

# Maxillary First Molar with Two Root Canals

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## الرحى الأولى للفك العلوي ثنائية قنوات الجذور

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**المخلص:** معرفة التشريح الشكلي للرحى الأولى للفك العلوي تعتبر من أساسيات نجاح علاج لب الأسنان. لقد تم عرض التشريح الشكلي للرحى الأولى للفك العلوي بكثرة، غير أن احتواء هذه الرحى على قناتين بالجذر نادرا ما يتم ذكره في الدراسات التشريحية لقنوات جذور الأسنان. نعرض هنا حالة لمريض عنده رحي أولى بالفك العلوي ثنائية قنوات الجذر تم تحويلها إلى قسم علاج لب الأسنان بجامعة تبريز للعلوم الطبية بإيران.

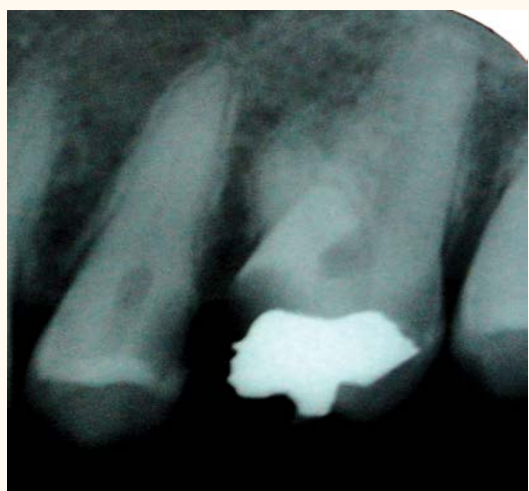
**مفتاح الكلمات:** جوف اللب السني، شذوذ، عظم الفك العلوي، علاج لب الأسنان، تقرير حالة، إيران.

**ABSTRACT:** Knowledge regarding the anatomic morphology of maxillary molars is absolutely essential for the success of endodontic treatment. The morphology of the permanent maxillary first molar has been reviewed extensively; however, the presence of two canals in a two-rooted maxillary first molar has rarely been reported in studies describing tooth and root canal anatomies. This case report presents a patient with a maxillary first molar with two roots and two root canals, who was referred to the Department of Endodontics, Tabriz University of Medical Sciences, Iran.

**Keywords:** Dental Pulp Cavity, abnormalities; Maxillary Bone; Root Canal Therapy; Case report; Iran.

**T**HOROUGH CLEANING, SHAPING AND the obturation of the entire root canal system are essential steps for successful endodontic treatment. Consequently, a thorough knowledge of root canal morphology and a good anticipation of their possible morphologic variation will help to reduce endodontic failure. Unusual root and root canal morphologies associated with molars have been recorded in several studies in the literature.<sup>1,2</sup> Maxillary first molars have the most complex root and canal morphology in the maxillary dentition; therefore, their anatomy has been studied extensively and there is a wide range of variation in the literature with respect to the number of roots and the number of canals in each root.<sup>2-13</sup> It is now generally accepted that the most common form of maxillary first molar has three roots and four canals.<sup>4</sup> The wide buccolingual dimension of the mesiobuccal root, and the associated concavities on its mesial and distal surfaces, are consistent with the majority of mesiobuccal roots having two canals, whereas there is usually a single canal in each of the distobuccal and palatal roots.<sup>5,6</sup> The incidence of

two mesiobuccal canals has been reported to range from 18–96.1%.<sup>3,4</sup> Other variations include one, four, and five canals, and an unusual morphology of root canal systems within the individual roots.<sup>4,6,11</sup> Cases with five and six root canals, or with a C-shaped canal configuration,<sup>7-8</sup> have also been reported. Martínez-Berna and Ruiz-Badanelli reported 3 cases in which the maxillary first molars had six root canals (three in the mesiobuccal, two in the distobuccal, and one in the palatine roots).<sup>9</sup> Palatal root canal variations were well-established by some case reports.<sup>5,10</sup> However, the presence of two canals in a two-rooted maxillary first molar has rarely been reported in studies describing tooth and root canal anatomy.<sup>10</sup> Such an anatomic variation has been reported in a limited number of previous studies in relation to the second maxillary molar; however, the present report documents the case in relation to the first maxillary molar, which is much less common.<sup>10,11</sup>



**Figure 1:** The initial radiograph showing the two-rooted maxillary first molar.

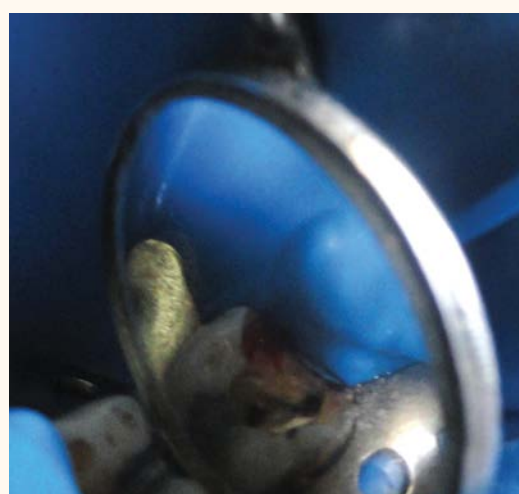
## Case report

A 35-year-old female patient with no history of systemic disease was referred to the Department of Endodontics of the Tabriz University of Medical Sciences in Iran. The patient's chief complaint was of severe spontaneous pain in the right maxillary first molar. After obtaining informed consent from the patient, pulpal and periapical tests were done. The vitality tests performed showed a severe response to cold and heat, and the electrical pulpal test similarly showed a severe response. The response of the tooth to percussion and palpation was within normal limits. The initial radiographic evaluation showed the presence of occlusal amalgam fillings and recurrent caries on the mesial surface, as well as a two-rooted maxillary first molar [Figure 1]. It should be noted that the left maxillary first molar had the same root canal anatomy [Figure 2]. The pre-treatment diagnosis for the pulpal condition was of symptomatic irreversible pulpitis, and for a periapical condition within normal limits. Local anaesthesia was administered with 2% lidocaine and 1:80000 adrenaline, and a rubber dam was placed. After the removal of the caries, the roof of the pulp chamber was removed completely and rinsed with a normal saline solution. One orifice was found in the buccal aspect; it had a large diameter compared to the typical buccal orifices in maxillary first molars. Subsequently, the other orifice was found in the palatal aspect [Figure 3]. No other orifice was found, even by exploration at  $\times 4.5$  magnification using a prismatic loupe (Zeiss Eyemag Pro S<sup>®</sup>. Carl Zeiss Meditec, Arese,



**Figure 2:** The left maxillary first molar with the same root canal anatomy.

Italy) and under the dental operating microscope (Seiler Revelation<sup>®</sup>, Seiler Instruments, St Louis, Missouri, USA). This morphology was confirmed by radiographic examination of the molar with K-Files #30 (DENTSPLY Maillefer, Ballaigues, Switzerland) in both canals [Figure 4]. The root canals were explored with a K-Flexofile ISO 20 (DENTSPLY Maillefer, Ballaigues, Switzerland). The lengths of the canals were determined by a Root-ZX II apex locator (Morita, Tokyo, Japan) and were confirmed with a periapical radiograph. The canals were then further prepared with Race rotary files (FKG Dentaire, La-Chaux-de-Fonds, Switzerland) with 0.04 and 0.06 tapers up to 1 mm short of the radiographic apex to #35 with a 0.06 taper using the crown-down technique. During root canal preparation, irrigation was performed using a normal saline solution, 2.5% sodium hypochlorite solution, and 17% ethylenediaminetetraacetic acid (EDTA). The canals were dried with absorbent



**Figure 3:** Two orifices in the floor of the pulp chamber, in the palatal aspect.



**Figure 4:** Radiographic examination with files revealed two root canals.



**Figure 5:** Obturated root canals.

paper points (DENTSPLY Maillefer, Ballaigues, Switzerland), and obturated using cold lateral compaction of gutta-percha points (DENTSPLY Maillefer, Ballaigues, Switzerland) and AH26<sup>®</sup> resin sealer (DENTSPLY Maillefer, Ballaigues, Switzerland). Postoperative radiography was used to evaluate the obturation quality [Figure 5]. The access cavity was then sealed with a temporary restorative material. The patient was referred to the Department of Operative Dentistry for restorative treatment.

## Discussion

The root and root canal morphology of teeth varies greatly in the reported literature. Prior knowledge of root and canal anatomy facilitates the precise detection of all root canals in a tooth during endodontic treatment. It has been shown that the total number of canals found and endodontically treated does not correspond to the number of canals actually existing in a tooth. The detection of root canals becomes difficult as a result of various factors.<sup>4,7,10</sup> It is therefore important that we understand the variables that have a direct influence on the detection and treatment of root canals. Many studies have evaluated the root canal morphology of the maxillary first molar, because this tooth presents a complex morphology that often renders treatment difficult.<sup>3,4,6</sup> The presence of additional root canals has been reported and discussed by several authors using a variety of study methods, including radiography, magnification,

clinical evaluation, dye injection, tooth sectioning, and scanning electron microscopy. Cone-beam computed tomography (CBCT) scans have attracted a lot of notice in the field of dentistry as a diagnostic and treatment-planning tool. Thus far, the chief use of CBCT has been in planning the placement of dental implants,<sup>13</sup> but many other possibilities exist and are being explored. The different applications of CBCT in endodontics include the assessment of non-endodontic or endodontic pathosis, internal and external resorption analysis, pre-surgical planning and canal morphology.<sup>14,15</sup>

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.<sup>4</sup>

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 20° mesial or distal aspect are good techniques to detect root canal morphology and anatomy.<sup>3,4</sup>

## Conclusion

Adequate knowledge of the morphology of the root canal system and its variations is essential for optimal endodontic treatment. The use of high-quality radiographs, with careful examination under magnification, is helpful so as to perform successful root canal therapy.

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