

Manuscript type- Case Report

Title- Case Report On Different Root Canal Morphologies Of Mandibular and Maxillary Premolars Along With CBCT

Authors:

1-Dr Ramesh Chandra, Professor, Department of Conservative Dentistry and Endodontics, Career Post Graduate Institute of Dental Sciences And Hospital, Lucknow.

Dr.rameshchandra01@gmail.com

2- Dr Mariyam Khan, Associate Professor, Department of Conservative Dentistry and Endodontics, Career Post Graduate Institute of Dental Sciences And Hospital, Lucknow

3- Dr Ankita Mehrotra, Associate Professor, Department of Conservative Dentistry and Endodontics, Career Post Graduate Institute of Dental Sciences And Hospital, Lucknow

4- Dr Taha Siddique, Assistant Professor, Department of Conservative Dentistry and Endodontics, Career Post Graduate Institute of Dental Sciences And Hospital, Lucknow

5- Dr Shambhawi Singh, Postgraduate student, Department Of Conservative Dentistry and Endodontics, Career Post Graduate Institute Of Dental Sciences And Hospital, Lucknow.

6- Dr Pragati Pandey, Postgraduate student, Department Of Conservative Dentistry and Endodontics, Career Post Graduate Institute Of Dental Sciences And Hospital, Lucknow.

ABSTRACT

A successful endodontic treatment depends on thorough knowledge about the root canal anatomy. Root canals do not always have a similar morphology.

Due to their varied morphologies, premolars need more advanced imaging modalities such as cone-beam computed tomography (CBCT) which has more advantages over conventional radiographic techniques.

The cases of mandibular and maxillary premolars with different canal configurations are discussed in this article. This article focuses on using CBCT to predictably diagnose and help in formulating treatment modalities for the teeth that appear with such a wide range of morphologies.

INTRODUCTION

Multirrooted teeth provides a varying root canal anatomy which requires a correct diagnosis and expert management.¹ Inability to detect and negotiate the complexities of the root canal system results in unpredictability about the treated tooth which leads to failure of the treatment.²

Typically, the mandibular first premolar have only one root. There have also been sporadic reports of two, three, and four-rooted variations (Trope et al., 1986). Two or more canals has also been seen in about 24% of mandibular 1st premolars (Trope et al., 1986; Lu et al., 2006). In case of mandibular second premolars, 97.5% have one canal, while 2.5% have two canals.³

Slowey has proposed that the mandibular first premolars which are often referred to as the "Endodontist's enigma"—as they pose a big challenge in comparison of all teeth in terms of successful endodontic therapy.⁴

The teeth with the greatest anatomic variances are maxillary premolars, according to Vertucci. The "S" or bayonet-shaped root canal is one such variant that frequently appears in maxillary premolars. Additionally, maxillary laterals, maxillary canines, and mandibular molars have been observed to have "S" shaped root canals.⁵

The root canal anatomy and its variations were classified by several researchers of which Vertucci's classification is the most accepted one, which are-

Type I (1), Type II (2-1), Type III (1-2-1), Type IV (2), Type V (1-2), Type VI (2-1-2), Type VII (1-2-1-2) and Type VIII (3) (Vertucci, 1984).⁶

This case report presents the endodontic management of mandibular and maxillary premolars with different canal morphologies along with CBCT.

CASE REPORT 1

A 65-year-old male reported to the Post Graduate Department of Conservative Dentistry and Endodontics with a chief complaint of intermittent pain in lower right posterior region of jaw for 3 weeks with occasional episodes of tooth sensitivity to hot foods. On clinical examination, tooth number 44 had a deep occlusal carious lesion which was tender on percussion. There was no relevant medical or dental history. Radiographic examination revealed the presence of a radiolucent area that extended to the pulp chamber and had two

roots, respectively. The pulp vitality test was done using the electric pulp tester (Ashoo Sons API Pulp Tester, Delhi, India) which revealed a vague result.

Based on clinical and radiographic assessment, a diagnosis of chronic irreversible pulpitis, was made and endodontic treatment was planned. The radiograph analysis also revealed #44 with two roots which was confirmed by using CBCT. The CBCT findings revealed on axial and sagittal section the tooth had 2 roots with 2 separate canals, Vertucci's Type IV (2).

The tooth was anesthetized using 2% lignocaine HCl with 1:200,000 units of adrenaline (Lignox, Indoco Remedies Ltd., India) and isolation of tooth was done with a rubber dam. Before accessing the pulp chamber, all caries were eliminated. A conventional access opening was done using endodontic access bur size 2 (Dentsply-Sirona, USA) which showed two orifices—one buccally and the other lingually. Pulp tissue was extirpated using barbed broaches and the pulp chamber was flushed with 3% Sodium hypochlorite. The patency of canal was confirmed with #10 no. K file (Dentsply). Cleaning and shaping with the ProTaper Gold rotary system (Dentsply Maillefer) up to F1 was completed. During instrumentation, the canals were periodically irrigated with 5.2% sodium hypochlorite, ethylenediaminetetraacetic acid (Desmear, Anabond Stedman Pharma Research, India) and the last rinse was done with 2ml of saline. Endoactivator was used for irrigant activation, tip size 25/04 taper at 10,000 cycles per minute (Dentsply-Sirona, USA). The position of the master cone was verified using a radiograph. A resin sealer (AH plus sealer, Dentsply-Sirona, USA) was used to complete the obturation of all the canals by warm vertical compaction technique. After a week, Bulk fill composite restorative material (Mani Bulk) was used to restore the access.

The quality of the obturation was subsequently confirmed with a final radiograph.

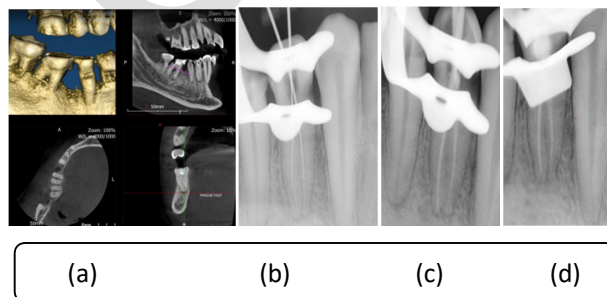


Fig a)CBCT showing axial section and sagittal section of tooth presenting 2 roots 2 canals (44). b)Radiograph showing working length determination c) radiograph showing master

CASE REPORT 2

A 28-year-old patient was referred to the department of conservative dentistry and endodontics for intentional root canal treatment of maxillary 1st premolar of right quadrant (14) followed by orthodontic treatment. Clinical examination revealed no decay or periodontal attachment loss. The preoperative periapical radiograph showed an unusual shaped root canal which was curved at apical third of the root like a bayonet shaped instrument.

CBCT was advised to know the exact canal morphology and anatomy of the root. CBCT findings revealed that the axial and sagittal section shows single root with 2 canal openings and 2 canal exits, Vertucci's Type IV (2). The root was significantly curved from the apical third which gave a shape of a bayonet.

The treatment plan that was implemented was same as that reported in Case Report 1. The quality of the obturation was subsequently confirmed with a final radiograph.

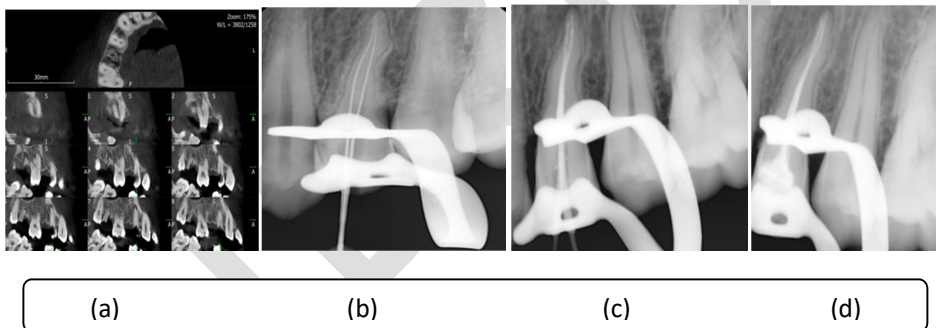


Fig a) CBCT showing axial section and sagittal section of tooth presenting bayonet shaped root and canal (14). b) radiograph showing working length determination c) radiograph showing master apical file. d) radiograph showing obturation

DISCUSSION

For a successful endodontic treatment, understanding of root canal anatomy is crucial, and inadequate understanding of it might result in treatment failure. The mandibular and maxillary premolars can have a complex and varied root and canal morphologies.^{7,8} Vertucci discovered that 74.0% of mandibular first premolar teeth had one canal, 25.5% had two

canals, and 0.5% had three canals. Of the mandibular second premolars, 97.5% have one canal, while 2.5% have two.⁶

Compared to the mandibular first premolars, the incidence of multiple roots, canals, and foramens is less in the second premolars.⁹ A study on the root morphology and canal design of human mandibular premolars was done by Jojo Kottoor who stated that the prevalence of numerous canals in mandibular second premolars was higher in Caucasian, Indian, and Middle Eastern populations (14–17%).¹⁰

In studies on extracted maxillary second premolars, it was found that 35.4% of them had two root canals at the apex. In Indians shows a higher incidence of type II configuration (33.6%) in the root canal morphology of the maxillary second premolar. The finding of additional type, namely type XIX (2-1-2-1), is rare.¹¹

CBCT, as opposed to standard radiography, can produce three-dimensional (3D) illustrations of teeth, which can help with more accurate imaging of the root and canal system as well as analysis of the internal and exterior architecture of the tooth. It is a non-invasive method that yields higher-resolution images than traditional radiography.¹²

CONCLUSION

Any tooth might have variations in the number of roots and root canals which is something every endodontist treating root canals should be aware of, and they should always be on the lookout for abnormal anatomy. To carefully examine the pulpal floor and negotiate the concealed root canal anatomy, clinicians must concentrate on using modern tools like dental operating microscopes and CBCT which is emphasized by our study.

REFERENCES

1. Al-Qudah A, Afaneh A, Hassouneh L. A Case Report of a Maxillary Second Molar with Two Distinct Palatal Canals, Confirmed by CBCT. *Clinical, Cosmetic and Investigational Dentistry*. 2023 Dec 31:199-203.
2. García-Guerrero C, Delgado-Rodríguez CE, Molano-González N, et al. Predicting the outcome of initial non-surgical endodontic procedures by periapical status and quality of root canal filling: a cohort study. *Odontology*. 2020;108:697–703. doi:10.1007/s10266-020-00494-z

3. Algarni YA, Almufarrij MJ, Almoshafi IA, Alhayaza HH, Alghamdi N, Baba SM. Morphological variations of mandibular first premolar on cone-beam computed tomography in a Saudi Arabian sub-population. *The Saudi Dental Journal*. 2021 Mar 1;33(3):150-5.
4. Bonny Paul and Kavita Dube Endodontic Treatment of a Mandibular Second Premolar with Three Roots and Three Canals Case Reports in Dentistry
5. Reuben J, Velmurugan N, Vasanthi S. Endodontic management of a maxillary second premolar with an S-shaped root canal. *Journal of Conservative Dentistry: JCD*. 2008 Oct;11(4):168.
6. Nidhi Shrivastava, Marisha Bhandari. Endodontic management of mandibular second premolar with three roots and three root canals: A case report. *Journal of orofacial sciences*.2016
7. Ahmed H, Versiani M, De-Deus G, Dummer P. A new system for classifying root and root canal morphology. *Int Endod J*. 2017;50(8):761–770. doi:10.1111/iej.126853.
8. Stone LH, Stroner WF. Maxillary molars demonstrating more than one palatal root canal. *Oral Surg Oral Med Oral Pathol*. 1981;51(6):649–652. doi:10.1016/S0030-4220(81)80017-56
9. Saeed Rahimi et al. Root Canal Configuration of Mandibular First and Second Premolars in an Iranian Population *Journal of Dental Research, Dental Clinics, Dental Prospects* 2007
10. Adnan A. Habib. Root canal configurations of the first and second mandibular premolars in the population of north Syria. *Journal of Taibah university medical sciences* 2015
11. Zheng QH, Wang Y, Zhou XD, Wang Q, Zheng GN, Huang DM. A cone-beam computed tomography study of maxillary first permanent molar root and canal morphology in a Chinese population. *J Endod*. 2010;36(9):1480–1484. doi:10.1016/j.joen.2010.06.01818.

12. Jethi N, Beniwal J, Ashraf F, Nain VJ, Singla I. Endodontic Management of Bayonet Shaped Canals in Single and Multirooted Second Premolar–Case Series.

UPSDJ