



C SHAPED CANAL- A REVIEW

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Abstract:

Knowledge of the root canal anatomy is essential for a successful root canal treatment. A proper identification of the C shaped canal is essential to avoid certain endodontic failures, therefore various anatomic features. radiographic interpretation, instrumentation can help to diagnose a C shaped canal and avoid errors. The aim of this review is based on the etiology, anatomic features, classification, diagnosis and management of the C-shaped canal configuration.

Keywords: C shaped canal, thermoplasticized gutta percha.

INTRODUCTION

For a successful endodontic treatment, a thorough knowledge of the root canal anatomy is mandatory. A thorough biomechanical cleaning and shaping of the root canal system, followed by hermetic seal of entire root canal space should be achieved for successful treatment. One such variation of the root canal system is the C-shaped canal configuration. It was first documented by Cooke and Cox in 1979. The prevalence of C-shaped root canal reported to range from 2.7% to 44.5% in mandibular second molars. Failure of Hertwig's epithelial root sheath to fuse on to the buccal or lingual root surface may be the main cause of this configuration. Two main basic form of C-shaped canal are single ribbon shaped canal from orifice to apex and multiple canals may present below the C-shaped orifice. Recognition of a C-shaped canal configuration before treatment can facilitate effective management, which will prevent irreparable damage that may put the tooth in severe jeopardy.^{1,2,3}

ETIOLOGY

The failure of fusion of Hertwig's epithelial sheath is the most common for the formation of the C-shaped canal configuration. Failure of the Hertwig's epithelial sheath to fuse on the buccal side results in the formation of a lingual groove, and failure to fuse on the lingual would result in a buccal groove. Hence,

this fusion is not uniform and a thin interradiolar ribbon connects the two roots together. Failure of the sheath to fuse on both the buccal and lingual sides will result in the formation of a conical or prism-shaped root. Fusion is most likely to occur if the distance between the root canals is small. Earlier, the irregular fusion of the Hertwig's epithelial sheath was attributed to trauma, such as radiation or chemical interference, but following the documentation of racial predilection, it is more likely to be of genetic origin. The root canals in such teeth merge in a very wide, slot like, single, continuous root canal morphology, which can assume the shape of a letter C.³

ANATOMIC FEATURES

1. ROOTS:

-conical or square configuration. Peiris et al., referred to the C-shaped roots of mandibular second molars as being 'gutter-shaped'.

2. Pulp chamber:

The pulp chambers of teeth with C-shaped canals mostly have greater apico-occlusal width with a low bifurcation. The connecting slit that gives the tooth its name of "C-shaped" may have closure to the buccal or lingual. If the buccal portion of the mesial and distal roots is fused, the slit goes through the area of fusion, and so the "C" is closed to the lingual.

If the lingual portion of the roots is fused, then the "C" is closed to the buccal

3. Root canal system

The root canal system of C-shaped canals shows broad, fan-shaped communications from the coronal to the apical third of the canal

CLASSIFICATION⁴

Melton et al in 1991 proposed the following classification of C-shaped canals based on their cross-sectional shape

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 al⁸ in 2004 modified Melton's method of classification into the following categories :

- Category I (C1): The shape was an interrupted 'C' with no separation or division.
- Category II (C2): The canal shape resembled a semicolon resulting from a discontinuation of the 'C' outline, but either angle or should be no less than 60°.

Category III (C3): Two or three separate canals and both angles, and were less than 60°.

- Category IV (C4): Only one round or oval canal in that crosssection.
- Category V (C5): No canal lumen could be observed (which is usually seen near the apex only).

Fan's Classification (Radiographic Classification)

1.Type I: Conical or square root with a vague, radiolucent longitudinal line separating the root into

distal and mesial parts. There was a mesial and a distal canal that merged into one before exiting at the apical foramen (foramina).

2. Type II: Conical or square root with a vague, radiolucent longitudinal line separating the root into distal and mesial parts. 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: Conical or square root with a vague, radiolucent longitudinal line separating the root into distal and mesial parts. There was a mesial and a distal canal, one canal curved to and superimposed on this radiolucent line when running toward the apex, and the other canal appeared to continue on its own pathway to the apex.

DIAGNOSIS AND MANAGEMENT^{2,3}

Radiographic Diagnosis

The preoperative awareness of a C-shaped canal configuration before treatment can facilitate effective management. Radiographic interpretation is overall more effective when based on film combinations ('preoperative and working length radiographs' or 'preoperative and final radiographs' or 'all three radiographs') than on single radiographs. Among the latter, working length radiographs are more helpful than the preoperative and final ones, whereas preoperative radiographs are the least effective in diagnosing the C-shaped cases

CLINICAL DIAGNOSIS

The pulp chamber in teeth with C-shaped canals may be large in the occlusoapical dimension with a low bifurcation. Alternatively, the canal can be calcified, disguising its C-shape. In a true C-shaped canal, it is possible to pass an instrument from mesial to distal aspect without obstruction

MANAGEMENT

Canal System Identification and Preparation

Modifications in the access cavity designs may be required for teeth with C-shape configuration to facilitate location and negotiation of the complete canal system. Hedstrom files are especially effective for efficient tissue removal. If hemorrhaging persists, then ultrasonic removal of tissue or placement of calcium hydroxide may be used between appointments to enhance tissue removal and control hemorrhage.

CANAL SYSTEM OBTURATION

Obturation of C-shaped canals may require technique modifications. The mesiolingual and distal canal spaces can be prepared and obturated as standard canals. However, sealing the buccal isthmus is difficult if lateral condensation is the only method used. Because this isthmus may not be prepared with a sufficient flare to permit deep placement of the spreader, application of thermoplasticized gutta-percha is more appropriate

RESTORATION AND PROGNOSIS

Technique modification may be required for restoration of C-shaped roots. During follow-up radiographic examination, the dentist should look for furcal breakdown because that region is the most difficult to obturate and is associated with the greatest risk of perforation. Restorations with failure in the furca have a poor prognosis. If the failure results from an apical etiology and apical surgery is not possible, viable options include extraction, extraoral retrofilling and replantation. When sound principles of cleaning and shaping, obturation and restoration are followed, the longterm prognosis for the C-shaped root retention equals that of other molars, but cautious optimism would seem most appropriate when prognosticating the success of the root canal treatment of a C-shaped canal.^{2,3}

CONCLUSION

The early recognition of these configurations facilitates cleaning, shaping and obturation of the root-canal system. It should be noted that using a radiograph showing files set to the canal terminus to diagnose and to determine canal morphology may not give the results expected. In some instances, it may be difficult to distinguish between C-shaped canal or one with single or three canals joining

apically. Thus, it is necessary to confirm the diagnosis by exploring the access cavity. Further long-term clinical studies are needed to substantiate the diagnosis of this variant using various diagnostic methods for a better understanding of this variant to facilitate cleaning, shaping and obturation of the root canal system

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