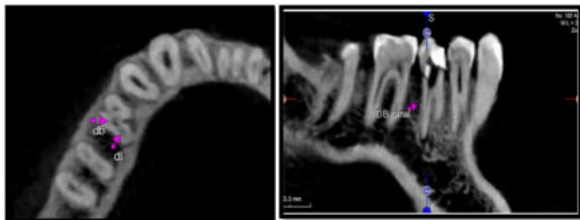


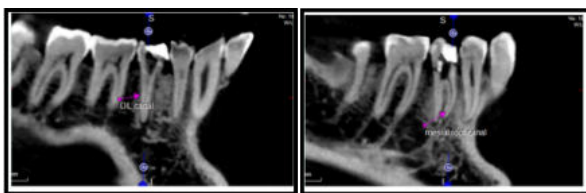
Figure 1:- Pre operative radiographs

Figure 2:- Access cavity



(a: Transverse view)

(b-1: Sagittal view illustrating DB canal)



(b-2: Sagittal view illustrating DL canal)

(b-3: Sagittal view illustrating MB canal)

Figure 3:- CBCT image showing two roots and three canals

(S-Sagittal view ; DB- Distobuccal canal ; DL - Distolingual canal ;MB-Mesio buccal canal )

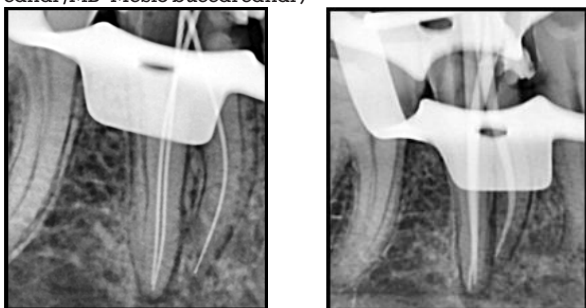


Fig 4:- Working length

Fig 5:- Master cone



Figure 6:- Obturation

**DISCUSSION**

This case report cites the existence of a second mandibular premolar with two roots and three canals with individual orifice and an apex. The exact etiology is still obscure, however teeth that undergo root development after birth are more sensitive to development of extra roots and canals. Metabolic diseases, trauma or pressure could be some of the reasons for the development of these kind of complex anatomies<sup>(8)</sup>. The mandibular canines and the premolars are believed to be the most commonly affected single-rooted teeth<sup>(9)</sup>.

The mandibular premolar is a very good example of complex anatomy. Studies on the root canal morphology of mandibular premolars have reported a fairly high percentage of these teeth to have more than one canal<sup>(10-12,14)</sup> Zillich and Dowson<sup>(15)</sup> in 1973 and El Deeb<sup>(16)</sup> in 1982 reported that the prevalence of three root canals with three distinct orifices that end in separate foramen was 0.4%. The atypical occurrence of three canals with two in distal root and one in mesial root had been reported by De Moor et al.<sup>(17)</sup> in the second premolar. Trope et al.<sup>(18)</sup> and Sabala et al. have reported ,in their in vivo studies ,that two canals were found in 5.2% of the patients and more than two canals were found in 4.4% of the patients in mandibular second premolar .

Studies of morphologic difference with respect to ethnicity have also been reported. Trope et al.<sup>(18)</sup> compared the number of roots and canals in mandibular premolars between African American and Caucasian patients. 4.8% of the African American had two or more roots in the mandibular second premolar as compared to 1.5% in the white patient group.

Differences based on the gender have also been reported. 547 patients were studied by Serman and Hasselgren<sup>(19)</sup> who found a gender differences with respect to the number of canals and roots. 50 women versus 29 men were reported to have had multiple roots and/or canals in mandibular first premolar, whereas 29 men versus 15 women exhibited multiple roots and/or canals in mandibular second premolar. In a mandibular second premolar, a single apical foramen may be found in more than nine out of ten cases, however two or more foramina might occur approximately 8.2% of the time. Contrastingly the incidence of two or more foramen in first mandibular premolar is 21.1%. Seema Yadav<sup>(20)</sup> in her case report of endodontic management of mandibular premolar with two roots emphasized the importance of magnification for management of branched canal configuration.

The awareness of the complexities of root canal system lead to better treatment outcomes, was the result of the study conducted by Ekim Onur Orhan et al.<sup>(21)</sup> who observed twenty-six mandibular second premolars with complex apical branching, .

Pre-operative radiographs, both straight and angled using parallel technique would give clues to the number of roots that exist. Yoshioka et al.<sup>(22)</sup> mentioned that sudden narrowing of the root canal space from the orifice to apex on a radiograph indicates canal multiplicity. Microscopes are widely used to explore the pulp chamber and identify the orifices with their better visualization. Also, attention to color changes on the pulpal floor and wall during inspection is helpful in locating orifices. Of late, CBCT has been used in endodontics for the evaluation of root canal anatomy, that allows the operator to visualize multiple sections of the roots and their canals. According to Nance et al.<sup>(23)</sup> the detection of canals increases significantly by CT scan compared with conventional radiography.

The present case shows two roots with three different canals. One should never underestimate the complex anatomy of the root canal morphology of mandibular second premolar. Various hints can guide the clinician to diagnose additional roots or canals and treat the tooth accordingly.

## REFERENCES

1. Trope M, Elfenbein L, Tronstad L. Mandibular premolars with more than one root canal in different race groups. *Journal of Endodontics* 1986; 12: 343-345.
2. Ingle JI, Bakland LK. *Endodontics*, 2nd edn. Philadelphia: Lea and Febiger, 1994; p. 43.
3. Vertucci FJ. Root canal anatomy of the human permanent teeth. *Oral Surg Oral Med Oral Pathol* 1984;58:589-99.
4. Kerekes K, Tronstad L. Morphometric observations on root canals of human premolars. *J Endod* 1977;3:74-9.
5. Vertucci FJ. Root morphology of mandibular premolars. *J Am Dent Assoc* 1978;97:47-50.
6. Zillich R, Dowson J. Root canal morphology of mandibular first and second premolars. *Oral Surg Oral Med Oral Pathol* 1973;36:738-44.
7. ElDeeb ME. Three root canals in mandibular second premolars - literature review and case report. *J Endod* 1982;8:376-7.
8. Woelfel JB. *Dental Anatomy*, 3rd edn. Philadelphia,, Lea and Febiger 1984,, 108-111.
9. Fuller JC, Deneby GE. *Concise Dental Anatomy and Wovphology*, 2nd edn. Chicago,, Year Book Medical Publishers Inc., 1984,, p. 269.
10. Amos ER. Incidence of bifurcated root canals in mandibular bicuspids. *J Am Dent Assoc*. 1955;50:70-71.
11. England MC Jr, Hartwell GR, Lance JR. Detection and treatment of multiple canals in mandibular premolars. *J Endod*. 1991;17:174-178.
12. Baisden MK, Kulild JC, Weller RN. Root canal configuration of the mandibular first premolar. *J Endod*. 1992;18:505-508.
13. Hoen MM, Pink FE. Contemporary endodontics retreatments: an analysis based on clinical treatment findings. *J Endod*. 2002;28:834-836.
14. Barrett MT. The internal anatomy of teeth with special reference to the pulp and its branches. *Dental Cosmos*. 1925;67:581-592.
15. Zillich R, Dowson J. Root canal morphology of mandibular first and second premolars. *Oral Surg Oral Med Oral Pathol*. 1973;36:738-744.
16. ElDeeb ME. Three root canals in mandibular second premolars: literature review and a case report. *J Endod*. 1982;8:376-377.
17. De Moor RJ, Calberson FL. Root canal treatment in a 237 Clujul Medical Vol. 91, No. 2, 2018: 234-237 mandibular second premolar with three root canals. *J Endod*. 2005;31:310-313.
18. Trope M, Elfenbein L, Tronstad L. Mandibular premolars with more than one root canal in different race groups. *J Endod*. 1986;12:343-345.
19. Serman NJ, Hasselgren G. The radiographic incidence of multiple roots and canals in human mandibular premolars. *Int Endod J*. 1992;25:234-237
20. Seema Yadav. Endodontic management of mandibular premolar with two roots. *International J of Applied Dental Sciences*. 2016;2(4):72-74.
21. Orhan EO, Dereci Ö, Irmak Ö. Endodontic outcomes in mandibular second premolars with complex apical branching. *J Endod*. 2017;43:46-51.
22. Yoshioka, T., Villegas, J., Kobayashi, C., & Suda, H. (2004). Radiographic evaluation of root canal multiplicity in mandibular first premolars. *Journal of endodontics*, 30(2), 73-74.
23. Nance, R., Tyndall, D., Levin, L. G., & Trope, M. (2000). Identification of root canals in molars by tuned-aperture computed tomography. *International Endodontic Journal*, 33(4), 392-396.