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Case Report

Management of a maxillary first molar with morphological aberration using spiral computed tomography

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This case report presents treatment of a maxillary first molar with an unusual morphology of only two roots and two canals unilaterally with the use of Spiral CT as a diagnostic tool.

Case report

A 33-year-old female patient with non contributory medical history was referred for endodontic treatment of maxillary right first molar (Tooth No. 16) by general practitioner. The clinical and radiographic examination revealed an endodontic access cavity prepared in 16 with temporary restoration (Fig. 1a).

Local anaesthesia containing 2% lidocaine with 1:80,000 adrenaline (Lignox 2% ADR, Warren, India) was administered and the tooth was isolated with rubber dam (Hygienic, Coltène Whaledent Inc, USA). Temporary access cavity material was removed and the endodontic access opening was redefined with cavity access set (Dentsply Maillefer, Ballaigues, Switzerland). Examination of the floor of the pulp chamber revealed a peculiar pattern of the dentinal map suggestive of only two root canal orifices, a buccal and palatal (Fig. 1b). No other orifice was found, even by exploration under the dental operating microscope (Seiler Revelation[®], Seiler Instruments, St Louis, Missouri, USA) under $\times 8$ magnification. Though IOPA findings were suggestive of two canals, it was unable to rule out the absence of third canal.

Introduction

Recognition of root canal morphology and its possible variations is essential for successful endodontic therapy and to obviate endodontic failures caused by iatrogenic mishaps.^{1,2} An intricate literature search indicate that maxillary first molars have a wide range of variations with respect to the number of roots and the canals in-situ.^{3–5} Intraoral periapical radiographs (IOPA), though a cardinal diagnostic tool for assessing the canal configuration, is inexact with its inherent limitations. Contemporary diagnostic methods such as cone beam computed tomography (CBCT) and computed tomography (CT) have emerged as a cogent tool for evaluation of root canal morphology and fill the diagnostic voids of an IOPA.^{2,6}

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Fig. 1 – (a) Pre-operative radiograph. (b) Intraoperative photograph showing buccal and palatal root canal orifices. (c), (d) and (e) CT scan showing axial sections of coronal, middle and apical third of the tooth respectively (arrow).

To authenticate the clinical finding, the patient was referred for spiral CT and scanning was performed using Dentascan (GE Healthcare, USA) software. The morphology of 16 was obtained in cross sections of 0.5 mm thickness. Axial evaluation at coronal, middle, and apical third confirmed two separate roots with single canals in each (Fig. 1c, d and e).

The working lengths of the canals were determined by a Root-ZX II apex locator (J. Morita, Tokyo, Japan) and were confirmed with a periapical radiograph. The two root canals were biomechanically prepared using Mtwo rotary instruments (VDW GmbH, Germany) well supplemented with 2.5% sodium hypochlorite solution and 17% ethylene diamine tetra-acetic acid (EDTA) alternatively between each

instrumented files. Calcium hydroxide (Metapex, Meta Biomed Co., Ltd.) was placed as an intracanal medicament for canal disinfection and the tooth was temporized.

The patient was recalled after a week. The canals were re-entered and irrigated to remove calcium hydroxide. 2% of chlorhexidine (Asep RC, Stedman Pharmaceuticals Pvt. Ltd) was used as final irrigant. The canals were dried with absorbent paper points (Dentsply Maillefer, Ballaigues, Switzerland), and obturated using cold lateral compaction of appropriate gutta-percha points (Fig. 2a and b) (Dentsply Maillefer, Ballaigues, Switzerland) along with AH Plus resin sealer (Dentsply Maillefer, Ballaigues, Switzerland). Six month review radiograph (Fig. 2c) showed no signs of periapical pathosis and the patient was asymptomatic.

Fig. 2 – (a) Intraoral periapical radiograph showing placement of appropriate mastercones. (b) Intraoral periapical radiograph showing completed obturation. (c) Intraoral periapical radiograph following six months review.

Discussion

Morphological variations in the root canal configuration of maxillary first molars are a topic of clinical interest that has been extensively documented in literature. Though some studies have reported six and more canals, expectation of fewer canals than the usual three or four canal configuration cannot be overlooked.^{1,2} Knowledge of root canal aberrations of fewer canals and roots can avoid iatrogenic mishaps like perforations, gauging and removal of the valuable cervical dentin in search of canals that can compromise the fracture resistance of the tooth.

The clinical phenomenon of maxillary first molar with two roots is uncommon and its documentation is least in literature. Clinical case studies have reported the percentage of 'fused buccal root' scenario in maxillary first molar to be as low as 0.4% and an *in vivo* study reported only three cases (0.5%) out of 538 teeth treated.^{5,6} On the contrary, an *in vitro* study concluded the occurrence of fused buccal roots to be 7.9% for maxillary first molars.⁷

Overlapping of anatomical structures and orientation errors of conventional two dimensional radiographs are overcome in contemporary imaging methods like CT and CBCT scanning. These contemporary diagnostic aids apart from increasing the possibilities of locating multiple canals, also aid in the diagnostic dilemma of fewer canals. They also have the additional provision of image reconstruction, analysis and alteration.^{8–10} The presented case report had used spiral CT

scan as an intraoperative diagnostic aid while studies by Rahimi et al¹¹ and Shakouie et al¹² had relied upon cognitive clinical and radiographic interpretations in managing two rooted maxillary first molar.

In the present case report, the morphological variation was unilaterally confined to the right maxillary first molar. The buccal and the palatal roots had single canal respectively at every level of cross section from the coronal to the apical third as observed in the axial section of the spiral CT scan. Spiral CT scan imaging also ruled out the possibility of additional canals in the buccal root. Moreover use of contemporary diagnostic aids like spiral CT scan in this case provided an insight into the anatomical aberration and intricacy of the root canal morphology preventing the possibility of iatrogenic mishaps.

Conclusion

The occurrence of 'two root scenario' in maxillary first molar is a rare clinical phenomenon with very low clinical incidence. This case report highlights the need for contemporary diagnostic aids along with dental operating microscope for successful endodontic therapy.

Conflicts of interest

All authors have none to declare.

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