



Endodontic Management of C- Shaped Canal in Mandibular Second Molar: A Case Report

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Abstract

Aberrant anatomy of root canal system always posed a problem for clinician and affects the endodontic treatment outcome. Proper knowledge of the root canal anatomy and its variations plays an important factor in success rates for root canal treatment. C shaped configuration of root canal is one of the aberrant morphology of mandibular second molars with high incidence in Asian population. This article reports a case of successful endodontic management of C shaped canal in mandibular second molar.

Keywords: Anatomical variation, Endodontic treatment, Mandibular molar

Introduction

The main objective of endodontic therapy is thorough cleaning and shaping followed by three dimensional obturation of root canal space together with fluid tight seal of the apical foramen. ^[1] The success of root canal therapy is dependent on understanding the root and root canal morphology. ^[2] Often anatomical variations in root canal system pose difficulties in treatment among most clinicians. 'C' shaped canal is type of an anatomical variation which was first documented by Cooke and Cox in 1979 in mandibular second molar. Prevalence of C shaped root canal reported to ranges from 2.7% to 44.5% in mandibular second molars. ^[3] Failure of Hertwig's epithelial sheath to fuse on to the buccal or lingual root surface is the main cause of this configuration. ^[4] Instead of several separate orifices this configuration consists of a ribbon shaped orifices with 180 degree arc view from occlusally starting from the mesiolingual orifice to the distal aspect of pulp chamber. ^[5]

Case Report:

A 37 year old female patient reported to the department of Conservative Dentistry and Endodontics with chief complaint of pain in lower right back tooth. On intraoral examination dental caries was detected approximating pulp space on tooth 47 with tenderness on percussion. Medical history was not significant. Radiographically, the tooth was conical in shape with fused mesial and distal roots with a thin radiolucent line between them, which gave the feature of C-shaped canal (figure 1). Heat and cold tests were positive. Tooth was diagnosed with symptomatic irreversible pulpitis. Root canal treatment was planned and explained to patient. Tooth was anesthetised with local anaesthesia (2% lidocaine with 1:80,000 epinephrine) and access preparation was done with endo-access bur (Dentsply,USA) after rubber dam isolation. Three canal orifices were detected in a semi-circular shape. Canals were negotiated with 10 K file and working length was confirmed radiographically

(figure 2). Proper glidepath was made upto 20 K-file with help of EDTA. Cleaning and shaping of mesial canals were performed till size F1 ProTaper file and distal canal to size F3 ProTaper file (Dentsply Maillefer, Ballaigues, Switzerland) with intermittent irrigation with 2.5% sodium hypochlorite (Prime Dental, Mumbai, India) and 17% EDTA (Prime Dental, Mumbai, India). Canals were dried with paper points and disinfected with calcium hydroxide. Patient recalled after 2 weeks and found to be asymptomatic. Intracanal medicament was flushed out from the canal and master cone was checked for snug fit (figure 3). Obturation was carried out with respective master cones (F1 and F3) and AH Plus sealer (Dentsply De Trey, Konstanz, Germany) with lateral compaction technique and temporary restoration was done (figure 4). Patient was recalled one week after for permanent restoration.

Discussion:

C-shaped canal is an acknowledged characteristic of mandibular molars with highest prevalence in second molars. Various classifications have been proposed for the diagnosis and treatment planning for the C shaped canal. According to Fan et al ^[6], C shaped configuration classified radiographically under 3 types:

Type I: Conical or square root with vague, radiolucent longitudinal line separating the root into mesial and distal parts. There was mesial and distal canal that merged into one before exiting at the apical foramen.

Type II: Conical or square root with vague, radiolucent longitudinal line separating the root into mesial and distal parts. There was mesial and distal canal, and the two canals appeared to continue on their own pathway to the apex.

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

Melton et al ^[7] classified on cross-sectional shape under 3 categories:

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

Category II: Semicolon shape orifice in which dentin separates main C-shaped canal from one mesial distinct canal.

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

Fan et al ^[8] modified Melton's classification into following categories:

Category I: Shape was uninterrupted 'C' with no separation

Category II: Canal resembled a semicolon resulting from the discontinuation of the 'C' outline, but either angle or should be no less than 60 degree

Category III: Two or three separate canals and both angles were less than 60 degrees

Category IV: Only one round or oval canal in cross-section

Category V: No canal lumen observed.

Clinical Implications:

Diagnosis of C-shaped canals can be done with proper radiographs at 20 degrees mesial and distal angulations and clinical examination. However, conventional radiographs posed limitations in proper detection of the C- shape configuration in many cases. Recent advances like cone beam computed tomography provides three dimensional images with high contrast resolution and reduced exposure. ^[9] Treatment of C-shaped canals includes complete debridement and thorough cleansing of complex root canal system. ^[10] Circumferential filing should be carried out to ensure maximum tissue removal with anti-curvature filing to prevent strip perforation. Any pulp chamber calcifications may be removed with ultrasonic tips with copious irrigation of 5.25% sodium hypochlorite to get a proper canal anatomy. Obturation of C-shaped canals is quite challenging due to its complex configuration. Sealing of the buccal isthmus to be done with lateral compaction method and the canals should be obturated with respective gutta-percha as prepared. Thermoplasticized gutta-percha is the most appropriate option for the obturation of C shaped canal configuration. ^[11,12]

Conclusion:

Proper knowledge about the aberrant canal anatomy determines the success of an endodontic treatment. Proper radiographs is highly required for understanding the root canal morphology along with utmost care during biomechanical preparation of C-shaped canal enhances the success rate of the treatment.

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Figure Legends:



Figure 1: Preoperative radiograph

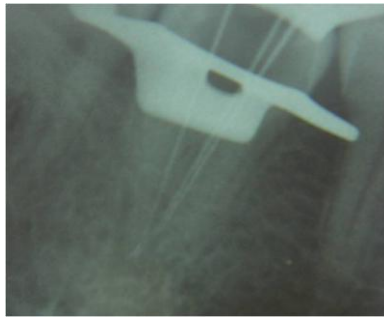


Figure 2: Working length determination radiograph

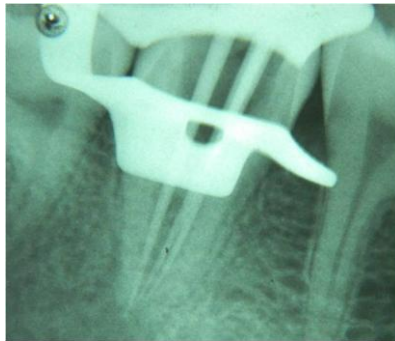


Figure 3: Master cone gutta-percha fit radiograph



Figure 4: Obturation radiograph with temporary restoration