

Maxillary First Molar with 3 Mesiobuccal Canals and 2 Palatal Canals: unusual? or overlooked!!

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Abstract

The complexity of the root canal system of maxillary molars presents a constant challenge, as the dentist must have a thorough knowledge of root canal morphology to provide successful endodontic treatment literature review pertaining to the morphology of maxillary first molars is discussed here we present with the unusual maxillary first molar with three mesiobuccal canals and two palatal canals.

Introduction

Permanent first molar teeth are one of the first teeth to erupt into the oral cavity and therefore possibly the most root canal indicated tooth for the endodontist. The most common cause of treatment failures in permanent maxillary first molars have been attributed to failure in detecting additional canals especially in the mesiobuccal root and therefore has resulted in more research and clinical investigation than any other root.^[1] The main objective of endodontic therapy is thorough mechanical and chemical cleansing of the entire pulp cavity and its complete obturation with an inert filling material.^[2]

Knowledge of root canal morphology is very difficult and important point for planning and performing of root canal therapy. Several anatomical variations existing in the root canal system may contribute to failure of root canal therapy. Root canals may be incompletely obturated because the operator fails to recognize their ramifications or the presence of extra canals. Several anatomical variations existing in the root canal system may contribute to failure of root canal therapy. Many authors have investigated the morphology and number of root and root canals in maxillary molars. These studies have shown that the majority of maxillary first molars have an additional mesiobuccal (MB) root canal.^[3]

According to literature review studies have shown that maxillary 1st molar have three roots in 95.9% cases and three root canals in 56.8% and four root canals in 43.1% cases respectively.

Presence of 4th canal is usually reported in mesiobuccal root in 95.6% cases because of its broad buccolingual dimension and associated concavities on its mesial and distal surface.^[4]

The mesiobuccal root of the first maxillary molar has generated more research and clinical investigation than any other root. The incidence of a maxillary first molar with two separate canals in the palatal root is less than 1%.^[5]

The form, configuration, and number of root canals present in maxillary first molars have been discussed for more than half a century.^[6]

This case report describes the diagnosis and successful endodontic management of a three-rooted maxillary first molar with six root canals: three canals in the mesiobuccal, one distobuccal root and two canals in the palatal root.

Case Report

A thirteen year old male patient reported with the chief complaint of mild pain in the left upper posterior region of the mouth since one month which had increased in intensity for the past four days. On clinical examination, occlusal caries was detected and was found to be tender on percussion. The patient's medical history was non-contributory. Based on clinical and radiographic evidences a diagnosis of irreversible pulpitis. Local anesthesia was given. An endodontic access cavity was done. Clinical examination revealed initially mesiobuccal, distobuccal and palatal canals. Examination of the pulp chamber floor revealed the presence of two similar hemorrhagic

points near the main mesiobuccal orifice[Fig. 1] with only one distobuccal canal[Fig. 2] and one near the main palatal orifice.[Fig. 3] A radiograph was taken which confirmed the presence of three canals in the mesiobuccal root,[Fig. 4] one distobuccal and two Palatal roots.[Fig. 5]

Working length determination was done at the second clinical appointment, the Bio mechanical preparation was done for all the canals in a sequential order which was accompanied with irrigation by the use of 2% sodium hypochlorite as irrigating solution. Master cone x ray was taken with the gutta-percha points.[Fig. 6] The canals were dried with paper points and the canals were obturated with gutta-percha. The tooth was restored with composite resin.



Fig. 3: Access cavity showing the 2 Palatal canal orifices



Fig. 1: Access cavity showing the 3 Mesiobuccal (MB1, MB2, MB3) Canal orifices



Fig. 4: IOPAR showing instruments in the Mesiobuccal root



Fig. 2: Access cavity showing the 3 Mesiobuccal (MB1, MB2, MB3) and 1 Distobuccal Canal orifices



Fig. 5: Working length IOPA



Fig. 6: Master Cone IOPAR with the gutta-percha points

Discussion

The knowledge on the complex tooth morphology of the maxillary first molar is an important factor for the planning and execution of endodontic therapy.^[7]

The variation in dental anatomy plays an important role in root canal therapy. Despite the current high success rate achieved in endodontic treatments, the mesiobuccal root is still associated with a considerable number of failures due to the difficulty in locating and obturating the second and/or third mesiobuccal canals.^[8]

Historically, studies on the incidence of the MB2 canal in maxillary molars have ranged from 36% to 54%, Weine, et al. were one of the first to acknowledge that the failure of endodontic treatment of maxillary molars is likely due to the failure to locate, instrument, and fill the MB2 canal. There are several reasons why the MB2 canal is challenging to locate and negotiate. Developmentally, there is often a dentinal cornice, or rounded growth of dentin, found in the middle of the mesial surface of the pulp chamber which conceals entry into the MB2 canal.^[9,10]

The prevalence of maxillary first molars with 2 palatal canals is rare. Also literature is scarce regarding presence of 2 separate palatal canals with separate orifices/separate exits or single exit. The tooth described in this case report had totally separated palatal roots, each with a distinct root canal. Variations in the root canal morphology of the maxillary first molar are quite common. During endodontic therapy, if the practitioner is unable to detect these variations the root canals might be left untreated which may be a reason for

the failure of the endodontic treatment. Thus a clinician should be aware of such variations and should open up his/her eyes to newer diagnostic techniques.^[5]

There are several methods for the location of the canals. The working length radiograph is the most informative radiograph for locating extra canals. If the endodontic files are not well centered in the canal on the radiograph, the possibility of additional canals should always be considered.^[1] To investigate properly the possibility of additional canals, the dentist should.^[1,10-13]

- Understand the complexity of the morphology of the tooth involved
- Take additional off-angle radiographs
- Ensure adequate “straight-line” access to improve visibility
- Examine the pulpal floor for “lines” to areas where additional canals may be located
- Remove a small amount of tooth structure that often may occlude a canal orifice
- The dentist should be suspicious of additional canals if endodontic files are not well centered in the canal on the radiograph or if endodontic files are not well centered in the canal clinically

Other aids to enhance visualization may include:

- A “champagne or bubble test” provided by NaOCl in the chamber
- Staining the chamber with methylene blue dye
- Trans illumination, the use of sharp explorers, location of bleeding points,
- Horizontally angulated preoperative radiographs

Use advanced diagnostic aids such as:

- Cone-beam computed tomography (CBCT)
- Spiral computed tomography (CT) scanning
- Magnification is paramount either a dental operating microscope

It must be assumed that most maxillary first molars will have 4 canals. The second MB canal is usually found 0.5-5 mm palatal to the main MB canal, often hidden under a cervical ledge. Cutting around the first orifice, cutting a trough in a straight line toward the palatal canal, or both, will usually allow the dentist to find it.^[11]

A rhomboidal access preparation should be made in contrast to the triangular form traditionally taught. This will allow access to the area just mesial to an imaginary line drawn from the MB orifice to the palatal orifice and will allow the necessary mesially directed shaping. Often,

subpulpal grooves, or developmental grooves on the pulpal floor, will provide a roadmap between the funnel-shaped entries to the canals. The higher incidence of multiple canals in the mesiobuccal root as compared to the distobuccal root could possibly be due to the mesiobuccal root being broad buccolingually while the distobuccal root is round or ovoid in cross-section. Sometimes fusion of distobuccal root with palatal root may occur due to distobuccal root being broad buccolingually and may result in additional canals in the distal root.^[12]

Treatment of the entire root-canal system is essential for the success of root-canal treatment. Thus, it is necessary for the clinician to have knowledge of dental anatomy and its variations. The frequency of two palatal roots is low, however, a few cases have been reported in the literature. Anatomical variations can occur in maxillary permanent molars. Although not very common, Knowledge of possible variations in internal anatomy of human teeth is important for successful endodontic treatment.^[14]

Prior to treatment, a tooth with unusual anatomical appearance on a radiograph should be carefully assessed, and additional radiographs with different angulations should be taken as its interpretation may reveal external and internal anatomic details that suggest the presence of extra canals and/or roots. Since the ultimate goal for patients and practitioners alike is the retention of natural teeth for a lifetime, endodontic therapy remains, and will continue to be, the primary treatment choice for teeth with pulpal and periradicular pathology.^[15]

Conclusion

This case report contributes to our understanding of the complexity of the root canal morphology found in maxillary first molars. Although such cases occur infrequently, dentists should be aware of them when considering endodontic treatment of a maxillary first molar. Based on the literature and this clinical case, it is evident that knowledge of the anatomical variations of the maxillary molars is extremely important for the success of endodontic treatment. The clinician should give special attention to the evidence of the occurrence of anatomical variations throughout the procedure.^[11,17]

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