



Case Report

MANAGEMENT OF C-SHAPED CANAL: CASE REPORT

Sandeep Kaur

Lecturer, Surendera Dental College and Research Institute, Sriganganagar, Rajasthan.

ABSTRACT

A thorough knowledge of the root canal anatomy and its variations is required for achieving success in root canal therapy, along with diagnosis, treatment planning and clinical expertise. One such variation of the root canal system is the C-shaped canal configuration. It is termed so because of the C-shaped cross-sectional anatomical configuration of the root and root canal. This case report describes successful management of C-shaped canal.

Keywords: C-shaped, canal configuration, root canal therapy.

Corresponding Author: Dr. Sandeep Kaur, Lecturer, Surendera Dental College and Research Institute, Sriganganagar, Rajasthan.

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INTRODUCTION

C-shaped canal anatomy was first documented by Cooke and Cox in mandibular second molar.¹ Canal configuration has a high prevalence in mandibular second molars (2.7% - 45.5%).² This C-shaped canal is an anatomical variation of a root fusion and a type of taurodontism. This results from the failure of Hertwig's epithelial sheath to develop or fuse in the furcation area in the developing stage of the teeth.³ Failure on the buccal side results in a lingual groove, and the opposite

cases is possible. Failure on both sides results in the formation of a conical or prism-shaped root.⁴ It is very difficult to diagnose C-shaped root canals based on two-dimensional radiographs. In some cases, particular radiographic findings can arouse a clinician's suspicion of C-shaped canal systems in mandibular molars if fused roots, poorly distinguished floor of the pulp chamber, working length radiograph with inserted instruments give the impression of a perforation in the furcation area⁵, instruments tend to converge at the root apex⁶. The C-shaped canal system thus

represents a challenge to its proper debridement and obturation. This case report describes successful management of of C-shaped canal.

CASE REPORT

A 43-year-old male patient reported to the Department of Endodontics with the chief complaint of spontaneous pain in the lower right posterior region. History revealed intermittent pain with the right mandibular first molar for the past 2 months, which had increased in intensity for the past 3 days. Subjective symptoms included sensitivity to thermal stimuli and an increase in intensity of pain. The patient's medical history was noncontributory. Previous dental history included extraction of the mandibular left second molar 3-4 years ago due to caries. Clinical examination of the right mandibular first molar revealed the presence of a large distoocclusal carious lesion which was sensitive to percussion. Periodontal probing around the tooth showed normal alveolar bone morphology, normal sulcular depth, absence of pockets, and mobility within physiological limits. Sensibility testing with dry ice caused an intense lingering pain; whereas, electric pulp testing showed exaggerated response. Preoperative radiographs revealed a distoocclusal radiolucency approaching the pulp space with a widened periodontal ligament space adjacent to the root apex. Multiple angulated radiographs confirmed the presence of fused roots. From the sensibility tests and clinical and radiographic examination, a diagnosis of symptomatic irreversible pulpitis with symptomatic apical periodontitis was made and routine nonsurgical endodontic treatment was planned. Treatment plan was explained to the patient and consent was obtained. Local anesthesia was induced using 1.8 ml 2% lidocaine with 1: 200,000 epinephrine. Following caries excavation, the distal surface of the tooth was restored

with Intermediate Restorative Material. Rubber dam was placed and a conventional endodontic access opening was established with an Endo Access Bur. On access opening, a single large C-shaped canal was located in the center of the pulp chamber. After clinical examination it was found that the tooth had two root canals which were fused buccally and had single C-shaped canal which extended all the way till the apex. Working length was determined using an apex locator and confirmed with radiographs. Cleaning and shaping was done using circumferential filing technique with ISO 2% taper files up to size 25 and further cleaning and shaping done with SAF of 2mm diameter and 21mm length with pecking motion having 0.4mm amplitude and 5,000 oscillations per minute. Irrigation was performed using normal saline, 5.25% sodium hypochlorite solution, and 17% ethylene diamine tetra acetic acid as final flush. Final rinsing of the canal was performed using normal saline. The canal was dried with absorbent points and obturation was performed using sectional method for the apical third, followed by backfill with thermoplasticized gutta-percha using Obtura II and AH Plus resin sealer. After completion of root canal treatment, the access cavity was restored using resin composite, followed by full coverage crown.

DISCUSSION:

Various classifications of C-shaped canals have been proposed to make the diagnosis and treatment planning easier. Melton et al proposed a classification based on the cross-sectional shape of the canal viz; continuous C shaped (C1), semicolon (C2) and separate canals (C3). Fan et al modified Melton's classification and considered that this type of canal system had to exhibit all of the following three features: (i) Fused roots, (ii) a longitudinal groove on the lingual or buccal surface of the root, and (iii) at least

one cross-section of the canal belonging to the C1, C2, or C3 configuration. Fan et al also classified C-shaped roots according to their radiographic appearance.⁷

Fava *et al.*⁸ had identified the existence of such anatomical variations in second molars in all the maxillary and mandibular second molars. Majority of the permanent mandibular first molars typically present with two well-defined roots, a mesial root with two canals and a distal root with a wide oval canal or two round canals.⁹

It is challenging to obtain a three dimensional obturation of the C-shaped canals due to its complex configuration. Thermoplasticized gutta-percha technique was used for all the cases which is the recommended technique for C- shaped canals.¹⁰

CONCLUSION:

The C-shaped root canal configuration is an anomaly and a high prevalence rate in mandibular molars. For successful endodontic management proper diagnosis, sound knowledge about aberrant root canal anatomy, a thorough chemo-mechanical preparation with a 3-dimensional obturation of C-shaped canals is essential to ensure a good long term prognosis.

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