Permanent Maxillary First Molar with Three Mesiobuccal Canals

Abstract

It is mandatory for every clinician to have a thorough knowledge about the normal internal anatomy of teeth; equally important is the awareness about variations in internal anatomy that could be seen with different teeth. The outcome of a root canal therapy depends significantly on the clinician’s awareness about root canal anatomy, followed by their clinical skills. Literature states that the permanent maxillary first molar shows a wide variation in the number of canals particularly with respect to the mesiobuccal root. This case report describes the endodontic management of a permanent maxillary first molar with three distinct mesiobuccal canals.

Keywords: Endodontic management, maxillary molar, mesiobuccal canal, mesiobuccal root

Introduction

A clinician’s knowledge about the morphological variation in root canals of different teeth plays a major role in the success of root canal therapy. If an extra canal is present with respect to a root, the ability of a clinician to find and instrument that extra canal plays a vital role in preventing failure of endodontic treatment. According to Weine et al., the main cause of failure of root canal treatment in permanent maxillary first molar is due to missed canal, most commonly pertaining to the mesiobuccal root.\(^1\) Weine et al. studied the canal configuration in the mesiobuccal root of maxillary first molar and successfully proposed the first classification of canal system with respect to mesiobuccal root.\(^1\)

According to different in-vitro studies conducted, there are more chances of presence of a second canal with respect to the mesiobuccal root of the maxillary first molar.\(^2\) However, there are very few studies which have reported the presence of a third canal with this mesiobuccal root. The incidence of such a third canal has been reported to be as low as 1.1–10%\(^5\,\)\(^6\) Ferguson and Favieri et al., Adanir, Martinez-Berná and Ruiz-Badanelli and Beatty, Kottoor et al., Nayak et al., Chalkar et al., Al-Habboubi and Al-Wasi have all successfully reported cases of a third mesiobuccal canal with respect to the permanent maxillary first molar.\(^7\)\(^8\)\(^9\)\(^10\)

This case report describes the endodontic management of a permanent maxillary right first molar with three distinct mesiobuccal canals.

Case Report

A 26-year-old male patient reported to the Department of Conservative Dentistry and Endodontics, in our institution with a chief complaint of pain in maxillary right posterior region since two weeks. On clinical examination, deep proximal caries with respect to 16 was seen and the tooth was tender on percussion. The nature of the pain was sharp, shooting and continuous and the pain was even more severe on consumption of hot food as explained by the patient. The pre-operative radiograph revealed deep proximal caries involving the mesial pulp horn [Figure 1a]. A combination of electric pulp testing and cold test were performed and the results for both were negative with respect to 16. There was no relevant medical and family history. Based on the clinical and radiographic examination, a diagnosis of acute irreversible pulpitis with associated apical periodontitis was made with respect to 16. Root canal treatment was initiated for 16 after explaining the treatment plan to the patient.

First, the patient was given a block injection of lidocaine with 1:80,000 epinephrine. Isolation is one of the keys to success of
endodontic therapy. Before starting with the access cavity preparation, the tooth was isolated with a rubber dam. Following this, the access cavity preparation was done. Initially, three root canals (mesiobuccal, distobuccal and palatal) were located. Once the deroofing of pulp chamber was done, two tiny bleeding points were observed around 2 mm and 4 mm, respectively, from the mesiobuccal (Mb) canal towards the palatal canal. An operating microscope (Serwell Medi‑Equipments Pvt. Ltd, Tamil Nadu, India) was used for exploring and locating more canal orifices with respect to the mesiobuccal root. With the help of champagne bubble test and a DG 16 endodontic explorer (HuFriedy, Chicago), a second canal (Mb 2) and third canal (Mb 3) were located [Figure 1b]. The Mb 3 canal was covered with a small amount of dentin which made it difficult to negotiate this canal initially. The dentin obstruction was removed with the help of rotary orifice opener file.

Straight line access was gained to all five canals prior to working length determination. Electronic working length was first determined using an electronic apex locator (J. Morita Mfg Corp, Japan). To confirm the apex locator readings a working length radiograph was taken [Figure 2a]. The Mb 2 and Mb 3 canals joined the Mb canal at the middle third and all three canals continued as a single canal from the middle third till the apex [Figure 2a]. All the canals were instrumented using Neoendo flex rotary file system (Neoendo and Orikam Healthcare India Private Limited) with a crown down shaping technique. Irrigation was done using 2.5% sodium hypochlorite. Calcium hydroxide paste was used in the form of an intracanal medicament and the cavity was sealed using a temporary filling material. The patient was recalled after 10 days for the second appointment. The patient was asymptomatic in this visit. Sodium hypochlorite was used to flush out the medicament from the canals. The canals were then dried using paper points. Master cone radiograph was obtained [Figure 2b]. Obturation was then done with gutta percha (Neoendo Gutta Percha Points) and AH-26 sealer (Dentsply DeTrey, Konstanz, Germany). Post obturation restoration was done using composite and post obturation radiograph was obtained [Figure 2c]. The patient was kept under observation. Six months follow up radiograph showed no signs of treatment failure [Figure 2d] and clinically the patient was totally asymptomatic.

Discussion

The most common cause for retreatment or failure in endodontic treatment of maxillary first molar is missed canal. Many times, a clinician fails to locate an extra canal which is present especially with respect to the mesiobuccal root of the maxillary first molar.[1] It is difficult to locate the Mb 2 and Mb 3 canals and even more challenging to negotiate these canals till the apex.[2] The Mb 2 and Mb 3 canals are frequently covered with a small amount of dentin even after initial access cavity preparation. This dentinal obstruction needs to be removed and the orifices should be opened using a rotary orifice opener file. This would make the negotiation and instrumentation of the second and third Mb canal possible.

The mesiobuccal root of a maxillary molar is broader mesiopalatally and literature states that a second mesiobuccal canal is frequently observed with a maxillary first molar having an incidence ranging from 53–95%.[4] However, very few cases have been reported about the presence of a third mesiobuccal canal in scientific literature. Thorough interpretation of a preoperative radiograph, use of magnification aids such as operative microscope and DG16 endodontic explorer, performing a champagne bubble test using sodium hypochlorite aids in locating the extra root canal orifices.

The mesiobuccal root in the present case showed a “Sert and Bayirli type XVIII” canal configuration which was confirmed with the help of a working length radiograph. This meant that both Mb2 and Mb3 canals joined the Mb canal at the middle third and continued as a single canal till the apex. The clinical photograph [Figure 1b] shows the presence of all three mesiobuccal root canal orifices.
2.5% sodium hypochlorite was used for irrigation in this case. The concentration of the irrigant used was 2.5% rather than 5.25% as it is safer to use hypochlorite at a lesser concentration to avoid destruction of periradicular tissues by irrigant extrusion which leads to sodium hypochlorite accident. Neoendo flex rotary files were used for canal instrumentation in the present study as they are suitable and are meant for use in curved and constricted canals owing to their flexibility and resistance to cyclic fatigue.

A maxillary first molar tooth should thoroughly be explored under adequate illumination to locate extra canal orifices especially with respect to the mesiobuccal root. The operator should have a thorough knowledge and clinical experience about the canal variations with regard to the mesiobuccal root of maxillary first molar. Periapical radiographs taken at 20 degrees angulation from the distal side helps in providing the accurate information about the number of canals and canal configuration with respect to the mesiobuccal root of maxillary molar. In this case, distally angulated radiographs, exploring the pulp chamber under operating microscope and the use of DG 16 endodontic explorer and champagne bubble test helped in identifying the extra Mb canal orifices. However modern and advanced imaging techniques like cone beam computed tomography and spiral computed tomography are far more superior than conventional periapical radiographs in the detection of extra root canals. The main drawback of these advanced techniques are increased exposure to radiation.

Thus, the mesiobuccal root of maxillary first molar frequently presents more than one canal which is the main cause for endodontic treatment failure of this teeth. The success of endodontic treatment with respect to the maxillary first molar depends on the detection, proper instrumentation and filling of these extra canals. A clinician’s inability to locate these extra canals leads to treatment failure due to missed canals.

Conclusion

Thorough knowledge about canal variations in a root, years of clinical experience combined with the use of magnification aids enables the clinician to successfully locate that extra canal in a root is the most common reason behind failure of endodontic treatment. In this case, we have successfully located and instrumented two extra canals in the mesiobuccal root of a permanent maxillary first molar.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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