

Different Obturating Techniques For Endodontic Management Of C-Shape Canal – Case Series

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Abstract

AIM- Management of c shape canals in mandibular second molar using three different obturating technique.

METHODS AND MATERIALS- Developmental disturbances increases complexity of root canals along with increase in lateral canals, anastomoses and apical deltas. A thorough understanding and a sound knowledge is required regarding the c-shaped canal systems related so as to identify and treat them in a proper fashion with careful clinical and radiographic examination for successful endodontic management. Three different obturation technique- lateral compaction technique, thermoplasticised technique and cold compaction technique are used for successful obturation of C- shape canals in this case report.

CONCLUSION- Complex intricacies and diverse morphology of C shaped canals can be managed successfully with proper irrigation and obturation techniques

Key Words- C- shape canal, Cold lateral compaction, Thermoplasticised compaction, Obturation, Gutttaflow

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I. Introduction

The main objective of root canal therapy is thorough cleaning and shaping and three dimensional filling of root canal system with an inert material as close to cementodentinal junction as possible.

Along with proper diagnosis, knowledge of anatomical variations and treatment planning forms the triad for successful endodontic treatment¹. One of the significant anatomical variation is C Shape canal morphology. This variation was first reported in endodontic literature by Cooke and Cox² in 1979.

C shaped canal morphology is an anatomical variation of root fusion and taurodontism. The etiology of this ribbon shaped canal can be due to failure of Hertwig's epithelial root sheath to develop or fuse in the furcation area in the embryologic stage of tooth development³. Failure on buccal side will result in lingual groove and vice versa. Failure on both side will result in formation of a conical or prism shaped root⁴.

C shape canal morphology has high incidence in mandibular second molar due to high incidence of root fusion. Case studies have also been reported in maxillary first molar, mandibular first molars, mandibular premolars and third molar teeth.

It is more common in Asians than in whites⁵. The prevalence of C shaped root canal reported to ranges from 2.7% to 44.5% in mandibular second molars. Gulabivala et al.⁶ reported the incidence of 22.4% in Burmese patients. Wang et al. found a high incidence of C-shaped canal system (41.27%) in mandibular second molars of a Chinese population.

Melton et al. proposed the following classification of C-shaped canals based on their cross-sectional shape⁵:

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 Seo et al. the most prevalent configuration types were Melton's type I (coronal region) and type III (apical region).

Fan et al. analysed the c shape canal system using microCT and modified Melton’s method into the following categories⁷ (Figure-1):

Category 1 (C1): the shape was an uninterrupted “c” with no separation or division

Category 2 (C2): the canal shape resembled a semicolon resulting from a discontinuation of the “c” outline, but either angle α or β [figure 3] should be no less than 60° .

Category 3 (C3): 2 or 3 separate canals and both angles, α and β , less than 60° [figure 4].

Category 4 (C4): only one round or oval canal in the cross- section

Category 5 (C5): no canal lumen could be observed (which is usually seen near the apex only)

Fan et al., classified c-shaped roots according to their radiographic appearance into three types (Figure-2):

Type 1: 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)

Type 2: 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

Type 3: 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

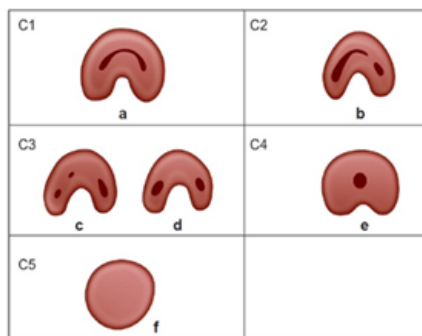


Figure-1
Classification of C- shape canal configuration



Figure-2 Radiographic types. (a) Type I, (b) type II, and (c) type III

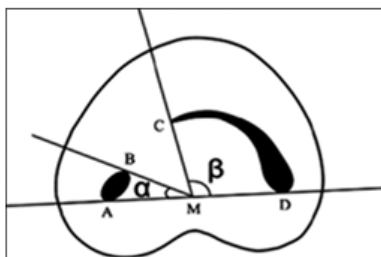


Figure -3 Measurement of angles for the C2 canal. Angle β is more than 60° . (a and b) Ends of one canal cross-section, (c and d) ends of the other canal cross-section, M, middle point of line AD; angle between line AM and line BM; β , angle between line CM and line D

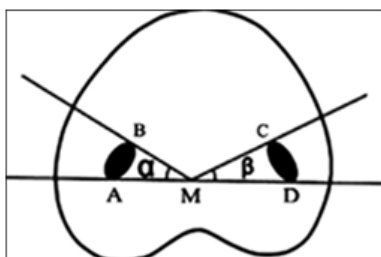


Figure -4 Measurement of angles for the C3 canal. Both angle α and angle β are less than 60° . (a and b) Ends of one canal cross-section; (c and d) ends of another canal cross-section; M, middle point of line AD; angle between line AM and line BM; angle between line CM and line DM

In the presence of C shape canal, it is important to select the proper obturation system. It is recommended to use thermoplasticised systems as it completely fill the variations and irregularities^{5,10}.

This report presents the management of C-shaped mandibular second molar teeth using three different obturation systems.

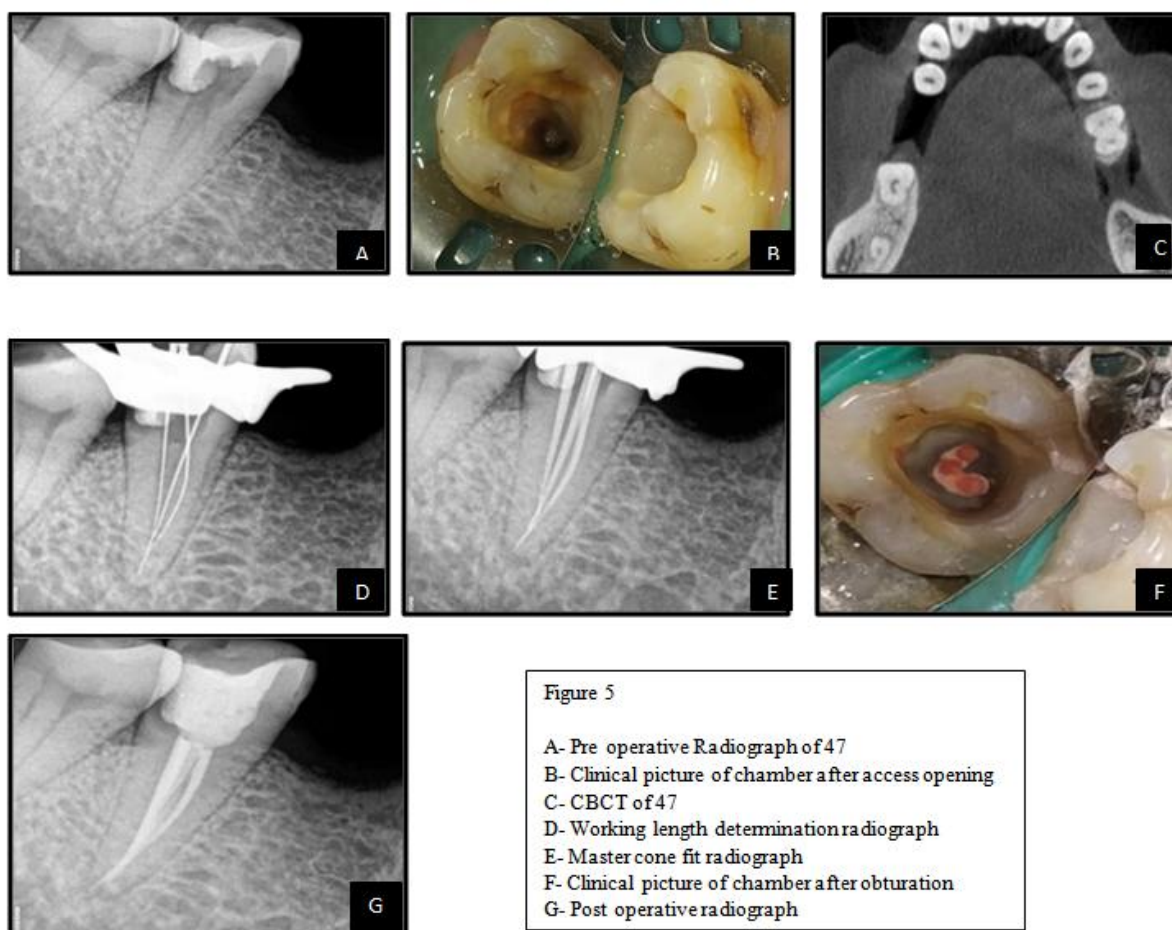
II. Case Report

CASE 1

A 30 year old female patient reported to the department of conservative dentistry and endodontics with a chief complaint of pain in lower right back tooth region. The medical history was non-contributory. Intra oral examination revealed temporary restoration on tooth 47 which was tender on percussion. Radiograph was taken which showed fused mesial and distal roots with PDL widening at apex. Diagnosis of previously initiated root canal therapy and apical periodontitis with respect to tooth 47 was made.

After achieving profound anaesthesia (2% Lignocaine with 1:200000 epinephrine), access cavity was modified under rubber dam isolation. On examination with DG-16, Fan et al anatomic C-shape category 1 and type 1 according to radiographic classification by Fan et al was found. Working length was determined using i-root electronic apex locator (Meta Biomed) and confirmed radiographically. Cleaning and shaping was completed with Hyflex CM rotary files (Coltene) followed by circumferential filing with hand K files to ensure maximum tissue removal.

Calcium hydroxide (Calcetin-Tehnodent India) was placed as an intracanal medicament. After 1 week patient was symptom free so fit of the master cone was checked and obturation was completed with selected master Gutta-percha (Dentsply, Maillefer) cone along with accessory cones with Sealapex sealer (Kerr endodontics) (Lateral Compaction obturation technique). Post endodontic build up was completed with composite (3M ESPE). (Figure 5)



CASE 2

A 25 year male was referred to the Department of Conservative Dentistry and Endodontics with a chief complaint of severe pain in lower right back tooth region for past four days. In Past dental history patient gives history of undergoing dental treatment four weeks prior related to that region.

Intra oral examination revealed temporary restoration present on tooth 47 which was tender on percussion and showed pus discharge from gingival sulcus on probing with grade II mobility. Radiographic evaluation showed periodontal ligament widening in radicular region. Diagnosis of previously initiated root canal therapy with apical periodontitis in relation to tooth 47 was confirmed.

Access cavity was modified under rubber dam isolation and pre endo build up was completed on distal aspect of tooth. Clinically Fan et al Category 2 and radiographic type 2 was found. Working length was determined using i-root electronic apex locator (Meta Biomed) and confirmed radiographically. Cleaning and shaping was completed with Hyflex CM rotary files (Coltene) followed by circumferential filing with K file.

5.25% sodium hypochlorite was used as an endodontic irrigant which was activated with Endo activator and Calcium hydroxide (Calcetin-Tehnodent India) was placed as an intracanal medicament and patient was recalled after 1 week.

On next appointment patient was asymptomatic, master was fitted to working length and radiograph was taken and obturation was completed with thermoplasticised technique (Calamus Dual 3D Obturation System – Dentsply, Maillefer). Post endodontic build up was completed with composite (3M ESPE).(Figure 6).

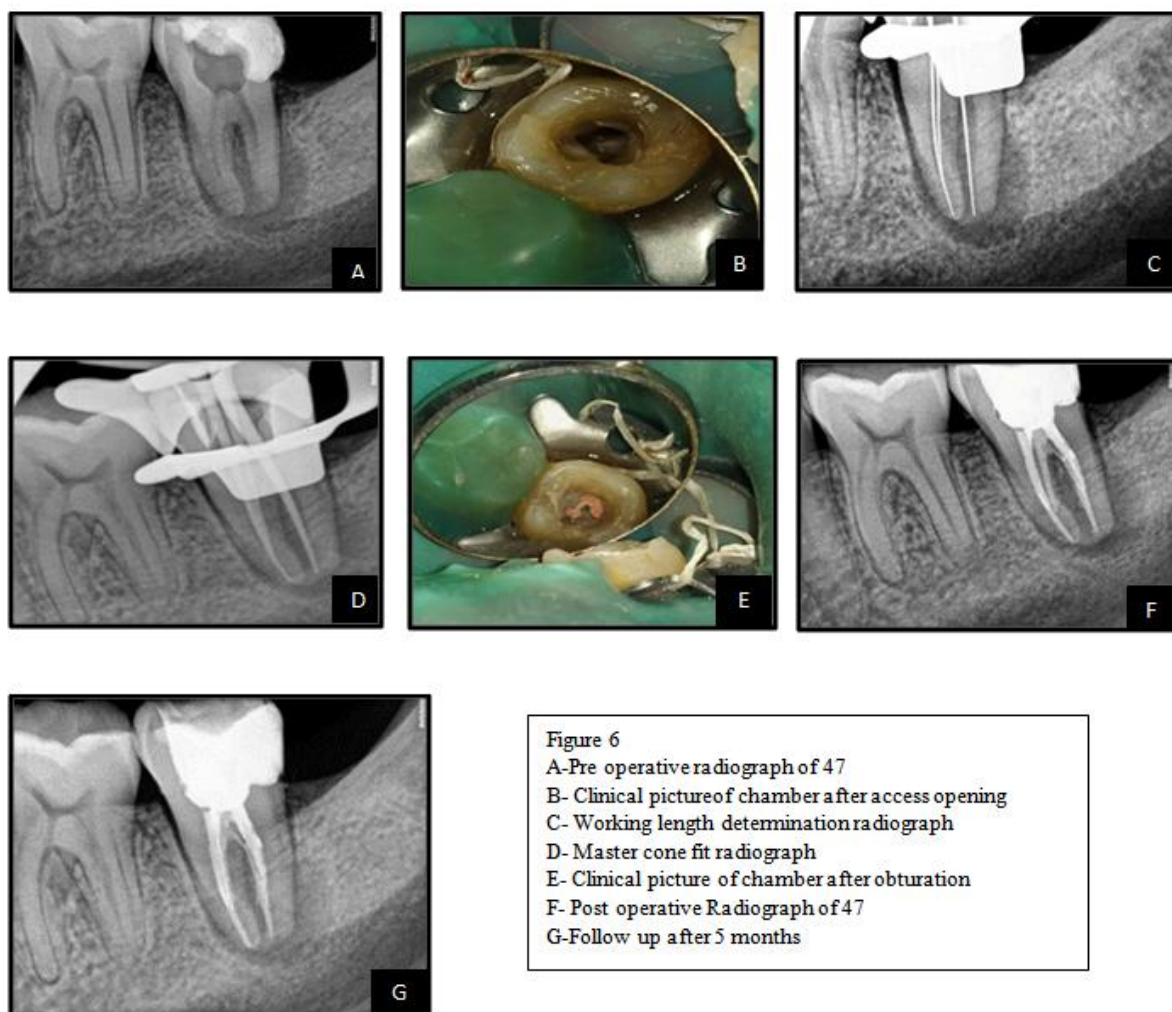


Figure 6
 A-Pre operative radiograph of 47
 B- Clinical picture of chamber after access opening
 C- Working length determination radiograph
 D- Master cone fit radiograph
 E- Clinical picture of chamber after obturation
 F- Post operative Radiograph of 47
 G-Follow up after 5 months

CASE 3

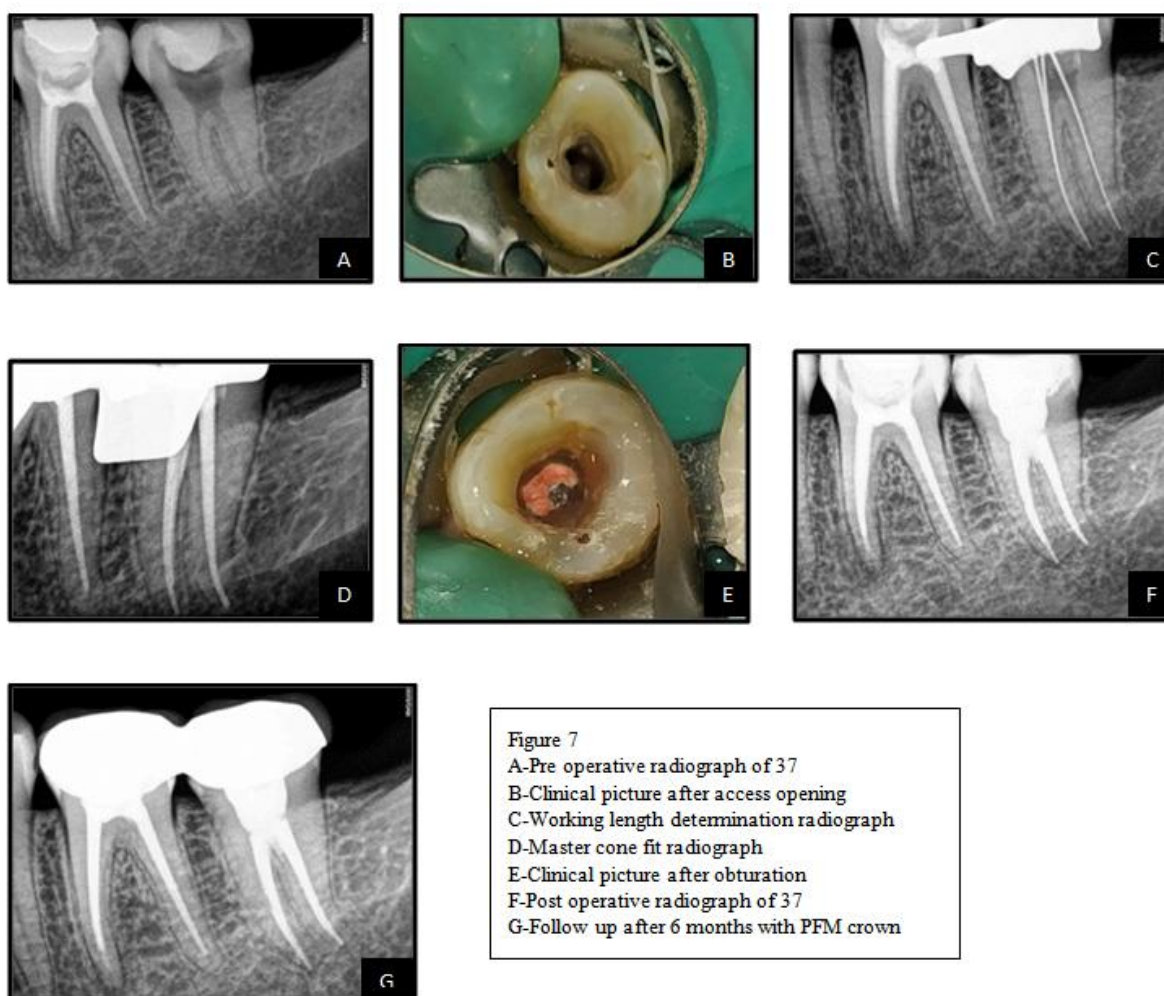
A 24 year female was referred to the Department of Conservative Dentistry and Endodontics with chief complaint of pain in lower left back tooth region. In past dental history patient gives history of undergoing dental treatment five days prior related to that region.

Intraoral examination revealed temporary restoration on tooth 37 which was tender on percussion. Radiograph was taken showing radiopacity in the coronal portion suggestive of temporary restoration. Diagnosis of previously initiated root canal therapy irt 37 was confirmed.

Access cavity was modified under rubber dam isolation and clinically type C1 c- shape configuration was seen according to Fan et al anatomic classification and type 2 radiographic classification.

Working length was determined using i root electronic apex locator (Meta Biomed) and confirmed radiographically. Cleaning and shaping was completed with Hyflex CM rotary file (Coltene) followed by circumferential filing with K file. Calcium hydroxide (Calcetin-Tehnodent India) was placed as an intracanal medicament and patient was recalled after 1 week.

On next appointment patient was asymptomatic and master cone radiograph was taken and obturation completed using Gutttaflowguttapercha points with gutta flow sealer(Coltene) and post endodontic build up completed using composite (3M ESPE).PFM crown was placed at six months follow up.(Figure 7)



III. Discussion

The definition of a C shaped canal is not yet clear. Some authors consider C-shaped canals as all those with a general outline of a “C” and present in a C-shaped root, regardless of whether a separate canal or orifice was observed¹¹.

The basic feature of C shape canal is presence of fin or web connecting the main canals⁵.

Radiographic findings helping arousing suspicion of C shaped canals are-

- fused roots and a longitudinal groove on the lingual or buccal surface of the root
- poorly distinguished floor of the pulp chamber and the persistence of hemorrhage or pain when separate canal orifices were found
- working length radiograph with inserted instruments give the impression of a perforation in the furcation area¹²
- instruments tend to converge at the root apex¹³

Additional measures should be undertaken during treatment of C shape canal for thorough debridement and cleaning of the canals⁸. Modified access cavity design, magnifying loupes, microscopes and CBCT helps in understanding the anatomy⁹.

Circumferential filing is essential for removal of pulp tissue and done carefully to avoid strip perforation during filing. Additional use of tissue dissolving irrigants and intracanal dressings is necessary. NaOCl and calcium hydroxide are the only agents in endodontics that display some tissue-dissolving ability. Moreover, an intracanal dressing with calcium hydroxide increases the tissue dissolving ability of NaOCl during the next appointment¹⁴.

An increased volume of irrigant and deeper penetration with small instruments using sonics or ultrasonics may allow for more cleansibility in fan-shaped areas of the C-shaped canal¹⁵.

Modifications in obturation techniques like lateral and warm vertical condensation helps in increasing the adaption and density of filling. C-shaped canal is considered as an extreme form of long oval canal and therefore thermoplasticised gutta-percha obturation techniques is advised for better adaptation and filling the web¹⁶.

IV. Conclusion

Due to the complexity of the root canals in developmental disturbances, treatment protocols require special attention. A thorough understanding and a sound knowledge is required regarding the c-shaped canal systems related so as to identify & treat them in a proper fashion with careful clinical and radiographic examination for successful endodontic management.

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