

MANAGEMENT OF MANDIBULAR SECOND MOLAR WITH C-SHAPED CANAL- A CASE REPORT

ABSTRACT

The variability of root canal system morphology presents a continuous challenge to endodontic diagnosis and therapeutics. C-shaped canal configuration is a variation that has a racial preference and is commonly seen in mandibular second molars. In this configuration, the canals are connected by slit or web. The presence of fin, slit and web makes through debridement difficult for the clinician. This case report deals with the management of case of C-shaped canal in mandibular second molar. Clinical examination revealed a Mandibular second Molar restored with temporary restorative material, tender on percussion and tooth showed no response to electric and thermal tests. Therefore, endodontic treatment was done and the patient reported complete relief of pain and found to be asymptomatic on review.

Key words: C-shaped canal, Mandibular second Molar, Root canal Anatomy.

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INTRODUCTION

The C-shaped canal, which was first documented in endodontic literature by Cooke and Cox in 1979, is so named for the cross-sectional morphology of the root and root canal¹. C-shaped canal configuration results from the failure of the Hertwig's epithelial sheath to fuse or its inadequate development during the root embryologic stage. The prevalence of C-shaped canal is between 2.7 and 9.0% in non-Asian population and is as high as 41.27% among the Asian population such as Chinese, Korean, and HongKong Chinese.²

CLASSIFICATION

Melton et al in 1991 proposed the following classification of C-shaped canals based on their cross-sectional shape³. (Figure 1)

Category I: Continuous C-shaped canal running from the pulp chamber to the apex defines a C-shaped outline without any separation.

Category II: The semicolon-shaped orifice in which dentine separates a main C-shaped canal from one mesial distinct canal.

Category III: Refers to those with two or more discrete and separate canals:

- Subdivision I: C-shaped orifice in the coronal third that divides into two or more discrete and separate canals that join apically.
- Subdivision II: C-shaped orifice in the coronal third that divides into two or more discrete and separate canals in the midroot to the apex.
- Subdivision III: C-shaped orifice that divides into two or more discrete and separate canals in the coronal third to the apex.

Fan et al⁴ classified C-shaped roots according to their radio-graphic appearance into three types. (Figure 2)

Type I, II, III - Conical or square root with a vague, radiolucent longitudinal line separating the root into distal and mesial parts.

1. Type I: There was a mesial and a distal canal that merged into one before exiting at the apical foramen.

2. Type II: There was a mesial and a distal canal, and the two canals appeared to continue on their own pathway to the apex.

3. Type III: There was a mesial and a distal canal, one canal curved to and superimposed on this radiolucent line.

The complexity of C-shaped canals makes them difficult to clean, shape, and obturates efficiently⁵. Failures can also be caused by procedural errors such as root perforation, separated instruments, or missed canals. The thin dentinal wall of the buccal or lingual groove may lead to strip perforation, which poses a considerable risk to tooth prognosis.

The purpose of this paper is to report the management of a mandibular second molar with C-shaped canal.

CASE REPORT

A 16 year old female patient reported to our Department of Conservative Dentistry and Endodontics, Malabar Dental College & Research Centre with a chief complaint of pain of her lower left back tooth. The medical history was noncontributory. Intra oral examination revealed temporary restoration on tooth 37. Tooth was tender on percussion and pulp sensitivity tests cold and EPT revealed no response. Radiographically the tooth was classified as Type II (Fan et al)⁴. External apical root resorption was also noted in the radiograph. The tooth was diagnosed as symptomatic apical periodontitis. Root canal treatment (RCT) was planned and explained to the patient.

The access cavity was prepared under local anesthesia (LA) and a single semicircle shape orifice was found and classified as category 1 (Melton et al). Working Length (WL) was established with radiograph and apex locator (J MORITA ROOT ZX II, Tokyo, Japan). Cleaning and shaping of the canal was done with hand K files and ProTaper rotary files (Dentsply Maillefer Ballaigues, Switzerland) up to F3. The anti curvature filing method was performed to avoid the strip perforation.

Irrigation was performed using 2ml of 5.25 % sodium hypochlorite after and 2ml of 17% Ethylenediamine tetraacetic acid after each

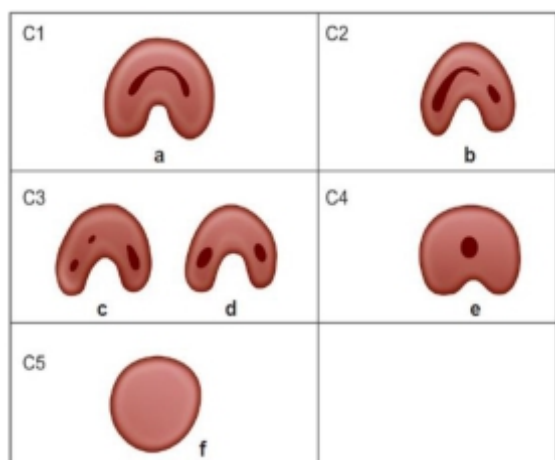


Figure 1-Melton DC (Department of Endodontics, University of Iowa College of Dentistry, Iowa City), Krell KV, Fuller MW. Anatomical and histological features of C-shaped canals in mandibular second molars. *J Endod.* 1991 Aug;17(8):384-388.

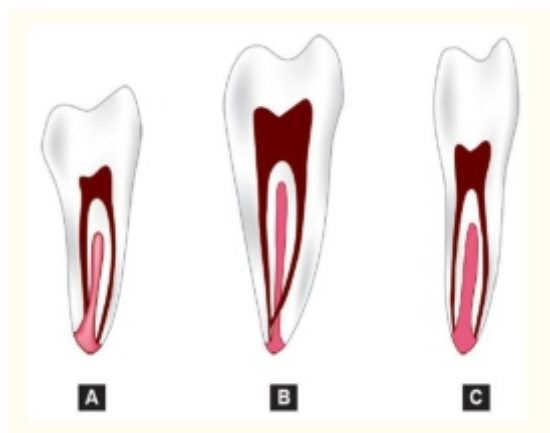


Figure 2- Fan B, Cheung GS, Fan M, Gutmann JL, Fan W. C-shaped canal system in mandibular second molars: Part II-Radiographic features. *J Endod.* 2004 Dec;30(12):904-908



Preoperative radiograph



'C' shaped orifice



Working length determined



Master cone selected



Obturation Done



Post endodontic restoration

instrument. As a final irrigation, 10 mL 17% , 10 Ethylenediamine tetraacetic acid mL 1% sodium hypochlorite, and 2ml saline solution were used using a 5ml syringe with a 30-gauge needle placed 1mm away from the working length⁶. Resorption was managed by giving Calcium hydroxide (Merck India Ltd) intracanal medicament for 2 weeks. Tooth was sealed with temporary restoration. (Zitemp India)

The patient was recalled after 2 weeks and was asymptomatic. Calcium hydroxide was retrieved with 1ml of 17% Ethylenediamine tetraacetic acid combined with ultrasonic agitation (Sonofile endodontic tips Endostar Poland) for 1min and a final rinse with 1ml of distilled water⁷. Radiograph was taken to confirm fit of the master cone. The obturation was performed using cold lateral condensation technique⁸ using AH plus sealer (Dentsply, Konstanz, Germany). Post endodontic restoration was done using Filtek™ Z350 XT (3M ESPE, USA) (shade A2) Universal Restorative Composite.

DISCUSSION

One of the most complicated situations with which the dentist is challenged during root canal treatment is with the management of a C shaped canal². The teeth that entitled as having a Cshaped canal system should essentially exhibit all the following three features: Fused roots, a longitudinal groove on the lingual or buccal surfaces of the root, and at least one crosssection of the canal belongs to the C1, C2, or C3 configuration²

Pulp sensitivity tests assess the integrity of the AΔ nerve fibers in the dentine pulp complex. A Negative response indicates that the AΔ fibers cease to function.⁸ The use of angulated radiographs, from a 20-degree mesial or distal projection increases the probability of revealing unusual root canal morphology⁹.

Access cavity should be redefined for adequate debridement. Orifice portion of the slit can be widened using Gates Glidden drills or size 25 instrument or smaller. During cleaning and shaping Abou-Rass et al.'s anti-curvature filing technique has been recommended to avoid root perforation indanger zones⁵.

A three-dimensional filling of a C-shaped canal may prove to be a problem due to the various intricacies present within the root canal system. Various Novel obturation techniques such as Ultrasonic compaction (UC), single cone with injectable Thermoplasticized gutta-percha (IT) core-carrier², Walid's technique, ZAP and TAP technique, Maggiore's modified MicroSeal technique have given successful results¹⁰. However literature showed lateral condensation technique is also an excellent method for obturating aberrant canals⁸.

CONCLUSION

"C" configuration, which is an important anatomic variation, presents a thin fin connecting the root canals. Recognition of unusual variations in the canal configuration is critical. The early recognition of these configurations facilitates cleaning, shaping, and obturation of the root canal system.

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