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Endodontic Management of a Mandibular First Molar with Five Root Canals: A Case Report

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Abstract

The root canal treatment of a mandibular molar with aberrant canal configurations can be diagnostically and technically challenging. The proper knowledge of the possible anatomical and morphological variations in the root canal system is important for a successful endodontic treatment. Mandibular first molars usually contain two roots (mesial and distal root). The mesial root mostly contain two root canals, and the distal root contain one to two root canals. The variability of the number of root canals in the mandibular first molars has been reported in the past, including 3%. - 28% of the middle mesial canal (MMC). In this case a mandibular first molar indicated for root canals, and two distal canals. Initially, four canals (mesiobuccal, mesiolingual, distobuccal, and distolingual) were identified. The mesiobuccal and mesiolingual canals were found in their normal locations while a fifth canal was noted between these two. This case demonstrates a rare anatomical configuration and supplements past reports of the presence of such configurations in permanent mandibular first molars.

Keywords: Middle mesial, CBCT, root canal

Introduction

The main objective of root canal treatment is to perform thorough shaping and cleaning of the entire root canal space and subsequent obturation with an inert filling material.¹ Inadequate removal of pulp tissue and microorganisms from the root canal system is the main

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cause of root canal failure. Although, this process becomes complicated with the presence of additional root canal systems. Therefore, it is imperative that the clinician must have a thorough knowledge of root canal morphology and its possible variations to achieve a high level of success.² One such example is the mesial root of the permanent mandibular first molar which usually has two roots; mesial and distal with two canals in mesial and one canal in the distal root.³

The mesial root of mandibular molars occasionally harbours an additional root canal system known as accessory mesial canal. Vertucci and William⁴ were the first researchers to describe the presence of middle mesial canal (MMC) in 1974; Since then, there are many case reports in the literature that discuss the presence of these accessory canals. Middle mesial canal is located in the developmental groove present between the mesiobuccal and mesiolingual root canal systems. Studies have reported the range of occurrence of this canal from 1% to 15%.^{3,5}

A classification of this accessory mesial canal (also known as middle mesial canal; MMC) Based on the anatomical variations. Pomeranz *et al.* classified them into three types:⁶

1. **Fin** - when there was a linking between middle mesial canal with either mesiobuccal or mesiolingual canal and an instrument could pass freely between them.

2. **Confluent** - when the middle mesial canal presented as a separate orifice and later on its course joined the mesiobuccal or mesiolingual canal.

3. **Independent** - if the canal presented completely separate from mesiolingual and mesiobuccal canals throughout its course.

This case report represents the management of a mandibular first molar with five root canals where cone beam computed tomography (CBCT) was used.

Case Report

A 34-year-old male patient with a non-contributory medical history reported in Department of Conservative Dentistry and Endodontics with the chief complaint of pain in lower right back teeth region since 7 days. On clinical examination Deep mesio-occlusal caries involving pulp with slight pain on percussion in lower right first molar (Tooth no. 46). Electronic pulp testing gave a delayed response. Intraoral periapical radiograph revealed presence of radiolucency on the mesio-occlusal aspect, involving the mesial pulp horn of the first molar. There was slight widening of apical periodontium [Figure-1].

A clinical diagnosis of symptomatic irreversible pulpitis with apical periodontitis was made. Endodontic treatment was planned and explained to the patient. Inferior alveolar nerve block was administered using 2% lidocaine with 1:80,000 epinephrine followed by isolation of the tooth using rubber dam. A conventional access cavity was prepared after excavation of caries. After an adequate access preparation was made, two mesial and two distal canal orifices were found [Figure-2]. Examining the fissure connecting the two mesial canals carefully, the tip of a # 08 file could be inserted into a spot located in the middle of the distance between the two mesial canals

The canal lengths were measured using an inbuilt apex locator (Econnect S, Eighteenth). A radiograph was taken to confirm the working length and the presence of three mesial canals (mesiobuccal, mesiolingual, and middle mesial) and two distal canals [Figure-3].

The canal orifices were widened using orifice opener and apical preparation up to 20.4% was carried out in the mesial canals and up to 25.4% in the distal canal using Neoendo Flex (Orikam, India) and RC Help-EDTA (Prime Dent, India) as lubricant. Irrigation was carried using normal saline and 3% sodium hypochlorite (Septodont, India). After drying the canals with paper Biomed, Korea) were selected which were confirmed by radiograph [Figure-4].

The canals were obturated using Endomethasone N (Septodont Healthcare, India) as sealer by single-cone obturation technique [Figure-5]. A temporary dressing (Cavit G,3M ESPE, Germany) was given and a radiograph was taken to confirm the obturation and three separate mesial canals were verified using CBCT of the same tooth [Figure-6].

Discussion

Clinicians generally begin root canal procedures based on their observation of external root canal anatomy as guided by radiographs. Despite the fact that presence of internal anatomic variances and anomalies is not uncommon. Among these internal deviations, the incidence of middle mesial canals ranges from 3% to 28.3% based on several case reports which make them difficult to locate.^{5,7-11} Moreover, these canals are known to have a high frequency of intercanal isthmuses which pose an additional barrier to shaping and cleaning procedures.¹²

In a study conducted by Fabra-Campos, a total of 760 mandibular molars were evaluated and it was found that 20 (2.6%) had three root canals within mesial root and 13 (65%) of the middle mesial canal joined the mesio buccal canal in its apical third whereas, 6 (30%) of these middle mesial canals joined the mesiolingual canals in their apical thirds and had mutual exits. It was noted that only one canal out of these 20 molars was categorised as independent which had a separate orifice and a separate portal of exit.¹³

Sert and Bayirli gave the classification of mesial canals based on its configuration reported in this study is type XV that is, three canal orifices with two exits in the mesial root.¹⁴ The groove between the mesiolingual and mesiobuccal orifices should then be carefully inspected with a sharp explorer for potential sticky point that is suggestive of an additional canal. As soon as the middle mesial canal orifice is located, small hand files should be used to negotiate it up to its middle third.

Furthermore, techniques/concepts such as multiple angulated radiographs, magnification, appropriately flared access cavity, careful examination of pulpal floor, use of ultrasonics, pursuing bleeding points and cone beam CT (CBCT) imaging can maximise the outcome for additional canal exploration.¹⁵

CBCT scanners use a cone-shaped beam alternatively regular CT scanners uses fan-shaped. It has been successfully used in endodontics for better understanding of the root canal anatomy¹⁶ evaluation of root canal preparation/obturation, detection of bone lesions¹⁷, and vertical root fractures.¹⁸

In this case report, one confirms the presence of three mesial canals in the root. Middle mesial canals are generally located centrally between the mesiobuccal and ML canals, and we, the clinicians, had trouble in locating the ML canal. Furthermore, we could confirm that the canals were obturated properly with CBCT images.

Conclusion

Managing additional abnormal canals can be challenging, but the inability to find root canals may cause failures. The evaluation of CBCT images can result in better understanding of root canal anatomy, by which clinician can able to investigate the root canal system which further leads to success of endodontic treatment.

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Legend Figures



Figure 1: Preoperative radiograph of mandibular right first molar.



Figure 2: Clinical view of the access cavity preparation showing five distinct root canal orifices; Mesiobuccal, Middle-mesial, Mesiolingual, Distobuccal, Distolingual.



Figure 3: Working length radiograph with a file placed in each of the three mesial canals, two distal canals.



Figure 4: Master cone placed in each of the five root canals of mandibular right first molar.



Figure 5: Final obturation of the mandibular right first molar.







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Figure 6: CBCT images (A) Axial view and (B), (C) Coronal views showing three distinct canals.