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Cruising the C-shaped canals on different techniques of obturation: A Two Case Reports

Abstract

The intricacies present in this variation of canal morphology can pose a challenge to the clinician during negotiation, debridement and obturation. Manual and electronic searches of literature were performed till 2014. Knowledge of the C-shaped canal configuration is essential to achieve success in endodontic therapy. Radiographic and clinical diagnoses can aid in identification and negotiation of the fan-shaped areas and intricacies of the C-shaped anatomy. Effective management of this anomalous canal configuration can be achieved with rotary and hand instrumentation assisted with sonics and ultrasonics. Modifications in the obturation techniques will ensure a 3-dimensional fill of the canal system and chamber retained restorations like amalgam or composites, serve as satisfactory post endodontic restorations. The main reason for failure in endodontic treatment of mandibular first molar is the inability to detect the presence of C-shaped canals prior to an endodontic therapy. This case report presents successful management of two rare cases of C-shaped canal configurations.

Key Words

C-shaped canals; configuration category; root canal obturation

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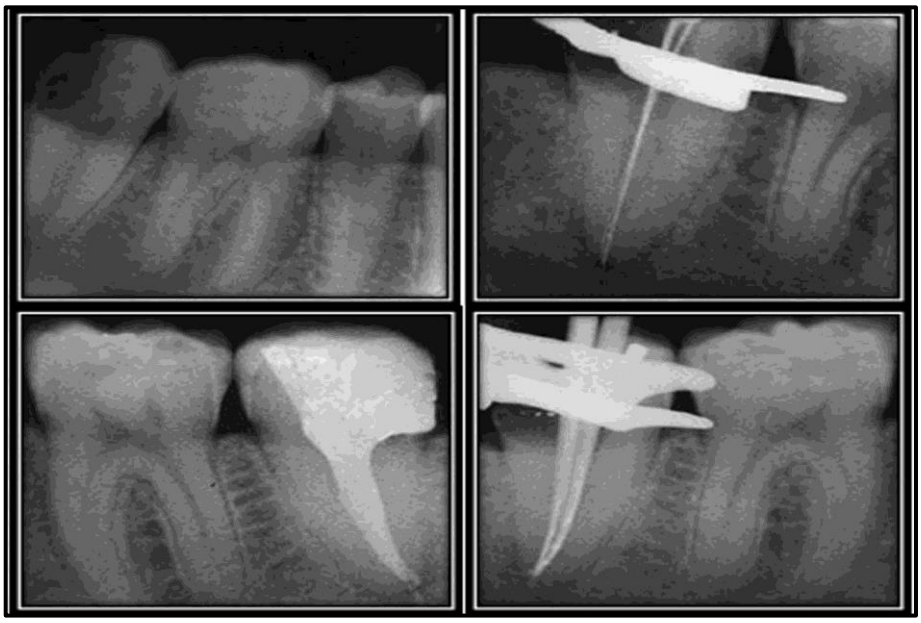
INTRODUCTION

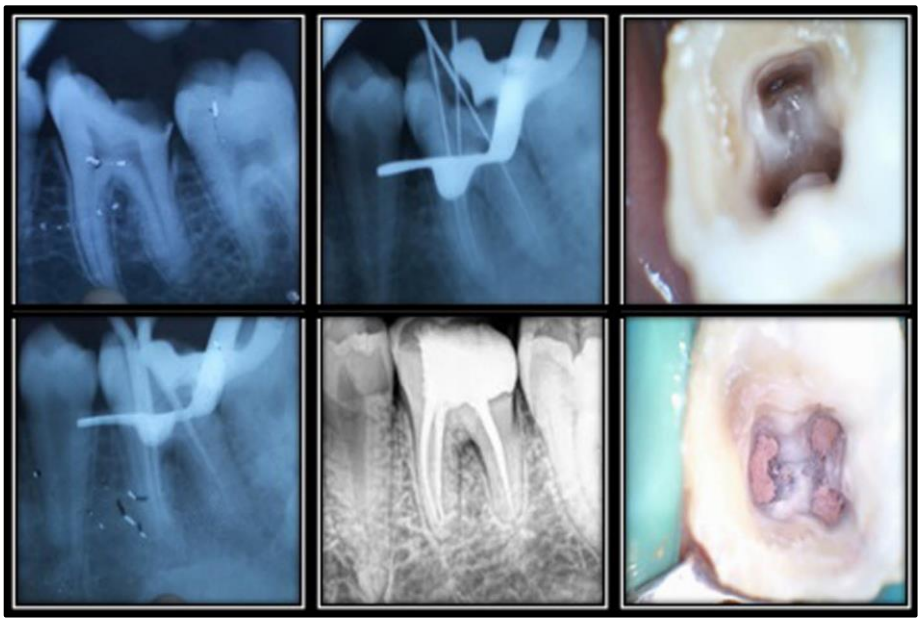
C-shaped canals were first documented in the endodontic literature by Cooke & Cox,[1] in three case reports. Studies of the root canal anatomy of mandibular second molars from Japanese,[2] Chinese,[3] and Hong Kong Chinese,[4] populations have found a high incidence of C-shaped roots and their canals. Instead of having several discrete orifices, the pulp chamber of C-shaped canal is a single ribbon shaped orifice with an 180˚arc. Below the orifice level, the root structure can harbor a wide range of anatomic variations. The C-shaped canal configuration presents with variations in both the number and location of the canal(s), as the canal(s) courses from the coronal to the apical third. The complexity of this canal configuration proves to be a challenge with respect to debridement and obturation and possibly the prognosis during root canal therapy. Recognition of a C-shaped canal configuration before treatment can facilitate effective management, which will prevent irreparable damage that may put the tooth in severe jeopardy.[5] No article until date had been reviewed on different techniques of obturations & its modification of C-shaped canals.

CASE REPORT

A 30 year old female patient reported to Department of Conservative dentistry & Endodontics ,with a chief complain of pain in 47 region. There was presence of prolonged sensitivity to hot and cold. Clinically, there was a presence of deep distoproximal carious lesion involving pulp, the tooth was showed early response to vitality tests. Radiographically, radiolucency was seen involving pulp with periapical widening. The patient was diagnosed with chronic apical periodontitis .Access cavity prepared with Endo Access bur and Endo Z bur (Dentsply). The pulpal floor revealed the presence of C-shaped orifice extending from distal to mesioliongual canal. The working length of each canal was established by measuring the penetration of a size 15 K-file (Flexofile, Dentsply Maillefer) until it reached the apical foramen, and then subtracting 1 mm (Ingle's method). The canals were prepared with the ProTaper Nickel-Titanium Rotary System (Dentsply Maillefer). The handpiece was used with an electric motor (X-Smart, Dentsply



Case Report 1



Case Report 2

Maillefer) at 250 rpm. Instrumentation started with S1 up to the length corresponding to beginning of the root curvature. The SX instrument was used in a similar manner at the same length. Instrumentation was completed with S1, S2, F1 and F2 instruments to working length. Additional enlargement was completed with nickel titanium hand files, with the mesial canals to a size 40 K-file and distal canals to a size 50 K-file (Nitiflex-Dentsply Maillefer) using the balanced force technique. 5.2% sodium hypochlorite was used continuously during root canal shaping, 2 mL for each file used; 0.5 mL of 17% EDTA was used at the end of the biomechanical preparation for 1 min and a final rinse of sodium hypochlorite was performed (Fig. 1). Master apical cone was inserted and check for tug back. Gutta flow (Roako Gutta flow) was removed from catridge on the mixing pad. This gutta flow was used as a sealer. Master apical cone placed in the sealer and inserted into canals. Obturation was completed using lateral condensation method. Post RCF restoration was placed.

CASE REPORT 2

A 30-year-old female patient was referred to the Department of Conservative Dentistry & Endodontics, for a number of root canal treatments. The 36 did not respond to vitality tests, but was without symptoms. The tooth was not tender to percussion or palpation and there were no

periodontal pockets associated with it. Radiographic examination showed the presence of caries very nearer to pulp. There was a slight widening of the periodontal ligament space in the apical area, and the tooth appeared to have two roots. Chronic apical periodontitis was diagnosed.A rubber dam placement was done. An access cavity was prepared, a C-shaped canal was observed in distal canal and separate mesiobuccal and mesiolingual canals, as the canal could be probed all the way round the circumference of the 'C'. The working length was established, and the canal was cleaned and prepared using same procedure as described in first case, with 5.2% per cent sodium hypochlorite and EDTAC irrigating solutions. The canal was prepared over two appointments, and an intracanal dressing of Pulpdent paste, a non-setting calcium hydroxide paste, was used. The distal canal was filled using modified technique of Microseal syatem (Sybron Endo) (Fig. 2).

DISCUSSION

The complexity of C-shaped canals requires appropriate cleaning and shaping procedure as well as modified filling technique. The filling of C-shaped canal with current technique is based upon clinical reports.[6]

Etiology: The failure of fusion of Hertwig's epithelial sheath is the most lucid explanation for the formation of the C-shaped canal configuration. 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. Hence, this fusion is not uniform and a thin interradicular ribbon connects the two roots together. Failure of the sheath to fuse on both the buccal and lingual sides will result in the formation of a conical or prism shaped root. Fusion is most likely to occur if the distance between the root canals is small.[5]

Classification: The clinician should not assume a fixed spatial relationship, if a C-shape is identified, but rather be aware of other possibilities. To facilitate a better understanding of the root canal anatomy of C-shaped canals the numerous classifications were proposed. The earliest classification was proposed by Manning and Melton *et al*.[5] However, there was no clear distinction between the categories in Melton's classification. Besides, Melton's and Manning's classifications describe only the appearances of the canal orifices, but fail to describe how the C-shaped configuration may vary along the root length. Various other classifications were then proposed by several authors.[5,7] In C - shaped canal obturation would be difficult for two reasons: (1) Divergent areas that are frequently unshaped and may offer resistance to obturating material flow, (2) Communications between the main canals of the C-shaped, through which the entrapped filling materials that should be captured between the apical tug back area and the level of condensation may pass from one canal to another. Obturation of C-shaped canals may require technique modifications. Mesiolingual and distal canal spaces can be prepared and obturated as separate canals. Sealing of buccal isthmus is difficult if lateral condensation is the only method used. Because this isthmus may not be prepared with sufficient flare to permit deep placement of spreader. Application of thermoplastisized gutta percha is more appropriate.[8] Martin developed a device called Endo Tec II (Medidenta, Inc, Woodside, NY), improved compaction. In 1993,an Army group termed a "Zap and Tap" maneuver: Preheating the EndoTec plugger for 4 to 5 seconds before insertion (zap) and then moving the hot instrument in and out short continuous strokes (Taps) 10 to 15 times. The plugger was removed while still hot, followed by a "Cold spreader with insertion of additional accessory points". Walid described the use of two pluggers simultaneously to down pack the main canals in his case, C-shaped run from distal to mesiolingual canal, separate mesiobuccal orifice. Two medium cones placed in distal and mesiolingual canals.a Touch N Heat (Sybron Endo) was used to sear off gutta percha at mesiolingual orifice where largest plugger selected was placed while down packing the distal canal with the smallest plugger. Then the smallest plugger used in distal canal was held in place while packing mesiolingual canal.[7] To ensure proper placement of the master cones in C-shaped canals, Barnett,[10] recommended placing a large diameter file in the most distal portion of the canal, before seating the master cone in the mesial canal. The file is then withdrawn and the master cone of the distal canal is seated, followed by placement of accessory cones in the middle portion of the C-shaped canal. Studies have shown that following the cleaning and shaping, the remaining dentin thickness around the canals is usually 0.2 to 0.3 mm. The resultant forces of compaction during obturation can exceed the dentin canal resistance, which may result in root fracture and perforation of the root. The method included apical filling with Mineral Trioxide

Aggregate (ProRoot MTA, Dentsply, Konstanz, Germany). The MTA was mixed according to the manufacturer, placed just before the apex and condensed with an ultrasonically activated plugger. Each tooth was temporarily sealed with a sponge, Cavit and a temporary resin filling for four to seven days to ensure that the MTA had set. After reopening the canals were rinsed again and filled by way of a warm vertical technique with gutta-percha and sealer. In the second case report, Root canals were filled using a modified technique of the MicroSeal system. The first step of the procedure was the selection of the correct master cone (Dentsply Maillefer) and its adjustment to achieve tug-back, 0.5 to 1 mm short of the working length. Sealer 26 (Dentsply) was placed into the canal with the master point and the sealer- coated master gutta-percha point was seated. A size B precurved finger spreader (Dentsply Maillefer) was inserted along the master point at the appropriate length for compaction. Initial lateral compaction was done with one or two size 20, .02 taper accessory points (Dentsply Maillefer) as suggested by Maggiore (2004). The spreader was reinserted and an appropri- ate compactor was coated with a uniform layer of material of the heated gutta-percha cartridge based on the manufacturers instruction. A coated gutta-percha compactor was then carried immediately to the void previously created in the canal by the spreader and was placed as close to the working length as possible. With the application of a resisting force to the compactor's backing-out motion but without any apical pressure, the rotation of the compactor began at a speed of 5000 rpm. After approximately 2 s, the compactor was removed slowly whilst being pushed softly against one side of the canal. Rotation did not stop until the compactor was removed from the canal. Mildpressure was then applied in apical direction (vertical compaction) with plugger followed by a reinsertion of the spreader. If the first step did not fill the canal completely, the compactor was coated with a further increment of a gutta-percha and the procedure repeated.[10]

CONCLUSION

When sound principles of biomechanical preparation, obturation, and restoration are followed, the long-term prognosis for the C-shaped root retention equals that of other molars, but cautious optimism would seem most appropriate when prognosticating the success of the root canal treatment of a C-shaped canal.

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