



ENDODONTIC MANAGEMENT OF A MANDIBULAR FIRST MOLAR WITH SEVEN CANALS- CASE REPORT

Endodontic

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ABSTRACT

The successful endodontic management of a mandibular first molar with seven canals is diagnostically and clinically challenging. Based on a few in vitro studies, its incidence is 0.2% to 3%⁶. The foremost challenge in management of a two-rooted mandibular first molar with seven canals lies in the careful diagnosis and exploration of all canals. The intricate network of canals within the same root increases the perplexity of the cleaning and shaping procedures and may lead to various mishaps in endodontics. This case report discusses the successful nonsurgical management of a two rooted mandibular first molar with four mesial and three distal canals which is an infrequent occurrence as scarce as hen's teeth

KEYWORDS

Mandibular first molar, Seven root canals, double middle mesial canal(DMMC), middle distal canal(MDC).

INTRODUCTION:

"In theory, theory and practice are the same. In practice, they are not."
-Albert Einstein

According to Hess, the root canal anatomy is the foundation of Endodontics. The mesial root of mandibular first molar commonly has 2 canals (94.4%) and their distal root has 1 (62.7%) or 2 (37.3%) canals.¹ The narrow ribbon-shaped isthmus harboring the pulp tissue or the groove connecting the two mesial or distal canals, may have accessory canals. The occurrence of an accessory canal midway between the distobuccal and distolingual canal in the distal root of mandibular first molar is called as the middle distal canal¹. The two accessory mesial canals in between the mesiobuccal and mesiolingual canals in the mesial root of the mandibular molar are named linguo-mesiobuccal(L-MB) and bucco-mesiolingual(B-ML) according to a new nomenclature^{2,9}. The existence of two accessory canals in the mesial root of the mandibular first molar has been entitled as the double middle mesial canal(DMMC) and its incidence was 3.3%^{6,10}. The occurrence of three canals in the distal root of mandibular first molar was 0.2% - 3%⁶.

The success rate of endodontically treated teeth has been reported to be 87.79%¹²⁻¹⁶. The management of complex root canal anatomy requires great caution during the exploration and establishment of proper working length in the canals with inter-communications. The crossing canals and their confluence can be demusing and transforms the cleaning and shaping procedures to be cumbersome to the operator. This case report presents a two rooted mandibular first molar with four mesial canals and three distal canals where all the three distal canals are joined at the apical third of the distal root¹¹⁻¹⁶.

CASE REPORT

A 38 year old male patient came to the Department of Conservative dentistry and Endodontics, with the chief complaint of pain over the lower left back teeth region. After clinical and radiographic examination, the left mandibular first molar(36) was diagnosed with symptomatic irreversible pulpitis with apical periodontitis(Figure1). Non-surgical endodontic treatment was planned, followed by the crown.

After receiving consent from the patient, the tooth was anaesthetized

using inferior alveolar nerve block. Under rubber dam isolation, the endodontic access was performed with a no. 2 Endoaccess bur(Dentsply) and the access cavity margins were refined using the Endo-Z bur(Dentsply). After pulpectomy, with the adjunct aid of dental loupe(3.5X magnification) and the DG-16(Dentsply) explorer, the mesiobuccal(MB), mesiolingual(ML), distobuccal(DB) and distolingual(DL) orifices were located initially. The working length was established using Ingle's radiographic method and confirmed using apex locator(J Morita Root ZX). From the distally angulated working length radiograph (Figure 2), ML and B-ML (of 2-1 canal pattern) were seen joining at middle third and exiting together from the mesial root. The MB and the L-MB (of 1-2-1 canal pattern) were seen joining at the coronal and apical thirds and exiting together. All these 4 canals in the mesial root revealed to be confluent at the apical third and exit as two separate canals from the mesial root. The MD canal was seen joining the DL canal at middle third and a separate DB canal is seen till the middle third of distal root. All the three joined to exit as a single canal from the distal root. In order to catch sight of such accessory canals that remained obscure beneath the lip of dentin, the groove connecting the mesiobuccal and the mesiolingual orifices was troughed using the LN-bur(Dentsply). The two accessory canals were located, one lingual to the mesiobuccal(L-MB) and the other buccal to the mesiolingual(B-ML) orifice. Thus, the 4 canals in the mesial root were the mesiobuccal(MB), linguo-mesiobuccal(L-MB), mesiolingual(ML) and the bucco-mesiolingual(B-ML) canals. Then, the pulp chamber floor was scouted using LN-bur(Dentsply) along the groove joining the DB and DL canals to locate the middle distal canal(MDC) orifice. Orifices were enlarged using an orifice enlarger(Coltene Hyflex EDM) and their working length was confirmed using angulated radiographs(Figure 2). Cleaning and shaping of all the seven canals were done using the Hyflex EDM files upto size 20/0.06(Coltene) using the crown down technique. The canals were irrigated using 5.25% sodium hypochlorite for 1min and 17% EDTA solution for 1min and the final irrigant used was saline. Canals were dried using absorbent paper points(Dentsply). Master cone of Protaper size F1(Dentsply) was selected for all six canals. After obturation, the final canal configuration was 1-2-1-2, with a criss-cross pattern in the mesial root with two separate exits. The three distal canals were seen confluent within the distal root. Obturation was done using warm vertical condensation and the sealer used was AH Plus (Dentsply). Post endodontic restoration was done using composite.

CASE REPORT



Figure 1: PRE-OP



Figure 2-working Length-7 Canals- MB1, MB2, ML1, ML2, DB, MD, DL



Figure 3- Master Cone- Combined DB, MD & DL; Combined MB1, MB2, ML1, ML2



Figure 4- Obturation Using Warm Vertical Condensation; Crossing Canals At Apical Third.



Figure 5- Post-endodontic Restoration Using Composite(class II)

DISCUSSION:

Since, "practice must always be grounded on sound theory", excellence in endodontic therapy can be achieved only by thorough knowledge about the varying complexities of root canal anatomy and its felicitous management to facilitate success in endodontics. The diagnosis of seven canals within a two rooted mandibular first molar is a hurdle to the operator without proper aids and scrupulous knowledge about the anomalous tooth morphology. Pertinent use of different aids of magnification like the loupes or dental operating microscopes (DOM), and the radiographic aids like cone-beam computed tomography (CBCT), are preferred to detect the additional canals and thus reduce the perplexity in its management.^{15,16}

The incidence of middle mesial canal (MMC) and middle distal canal in the mandibular first molar are 1-15% and 0.2-3% respectively¹¹. Fabra-Campos and Bond reported the presence of three mesial canals^{17,18} and Stroner stated the presence of three distal canals in the mandibular first molars.¹⁹ The prevalence of middle canals in the different populations like the Americans, Europeans, and Indians ranged from 0.26% to 53.8%.¹² The incidence of double middle mesial canal (DMMC) was recorded as 3.3%.⁶

Bansal et al proposed a classification for the double middle mesial canal (DMMC) in the mesial root of mandibular molars based on the conducted literature review¹². In the independent type, all the four canals exit from four separate foramina. In the confluent type, the L-MB is confluent with the MB and the B-ML is confluent with the ML canals and they exit as two separate canals from the mesial root¹². In the third type, all the four canals join and exit the mesial root as a single canal. The prevalence of the confluent configuration has also been reported by other researchers to lie between 46.7% and 96%²⁰⁻²². Karapinar-Kazandag et al reported all MMC to have a confluent

anatomy with no incidence of independent or fin anatomy. The confluency pattern varied between the first and second molars. In the mandibular first molar, the middle canal frequently crossed the midline and merged with the MB canal, whereas in the second molar, it more frequently joined the ML canal²⁰. The configuration of the accessory mesial canals of the mandibular molar in this case report can be elucidated with its radiographic details to be categorized under the confluent type of DMMC.

The access cavity was prepared and modified using long shank burs and DG-16 explorer while strictly abiding to the proposed laws of access cavity preparation by Krasner and Rankow. The specifically stated law of CEJ, laws of symmetry, law of color change, and the laws of orifice location can relate to both consistent as well as varying anatomic configurations of the pulp chamber. The represented case with two rooted mandibular first molar with seven canals were diagnosed using digital radiography and aids for magnification like the loupes. The use of CBCT has been limited to cases which cannot be managed by conventional or digital radiography and also requires special consent from the patient¹⁷.

The prevalence of untreated canals associated with periapical pathology accounts to be 82.6% and it contributes to the increased failure rate after endodontic management.²³ Reeh et al reported the occurrence of 7 canals in the mandibular first molar with 4 canals in mesial root and 3 canals in distal root based on clinical and intra-oral periapical radiographic findings.²⁴ Hess explained that differentiation of the root canals occur due to the deposition of secondary dentine within the canal at the cervical, middle and apical thirds in the mesiodistal direction. Peiris et al also confirmed that canal differentiation is completed at around 30-40 years of age in both first and second molars. At this age, there are more chances for development of middle canal in the mandibular molar²⁵. This case report presents a 38 year old male patient with a two-rooted mandibular first molar with 7 canals.

In this case report, the use of digital radiographic examination (Vista Scan) in association with an adequate clinical inspection of the floor of the pulp chamber using loupes and endodontic explorer was adequate to depict the variable anatomy clearly. Long shank burs, ultrasonic tips and a sharp DG-16 explorer are essential aids that are advocated to locate them²⁵. Further, while cleaning and shaping multiple interconnected canals within the same root, complete disinfection with minimal canal enlargement in order to preserve the intervening dentin is the greatest challenge to an endodontist. Since, the tremendously evolving thermomechanically treated NiTi files are at its verge of proliferation, appropriate use of such aids coupled with warm vertical condensation or thermoplasticized obturation can add to the success in endodontics. The integrated use of Hyflex EDM (Coltene) files under the standard irrigation regimen using 5.25% sodium hypochlorite and 17% EDTA, followed by the warm vertical condensation are presumed to act as sublime aids in accomplishing the successful management of this rare entity.

CONCLUSION:

This case report reiterates the complexity and management of a two-rooted mandibular first molar with seven canals and is intended to reinforce the clinicians' requisite to be aware of the variable morphology of root canals in this tooth. Since "alone we can do little while together we can create wonders", the combined use of the appropriate aids are inevitable in magnifying the success of endodontic management.

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