

Endodontic Management of Mandibular Molar with Middle Mesial and Middle Distal Canals Confirmed with Aid of CBCT: A Rare Case Report

Ashtosh Shandilya^{1*} Shruti Sial² Naveen K Gupta³ Diksha Maheswari⁴ Shweta Bandhe⁵

¹Senior Lecturer, Department of Conservative Dentistry and Endodontics, Government Dental College Raipur, Chhattisgarh, India.

²Reader, Department of Conservative Dentistry and Endodontics, Government Dental College Raipur, Chhattisgarh, India.

³Senior Lecturer, Department of Conservative Dentistry and Endodontics, New Horizon Dental College and Research Institute, Bilaspur, Chhattisgarh, India.

⁴Senior Lecturer, Department of Conservative Dentistry and Endodontics, Government Dental College Raipur, Chhattisgarh, India.

⁵Senior Lecturer, Department of Conservative Dentistry and Endodontics, Government Dental College Raipur, Chhattisgarh, India.

ABSTRACT

Background: The endodontic treatment of a mandibular molar with unusual root canal morphology can be diagnostically and clinically challenging. This case report presents the treatment of a mandibular first molar with six root canals, of which three canals were located in the mesial and three in distal root with the help of CBCT. The presence of three canals in the distal root of mandibular molars has been reported to have an incidence of 0.2–3%. A 42-year-old male patient reported with a complaint of pain in relation with tooth number 36. On clinical examination Symptomatic apical periodontitis diagnosis was made with 36 and root canal treatment was planned. Additional canals were located as middle mesial and middle distal with the aid of CBCT. Dentists should take advantage of new diagnostic aid, such as CBCT to be able to find and treat the hidden and unusual anatomy.

Keywords: Cone beam computed tomography, mandibular first molar, middle mesial, middle distal canals.

INTRODUCTION

The main objective of endodontic treatment comprises meticulous mechanical instrumentation, chemical disinfection, and obturation of the root canal space. The frequently attributed cause for failure of nonsurgical endodontic treatment is the inability to identify and negotiate extra root canals, leading to inadequate cleaning and shaping.¹ Numerous case reports have described the presence of a middle mesial (MM) and distal canals. In 2018, Ahmad H Jabali² has reported a case with six canals consisting of three canals in the mesial root and three in the distal root. Advanced diagnostic tools such as cone beam computed tomography (CBCT) scan plays an important role in the diagnosis and management of such a complex canal configuration. Before the introduction of CBCT, the incidence of MM canal ranged between 1 and 15%,^{3,4,5} whereas

a recent study⁶ has reported a much higher incidence of 46.2% in mandibular first and second molars. Use of CBCT to identify root canal system has been supported by Matherne et al.⁷ In addition to the MM canal, very few cases have reported a third canal located in the distal root. The incidence of the MD canal is very rare and found to be 0.2 to 3% of the reported cases.⁸⁻¹⁴ This case report presents the management of a mandibular first molar with six root canals, three in mesial and three in distal root. In addition, this case report highlights the use of CBCT as a diagnostic tool in endodontics.

CASE REPORT

A 42-year-old male patient reported to our department with discomfort and intermittent pain in the left mandibular region. The medical history

Received: Jan. 19, 2021; Accepted: Mar. 11, 2021

*Correspondence Dr. Ashtosh Shandilya.

Department of Conservative Dentistry and Endodontics, Government Dental College Raipur, Chhattisgarh, India.

Email: shandilyaashutosh16@gmail.com

was non-contributory and history of present illness showed that there were few episodes of recurrent pain in that region for the past 2 months. Pulp testing with cold and electric pulse tester was nonresponsive. Radiovisiograph revealed a radiolucency around the periapex of the left mandibular first molar [Figure 1 A]. It was diagnosed as symptomatic apical periodontitis. Treatment plan was explained to the patient and endodontic treatment was initiated under rubber dam isolation. This case was ethically approved and written consent has been taken from patients. [Figure 1]

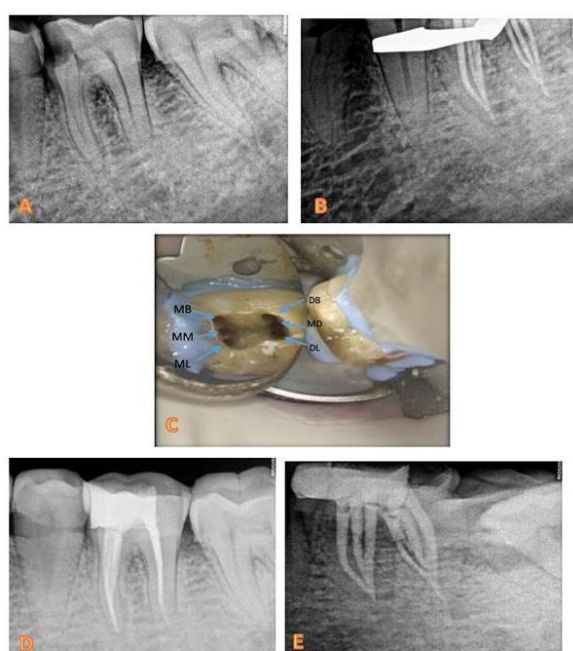


Fig 1 A to E : (A) Preoperative radiograph of mandibular first molar showing caries extension up to the pulp and widened periodontal ligament space. (B) Master cone radiograph showing gutta-percha in six separated canals. (C) Access cavity showing three mesial and three distal canals. (D) Radiograph after obturation. (E) Radiograph with different angle showing six obturated canals.

Abbreviations: mesio-buccal: MB, middle-mesial: MM, mesio-lingual: ML, disto-buccal: DB, middle distal: MD, disto-lingual: DL

On first visit anaesthesia of mandibular left first molar was achieved with inferior alveolar nerve block using 2% lignocaine and an endodontic access cavity preparation was done. Four canals were located in the chamber, two in the mesial side and

two in the distal side. On careful examination with endo explorer, an additional orifice was detected between the two main canals, both mesially and distally. Glide path and patency were achieved using no. 8, and 10 k-files.

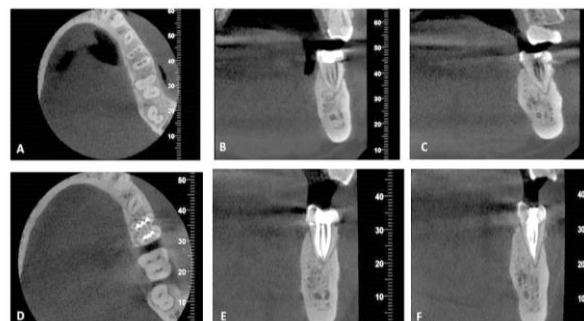


Fig 2 A to F:(A)Axial view CBCT image showing three canals in mesial root and distal root.(B)Coronal view CBCT image of mesial root showing three separate canals merging at apical 1/3rd of the root.(C)Coronal view CBCT image of distal root showing three separate canals merging at apical 1/3rd of the root.(D)CBCT image showing three obturated canals in mesial root and three obturated canals in distal root.(E)CBCT image of mesial root showing three obturated canals merging at apical 1/3rd of the root.(F)CBCT image of distal root showing three obturated canals merging at apical 1/3rd of the root. Working length radiographs were taken at different angulations with a file placed in each canals and confirmed with electronic apex locator (Endy 6200 by IONYX). After the initial instrumentation access cavity was temporarily restored and patient was sent to the CBCT centre. Additional canals were confirmed with the help of CBCT. [figure 2 A, 2B, 2C] Cleaning and shaping was performed at second visit using a crown-down preparation with rotary instruments (Neoendo Flex Files by Orikam) under profuse irrigation with 5% sodium hypochlorite solution. After drying the root canals with sterile paper points, obturation was carried out with gutta-percha cones (Neoendo by Orikam) using zinc oxide eugenol sealer. [figure 1 D, 1E]. Since the anatomy was unusual, CBCT image was taken to confirm the anatomy. CBCT imaging confirmed the presence of six canals with the concerned tooth. [figure 2]

DISCUSSION

A thorough understanding of tooth morphology, careful interpretation of angled radiographs, proper

access preparation, and a detailed exploration of the interior of the tooth are essential prerequisites for a successful treatment outcome.¹⁵ Morphologic variations and aberrations in root canal anatomy should always be considered at the beginning of treatment. ¹⁵To minimize the risk of endodontic treatment failure, a precise knowledge of the root canal morphology is vital. Due to the paradigm shift in the recent advances in diagnostic aids in endodontics, CBCT has been a major breakthrough in digital dental imaging since its introduction in 1996. Most mandibular first molars have one mesial root and one distal root usually with the presence of two canals in the mesial root and one or two canals in the distal root. The prevalence of a single canal of the distal roots of mandibular first molar is very high where the presence of three and four canals is very low.¹⁶ Alenezi ¹⁷ and Ahmed H Jabali ²reported a case of mandibular first molar with three canals existing in the mesial root and three canals in the distal root. The incidence of three canals in the distal root is 0.2%-3% and that of the middle mesial canal is 1%-15%.¹⁹ A significant constraint in conventional radiography is that it produces a 2D image of a 3D object, resulting in the superimposition of the overlying structures. Therefore, such radiographs are of limited value in cases with complex root canal anatomy. In the present case CBCT images confirmed the presence of three canals in each root which can be described as additional Type (3-1) canal configuration according to Gulabivala and co-workers ¹⁸. In this case the middle mesial canal and middle distal canal originated as a separate orifice and merged in the apical third to open as single foramen.

CONCLUSION

It is mandatory that the clinician should possess a thorough knowledge of not only the normal anatomy of the root canal system, but also aberrations. Necessity is the mother of all inventions and CBCT has truly served the purpose of not only aiding in diagnosis but also improving management which ultimately improves treatment outcomes thereby making it a desirable addition to the endodontist's armamentarium. When the diagnosis from clinical and conventional radiographic assessment is inconclusive, CBCT, which overcomes many of the limitations in periapical radiographic techniques, should be considered as a potentially useful imaging device.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

REFERENCES

1. Vertucci JF. Root canal anatomy of the human permanent teeth. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1984; 58:589-99.
2. Jabali AH. Middle Mesial and Middle Distal Canals in Mandibular First Molar. *J Contemp Dent Pract* 2018;19(2):233-236.
3. Pomeranz HH, Eidelman DL, Goldberg MG. Treatment considerations of the middle mesial canal of mandibular first and second molars. *J Endod* 1981 Dec;7(12):565-568.
4. Fabra-Campos H. Three canals in the mesial root of mandibular first permanent molars: a clinical study. *Int Endod J* 1989;Jan;22(1):39-43.
5. Goel NK, Gill KS, Taneja JR. Study of root canals configuration in mandibular first permanent molar. *J Indian Soc Pedod Prev Dent* 1991 Mar;8(1):12-14.
6. Azim AA, Deutsch AS, Solomon CS. Prevalence of middle mesial canals in mandibular molars after guided troughing under high magnification: an *in vivo* investigation. *J Endod* 2015 Feb;41(2):164-168.
7. Matherne RP, Angelopoulos C, Kulild JC, Tira D. Use of conebeam computed tomography to identify root canal systems *in vitro*. *J Endod* 2008 Jan;34(1):87-89.
8. Stroner WF, Remeikis NA, Carr GB. Mandibular first molar with three distal canals. *Oral Surg Oral Med Oral Pathol* 1984 May;57(5):554-557.
9. Al-Qudah AA, Awawdeh LA. Root and canal morphology of mandibular first and second molar teeth in a Jordanian population. *Int Endod J* 2009 Sep;42(9):775-784.
10. Ahmed HA, Abu-bakr NH, Yahia NA, Ibrahim YE. Root and canal morphology of permanent mandibular molars in a Sudanese population. *Int Endod J* 2007 Oct;40(10):766-771.
11. Sert S, Bayirli GS. Evaluation of the root canal configurations of the mandibular and maxillary

permanent teeth by gender in the Turkish population. *J Endod* 2004 Jul;30(6):391-398.

12. Sperber GH, Moreau JL. Study of the number of roots and canals in Senegalese first permanent mandibular molars. *Int Endod J* 1998 Mar;31(2):117-122.

13. Izaz S, Nagesh B, Sunil CHB, Dasari B. Endodontic management of a hidden middle distal canal in mandibular first molar with post-operative CBCT—a case report. *Indian J Conserv Endod* 2016 Jul-Sep;1(2):65-68.

14. De Moor RJ, Deroose CA, Calberson FL. The radix entomolaris in mandibular first molars: an endodontic challenge. *Int Endod J* 2004 Nov;37(11):789-799.

15. Vertucci FJ. Root canal morphology and its relationship to endodontic procedures. *Endod Top* 2005;10:3-29.

16. Filpo-Perez C, Bramante CM, Villas-Boas MH, Duarte MA, Versiani MA, Ordinola-Zapata R. Micro-computed tomographic analysis of the root canal morphology of the distal root of mandibular first molar. *J Endod*. 2015;41:231-6.

17. Alenezi MA, Aldajani M, Al-Qathami HO, Al-Shommrani S. Endodontic management of a permanent mandibular first molar with unusual root canal configurations: Two case reports. *Saudi Endod J*. 2017;7:181-5.

18. Gulabivala K, Aung TH, Alavi A, Ng YL. Root and canal morphology of Burmese mandibular molars. *Int Endod J*. 2001;34:359-70.

19. Sharma P, Shekhar R, Sharma A. Endodontic Management of Mandibular First Molar with Six Canals Using CBCT- Report of a Case. *J Clin Diagn Res*. 2016;10(8).