



## A Maxillary Second Premolar with Four Canals: A Case Report

Kasra Karamifar <sup>a,b\*</sup> , Afsoon Tondari <sup>c</sup> 

<sup>a</sup> Sector of Angiogenesis Regenerative Medicine, Dr. Hajar Afsar Lajevardi Research Cluster (DHAL), Hackensack, NJ, USA; <sup>b</sup> Oral and Dental Disease Research Center, School of Dentistry, Shiraz University of Medical Sciences, Shiraz, Iran; <sup>c</sup> Department of Restorative Dentistry, Shiraz Azad University, Shiraz, Iran

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\*Corresponding author: Kasra Karamifar, Ghasrodasht St., Dental School, Shiraz University of Medical Sciences, Shiraz, Iran.

E-mail: kasra.karamifar@gmail.com



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### ABSTRACT

Profound knowledge of the internal anatomy and configuration of the teeth plays a pivotal role in the success of standard root canal treatment. The presence of unexpected extra root canals has been reported in all the teeth, making root canal treatment a challenge for every clinician. Although the maxillary second premolar is no exception to this rule, the presence of a variety of multiple canals is relatively rare. In fact, the presence of three separate root canals has been reported in only 1-6% of cases. A 33-year-old male was referred for root canal retreatment of his left maxillary second premolar. An intraoral periapical radiograph revealed previous substandard endodontic treatment. Retreatment was performed under an operating microscope, and four root canals were found, which is, in fact, very rare. This case highlights another variation in the morphology of such teeth and it does highlight the importance of using magnification, especially an operating microscope in endodontic treatment.

**Keywords:** Anatomical Variations; Dental Operating Microscope; Maxillary Second Premolar

### Introduction

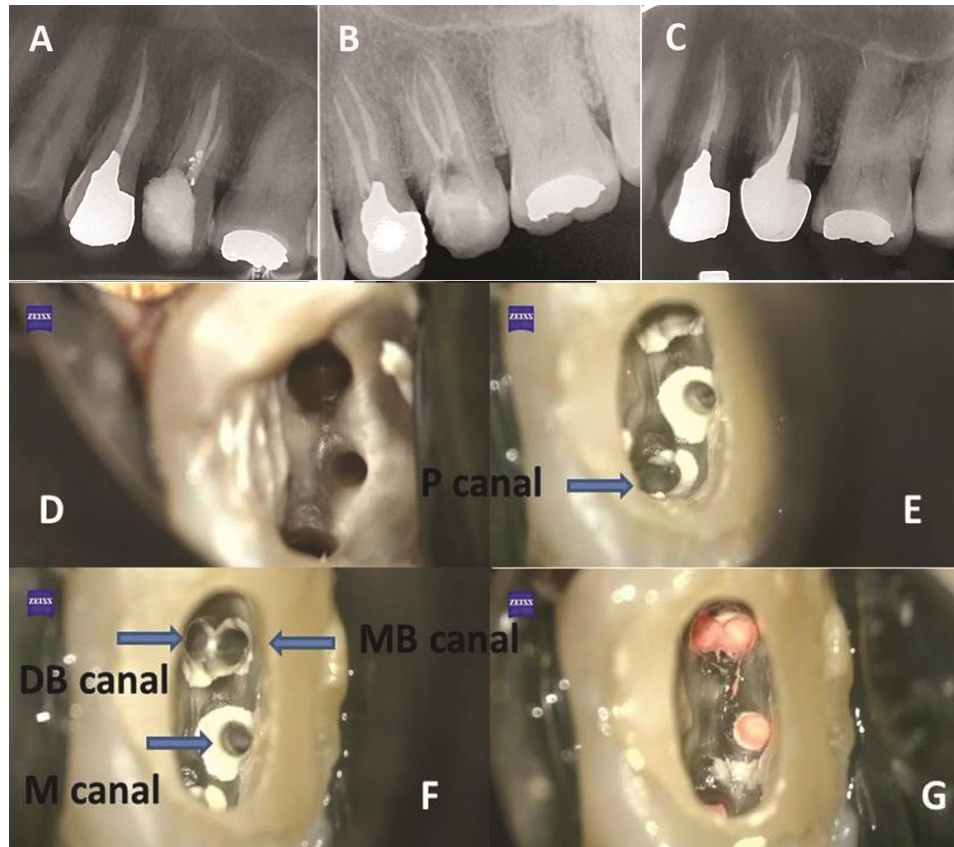
Thorough knowledge of the internal anatomy of the teeth is the first step in root canal treatment [1-3]. As a matter of fact, anatomic variations in the teeth can challenge the clinician before undertaking the root canal treatment procedure, necessitating the detection of anatomical variations [4, 5] to render successful root canal treatment [6]. Although maxillary premolars usually have two root canals, the prevalence of three distinct root canals has been reported to be 1-6% [7-9]. To the best of our knowledge, only two cases of maxillary premolars with four root canals have been reported in the literature to date [10, 11]. Several methods such as conventional radiography, cone-beam computed tomography (CBCT), and magnification [8, 10, 11] have been used to detect any varied morphologies.

This case report presents the endodontic treatment of a maxillary left second premolar with four separate root canals and roots: one mesiobuccal (MB), one distobuccal (DB), one mesial (M), and one palatal (P) root canal with the help of an operating microscope.

### Case Report

A 33-year-old male patient was referred by a general dentist for endodontic retreatment due to a complaint of pain on mastication in his maxillary left second premolar and since the previous root canal treatment of the tooth performed by the general dentist a few years ago seemed to be inadequate for crown placement. The patient's medical history was noncontributory. No swelling, sinus tracts, or lymphadenopathy was evident on extraoral and intraoral examinations. Normal mobility, periodontal probing, horizontal bone height, and density were recorded. The referring dentist had made a temporary filling and the tooth was not in occlusion and the cusps were reduced previously.

Periapical radiograph showed that the maxillary left second premolar had substandard obturated root canals with a temporary filling placed by the referring dentist and that there were early signs of loss of lamina dura (Figure 1A). Pulp sensibility tests were negative, consisting of the cold test (Denronic, Aeronova GmbH & Co. KG, Germany) and electrical pulp test (EPT)



**Figure 1.** A) Preoperative radiograph shows the presence of a temporary restoration and underprepared and poorly obturated root canals with early signs of loss of lamina dura; B) The final radiograph shows the obturated root canals; C) The follow-up radiograph after 12 months shows healthy periapical tissues; D) Prepared canals before obturation; E, F) Four canals before obturation after sealer placement in the canals can be seen vividly; G) Obturation of the 4 canals was done

(Parkell Electronics Division, Farmingdale, NY, USA). The patient reported only a slight sensitivity to percussion during examinations. The diagnosis made was chronic apical periodontitis. Nonsurgical endodontic retreatment was recommended. The patient signed an informed consent form. Anesthesia was achieved by the administration of buccal infiltration with 1.8 mL of 2% lidocaine and 1:100000 epinephrine (Persocaine-E, Darou Pakhsh, Tehran, Iran). The tooth was isolated with a rubber dam (Sanctuary Dental Dam Systems, Ipoh, Malaysia), and the access cavity was prepared. The initial penetration of the pretreated root canals was performed with a #2 Gates–Glidden drill (Mani, Nakaakusu, Japan). The presence of developmental grooves on the pulp chamber floor helped raise suspicions about the presence of an extra root canal. Increasing the magnification up to 21.25× and careful examination of the pulp chamber floor revealed the presence of a mesial root canal under a dental operating microscope (Zeiss, Opmi Pico, Carl Zeiss,

Oberkochen, Germany). After obturation of the buccal root canal, the presence of another buccally-oriented root canal was suspected. The root canals were negotiated with a #12 C-file (VDW GmbH, Munich, Germany). The working lengths were determined using an electronic apex locator (EAL) (Dentaport ZX, J. Morita Corporation, Tokyo, Japan). The root canals were initially prepared with a #20/0.02 RaCe file (FKG Dentaire, La Chaux-de-Fonds, Switzerland). Four root canals (MB, DB, M, and P) were prepared with XP-Endo Shaper (FKG Dentaire, La Chaux-de-Fonds, Switzerland). Calcium hydroxide was placed in the root canals as inter-appointment dressing. The tooth was restored temporarily with glass ionomer (Fuji II LC, GC Corporation, Tokyo, Japan). At the second appointment, seven days later, the patient was asymptomatic. A rubber dam was placed, and a part of the temporary restoration was removed; then, the root canals were irrigated again with 2.5% Sodium Hypochlorite using 30-gauge side-vented Endotop irrigation needles (Endo-

Top; PPH CerKamed, Stalowa Wola, Poland). The working lengths were determined again with the help of an EAL. The root canals were prepared and enlarged up to #35.04 RaCe file (FKG Dentaire, La Chaux-de-Fonds, Switzerland). In order to remove the smear layer, 17% ethylenediaminetetraacetic acid (EDTA) (Meta-Biomed Co. Ltd, Chungcheongbuk-do, Korea) was used for one min and was activated with XP-Endo Finisher (FKG Dentaire, La Chaux-de-Fonds, Switzerland). Normal saline solution was used as the final irrigation solution. The root canals were dried with sterile paper points and obturated with gutta-percha and AH-Plus sealer (Dentsply DeTrey GmbH, Konstanz, Germany) using the lateral condensation technique. A temporary restoration was placed, and a final radiograph was taken. The patient was referred back for a permanent restoration. After 12 months, the patient was recalled for a follow-up visit; the tooth was free of any symptoms and completely functional (Figure 1B to 1G).

## Discussion

This case report described a maxillary second premolar with four root canals: one MB, one DB, one M, and one P root canal. Although this is the third reported case of maxillary second premolar with four root canals thus far in the literature, it is unique in some aspects in terms of morphology, making it totally different from the previous two cases [10, 11]. The tooth had four separate canals and roots, while the previous cases had three roots, and this shows another morphology variation in these teeth. The treatment of these complex cases can be extremely challenging, especially in terms of locating and negotiating the root canals. Careful examination of the pulpal floor under magnification and proper light, and careful evaluation of preoperative radiographs can be helpful.

Radiographic evaluation can be considered as the second eye in the diagnosis and treatment planning. Although conventional radiographs are widely used, they offer a limited amount of information. In fact, CBCT offers more detailed information for a better understanding of the internal anatomic variations of teeth [12-14]. However, it should be taken into consideration that the exposure of patients to radiation should be minimized [15], and this can be achieved through other methods, such as using magnification, especially with a dental operating microscope [16].

Magnification with loupes or dental microscopes helps identify extra root canals or hidden orifices, trace the cracks or fracture lines, remove root canal obstructions, refine the access cavity preparation procedures, and, in all aspects of

endodontic microsurgery, avoid unnecessary patients' exposure to radiation [17]. Operating microscopes can provide various ranges of magnification with adequate light if needed in treating complicated cases.

XP-Endo Finisher has been effective in removing gutta-percha remnants from the root canal walls [18, 19]. Therefore, a combination of XP-Endo Shaper and Finisher was used in preparing the root canals to minimize the stresses exerted on the root canal walls and, at the same time, achieve the maximum level of cleanliness as the roots of this tooth type are expected to be tiny [19, 20].

Although the success rate of single *versus* two-visit treatment has been reported to be similar [21], there is a chance of higher healing rate in teeth with apical periodontitis when calcium hydroxide is used as inter-appointment dressing and as an intracanal medicament [22]. Therefore, two-visit treatment was selected.

This article provided useful clinical information for performing endodontic therapy in a case with complex internal anatomy with the help of a dental microscope under high magnification and intense light, which contributes to revealing another complex internal anatomy variation in maxillary second premolars.

## Conclusion

The clinical significance of this case is that it is the third report of a maxillary second premolar with four root canals and the first case with four roots. Therefore, it is important that more attention be paid to the internal anatomy of the tooth in clinical work. The use of a dental operating microscope seems an indispensable adjunct to the endodontic armamentarium in the management of complex cases.

Conflict of Interest: 'None declared'.

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