Management of C-shaped root canal configuration in mandibular second molar

Abishek Lakinepally,¹ Sonali Sharma,² Dileep Kishore Samarth,³ Nishant Sinha⁴

¹Conservative Dentistry and Endodontics, Army Dental Corps, Hyderabad, Telangana, India

²Department of Conservative Dentistry and Endodontics, Army Dental Corps, New Delhi, Delhi, India

³Conservative Dentistry & Endodontics, S.V.S Institute of dental sciences, Mahabubnagar, Andhra Pradesh, India

⁴Army Dental Corps, New Delhi, Delhi, India

Correspondence to

Dr Abishek Lakinepally,
drabi2k9746@gmail.com

Accepted 6 September 2018

DESCRIPTION

The C-shaped root canal configuration is an anatomical variation of root fusion and a type of taurodontism commonly seen in the mandibular second molar with prevalence ranging from 2.7% to 45.5% in different populations.¹ In this configuration, the root canals are connected by slit or web with varying anatomy along the root length which makes thorough debridement obstacle for the clinician.² Cone-beam CT (CBCT) is a three-dimensional imaging technique that facilitates and improves understanding the complex morphology. This article presents a case of C-shaped root canal configuration of mandibular second molar managed by using CBCT and modification in obturation techniques.

A 40-year-old female patient reported with pain in the lower left back teeth region. Medical history of the patient was unremarkable. Intraoral examination revealed deep class I carious lesion on tooth 37 with tenderness on percussion. Thermal test was performed to check the vitality of the tooth which revealed dull pain, which was increased by heat and relieved by cold. Radiographically, deep dental caries was seen involving pulp without any periapical changes, there was radicular proximity of mesial and distal roots, a large distal canal and blurred image of a third canal in between. All the features were predictive of existence of C-shaped root canal (figure 1).³ The tooth was diagnosed with symptomatic irreversible pulpitis. Root canal treatment was planned and explained to the patient. Tooth was anaesthetised and isolated under rubber dam. Access cavity was prepared and visualised under surgical operating microscope (Carl Zeiss Surgical, Oberkochen, Germany). The floor of the pulp chamber showed three distinct orifices. The mesiobuccal and distal orifices were

Figure 2 Access cavity preparation showing three distinct orifices. D, distal; MB, mesiobuccal; ML, mesiolingual.

seen close together with a fin connecting two orifices, and the mesiolingual orifice was seen distance from the mesiobuccal and distal orifices which was similar to Min's type III C-shaped root canal configuration (figure 2).⁴ The pulp chamber was irrigated with 5% sodium hypochlorite (Cmident India, Delhi). Working length was determined using apex locator (Root ZX II, J Morita, Tustin, California, USA) and confirmed with radiographs. In the radiograph, the K-file placed in the mesiobuccal canal was seen ending in distal foramen of the tooth (figure 3). Radiographically, the instrument is seen as if exiting the furcation and converging at the apex which is the most common feature of Fans C 2 Semicolon type C-shaped root canal configuration.⁵ CBCT (Carestream, Rochester, New York, USA) was taken to check the continuity of C-shaped root canal and rule out furcation involvement. Coronal third section revealed mesiobuccal and distal orifices

Figure 1 Preoperative radiograph showing conical fused roots.

Figure 3 Working length determination showing mesiobuccal root canal ending in distal foramen.

© BMJ Publishing Group Limited 2018. No commercial re-use. See rights and permissions. Published by BMJ.

To cite: Lakinepally A, Sharma S, Samarth DK, et al. *BMJ Case Rep* Published Online First: [please include Day Month Year]. doi:10.1136/bcr-2018-226367

Figure 4 Cone-beam CT axial images: (A) Coronal third section showing mesiobuccal (MB) and distal (D) orifices close together connected by a fin and mesiolingual (ML) orifice seen existing as a separate canal. (B) Middle third section showing radicular lingual groove suggestive of incomplete fusion between two roots. (C) Apical third section showing MB and D root canals joining to form one single C-shaped root canal from middle third to apical third of the root.

Figure 5 One-month postoperative radiograph.

close together connected by a fin and mesiolingual orifice seen existing separately at a distance. Middle third section revealed radicular lingual groove suggestive of incomplete fusion between two roots resulting in C-shaped root canal and three separate orifices.⁵ Apical third section revealed mesiobuccal and distal root canals joining to form one single C-shaped root canal from middle third to apical third of the root (figure 4). Cleaning and shaping were completed using K files (Mani, Japan) with circumferential anticurvature filing and self-adjusting rotary files (SAF, Redent Nova, Israel). Ultrasonic

activation of irrigant enhanced necrotic tissue removal. In the next appointment, master cone radiograph was taken which confirmed the apical extension of gutta percha. Thermoplasticised gutta percha technique and warm vertical condensation are the recommended techniques for C-shaped root canals. The case treated presents Fan's radiographic type III,⁵ since case reports with such type of root canal configuration used lateral condensation technique, we used the same technique and found good results with gutta percha and AH Plus (Dentsply Maillefer Company, USA) as endodontic sealer into the complex anatomy of the root canal (figure 5).^{6,7}

Learning points

- ▶ Usage of diagnostic aids like cone-beam CT and operating microscopes help in understanding the anatomical variations.
- ▶ Continuous circumferential anticurvature filing along the periphery of the C-shaped root canal assisted with ultrasonic activation of sodium hypochlorite enhances tissue removal.
- ▶ Modifications in obturation techniques like lateral and warm vertical condensation help in increasing the adaptation and density of filling.

Contributors AL has done the case. DKS and SS have prepared the manuscript. NS has taken the photographs.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 Neelakantan P, Subbarao C, Subbarao CV, *et al.* Root and canal morphology of mandibular second molars in an Indian population. *J Endod* 2010;36:1319–22.
- 2 Fan W, Fan B, Gutmann JL, *et al.* Identification of C-shaped canal in mandibular second molars. Part I: radiographic and anatomical features revealed by intraradicular contrast medium. *J Endod* 2007;33:806–10.
- 3 Al-Fouzan KS. C-shaped root canals in mandibular second molars in a Saudi Arabian population. *Int Endod J* 2002;35:499–504.
- 4 Min Y, Fan B, Cheung GS, *et al.* C-shaped canal system in mandibular second molars Part III: The morphology of the pulp chamber floor. *J Endod* 2006;32:1155–9.
- 5 Chai WL, Thong YL. Cross-sectional morphology and minimum canal wall widths in C-shaped roots of mandibular molars. *J Endod* 2004;30:509–12.
- 6 Elumalai D, Kumar A, Tewari R, *et al.* Management of C-shaped root canal configuration with three different obturation systems. *European J Gen Dent* 2015;4:25–8.
- 7 Kadam N, Ataide IdeNoronhade. Management of C-shaped canals: Two case reports. *J Orofac Sci* 2013;5:37–41.

Copyright 2018 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <http://group.bmj.com/group/rights-licensing/permissions>. BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Become a Fellow of BMJ Case Reports today and you can:

- ▶ Submit as many cases as you like
- ▶ Enjoy fast sympathetic peer review and rapid publication of accepted articles
- ▶ Access all the published articles
- ▶ Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact consortiasales@bmjgroup.com

Visit casereports.bmj.com for more articles like this and to become a Fellow