Case Report

Endodontic Management of a Permanent Mandibular First Molar with Three Mesial Root Canals: Two Case Reports

Reza Sayyad Soufdoost1* and Ali Jamali Ghomi2

1Department of Endodontics, Dentistry Research Institute, School of Dentistry, Shahed University, Tehran, Iran
2Department of Prosthodontics, Faculty of Dentistry, Shahed University, Tehran, Iran
*Corresponding author: Reza Sayyad Soufdoost, Department of Endodontics, Dentistry Research Institute, School of Dentistry, 26 Firouz dehghan Alley, Flistin st, Tehran, Iran; Mobile: +989123091861; Email: rezasoof@yahoo.com

Received Date: 05-02-2019
Accepted Date: 05-07-2019
Published Date: 05-21-2019
Copyright: © 2019 Reza Sayyad Soufdoost

Abstract

An additional canal is one of the great number variations occurred in root canal system. A comprehensive knowledge of the root canal anatomy is the mandatory factor which leads to successful endodontic treatment. In the case of mandibular first molar with the possible occurrence of a fifth canal, precise clinical evaluation including multiple angulated radiographs, through examination of chamber floor, CBCT and other adjunctive aids can help clinicians to overcome the failure of endodontic treatment. This article describes two cases of mandibular first molar with three canals in mesial root which treated endodontically.

Keywords: Additional canal; Endodontic treatment; five root canals; Mandibular first molar; Middle mesial canal

Abbreviations: MM: Middle Mesial; CBCT: Cone Beam Computed Tomography; MB: Mesio-Buccal; ML: Mesio-Lingual.

Introduction

Number and configuration of roots have been a constant challenge in over the years [1]. Many endodontic treatments were failed due to lack of knowledge of roots anatomy and complexity [2]. Generally, mandibular first molar is described as a tooth with two roots including two canals in mesial root and one or two in distal root [3]. Complete trust in pre-estimated number of root canals can lead clinicians to incomplete and failed endodontic treatment. The incidence of a first mandibular molar with five roots has been reported between 1% to 15% [4]. During the development of the roots, secondary
Dentin apposition compresses the connective tissue resulting in forming a vertical wall which is known as an extra or additional canal [5]. Middle Mesial (MM) canal in mandibular first molars was classified by Pomerans et al as confluent when the canal began from a separate orifice but met the mesio-buccal (MB) or mesio-lingual (ML) canal, independent if it drew from orifice to apex separately and finally, when the instrument could pass freely between the mesio-buccal or mesio-lingual canals. MM canal is always located in the groove between mesio-obuccal and mesio-lingual canals. Hence, this area should be checked for middle mesial canal [6]. Also, advance diagnostic tools such as cone beam computed tomography (CBCT), micro-computed tomography and dental operating microscope have played an important role to increase the knowledge of clinicians about the root anatomy [7]. In the present clinical report, we described the diagnosis and successful management of two cases of mandibular first molar with complex morphological variation and potential of an extra canal in mesial root which were treated endodontically.

**Case reports**

**Case 1**

A 25-year-old man presented to endodontic department of Shahed Dental School with chief complaint of continuous pain in lower left back teeth. The patient's medical history was noncontributory. Patient had history of pain more than 2 days. Clinical and radiographic examinations were performed. Intraoral examination revealed a deep distal caries on left mandibular first molar (tooth #19). The tooth was tender to vertical percussion. A vitality test of the tooth was positive. Radiographic examination of the affected tooth revealed an unusual anatomy of mesial root with minimally two canals in mesial root and two canals in distal root as well as a big disto-occlusal lesion with an involvement of pulp chamber (Figure 1). Around the apical portion of mesial root PDL was widened. According to subjective and objective findings, a diagnosis of irreversible pulpitis was made. After Inferior alveolar nerve block injection of Lidocaine with 1:100,000 epinephrine (Daroupakhsh, Tehran, Iran), access cavity was prepared on the occlusal surface and all carries was removed. The tooth was isolated by rubber dam. At the pulp chamber floor, disto-buccal, disto-lingual, mesio-buccal and mesio-lingual canal orifices were observed. Initial negotiation was carried out by K file #15. After initial filing and several cleansing with 2.5% sodium hypochlorite, still bleeding was detectable from the point between mesio-buccal and mesio-lingual orifices.

![Image](image1.png)

**Figure 1:** Periapical (A) and Bitewing (B) radiographs of a patient with mandibular left first molar involvement (tooth #19).
Operating microscope (OPMI pico, Zeiss, Jena, Germany) was used to find MM canal and it was prepared along other canals (Figure 2). An electronic apex locator (Raypex 5, VDW GmbH and Munich, Germany) was used to determine the initial working lengths. Five Initial files set in root canals and then initial radiograph was taken with straight angulation (Figure 3A). In first radiograph, files in ML and MM canals were superimposed on each other. So, a second radiograph with the mesial angulation was requested. In the second radiograph, all five canals were separated distinctly (Figure 3B). Files in MM canal and ML canal were met each other near the middle third of the mesio-lingual root. The instrumentation of distal and mesial root canals was performed up to 35#k files (Mani, Tochigi, Japan). Besides, a rotary system (Protaper, Dentsply Sirona, New York city, USA) was used to complete the canal preparation. In order to remove pulp completely, 2.5% sodium hypochlorite was used as an irrigant to digest pulp tissue. In addition, 17% EDTA (Dentonics, North Carolina, USA) was used several times during procedure to remove smear layer. All canals were dried by sterile paper points (Aria Dent, Tehran, Iran). All canals were obturated by lateral condensation technique with gutta-percha (Dentsply Maillefer, Switzerland) and root canal sealer (AH-26, DeTrey, Dentsply, Konstanz, Germany).

Figure 2: Clinical photograph of access opening showing three mesial root canals.

Figure 3: Working length radiographs with straight angulation (A) and mesial angulation (B).
The final radiograph confirmed an ideal condensed root filling material and working length in mesial and distal root canals (Figure 4A). In the same visit, the access cavity was restored with Amalgam. At 6 months follow-up visit, the patient was asymptomatic clinically and the radiographic examination showed healthy periodontium and periradicular tissue (Figure 4B).

Case 2

A 27-year-old man presented to endodontic department of Shahed Dental School with chief complaint of continuous pain in lower right back teeth. The patient’s medical history was normal. Patient had history of pain for 2 months and tissue around the tooth#30 was swollen. Intraoral examination revealed a deep distal caries on left mandibular first molar (tooth#30). The tooth was tender to vertical percussion. A vitality test of the tooth was negative. Radiographic examination including panoramic, periapical and bite-wing of the affected tooth revealed minimally two canals in mesial root and a big disto-occlusal lesion with an involvement of pulp chamber (Figure 5A, 5B, 5C).

According to subjective and objective findings, a diagnosis of pulp necrosis with chronic apical periodontitis was made. After Inferior alveolar nerve block injection of Lidocaine with 1:100,000 epinephrine (Daroupakhsh, Tehran, Iran), access cavity was prepared on the occlusal surface and all carries was removed. The tooth was isolated by rubber dam. At the pulp chamber floor, disto-buccal, disto-lingual, mesio-buccal and mesio-lingual canal orifices were observed. The instrumentation of distal and mesial root canals was performed up to 35#k files (Mani, Tochigi, Japan).

Figure 4: Final periapical radiograph of tooth#19 with five root canals (A) and periapical radiograph of tooth #19 after 6 months of follow-up (B).

Figure 5: Panoramic (A), Periapical (B) and Bitewing (C) radiographs of a patient with mandibular right first molar(tooth#30).
Besides, a rotary system (Protaper, Dentsplysirona, New York City, USA) was used to complete the canal preparation. 2.5% sodium hypochlorite was used as an irrigant to digest pulp tissue and control the bleeding, but due to continuous bleeding calcium hydroxide was placed in all canals as an intracanal medication. Cavit (3M, Seefeld, Germany) was placed in access cavity in order to make a coronal seal. In second visit, after injection and isolating the tooth #30, all temporary filling and calcium hydroxide was removed. The floor of pulp chamber carefully was examined with endodontic explorer and MM orifice was found between mesio-buccal and mesio-lingual orifices with a little bit shifting toward mesio-buccal orifice. An electronic apex locator (Raypex5, VDW GmbH and Munich, Germany) was used to determine the initial working lengths. Five Initial files set in root canals and then initial radiograph was taken. The initial radiograph verified the working length of all root canals (Figure 6). According to initial radiograph files in MM canal and MB canal were met each other near the apical third of the mesio-buccal root. Preparation of all five canals was completed. Cleansing of canals was done regularly with 2.5% sodium hypochlorite. In addition, 17% EDTA (Dentontics, North Carolina, USA) was used several times during procedure to remove smear layer. All canals were dried by sterile paper points (Aria Dent, Tehran, Iran) followed by obturation by lateral condensation technique with gutta-percha (Dentsply Maillefer, Switzerland) and root canal sealer (AH-26, DeTrey, Dentsply, Konstanz, Germany). The final radiograph confirmed an ideal condensed root filling material and working length in mesial and distal root canals (Figure 7A). In the same visit, the access cavity was restored with Amalgam. At 6 months follow-up visit, the patient was asymptomatic clinically and the radiographically (Figure 7B).

Figure 6: Working length radiographs with straight angulation.

Figure 7: Final periapical radiograph of tooth #30 with five root canals (A) and periapical radiograph of tooth #30 after 6 months of follow-up (B).
Discussion

Anatomical variation of the root canal system is considered as one of the most important reasons of endodontic treatment failure. Missing a root canal during endodontic treatments results in inadequate treatment and incomplete elimination of microorganisms [8]. Debridement of the root canal system of necrotic or infected pulp tissues is a key factor for a successful endodontic treatment [9]. After a while, teeth with incomplete debridement of root canals system might be re-infected due to remained microorganisms in the root canal space. Developmental grooves are considered as an important landmark for presence of an extra canal. Thus, modification of access cavity from triangle to rectangular in both mesial and distal roots should be considered to facilitate the finding of the extra canal orifices [10]. In addition, an endodontic explorer is a helpful adjunctive tool which helps dentists to find the additional canals, however, in order to expose the developmental groove, dentinal bridge should be removed by small bur or ultrasonic tip. Precise radiographic examination and interpretation is the inevitable part to identify unusual canal morphology associated with mandibular first molar [11]. A preapical radiograph with a good quality and an appropriate angulation could render primary comprehensive information about root anatomy and morphology which is important for future treatment plan and achieving long-term success of the root canal treatment [12]. Traditionally, a preapical radiograph was employed during endodontic procedure whether to make diagnosis or to determine working length. In the current cases, radiographs in mesial angulation were used to determine the unusual root canal configurations as it has been recommended in previous studies. Also, these cases supported previous reports of existence of third canal in mesial root of mandibular first molar. Reyhani et al, reported fifth canal in first mandibular molar with a confluent MM canal which met MB root canal while we stated 2 cases that in case # 1, MM canal met ML root canal and in case #2, MM canal met MB root canal.

In some clinical situations, the use of a conventional intraoral radiograph alone is not enough to find the variable morphologic structure of root canals since conventional radiographs display two dimensional images from three dimensional objects [13]. According to Karapinar et al [14], using dental operating microscope could help clinicians to find accessory and additional canals by improving dentist visualization as we used dental operating microscope to find MM canal. More recently, three dimensional models are recommended to achieve arbitrary viewpoints of root canals. If periapical radiographs are not useful alone to find third mesial canal (MM) in first mandibular molar, using dental operating microscope, cone beam computed tomography (CBCT) and other adjunctive tools could be used to gain more information about the root morphology and canal distribution.

Conclusion

This article describes two cases of mandibular first molar with five canals which treated endodontically. Moreover, using dental operating microscope, precise inspection of chamber floor with endodontic explorer and multi angulated radiographs enhances the ability of clinicians to identify the MM canal.

Acknowledgement

No

Conflict of interest

Authors have no conflicts of interest to disclose

References

4. Baugh D and Wallace J. Middle mesial canal of the man-


