

CASE REPORT

C-shaped canals in mandibular second molars

Ravichandra¹, Harikumar²

Professor, Dept of Conservative Dentistry and Endodontics
Kamineni Institute of Sciences
Sripuram, Narketpally, Nalgonda Dist.
Andhra Pradesh, India.

Professors^{1&2}

Article Info

Received: 9th October, 2009

Review Completed: 17th November, 2009

Accepted: 15th December, 2009

Available Online: 18th April, 2010

© NAD, 2010 - All rights reserved

Abstract

Aims: This clinical report presents the endodontic treatment of two mandibular second molars with a C-shaped canal systems.

Summary: According to the endodontic literature a C-shaped root canal is most frequently seen in mandibular second molar. Once recognised, the C-shaped canal is a challenge with respect to debridement and obturation. We observed this configuration in two of our cases and successfully treated them in the department of Conservative Dentistry and Endodontics, Kamineni Institute of Dental Sciences.

Key learning points: *C-shaped root canal morphology occurs mostly in mandibular second molars in Asian population.*

Thorough knowledge of the root canal anatomy is necessary to perform a successful endodontic treatment.

Key Words:

C-shaped canals, canal configurations, mandibular second molars

INTRODUCTION:

A thorough knowledge of the anatomy of teeth involved in root canal treatment is essential for successful debridement and obturation of the root canal system.

Recognition of unusual canal configurations and variations are paramount because it has been established that the root with a single tapering canal and the apical foramen is the exception rather than rule.¹

Of particular interest is the canal configuration of the mandibular second molar as a great deal of variations can occur. C-shaped canals are common with a presence of a thin fin connecting the root canals being the main anatomical feature.²

Once recognised the C-shaped canal presents a challenge with respect to debridement and

obturation, especially because it is unclear whether the C-shaped orifice found on the floor of the pulp chamber actually continues to the apical third of the root.²

The present reports describe the root canal treatment in two mandibular second molars with C-shaped canal configurations.

REPORT 1:

A 23 year old female patient came to our Department of Conservative Dentistry and Endodontics, Kamineni Institute of Dental Sciences, Nalgonda, with a chief complaint of pain in the mandibular left second molar. The patient had no significant medical history. Subjective symptoms of prolonged sensitivity to hot and cold were present. The objective symptoms were observed as percussion sensitivity and hyper reactivity to heat and cold, with an absence of periradicular change

Address for correspondence:
tanushree@yahoo.co.in

radiographically (fig 1) and lack of swelling of the surrounding tissue. Therefore, the patient was diagnosed with irreversible pulpitis. The radiograph showed a single conical root which was seen bilaterally (fig 2).

After the administration of local anaesthesia (Lignox 2%, Indico Remedies, Warren, Goa) under rubber dam isolation the access cavity was prepared, the pulp chamber was irrigated with 5% sodium hypochlorite to debride the chamber fully and to identify the nature of the canal system present. The pulpal floor showed a single C-shaped canal extending till the apex (fig 3). Working length was determined using apex locator (Root ZX, J. Morita USA, Irvine, CA) and radiographs (fig 4). Cleaning and shaping was done with rotary ProTaper rotary files (Dentsply Maillefer, Ballaigues, Switzerland) and apical third was shaped to size 40 with K-Flex files (FKG Dentaire, La Chaux-de-Fonds, Switzerland). In between the instrumentation, the canal was irrigated with 5% sodium hypochlorite and passively activated with ultrasonic unit, Piezon EMS (EMS GmbH, Munich, Germany) for 1 minute for maximum debridement of the complex anatomy of the root. Calcium hydroxide intracanal medicament was placed for one week. At the next appointment, the medicament was flushed and smear layer was removed with 17% EDTA and 5% sodium hypochlorite. The canal was obturated with thermoplasticized gutta-percha technique (Obtura II, Obtura Spartan, Fenton, Missouri, USA) and AH-Plus sealer (Dentsply DeTrey GmbH, Konstanz, Germany) (fig 5, 6, 7, 8).

REPORT 2:

A 19 year old female patient came to our department with a chief complaint of severe pain in the mandibular right second molar. Clinical and radiographical examination revealed irreversible pulpitis due to dental caries (fig 9).

After rubber dam isolation and access cavity preparation under local anaesthesia, the pulpal floor showed separate mesiolingual canal and joined mesiobuccal and distal canals (C2 type- Semicolon shape, Melton et al. 1991). The working length radiograph showed as if the file exiting from the furcation of the root (fig 10). Later the cleaning and shaping and obturation of the canal were followed as in case report 1 (fig 11, 12, 13).

DISCUSSION:

The variability of the root canal system of multirouted teeth represents a challenge to both endodontic diagnosis and treatment. The preoperative awareness of potential anatomic variations is essential for the success of the endodontic treatment.

The C-shaped canal is not uncommon and this is confirmed by studies in which frequencies ranging from 2.7%³ to 8%² have been reported. The prevalence is higher in the middle Asia upto 10.6% in Saudi Arabians⁴ and 19.14% in Lebanese.⁵ In northeast Asia, the prevalence is 31.5% in Chinese⁶ and 32.7% in Koreans.⁷

This variation may occur in mandibular first molars,⁸ maxillary molars,^{9, 10} mandibular first premolars¹¹ and even in maxillary lateral incisors,¹² but it is most commonly found in mandibular second molars.^{8, 10, 13} When present on one side, C-shaped canal may be found in contra lateral tooth in over 70% of individuals.¹⁴

In the view of above incidence and variability in canal configuration,¹⁵ in our present case reports, all the necessary steps to locate, debride and clean and shape the complex anatomy have been followed. The passive ultrasonic activation was done to necessitate the irrigant flow into the complex canal anatomy and thereby maximally debride the root canal system.¹⁶ Thermoplasticized gutta-percha technique was followed for obturation as studies have shown that this technique leads to better flow of the gutta-percha and sealer into the complex anatomy of the canal and gives a three-dimensional obturation of the root canal.^{17, 18}

CONCLUSION:

Although the prevalence is less, C-shaped canals can vary in number & shape along the length of the root, with the result that debridement, obturation & restoration in this group may be unusually difficult.

Therefore, careful location & negotiation of canals & meticulous mechanical & chemical debridement of the pulp tissue should be carried out in order to successfully treat a C-shaped canal.

REFERENCES:

1. Abou-Rass M, Frank L, Glick DH: The anticurvature filing method to prepare the curved root canal. *J Am Dent Assoc* 1980; **101**: 792-794.
2. Cooke HG 3rd, Cox FL: C-shaped canal configurations in mandibular molars. *J Am Dent Assoc* 1979; **99**: 836 –839.
3. Weine FS, Pasiewicz RA, Rice RT :Canal configuration of the mandibular second molar using a clinically oriented in vitro method. *J Endod* 1988; **14**: 207–213.
4. Al Fouzan KS: C-shaped root canals in Mandibular second molars in a Saudi Arabian population. *Int Endod J* 2002; **35**: 499-504
5. Haddad GY, Nehme WB, Ounsi HF :Diagnosis, classification, and frequency of CShaped canals in mandibular second molars in the Lebanese population. *J Endod* 1999; **25**: 268 –271.
6. Yang ZP, Yang SF, Lin YC, Shay JC, Chi CY: C-shaped root canals in mandibular second molars in a Chinese population. *Endod Dent Traumatol* 1988; **4**: 160 –163.
7. Seo MS, Park DS : C-shaped root canals of mandibular second molars in a Korean population: clinical observation and in vitro analysis. *Int Endod J* 2004; **37**: 139–144.
8. Bolger WL, Schindler WG: A mandibular first molar with a C-shaped root configurations. *J Endod* 1988; **14**: 515-519.
9. Yılmaz Z, Tuncel B, Serper A, Calt S: C-shaped root canal in a maxillary first molar: a case report. *Int Endod J* 2006; **39**: 162– 166.
10. Dankner E, Friedman S, Stabholz A: Bilateral C shape configuration in maxillary first molars. *J Endod* 1990; **16**: 601–603.
11. Lu TY, Yang SF, Pai SF: Complicated root canal morphology of mandibular first premolar in a chinese population using the cross section method. *J Endod* 2006; **32**: 932– 936.
12. Boveda C, Fajardo m, Millan B: Root canal treatment of an invaginated maxillary lateral incisor with c-shaped canal. *Quintessence Int* 1999; **30**: 707-711.
13. Jerome CE: C-shaped root canal systems: diagnosis, treatment, and restoration. *Gen Dent* 1994; **42**: 424 –427.
14. Sabala CL, Benenati FW, Neas BR: Bilateral root or root canal aberrations in a dental school patient population. *J Endod* 1994; **20**: 38–42.
15. Bing Fan, Yi Min, Guanfan Lu, Jun Yang, Gary S.P. Cheung, and James L. Gutmann: Negotiation of C-Shaped Canal Systems in Mandibular Second Molars. *J Endod* 2009; **35**: 1003–1008.
16. Sabins RA, Johnson JD, Hellstein JW: Comparison of the cleaning efficacy of short term sonic and ultrasonic passive irrigation after hand instrumentation in molar root canals. *J Endod* 2003; **29**, 674-678.
17. Fulton S, Yee, Jay Marlin, Alvin Arlen Krakow and Poul Gron: Three-dimensional obturation of the root canal using injection-molded thermoplasticized gutta-percha. *J Endod* 1977; **3**, 168-173.
18. Bowman CJ and Craig Baumgartner J: Gutta-percha obturation of lateral grooves and depressions. *J Endod* 2002; **28**, 220-222

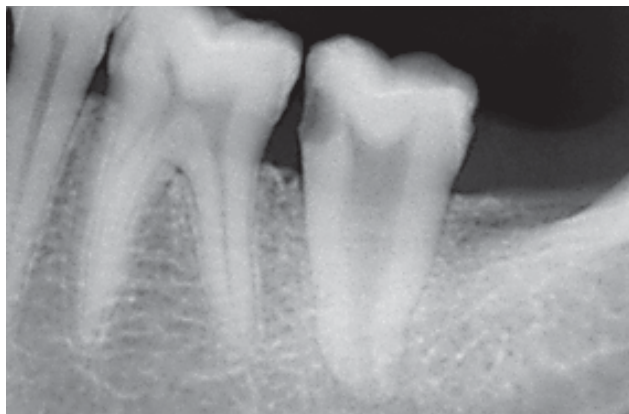


Fig1: pre-operative diagnostic radiograph

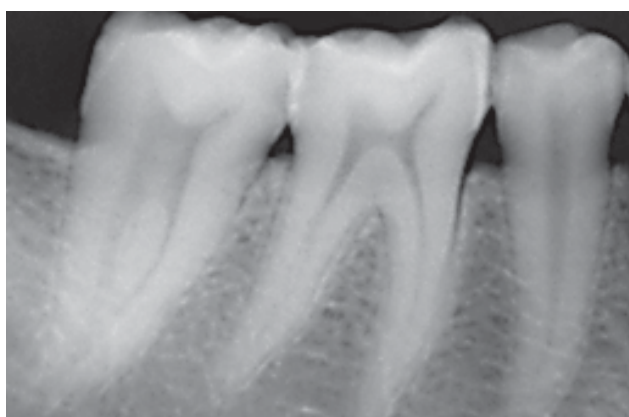


Fig2: Radiograph of contralateral tooth



Fig3: Isolation and Access Cavity Preparation

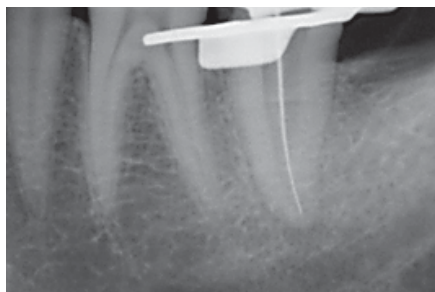


Fig4: Working length radiograph

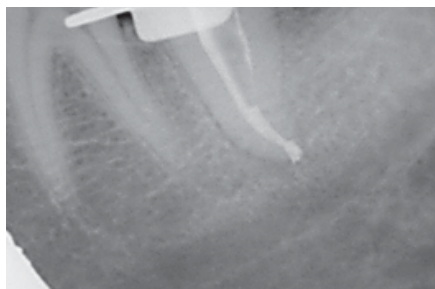


Fig5: Apical Fill with Obtura II

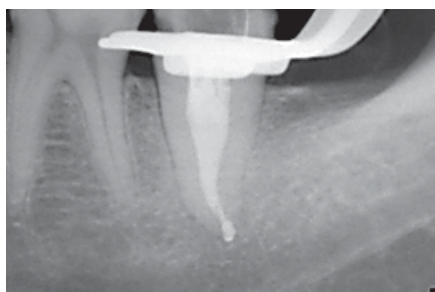


Fig6: Backfill with Obtura II

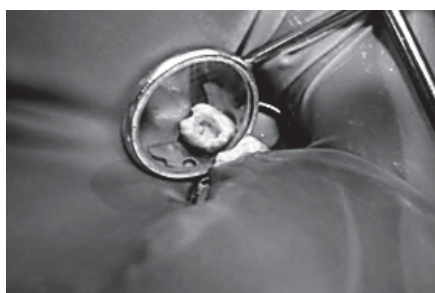


Fig7: Post-Obturation view of Access Cavity

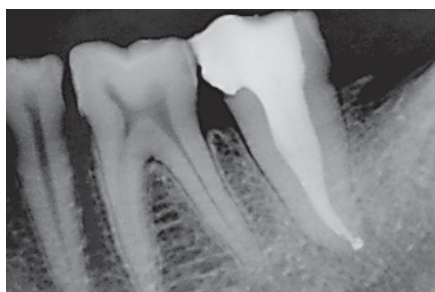


Fig8: Radiograph of Post-Obturation Restoration

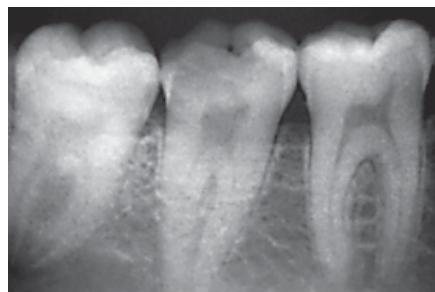


Fig9: Preoperative diagnostic radiograph

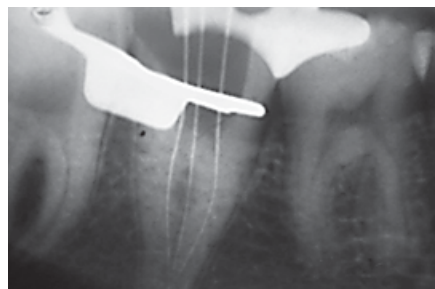


Fig10: Working Length Radiograph

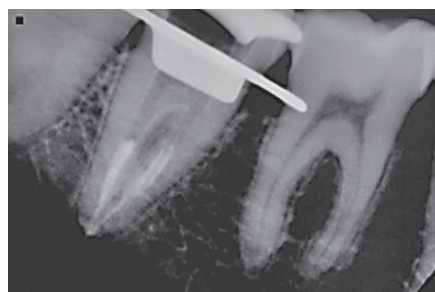


Fig11: Apical Fill with obtura II

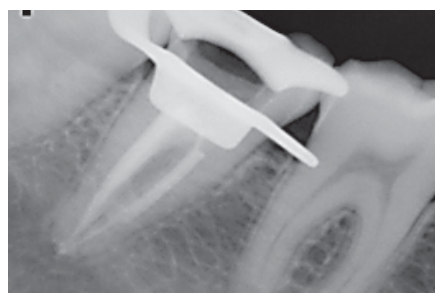


Fig12: Backfill with Obtura II

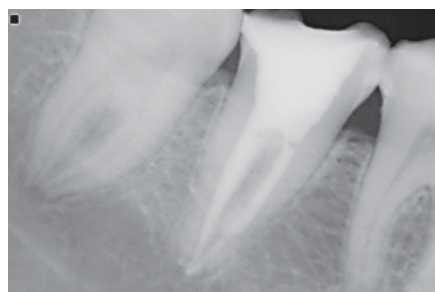


Fig13: Radiograph of Post-Obturation Restoration