

Maxillary First Molar with Three Mesio Buccal Root Canals: A Case Report

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Abstract. A case report to present the endodontic management, and the follow up of a maxillary first molar with three mesio buccal canals with separate orifices and apical foramina (Vertucci Type VIII). Root canal treatment was provided, final restoration was accomplished and reevaluation was performed. The results of this case report revealed a successful endodontic treatment, and that treating extra canals in maxillary first molars is challenging due to the difficulty in locating and managing it. This often leads to endodontic failures due to the residual bacteria that are present inside the missed canals. Complete clinical and radiographic examination and a thorough knowledge of the morphology of teeth are necessary for successful clinical results.

Keywords: Maxillary first molar, Mesio buccal root, three canals in MB root.

Introduction

Knowledge of the internal dental morphology is essential for planning and performing a successful root canal treatment. The anatomical variations that exist in the root canal system may contribute to the failure of root canal therapy. The morphology and the anatomy of the maxillary first molar have been extensively reviewed in the literature; revealing that this tooth may present a great variety of anatomical configurations^[1].

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Accepted for publication: 21 January 2012. Received: 28 October 2011.

Cohen and Burns^[2] described this tooth as “the most treated, but least understood posterior tooth with the highest endodontic failure rate”. Weine *et al.*^[3] reported that many treatment failures in the maxillary permanent first molar were related to the inability to locate and clean the mesiopalatal canal. Wolcott *et al.*^[4], examined 1,873 conventionally treated and retreated maxillary molars over a 2-yr period by five endodontists. They noted a significant difference in the incidence of mesiopalatal canals located during initial treatments and retreatments. They concluded that failure to locate and treat mesiopalatal canals decreased the long-term prognosis of endodontic therapy in maxillary molars.

Most of the scientific reports discussed the frequency of two root canals in the mesiobuccal (MB) root. *In vitro* studies are slightly more likely to report two canals in the maxillary first molar than *in vivo* clinical studies^[5]. However, the incidence appears to increase to 93% with the more routine use of the surgical operating microscope and specific instruments adapted for microendodontics during the modified endodontic access opening procedure^[3,5,6]. A variety of methods have been suggested in the literature to aid in locating mesiopalatal canals. Neaverth *et al.*^[7] advocated using a heart-shaped access, and countersinking the floor of the pulp chamber palatal and mesial to the mesiobuccal canal with a round bur. Pomeranz and Fishelberg^[8] discussed the importance of an improved access and by thoroughly probing the fissure or groove between the MB, and the palatal canals to locate the mesiopalatal canal. Weller and Hartwell^[9] confirmed the need for improved access in their *in vivo* radiographic retrospective study of 835 first permanent molars. They found more than doubled the detection rate of mesiopalatal canals located from a similar previous study^[10]. This was achieved by utilizing a rhomboidal to cuboidal access, and probing the groove or fissure between the MB and palatal canals. Although the third MB canal was located in several *in vitro* studies^[8,16-19], to date, there seems to be very few of previous reports describing, locating and obturating it in the literature^[20-26] (Table 1). However, this case report seems to be the first to show the successful endodontic treatment of three completely independent canals with separate orifices and apical foramina (Vertucci Type VIII). The purpose of this article is to report the successful identification and obturation of a third canal in the MB root of

a permanent maxillary first molar, and provide a four year recall showing a successful treatment.

Table 1. List of reported cases of maxillary first molar with three mesio buccal canals showing the numbers of canals in each root and their configuration.

Authors	Year	Canal Configuration		
		MB	DB	P
Pomeranz and Fishelberg ^[8]	1974	3MBs	1DB	1P
Martinez-Berna and Ruiz-Badanelli ^[20]	1983	3MBs	2DBj	1P
Beatty ^[21]	1984	3MBs	1DB	1P
Ferguson <i>et al.</i> ^[22]	2005	3MBj	1DB	1P
Favieri <i>et al.</i> ^[23]	2006	3MBj	1DB	1P
Adanir ^[24]	2007	3MBj	1DB	2P
Ibrahim ^[25]	2009	3MBj	1DB	1P
Garg <i>et al.</i> ^[26]	2010	3MBj	1DB	1P
Present study	2011	3MBs	1DB	1P

s: separate canals with separate foramina, *j*: separate canals which are joined apically.

Case Report

A 33-years-old Yemeni female was referred to the dental clinics at King Abdulaziz University (Jeddah, Saudi Arabia) for a root canal treatment of her right maxillary first molar. The tooth was an abutment of an old failed bridge that needed to be replaced. The patient's medical history was non-contributory. The tooth was asymptomatic and clinical examination revealed that the tooth had deep recurrent caries occlusally and cervically. The tooth gave a negative response to sensitivity testing (cold and EPT) and both percussion and palpation. Radiographic investigation revealed an apical radiolucency related to the buccal roots (Fig. 1). Hence, a diagnosis of necrotic pulp with asymptomatic apical periodontitis was made. Root canal therapy was initiated under local anesthesia and rubber dam isolation. Then, a trapezoidal shaped access opening was obtained. On careful inspection of the floor of the pulp chamber, the three main canals, mesio buccal (MB), disto buccal (DB), and palatal (P), were located. Upon looking for the second mesio buccal (MB2) canal, a soft and sticky area was located in the middle between MB and P canals, which was located some distance away from the usual MB2 orifice's location, almost half the way between MB and P orifices (Fig. 2). Another very small sticky area was also located after thoroughly probing of the fissure between the MB and P canals with an endodontic explorer (Alfred Becht GMBH, Offenburg, Germany). However, several

attempts to introduce a file were unsuccessful. After troughing the fissure with an ultrasonic tip (SybronEndo, Orange, CA USA), a file was successfully placed into the groove area. A radiograph was taken to confirm the presence of three canals in the MB root (Fig. 3). Both MB2



Fig. 1. Preoperative radiograph showing a right maxillary first molar an apical radiolucency related to the buccal roots.

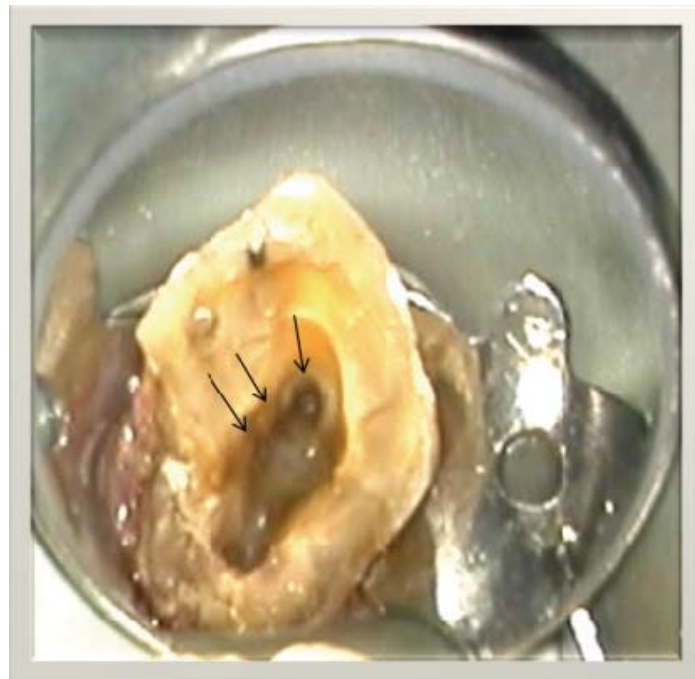


Fig. 2. A clinical photograph showing the location of the three MB orifices. Notice the far location of the MB3 orifice.

and MB3 were very narrow and hard to negotiate. K-files #8 & #10 (Thomas, France) were used for the negotiation followed by the determination of the working length for all canals using radiographs according to parallel technique. The three MB canals were distinct canals having three separate orifices and foramina (Vertucci type VIII). Coronal flaring was carried out by using Gates-Glidden burs numbers 3 and 2 (Mani, Inc., Tochigi, Japan). Cleaning and shaping was done using conventional hand instruments (K-file) (Thomas, France) to an apical size of 30 for the three MB canals, and size 40 for the DB and P canals using crown down technique (Fig. 4). 5% sodium hypochlorite was used for irrigation through the whole procedure. All five root canals were obturated with AH 26 (DENTSPLY Inter., York, PA USA) and laterally condensed to a none standardize medium fine gutta-percha cones (Spident Co., Ltd., Namdong-gu Namdong-gu Incheon, Korea) using finger spreaders size 3 and 4. Final radiographs with different angulations were taken to establish the quality of the obturation (Fig. 5). After completion of root canal treatment, the tooth was filled with IRM temporary filling material (DENTSPLY Inter., York, PA USA) and referred immediately for final restoration. A fiber post (Coltène/Whaledent AG, Altstätten, Switzerland) in the palatal root was placed and porcelain fused to a metal crown was cemented. The patient failed to come for recall visits, but finally showed up after four years. The tooth was asymptomatic and showed evidence of healing of the periapical radiolucency indicating successful endodontic treatment (Fig. 6).

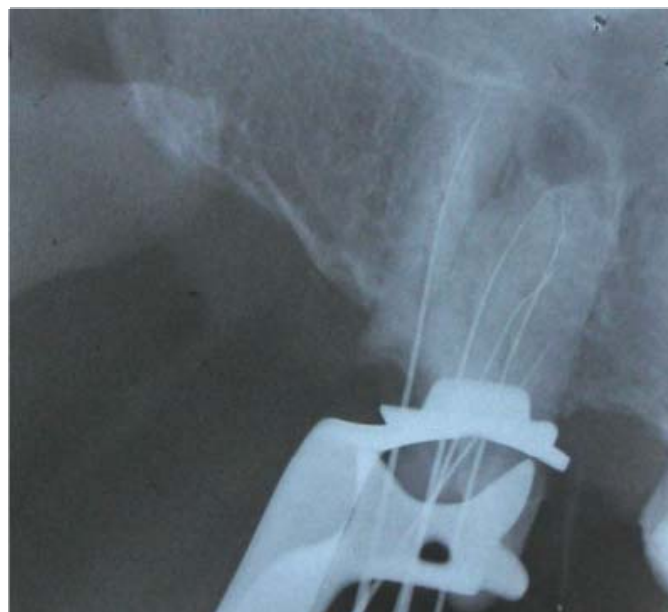


Fig. 3. A radiograph confirming the presence of three canals in the MB root.

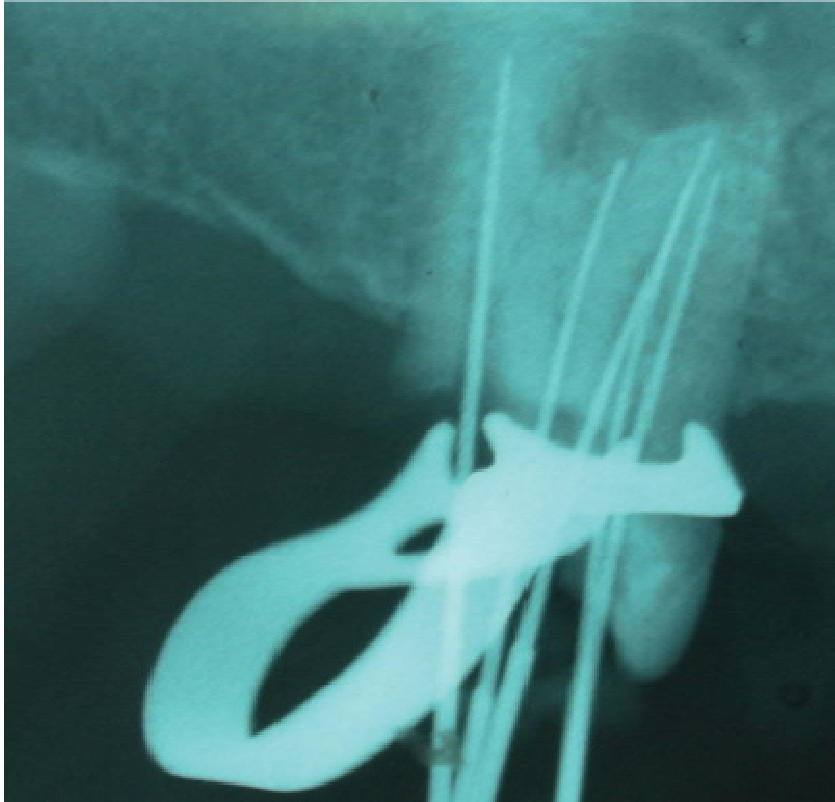


Fig. 4. Master file radiograph.

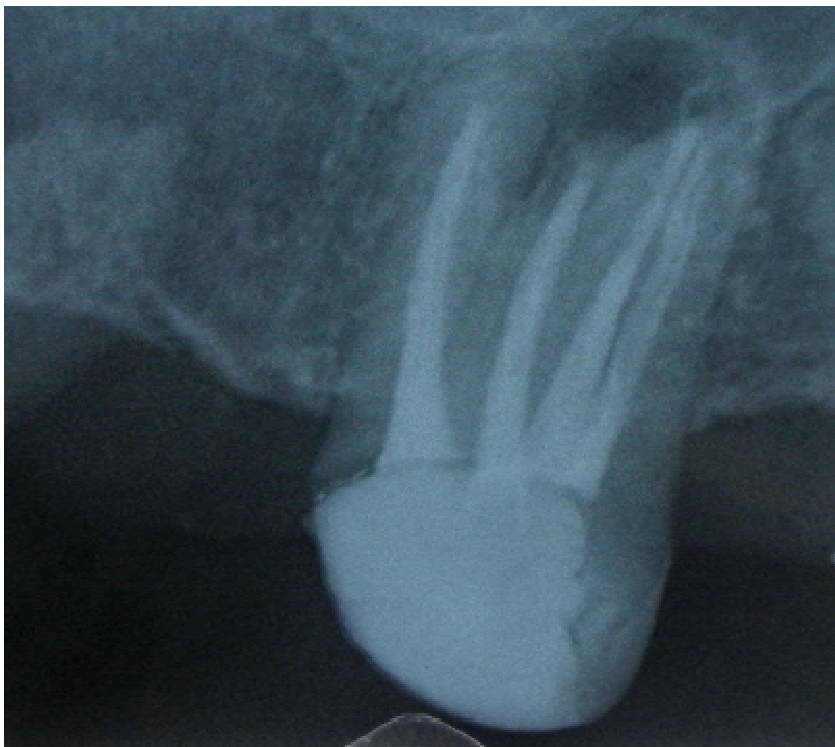


Fig. 5. Post obturation radiograph showing three distinct MB canals (Vertucci class VIII).

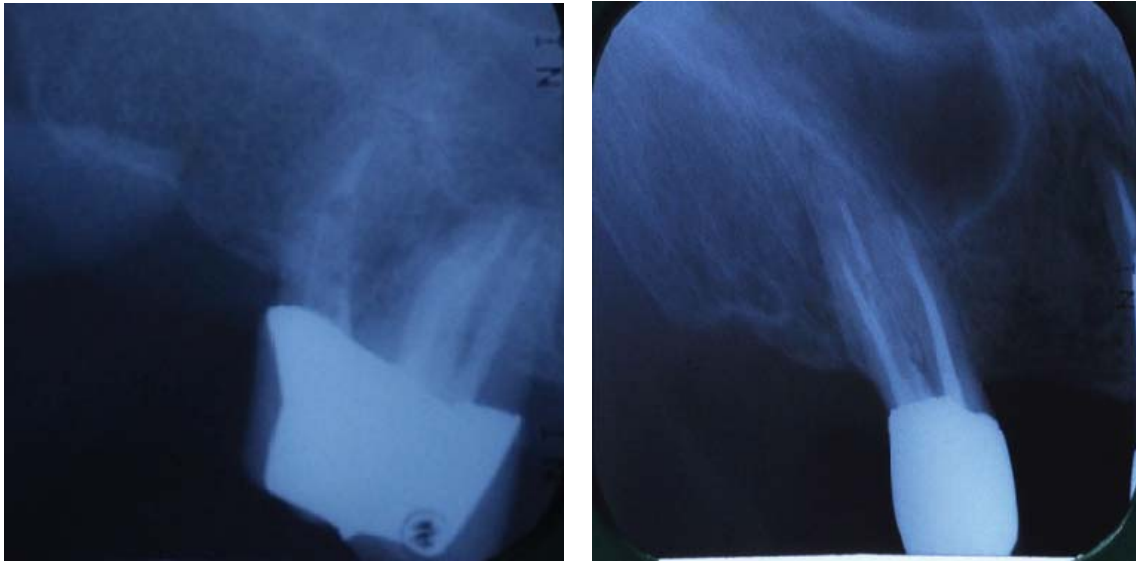


Fig. 6. Follow-up radiographs.

Discussion

Anatomical variations are not uncommon in molar teeth. Most of these variations in the maxillary molars are related to the number of root canals in the MB root^[3,5,6]. Knowledge of possible anatomic variations is basic for the planning of appropriate endodontic treatment. There have been numerous reports in the literature on the prevalence of MB2 canals in the permanent maxillary first molar^[10,11]. However, the third MB canal, to date, has seldom been reported. The third canal reported in this article was located without the aid of the surgical operating microscope. Undeniably, endodontists should continue to suspect the existence of additional canals until confirming that all measures have been ruled out in locating them. This is noteworthy, and seems to agree with Sempira and Hartwell^[12]. They evaluated whether a surgical operating microscope would increase the number of MB2 canals that could be located and obturated to within 4 mm of the root apex *in vivo*. They reported that the use of a surgical microscope did not increase the number of MB2 canals located, compared with those reports where access preparations were modified and the microscope was not used. However, other *in vivo* and *in vitro* studies reported that magnification did aid in the identification and negotiation of MB2 canals^[6,13-15].

The internal canal morphology of the mesiobuccal root of the maxillary first molar was assessed in several clinical and laboratory studies^[5]. A single apical foramen was found 61.6% - 86% of the times,

while two separate apical foramina were present 14% - 38.3% of the time depending on the methodology^[5]. The two-canal system of the mesiobuccal root of the maxillary first molar has a single apical foramen, roughly twice as often as the two-canal and two-foramen morphology, in weighted studies^[5]. Few studies reported the configuration of the three canals in the MB root and how they exited (Table 1). Few studies also reported three separate canals in the MB root^[8,20,21]. The majority of the studies had one completely separate canal which was the MB1, and the other two (MB2 and MB3) had two openings and one foramen^[16,22-26]. In this case-report, the MB root of the maxillary first molar presented with three separate independent canals. The three canals were separate all the way to the apical foramina (Vertucci type VIII).

Conclusion

The incidence of root and canal variations seems to be high. The dental practitioners must exert every effort to find and treat all canals for a successful clinical result. They should suspect the presence of additional canals in each root when performing endodontic therapy on the maxillary first molar until they are satisfied that all measures have been exhausted in locating them.

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تقرير حالة لثلاث قنوات في جذر الشدق الإنسي للضرس الأول من الفك العلوي

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المستخلص. كان الغرض من هذه الدراسة عرض العلاج والمتابعة اللبية لحالة الرحى الأولى من الفك العلوي للجذر الإنسي شذقي ذو القنوات الثلاثة المنفصلة من الفتحات إلى النقب القمي (النوع الثامن من فرتوشي). ولقد قدم العلاج اللبي، وأنجز الترميم النهائي وأجريت إعادة التقييم. كشفت نتائج الدراسة نجاح العلاج اللبي. فقد تبين أن علاج قنوات إضافية في أضرار الفك العلوي يمثل تحدياً لإمكانية عدم القدرة على العثور على هذه القنوات الجذرية وبالتالي على علاج مناسب. هذا غالباً ما يؤدي إلى فشل العلاج اللبي نتيجة لوجود بكتيريا في القنوات الجذرية المفقودة. إن استكمال الفحص السريري والإشعاعي والمعرفة الوافية لمورفولوجي هذه الأسنان أمر ضروري لتحقيق نتائج سريرية ناجحة.