

Endodontic Treatment of Radiculous Maxillary Premolars: Two Case Reports

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Abstract

Maxillary premolars have highly variable root canal morphology, but the possibility of three canals, especially in the second premolar, is quite low; however, it must be considered in clinical and radiographic evaluations during endodontic treatment. These case reports describe the diagnosis and successful clinical management of two patients with three-rooted maxillary first and second premolars.

Keywords: Anatomical variations, maxillary premolar, root anatomy.

Introduction

Maxillary premolars may have one, two, or three roots and canals (1). The majority of anatomical studies found that the most common form of the maxillary first premolar is the two-rooted form. All of the anatomical studies found that the most common form of the maxillary second premolar is a single root (2).

Successful endodontic therapy is dependent on the cleaning, shaping and obturation of the entire root canal system. Therefore, successful root canal therapy requires a thorough knowledge of tooth anatomy and root canal morphology, which may be quite variable within the norm (2).

Although three-rooted maxillary premolars are rare, the possibility of extra-roots or canals should be considered to ensure successful endodontic treatment.

Different studies have been done about the anatomy of maxillary premolars in different races that have reported different

estimated incidence about three-rooted maxillary premolars (Tables 1 and 2).

In this manuscript, two cases of maxillary first and second premolars are presented.

Case reports

Case 1

A 32-year-old male presented at the dental clinic of the Faculty of Dentistry, Mashhad University of Medical Sciences, Mashhad, Iran, because of spontaneous pain in maxillary left first premolar.

The pulp had been exposed by a deep carious lesion and tooth had spontaneous pain and pain during chewing.

Diagnostic tests showed that tooth was not sensitive to electric pulp testing (Vitality Scanner, Analytic Technology, Glendora, CA, USA), cold (ice stick), heat (hot burnisher), and palpation. The tooth had moderate pain on percussion.

Radiographic findings were consistent of periapical radiolucency and carious lesion on the distal surface (Fig. 1), so periodontal status was diagnosed as "chronic apical periodontitis" and pulpal status as "necrosis".

The tooth was isolated with rubber dam and the coronal access was prepared. After

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Table 1: Studies of Apical Canal Configurations for the Maxillary First Premolar

Authors	One canal (%)	Two canals (buccal and palatal) (%)	Three canals (two buccal, one palatal) (%)	Race
Pineda and kuttler (3)	50.1	49.4	0.5	Spanish
Carns and skidmore (4)	22	72	6	American (Morgantown)
Vertucci (5)	26	69	5	American (Florida)
Walker (6)	36	64	0	Chinese
Pecora et al (7)	17.1	80.4	2.5	Brazilian (São Paulo)
Caliskan et al (8)	9.8	90.2	0	Turkish (Izmir)
Kartal et al (9)	9.7	88.6	1.7	Turkish (Istanbul)
Soares and Leonardo (10)	–	–	Case report	Brazilian (Diamantina)
Woodmansey (11)	–	–	Case report	American (Montana)
Jafarzadeh (12)	–	–	Case report	Iranian (Mashhad)
Javidi et al (13)	–	–	Case report	Iranian (Mashhad)
Arisu and Alacam (14)	–	–	Case report	Turkish (Ankara)

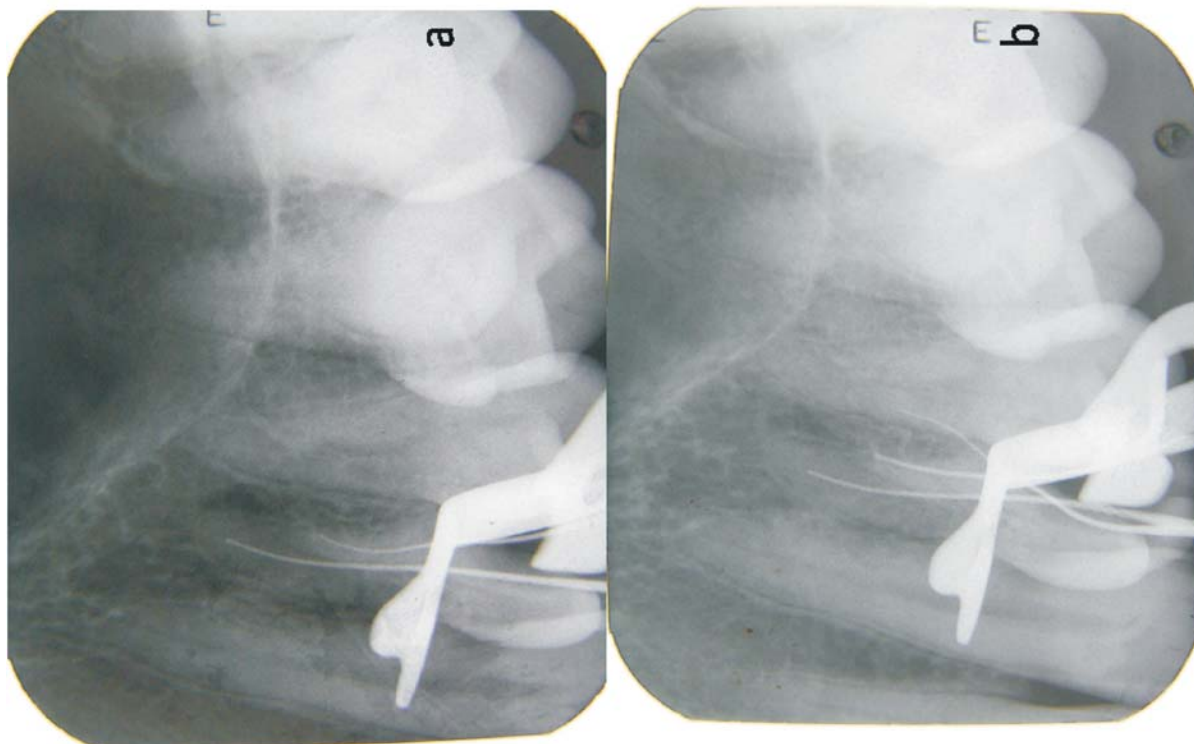
Table 2: Studies of Apical Canal Configurations for the Maxillary Second Premolar

Authors	One canal (%)	Two canals (buccal and palatal) (%)	Three canals (two buccal, one palatal) (%)	Race
Pineda and kuttler (3)	81.8	18.2	0	Spanish
Vertucci (5)	75	24	1	American (Florida)
Barkhordar and Sapone (15)	–	–	Case report	American (San Francisco)
Pecora et al (16)	67.3	32.4	0.3	Brazilian (São Paulo)
Caliskan et al (8)	72	28	0	Turkish(Izmir)
Kartal et al (9)	55	44.3	0.7	Turkish (Istanbul)
Loh (17)	49.4	50.6	0	Singaporeans
Ferreira et al (18)	–	–	Case report	Brazilian (São Paulo)
Low (19)	–	–	Case report	Hong Kongese
Soares and Leonardo (10)	–	–	Case report	Brazilian (Diamantina)

Fig. 1: Diagnostic radiograph of maxillary first premolar



Fig. 2: Working length radiograph: two initial files and one missed canal (a) Working



placing the initial files (K-file, Maillefer, Dentsply, Switzerland) and taking radiograph to determine working length, an extra root canal was noted (Fig. 2a). Two buccal canals and one palatal canal were

found as suggested by another working length radiograph (Fig. 2b). Cleaning and shaping of each of three canals was performed by passive step back technique up to file #25 (for buccal roots) and 30 (for

Fig. 3: Obturation radiograph: three filled canals



palatal root) and gates gliddens #1, 2, 3 and 4. NaOCl was used as irrigant. Finally the canals were filled by lateral condensation technique using gutta-percha and sealer (AH26, Dentsply DeTray, Konstanz, Germany) (Fig. 3).

This treatment was executed in a single session.

Case 2

A 26-year-old female presented at the dental clinic of the Faculty of Dentistry, Mashhad University of Medical Sciences, Mashhad, Iran, because of spontaneous pain and pain caused by cold and heat in maxillary left second premolar. The patient described the pain following cold and heat

which appeared delayed and continuous. Also patient stated pain during chewing and also a history of restorative treatment on given tooth.

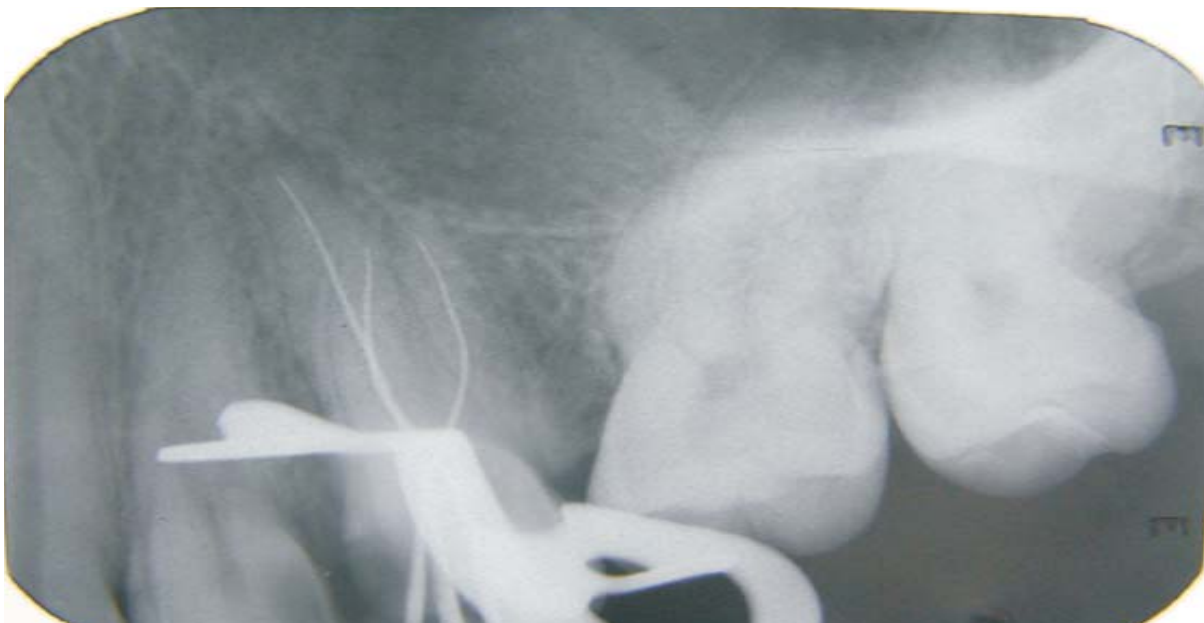
The pulp had been exposed by a deep carious lesion. Diagnostic tests showed that tooth was sensitive to electric pulp testing (Vitality Scanner, Analytic Technology, Glendora, CA, USA) (point scale 5), cold (ice stick), heat (hot burnisher) and not sensitive to palpation. The tooth had slight pain on percussion.

Radiographic findings were consistent of loss of lamina dura and PDL widening (Fig. 4), so periodontal status was diagnosed as "chronic apical periodontitis" and pulpal status as "chronic irreversible pulpitis".

Fig. 4: Diagnostic radiograph of maxillary second premolar



Fig. 5: Working length radiograph: three initial files



The tooth was isolated with rubber dam and restoration was removed and the coronal access was prepared. Two buccal canals and one palatal canal were found as suggested by initial diagnostic radiograph (Fig. 4). The pulp was extirpated and working length of tooth was determined by

using K-files (Maillefer, Dentsply, Switzerland) (Fig. 5). Cleaning and shaping of each of three canals was performed by passive step back technique up to file #25 (for buccal roots) and 30 (for palatal root) and gates gliddens #1, 2, 3 and 4. NaOCl was used as irrigant. Finally the canals were

Fig. 6: Obturation radiograph: three filled canals



filled by lateral condensation technique using gutta-percha and sealer (AH26, Dentsply DeTray, Konstanz, Germany) (Fig. 6). This treatment was executed in a single session.

Discussion

Endodontic success in teeth with extra-roots or canals requires a correct diagnosis and careful clinical and radiographic evaluation. Morphological variation in pulpal anatomy must be considered. Although preoperative radiography gives a two-dimensional image of a three-dimensional object, there are some guides that suggest the presence of extra-canals/roots. Whenever there is an abrupt straightening or loss of radiolucent canal in

the pulp cavity, an extra-canal should be suspected, either in the same root or in other independent roots (10). Also, whenever the mesiodistal width of the mid-root image is equal to or greater than the mesiodistal width of the crown, the tooth most likely has three roots (20). Multiple canals are also common when a radiograph shows an intracanal instrument as eccentric in the root (8).

When confronted with unusual tooth anatomy as three rooted maxillary premolars, good illumination and magnification can make treatment easier. With the aid of an operating microscope or loop, it is possible to locate all the root canal orifices (14).

When there are three roots, an oval or triangular cavity is often found, with the corners falling over the canal orifices (8).

Some studies have advocated a T-shaped access outline (20). Balleri et al (21) suggested that the outline of the access cavity was shaped by a cut at the bucco-proximal angle from the entrance of the buccal canals to the cavo-surface angle.

An apex locator was used to estimate the working lengths prior to establishing a working length estimation radiograph. This improves the chance of estimating the correct length when canals are likely to be superimposed on a radiograph (14).

Since getting a successful outcome in some of anatomic variations is difficult, a comprehensive assessment of the anatomy and a true diagnosis can help all practitioners, so considering all of the above can lead clinicians to successful treatment.

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