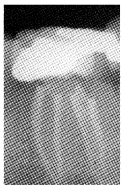

CASE REPORT

C-shaped root canal in a maxillary first molar: a case report

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Abstract

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Aim This case report presents an unusual C-shaped root canal system in a maxillary first molar tooth.

Summary Although C-shaped root canals are most frequently seen in the mandibular second molar, they may also appear in maxillary molars. A literature search revealed only a few case reports of C-shaped root canal systems in maxillary molars. The present case describes a C-shaped canal in the buccal root of a maxillary first molar. The endodontic access cavity displayed two canal orifices, one leading to the canal system in the buccal root, the other into the palatal root canal system. In the buccal root, what appeared to be the mesial and distal canals joined to form a single C-shaped canal.

Key learning points

- Careful examination of radiographs and the internal anatomy of teeth is essential.
- The location and morphology of root canals should be identified at high magnification under the microscope.

Keywords: C-shape, endodontics, maxillary first molar, root canal anatomy.

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Introduction

A well designed access preparation facilitates root canal preparation and filling of all branches of the canal system. Obviously, clinicians must have adequate knowledge about root canal morphology and its possible variations (Burns & Herbranson 2002) in order to achieve a technically satisfactory outcome.

Maxillary molars may have complex root canal systems that are difficult to manage. Variations often occur in mesio-buccal roots (Kulild & Peters 1990, Fogel *et al.* 1994), the most common finding being the occurrence of two canals. Some authors have reported that the frequency of a mesio-buccal root with two canals varies between 70% and 96%

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(Hartwell & Bellizzi 1982, Kulild & Peters 1990, Gorduysus *et al.* 2001, Maggiore *et al.* 2002). Accordingly, the root canal system of maxillary molars must be examined meticulously by the clinician, preferably under magnification provided by a surgical operating microscope.

In maxillary first molars, cases of morphological variations, abnormal numbers of roots or the existence of C-shaped root canals have been reported previously (Beatty 1984, Newton & McDonald 1984, Bond *et al.* 1988, Dankner *et al.* 1990, Malagnino *et al.* 1997, De Moor 2002, Maggiore *et al.* 2002). C-shaped canals may occur in mandibular first molars and maxillary molars but are most commonly found in mandibular second molars (Bolger & Schindler 1988, Dankner *et al.* 1990, Jerome 1994). The variation appears to be genetically determined, which may be used in tracing the ethnic origin of affected patients (Gulabivala *et al.* 2002). Recent studies of the root canal anatomy of mandibular second molars from Japanese, Chinese and Hong Kong Chinese populations have revealed an incidence of C-shaped root canals between 14% and 52% (Yang *et al.* 1988, Seo & Park 2004).

The purpose of this report is to present the root canal treatment of a rare case of a maxillary first molar with a C-shaped canal system in the buccal root.

Case report

A 28-year-old Caucasian female (Turkish), whose medical status was noncontributary was referred to the Endodontic Clinic at the School of Dentistry, Hacettepe University. The reason of her pain was diagnosed to be irreversible pulpitis in her maxillary right first molar. After adequate anaesthesia and isolation with rubber dam, an endodontic access cavity was established. Two canal orifices were defined, one in the buccal root and the other in the palatal root. It was recognized that the single canal orifice in the buccal root led into mesial and distal canals that joined to form a C-shape (Fig. 1). Working length was determined radiographically with three files of sizes 15, 25, 35 in the buccal canal from mesial to distal and a size 40 file in the palatal canal (Fig. 2). In the radiograph taken to determine working length, it appeared that at the apex of the C-shaped canal there were three foramina; the palatal root had a single, wide root canal. Canals were flared using a step-back technique. An inter-appointment dressing of calcium hydroxide (Merck KGaA, Darmstadt, Germany) was sealed in the pulp chamber with Coltosol F (Coltène AG, Altstätten, Switzerland) as a coronal temporary filling. A week later at the second appointment, after cleaning and shaping of the root canals, a radiograph was taken with

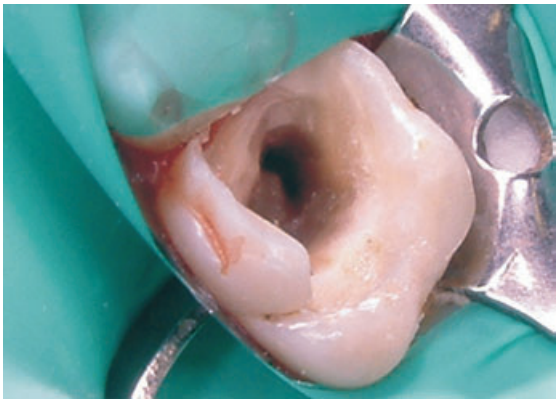

Figure 1 The C-shaped orifice of the buccal canal.

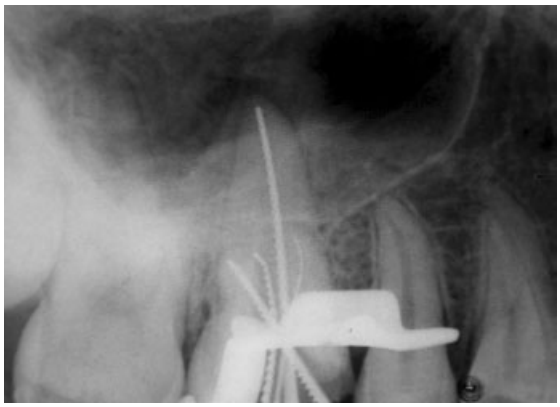

Figure 2 In the radiograph taken to determine working length, the C-shaped canal in the buccal root appeared to have three foramina; the palatal root had a single wide canal.

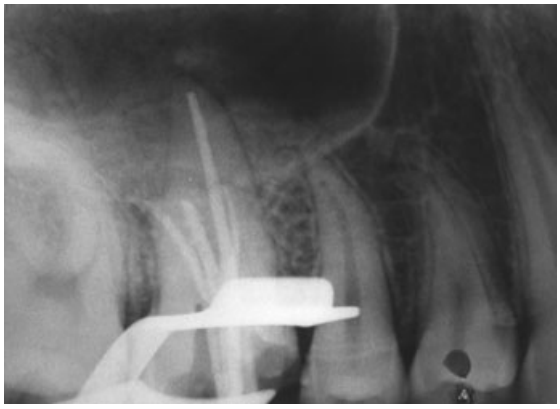

Figure 3 The radiograph displaying the master cones.

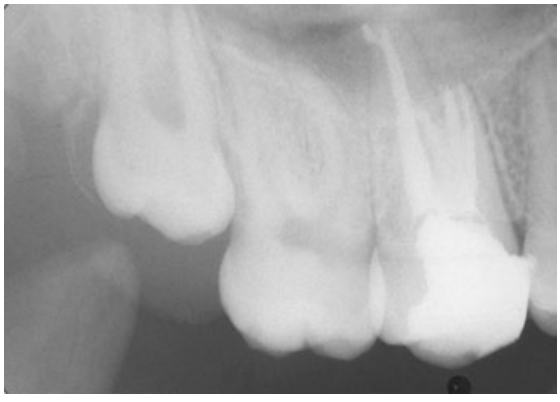

Figure 4 Postoperative radiograph of completed root filling.

master cones of size 60 for palatal and 55, 55, 40 for the buccal apices (Fig. 3). Subsequently, the root canals were filled with AH26 (Dentsply DeTrey GmbH, Konstanz, Germany), and gutta-percha using the lateral condensation technique (Fig. 4). The patient

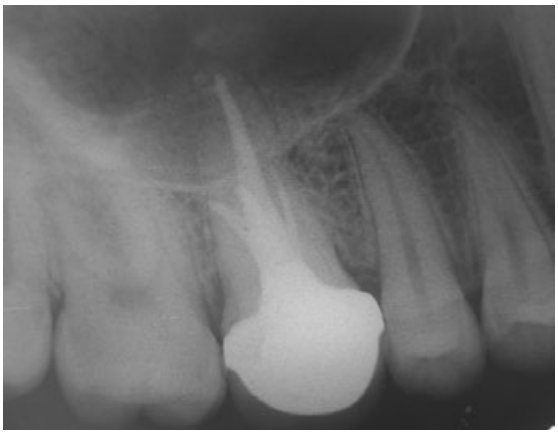

Figure 5 Two year postoperative radiograph.

was then referred to the Department of Prosthodontics for a permanent restoration. The 2 year follow-up radiograph displays normal periradicular appearance (Fig. 5).

Discussion

Case reports of variations in the number of root canals of maxillary first molars have been published (Beatty 1984, Fava 2001, Maggiore *et al.* 2002). Beatty (1984) reported a maxillary first molar with five canals, three of which were in the mesio-buccal root. Bond *et al.* (1988) and Maggiore *et al.* (2002) reported maxillary first molars with six root canals. C-shaped canals, which are considered as one such variation may also be present in maxillary first molars. C-shaped canals were first documented in the endodontic literature by Cooke & Cox (1979). The main anatomical feature of C-shaped canals is the presence of a fin or web connecting the individual root canals. Roots containing a C-shaped canal often have a conical or square configuration (Fan *et al.* 2004). According to De Moor (2002) the probability of observing a C-shaped canal in a maxillary first molar was as low as 0.091%.

A limited number of reports have described the existence of C-shaped canals in maxillary first molars (Newton & McDonald 1984, Dankner *et al.* 1990, De Moor 2002). These teeth provided examples of palatal and disto-buccal canals merging to form a C-shaped canal. In the present case, there were only two canals located in the buccal and palatal aspects of the access cavities. In the buccal root, the mesial and distal canals merged to form a C-shaped single canal, which led to three separate foramina at the apex. The existence of a single, wide palatal root canal was evident.

This case confirms the necessity of meticulous examination of the floor of the pulp chamber in conjunction with proper radiographic evaluation of the root canal anatomy. Although the incidence of root variations is rare, as far as the prognosis of individual cases is concerned, their importance should not be underestimated. Root canal morphology should be examined further during treatment through the evaluation of radiographs taken from different horizontal angles. Recent imaging technologies and the use of operating microscopes may be helpful in detecting variations of root canals.

Conclusion

Whereas C-shaped root canal morphotypes are classically reported in mandibular molars, the present case has demonstrated this configuration in a maxillary first molar.

Disclaimer

Whilst this article has been subjected to Editorial review, the opinions expressed, unless specifically indicated, are those of the author. The views expressed do not necessarily represent best practice, or the views of the IEJ Editorial Board, or of its affiliated Specialist Societies.

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