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Case Report: Permanent Maxillary First Molar with Two Roots and Two Canals: A Rare Case Report

Ebadolah Tahmasebi[1], Seyed Mohammad Javad Aslani[1*], Tahereh AliAbadi[2]

[1]*Resident of Endodontic, Dept of Endodontics, Faculty of Dentistry, Zahedan University of Medical Sciences, Zahedan, Iran*

[2]*Assistant Professor, Dept. of Endodontics, Faculty of Dentistry, Zahedan University of Medical Sciences, Zahedan, Iran*

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ABSTRACT

Human maxillary first molars are usually considered as three-rooted teeth with four root canals for the presence of a second canal in the Mesio Buccal root (MB2). In addition, lateral ramifications and apical delta of the root canal system may frequently occur, increasing the probability of leaving untreated spaces after the root canal therapy.

A thorough knowledge of root canal morphology and good anticipation of their possible morphological variations may help to prevent iatrogenic errors and ensure success. The importance of the knowledge of the anatomy of root canals cannot be overemphasized. Unusual root and root canal morphologies associated with maxillary molars have been reported in several studies, in the literature. This clinical report presents a permanent maxillary first molar with an unusual morphology of two roots with two canals.

*** Corresponding Author:**
Seyed Mohammad Javad Aslani.
Address: Department of Endodontics, School of Dentistry, Zahedan University of Medical Sciences, Zahedan, Azadegan st, Khorramshahr Ave, Iran.
Tel: +98 9177179907
E-mail: Aslani.j1370@gmail.com

Introduction

Successful root canal treatment requires knowledge of the anatomy of the root and root canal.(1) However, anatomical variations can occur, which can complicate root canal treatment. Incomplete endodontic treatment is more likely to occur in teeth with such anatomical complexities, resulting in the failure of endodontic treatment.(2)

Maxillary first molars have the most complicated root and canal morphology of the maxillary dentition; therefore, their anatomy has been evaluated extensively in various studies.(3) There is a wide range of variations in the literature with respect to the number of canals in each root and the number of roots. It is now generally accepted that the most common form of maxillary first molar has three roots and four canals;(3) More than 95% of the maxillary first molars have three roots mesiobuccal, distobuccal, and palatal. The mesiobuccal root has the highest anatomical variability and has two or more canals in 56.8% of cases.(4) In contrast, the palatal root has the lowest variability, with a single canal in 99% and a single apical foramen in 98.8% of cases.(4,5) The incidence of two mesiobuccal canals has been reported to range from 18% to 96.1%.(6,8) Other variations for maxillary first molars include one (8), four (9), and five(10) roots and unusual morphology of root canal systems within individual roots. Cases with five (11) and six (12) root canals or with a C-shaped canal configuration(13) have also been reported earlier.

Two-rooted maxillary first molar with two canals has rarely been reported.(14)The fusion of two buccal roots is one of the most common aberrations of maxillary molars. A total of 0.4% of first maxillary molars and 2.2% of second maxillary molars have been reported to have this anomaly(15,16) Such an anatomic variation has been reported in a limited number of studies for second maxillary molar. The present case series reports three maxillary first molars with fusion of the two roots and two canals.(17)

Case Report

A 22-year-old female presented to the Department of Endodontics, Zahedan Faculty of Dentistry, with a chief complaint of spontaneous toothache in her maxillary left first molar(Figure1) for the previous two days.

Fig1: Preoperative periapical radiograph showing two roots i.e., buccal and palatal

Medical history was significant for moderate mental retardation since childhood. The tooth was sensitive to temperature variations and electric pulp test and tender to vertical percussion. The tooth was diagnosed with irreversible pulpitis with apical periodontitis. Local anesthesia was administered with 2% lidocaine and Epinephrine 1:80000 (DarouPakhsh, Tehran, Iran) and a rubber dam was placed. After removal of caries the pulp chamber was completely rinsed with normal saline. Exploration of the root canal orifices resulted in finding one buccal and one palatal orifice.

We suspected that the tooth had two roots, and because The root structure was not clearly demonstrated on P.A radiography, the patient was referred for small field of view Radiography. No extra orifice was found by further exploration and The morphology was confirmed by Cone-Bean Computed Tomography (CBCT) Scan(Figure 2,3).

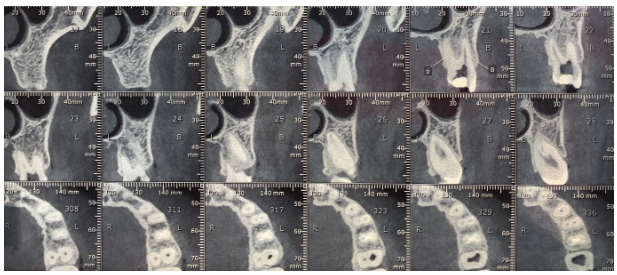

Fig2:Cbct image of first maxillary molar with two roots and two canals

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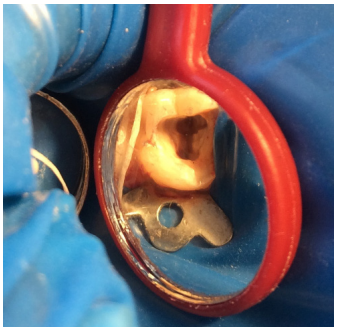

Fig3: Pulp chamber floor revealing two large orifices, buccal and palatal.

The diameter of the buccal orifice was larger than the typical mesiobuccal or distobuccal orifices in the maxillary first molar. The shape of access cavity was ovoid rather triangular or rhomboidal. Working length was determined with apex locator (Root ZX, J Morita Mfg. Corp., Japan) and confirmed radiographically. All canals were instrumented with stainless-steel hand k-files accompanied by Flex Master Introfile (VDW, Munich, Germany) rotary instrument for coronal flaring and then further prepared with RaCe rotary files (FKG; Dentaire, La-Chaux-de-Fonds, Switzerland) with 0.04 and 0.06 tapers to 1 mm short of the radiographic apex up to file #35 with 0.06 taper using the crown-down technique. Root canals were irrigated by sodium hypochlorite 5.25% and dried completely. Before root canal obturation, the working length was radiographically confirmed with gutta-percha (Figure 1D). Root canals were obturated with gutta-percha (Meta Biomed Co. Ltd, Cheongju city, Chungbuk, Korea) and AH26 (Dentsply, DeTrey, Konstanz, Germany) sealer using lateral condensation technique. Obturation quality was confirmed radiographically (Figure 4).

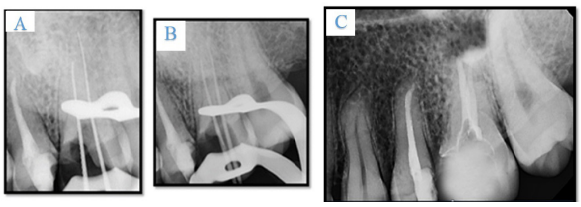

Fig 4:A) Working length determination; B) Master cone determination C)Post-operative radiograph after treatment

Discussion

The maxillary first molars are three rooted, two buccal and one palatal. The mesiobuccal root is broad in the buccopalatal plane and narrow in the mesiodistal plane, similar to a maxillary premolar root configuration. The root generally exits the crown mesially and can abruptly curve distally. The distobuccal root is the smallest and can vary in cross-section from round to oval with the narrow dimension oriented mesiodistally; it can curve mesially in the apical third. The palatal root is the bulkiest, oval, with the widest dimension oriented mesiodistally, and generally curves buccally in the apical third. The mesiobuccal root often curves distopalatally in the apical third of the root.The tooth usually has four root canals, the additional canal being located in the mesiobuccal root.(1,3) radiographs is imperative to ensure successful root canal preparation.However radiographs are two dimensional images of a three-dimensional object. The clinician must be aware of this limitation during radiographic interpretation.(18) Pécora et al. (1992) affirms that one of the main reasons for the failure of root canal therapy is the lack of sufficient knowledge concerning the anatomy of teeth, both internal and external.(19)

The development of technology has made it possible for computed tomography to be used in the diagnosis and evaluation of endodontic dental anatomy. Various methods have been used for the analysis of internal dental anatomy, such as sectioning, canal staining and tooth clearing techniques, as well as radiographic techniques such as conventional and contrast medium-enhanced radiography. Although tooth-clearing techniques have been generally considered the gold standard for the evaluation of root canal morphology, these techniques are in vitro methods that use only extracted teeth; the clinical methods used for analyzing the internal anatomy of teeth are X-rays and tomograms.(20)

Adequate knowledge and experience can improve the operator's ability to find additional canals (2) especially in the maxillary molars. Many studies have evaluated the root and canal morphology of the maxillary first molar

because this tooth often presents with complex morphology that often render treatment difficult.(2,3)The 2-rooted type of the maxillary first molar is rarely reported. Its incidence in the literature is 3.9%.(2)The fusion of the two buccal roots has the prevalence of 0.4% in maxillary first molars and 2.2% of second maxillary molars have been reported to have this variation .(16,17) Fava (2001) reported a case of maxillary first molar with two roots; two canals in the buccal root (Vertucci type IV) and one palatal root canal.(21) Nevertheless, presence of only one buccal root with one canal is extremely rare.(16)Presence of additional root canals has been reported and discussed by several authors, and a variety of study methods, including radiographs, magnification, clinical evaluations, dye injection, tooth sectioning, and scanning electron microscopy have been used for this purpose. Although the incidence of a maxillary first molar with two canal and even a single buccal root canal is not high, it is important to take these abnormalities into consideration during root canal therapy of maxillary molars in order to prevent accidents and ensure successful long-term outcome. We also accentuate the role of CBCT as an objective analytical tool to ascertain root canal morphology in unusual cases.

Root canal morphology should be examined further during treatment through the evaluation of radiographs taken from different horizontal angles. The use of a preoperative radiograph and additional radiographic views from a 20º mesial or distal aspect are good techniques to detect root canal morphology and anatomy.(15)

Due to the patient's mental problems, the patient's cooperation for taking radiographs during the treatment was very low and we did not expose the patient to extra exposure due to the principle of Alara.The patient's second left molar also had two canals and two roots. Due to the lack of caries in the upper right right tooth, according to the rules of medical ethics, no additional radiographs were obtained from the patient in that area, but it is recommended to examine this variation bilaterally in future studies.

Conclusion

Clinicians must have adequate knowledge about root canal morphology and its variations. The location and morphology of root canals should be evaluated by radiography before and during root canal treatment. Careful examination of radiographs and the internal anatomy of teeth are essential for successful treatment.

Acknowledgement

Conflict of Interest: 'None declared'

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