

Endodontic Management of C Shaped Root Canal System Using Three Dimensional Obturation Techniques: Case Reports

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ABSTRACT

Background: Unusual root canal anatomy always poses a diagnostic and treatment challenge. Identification of such variation is important for the success of the root canal treatment outcome. The C- shaped root canal configuration is one of the aberrant morphologies of molar teeth, commonly the mandibular second molar. In this configuration, the canals are connected by slit or web. The presence of fin, slit and web makes through debridement obstacle for the clinician. This two case reports present successful management of C-shaped mandibular second molar by using different obturation techniques.

Keywords: C- shaped canals, Thermoplasticised, Thermafill, Mandibular second molar.

INTRODUCTION

The C-shaped configuration of root canal is one of the most important anatomical variations of the canal. It was first documented by Cooke and Cox in 1979. The failure of Hertwig's epithelial root sheath to fuse onto the buccal or lingual root surface may be the main cause of this configuration [1]. Canal configuration has been shown to have a high prevalence in mandibular second molars with a percentage ranging between 2.7%-45.5%. [2] & also occur in mandibular premolars, maxillary molars, and mandibular third molars. The intricacies present in C shaped canal morphology can pose a challenge to the clinician during negotiation, debridement and obturation so knowledge of the C-shaped canal configuration is essential to achieve success in endodontic therapy. In particular, long and narrow isthmuses, which are generally found in C1 and C2 configurations, complicate the preparation and filling of root canals. [3] So it is important to select the proper obturation system.

Many authors recommended thermoplasticised systems as it completely fills the canal irregularities. These two case reports present the management of C-shaped mandibular second molar.

CASE REPORT 1

A 39-year-old female patient reported to Department of Conservative Dentistry and Endodontics with a complaint of pain in her lower right back tooth. The medical history was noncontributory. Intra oral examination revealed dental caries on tooth 47 with necrotic pulp and slight pain on percussion. The tooth was not responsive to the electric pulp test (EPT). Radiographically the tooth was conical in shape with fused mesial and distal root with a thin radiolucent line between them, with a suspected C-shaped canal with periapical lesion. The tooth was diagnosed with necrotic pulp with apical periodontitis. Root canal treatment (RCT) was

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planned and explained to the patient. The access cavity was prepared under local anaesthesia (LA) and a single semicircle shape orifice was found. Cleaning and shaping of the canal was done with hand K files and ProTaper rotary files (Dentsply Maillefer, Ballaigues, Switzerland) up to F3. Copious amount of 5.25% sodium hypochlorite with active irrigation system was used for irrigation and calcium hydroxide dressing was given as an intracanal medicament. The patient was recalled after one week and was sign and symptom free. Obturation was performed using the Carrier based thermoplasticized technique (Thermafill, Dentsply Maillefer). (Figure-1)

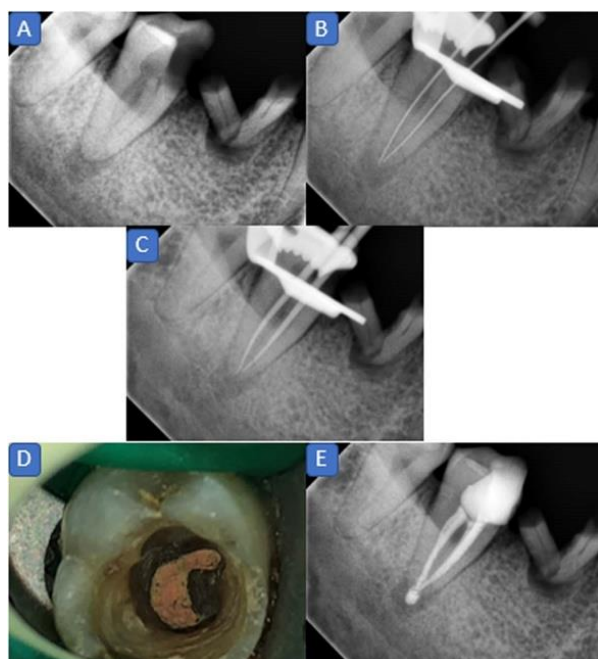


Fig 1: (A) Pre Operative (B) Working Length (C) Master Cone (D) clinical picture after Obturation C1 configuration of C- shaped canal by Fan et al. (E) Obturation.

CASE REPORT 2

A 22-year-old male patient reported to Department of Conservative Dentistry and Endodontics with a complaint of pain in his lower left back tooth region. After clinical and radiographic examination nonsurgical endodontic treatment was planned. The access cavity was prepared under rubber dam application and local anesthesia (LA). According to fan et al, C2 configuration was found. Cleaning and shaping of canal was done by hand K files and ProTaper rotary files (Dentsply Maillefer, Ballaigues, Switzerland) up to F3. Irrigation was

performed by 5.25% NaOCl, 17% EDTA as final flush and normal saline as final rinsing of the canal. Calcium hydroxide dressing was given as an intracanal medicament. The patient was recalled after one week. After one week patient was sign and symptom free. So, Obturation was performed by ultra fill 3D (coltene, waldent) thermo plasticized technique. Silver Amalgam was used as permanent post endodontic restoration. Stainless steel fixed crown prosthesis was given.

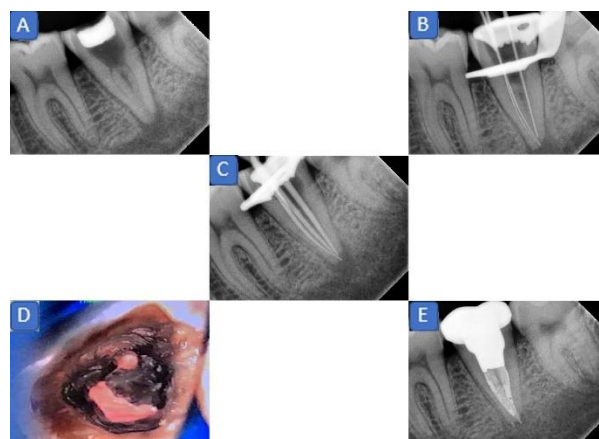


Fig 2: (A) Pre-Operative (B) Working Length (C) Master Cone (D) clinical picture after Obturation C2 configuration of C- shaped canal by Fan et al. (E) Obturation.

DISCUSSION

C-shaped root canal configuration is one of the most difficult situations with which the dentist is confronted during endodontic treatment of teeth. It was first described by Keith (1908), and later by Keith and Knowles (1913), Pedersen (1949), Tratman (1950), and Cook and Cox (1979) (Jafarzadeh and Wu, 2007). [4] C-shaped configuration is reported to be more prevalent among females (16.5%), as compared to that of males (10.4%). [5] Bilateral occurrence of C-shaped canals has been reported in percentage of 70%-81%. [6] According to Fan et al. indicated that a majority of teeth with C-shaped canal system showed an orifice with an uninterrupted "C" configuration. [7] The teeth that qualified as having a C-shaped canal system had to exhibit all the following three features: Fused roots, a longitudinal groove on the lingual or buccal surfaces of the root, and at least one cross-section of the canal belongs to the C1, C2, or C3 configuration.

Although the C-shaped canals instrumented by NiTi rotary instruments showed higher percentage of uninstrumented canal surface than manual K-files, the NiTi group produced less straightening, less apical canal transportation, and fewer incidences of perforations. Although NiTi rotary files should still be the instruments of choice for preparing C-shaped canals. It can be recommended that the 2 techniques be combined to obtain better debridement in clinical practice. After instrumentation by NiTi rotary instruments, K- or H-files could be passively introduced into the canal, and filing could be specifically directed toward the isthmus areas. However, according to the high percentage of untouched canal area of C-shaped canal systems in both groups, the use of chemical agents and other modalities (such as sonication and ultrasonication) for cleaning and disinfection cannot be overemphasized in the treatment of the C-shaped root canal system. [8]

A three-dimensional filling is of critical importance for the ultimate success of all root canal procedures. When obturating C-shaped canals, the popular cold lateral compaction technique has been reported to have a less dense radiographic appearance even after using a large number of accessory gutta-percha points (Weine 1994). The gutta-percha does not fill the discrepancies and the narrow connecting slit of the C-shaped canal system (Liewehr et al. 1993) and the resultant forces of lateral compaction during obturation can exceed the dentin canal resistance, which may result in root fracture and perforation of the root. [9]. In addition, the challenges of canal shaping do not always provide a flared preparation for deep placement of a spreader without perforating the canal wall (Jerome 1994). To address this problem, thermoplasticized gutta-percha filling techniques have been advocated in filling C shaped canals where compaction of softened gutta-percha should predictably fill root canal aberrations (Simon 1993, Jerome 1994, Weine 1994, Gutmann & Witherspoon 2002). The efficacy of injectable thermoplasticized gutta-percha in filling canal irregularities, such as fins, cul-de-sacs, internal resorption cavities and lateral canals, is well documented. To prevent overfilling and apical extrusion with this filling technique, several authors (ElDeeb 1985, Bradshaw et al. 1989, Gatot et al. 1989, Olson et al. 1989) suggested the placement of a master gutta-percha cone into the apical part of

the root canal prior to using the injection technique to prevent extrusion of injected gutta-percha. The core-carrier technique, which uses heat-softened alpha phase gutta-percha encased around a plastic carrier, provides excellent adaptation of gutta-percha to the prepared canal walls and irregularities (Gutmann et al. 1993). Ultrasonically energized spreaders that produced frictional heat and plasticized gutta-percha were advocated as an aid for lateral compaction of gutta-percha cones (Moreno 1977) to produce a more homogeneous root filling (Baumgardner & Krell 1990). The core-carrier technique was the most effective technique when assessed by gutta-percha area in this simulated C-shaped canal. [10]

First case represents type I C-shaped canal according to Fan *et al.* [7] radiographic classification of C-shaped canal. In this case radiolucent longitudinal line separates the root into distal and mesial parts fusing at the apical apex. Distal canal was oval shaped and the accessibility up to the apical third' this case was managed with Thermafill. The quality of obturation of oval canals with warm gutta-percha was found to be superior to that with cold gutta-percha. A C-shaped canal can be considered as an extreme form of long oval canal and so, second case was managed by injectable thermoplasticised gutta-percha obturation techniques.

The proper diagnosis plays a key role for the management of C-shaped canals. Depending upon the morphology the management mode can be selected. Nevertheless, the three-dimensional seal of root canal is most important.

CONCLUSION

The successful endodontic management needs proper knowledge about aberrant root canal systems. The proper diagnosis and treatment plan play a key role for the management of C- shaped root canals. Due to the complex root canal anatomy of teeth with C-shaped root canal system, successful cleaning and shaping followed by three-dimensional sealing of aberrant space, it's necessary to know and learn appropriate techniques of irrigation and filling with suitable obturation techniques.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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