

Is a C-shaped configuration possible in teeth other than mandibular molars?

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This case report presents a maxillary third molar with a C-shaped canal system. This is the first known description of a maxillary third molar with C-shaped anatomy. This unique pulp chamber morphology was observed under the operating microscope. Root canal treatment consisted of cleaning and shaping combined with ultrasonic irrigation with sodium hypochlorite. A calcium hydroxide dressing was applied between appointments. Obturation of the root canal system was performed with warm vertical condensation. The complexity of this canal morphology requires the prudent clinician to perform strict measures to achieve satisfying results. (*Quintessence Int* 2009;40:541–543)

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A C-shaped root canal system is a morphologic anomaly with ethnic group association.¹ This structure can harbor a wide range of anatomic variations and has 2 basic groups: (1) a single ribbonlike morphology from the orifice to the apex and (2) 3 or more distinct canals below the orifice.¹

Maxillary third molars have been described as having variable and complex root and crown morphology. However, PubMed and Google searches for maxillary third molars with C-shaped morphology yielded no results.

This report presents an unusual case of root canal treatment in a maxillary third molar with a C-shaped canal system.

CASE REPORT

A 35-year-old healthy white man was referred for endodontic treatment of the maxillary right third molar. The patient's primary complaints were high sensitivity to cold drinks and episodes of spontaneous pain. Radiographic examination revealed deep caries lesions, conical root configuration, and a periradicular radiolucency (Fig 1). The tooth responded with hypersensitivity to the cold test (Endo-Ice, Hygienic) and was diagnosed with irreversible pulpitis and chronic periradicular periodontitis caused by partial necrosis in a multirrooted tooth.

A C-shaped morphology was observed under the operating microscope (Fig 2). Working length was determined using an electronic apex locator (Raypex-4, VDW) and confirmed by a radiograph. Cleaning and shaping were supplemented with ultrasonic irrigation with 2.5% sodium hypochlorite. Calcium hydroxide dressing was applied between appointments.

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Fig 1 Preoperative radiograph of a maxillary right third molar. Note the deep caries lesion in the mesial and distal aspects, as well as apical radiolucency.

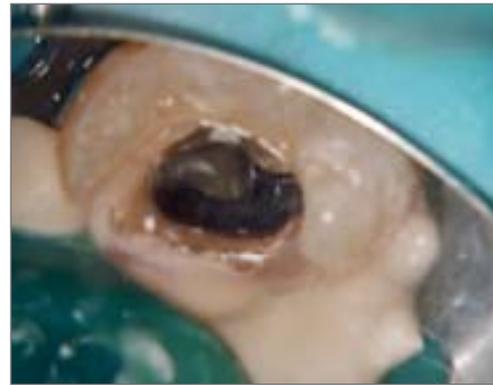


Fig 2 Clinical photograph of the pulp space taken through the lens of the operating microscope. Note the classic C-shaped pattern. The mesial aspect was isolated with glass-ionomer cement (Fuji IX, GC).

Warm vertical condensation with gutta-percha (Dentsply Maillefer) and AH-26 as a sealer (Dentsply DeTrey) was used to fill the complex root canal system (Fig 3). An operating microscope (OPMI Pico, Carl Zeiss Meditec) was employed throughout the procedure to enable sufficient illumination and magnification. The patient was then referred for a permanent restoration.

Follow-up examination 21 months after endodontic treatment revealed healing of the periradicular radiolucency with no signs or symptoms (Fig 4). The patient was advised to return to the prosthodontist because of an open margin in the final restoration.

DISCUSSION

C-shaped canal morphology is usually found in mandibular second molars, although involvement of other teeth has been reported. A literature review of 8,399 maxillary first molars from 34 studies showed an C-shaped incidence of 0.12%.²

In the present case report, a C-shaped root canal morphology in a maxillary third molar is described. Although this tooth type presents a wide morphologic variation, to the best of our knowledge, this is the first case report describing the occurrence of a C-shaped maxillary third molar and its endodontic treatment. Furthermore, in a previous study on the canal morphology of maxillary third molars, C-shaped morphology was not observed.³

Radiographic identification of this phenomenon is difficult, and occasionally, it is identified only during access-cavity preparation. The use of operating microscopes may be helpful in detecting root canal variations⁴ (see Fig 2), especially in treatment of maxillary third molars, in which access and illumination are often limited.

Ultrasonic activation of the irrigation solution may be advantageous in removing the infected tissues from the canal system,⁵ and the use of warm vertical condensation is recommended to achieve 3-dimensional obturation of the root canal system.⁵



Fig 3 Postoperative radiograph demonstrating the filling of the canals. Note the communication between the palatal and distobuccal canals.



Fig 4 Follow-up radiograph 21 months after root canal treatment. The tooth is asymptomatic and has been restored by a post and core, as well as a crown. Apical healing is observed.

The present case confirms the necessity for meticulous examination of the floor of the pulp chamber at high magnification and illumination under the operating microscope in conjunction with proper radiographic evaluation of the root canal anatomy. The prudent clinician should be aware of the possible occurrence of C-shaped anatomy in maxillary third molars and treat these teeth accordingly.

REFERENCES

1. Fan B, Cheung GS, Fan M, Gutmann JL, Fan W. C-shaped canal system in mandibular second molars: Part II—Radiographic features. *J Endod* 2004;30:904–908.
2. Cleghorn BM, Christie WH, Dong CC. Root and root canal morphology of the human permanent maxillary first molar: A literature review. *J Endod* 2006;32:813–821.
3. Alavi AM, Opananon A, Ng YL, Gulabivala K. Root canal morphology of Thai maxillary molars. *Int Endod J* 2002;35:478–485.
4. Yilmaz 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.
5. Jafarzadeh H, Wu Y. The C-shaped root canal configuration: A review. *J Endod* 2007;33:517–523.