

Management of C Shaped Canals: 3 Case Reports

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ABSTRACT

Introduction: Thorough knowledge of the root canal morphology is essential for successful endodontic therapy. C-shaped canal configuration is commonly seen in mandibular second molars. These canals are challenging to negotiate, debride and obturate because of the high incidence of anastomoses, lateral canals, and apical deltas. Inability to detect and debride C-shaped canal anatomy can lead to endodontic failure.

Case report: This case report highlights the management of three different cases of C- shaped canal configurations using thermoplasticised gutta-percha technique and management of associated pulpal floor perforation

Conclusion: Complex intricacies and diverse morphology of C shaped canals can be managed with advanced irrigation and obturation techniques.

Keywords: C- shaped canal, perforation, thermoplasticised gutta-percha

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

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. Failure of the Hertwig's epithelial sheath to fuse on the buccal side will result in the formation of a lingual groove, and failure to fuse on the lingual would result in a buccal groove. Failure of the sheath to fuse on both the buccal and lingual sides will result in the formation of a conical root.³

The C-shaped canal configuration has racial predilection. Higher incidence reported in countries belonging to the Asian continent like Chinese (31.5%) and Koreans (44.5%).^{4,5}

CASE 1

A 25 year old female patient reported to the department of Conservative Dentistry and Endodontics with a chief complaint of pain in lower left back tooth. Intraoral examination revealed dental caries on tooth 37 and tenderness to percussion. Radiographically, a large coronal radiolucency was seen in tooth 37 closely approximating the pulp space along with an associated periapical radiolucency (Figure 1a). Tooth was conical in shape with fused mesial and distal roots. After proper isolation and anesthesia, an access cavity was prepared and Fan et al C1 type canal anatomy was found. After working length determination, canal was prepared with ProTaper rotary files (Dentsply Maillefer, Switzerland) up to F3 followed by circumferential filing with hand K files (Dentsply Maillefer, Switzerland) (Figure 1b). 5% sodium hypochlorite (Acrylates, India) was used as an endodontic irrigant which was activated with Endo activator

(Dentsply Maillefer, Switzerland). Calcium hydroxide (RC Cal Prime Dental Products, Thane, India) was placed as an intracanal medicament. After 1 week, fit of the master cone was checked and obturation was completed with thermoplasticised gutta-percha (Calamus, Dentsply Maillefer, Switzerland) (Figure 1c). Post endodontic restoration with amalgam was done (Figure 1d).

CASE 2

A 45 year old male patient reported to the department of Conservative Dentistry with a chief complaint of pain in lower left back tooth. Patient gave the history of prior dental treatment of the same tooth at a private clinic. Clinically, temporary restoration was seen in tooth 37. On removing the restoration, perforation was seen in the floor of the pulp chamber. Radiographically, a large radiolucency in the crown and the floor of the pulp chamber was seen. Two fused roots indicating a C-shaped canal anatomy was observed (Figure 2a). On examining the floor of the pulp chamber using 2.5 X magnifying loupe (STAC, Mumbai), pulpal floor perforation was seen between the mesial and distal canal orifices (Fan et al C3 type canal) (Figure 2b). After local anesthesia administration and rubber dam placement, working length was determined (Figure 2c). Orifices were preflared with #2 Gates-Glidden drills, then the canals were blocked with appropriate sized gutta-percha points before perforation repair. Mineral trioxide aggregate (MTA – ANGELUS; Peterborough, UK) was mixed as per manufacturer's recommendations and carried to the perforation site with an amalgam carrier and gently condensed (Figure 2d). Moist cotton pellet was placed on MTA, gutta-percha points were removed from the canals, followed by temporary restoration. After two days, canals were prepared with ProTaper rotary files (Dentsply Maillefer, Switzerland) up to F2 followed by thermoplasticised gutta-percha obturation (Calamus, Dentsply Maillefer, Switzerland) (Figures 2e and 2f). Post endodontic restoration with fiber reinforced composite (GC everX posterior, GC Europe) was done (Figures 2g and 2h).

CASE 3

A 31 year old female reported to the department with a chief complaint of pain on eating food in lower left back tooth. Clinically, tooth 37 was carious and tender on percussion.

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Radiographically, occlusal radiolucency was evident involving the pulp. A single fused root with a wide canal sugges-

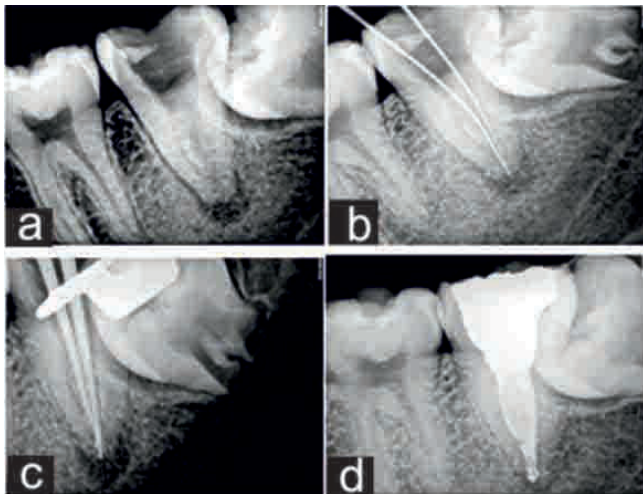


Figure-1: (a) Preoperative radiograph, (b) Working length radiograph, (c) Master cone radiograph, (d) Post obturation radiograph

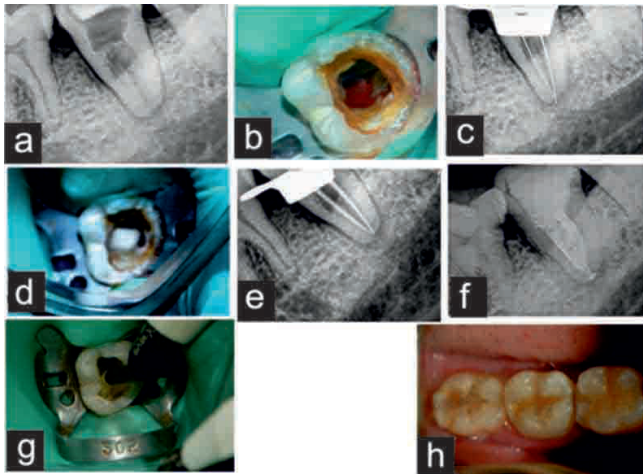


Figure-2: (a) Preoperative radiograph, (b) Preoperative photograph, (c) Working length radiograph, (d) Perforation repair with MTA, (e) Master cone radiograph, (f) Post obturation radiograph, (g) Fiber reinforced composite build up, (h) Post operative photograph

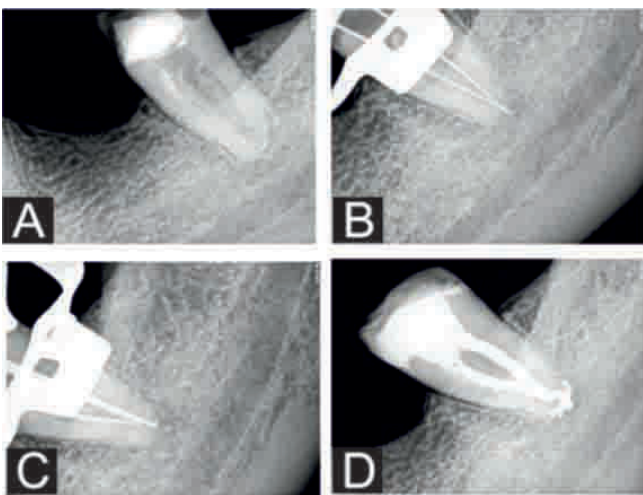


Figure-3: (a) Preoperative radiograph, (b) Working length radiograph, (c) Master cone radiograph, (d) Post obturation radiograph,

tive of a C-shaped canal anatomy was seen (Figure 3a). After rubber dam isolation and profound anesthesia, an access opening was prepared. Working length was determined after locating two separate canals (Fan et al C2 type anatomy) in the pulp chamber floor (Figure 3b). Canals were prepared with ProTaper rotary file system (Dentsply, Maillefer) upto F2 and radiograph was taken to confirm fit of the master cone (Figure 3c). Obturation was done with thermoplasticised gutta-percha (Calamus, Dentsply Maillefer, Switzerland). Canals were seen joining in the apical third in the post obturation radiograph. Post endodontic composite restoration was carried out (Figure 3d).

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.⁶

Treatment of the C-shaped canals should be accompanied by additional measures for complete debridement and thorough cleansing of the complex root canal anatomy. Access cavity design modification may be required to locate and negotiate the entire root canal system.⁷ Magnifying loupes, microscope and CBCT aids in better understanding the canal system in the pulpal floor.⁸ Self - adjusting file system is found to be efficacious in cleaning and shaping C-shaped canals.⁹ Circumferential filing should be done to ensure maximum tissue removal and care should be taken to avoid strip perforation. Calcifications in the pulp chamber should be negotiated with ultrasonic tips to reveal the canal anatomy completely. Copious irrigation with 5.25 % NaOCl should be done to debride the intricacies of the C-shaped canal. Irrigant should be activated using ultrasonics or sonics.¹⁰

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

This case report shows management of four different C-shaped canal anatomies successfully using thermoplasticised guttapercha technique. It also highlights basic treatment regimen for C-shaped canals.

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