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Case Report Open Access

# Endodontic retreatment of mandibular molars with the presence of missed middle mesial root canals: An important clinical lesion

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## Abstract

**Aim:** Untreated root canals may have a direct impact on root canal treatment (RCT) outcome. The aim of this case report is to describe the nonsurgical root canal retreatment of two mandibular first molars in a patient's mesial roots that had previously missed middle mesial root canals (MMC).

**Methodology:** A 14-year-old female was referred to the our clinic with the complaint of pain in the posterior areas of the right and left mandibula. During the examination, previous RCTs [teeth 36 (mandibular left first molar) and 46 (mandibular right first molar)] were observed. Besides, these teeth have periradicular lesions in the mesial roots probably due to unsuccessful previous treatment. Nonsurgical retreatment was suggested and accepted. Access cavities were prepared and the unnoticed MMCs were detected at the isthmus connecting both mesiobuccal and mesiolingual canals. All the root canals were shaped with NiTi rotary endodontic files. During the shaping, the root canals were irrigated copiously with NaOCl, EDTA, clorhexidine, and saline solutions under a certain protocol. Calcium hydroxide was used for intracanal dressing. Gutta-percha and a resin-based root canal sealer were used for filling. Coronal restorations of the teeth were completed with a composite resin.

**Conclusion:** At follow-up examinations after 3-, 6-, and 12-months, the teeth were asymptomatic and radiographically showed repair of the lesion. Healing was achieved without any need for further endodontic surgical intervention.

**Keywords:** Anatomy, case report, endodontic retreatment, middle mesial canal

## Introduction

Persistent bacterial infection, inadequate root canal filling, untreated canals, improper coronal seal/restoration, and procedural errors as variables can be responsible for apical periodontitis and may cause endodontic failure (1). For this reason, the root canals should be properly scouted, debrided, disinfected, and filled so the occurrence, or continuity, of periapical periodontitis can be minimized (2-4). When the primary root canal treatment (RCT) fails, nonsurgical root canal retreatment (NRCT) is usually considered to be the first treatment option in these cases. Thus, the main objective of NRCT is to remove all previous fillings and to allow thorough reinstrumentation, disinfection, and refilling of the root canals. Specifically, curved canal retreatment is difficult due to potential complications. Therefore, several techniques have been developed and suggested for removing the fillings: endodontic NiTi file systems with or without heat, solvents, and/or ultrasound, and lasers (5). However, complete removal of fillings did not occur with any of the techniques investigated.

Variations in tooth anatomy should always be considered because limited knowledge of morphology may increase the likelihood of missing root canals during treatment (1). Due to its small prevalence and small diameter, root canals such as maxillary molars second & third mesiobuccal canals, or mandibular molars middle mesial canal (MMC), may go unnoticed, which may compromise the RCT (4, 6). The reported (1, 7-9) incidence of RCT failure due to missed canals ranging from 12% to 42% in different populations.

The presence of an independent MMC in mandibular molars was first reported by Vertucci & Williams (10) and Barker et al. (11) in 1974. According to Pomeranz et al. (12) MMCs can be classified into three categories: fin, confluent, or independent. Fin is when a file can pass freely between the mesiobuccal (MB) or mesiolingual (ML) canal and the MMC. Confluent is when the MMC originates as a separate orifice but apically joins with the MB or ML canal, and independent is when the MMC originates as a separate orifice and terminates as a separate foramen. A broad single mesial canal in which three master cones could be cemented to the apex at the same time was also included as an independent MMC (12).

The following case report describes the successful nonsurgical root canal retreatment of two mandibular first molars with periapical lesions of their mesial roots which have previously unnoticed MMCs.

## Case Report

A 14-year-old female was referred to the Department of Endodontics in the Dental Faculty of Akdeniz University with a complaint of pain in the posterior areas of the right and left mandibula. The past medical history of the patient was non-contributory. On radiographic examination (Fig. 1), there were previous RCTs performed on teeth 26 (maxillary left first molar), 36 (mandibular left first molar), and 46 (mandibular right first molar). In addition, radiolucencies were observed at the periradicular regions of mesial roots of teeth 36 and 46. A composite restoration and a seconder caries were detected in tooth 16 (maxillary right first molar). On extraoral examination, there was a light bone expansion on the relevant areas of the complaint. On intraoral examination, there was a small swelling of the vestibule cortex in the concerning areas covered with normal mucosa. The teeth (teeth 36 and 46) were slightly tender to percussion with probing and exhibited normal mobility. According to the patient, the RCTs had been performed a few years ago. Based on these findings, the patient was diagnosed as having periradicular lesions of the right (tooth 46) and left (tooth 36) mandibular first molars (mesial roots) due to unsuccessful previous RCTs. The root canal retreatment was suggested and accepted. At the same visit, RCTs were initiated on these teeth. The treatment procedures described below were first applied to tooth 36 and then tooth 46.

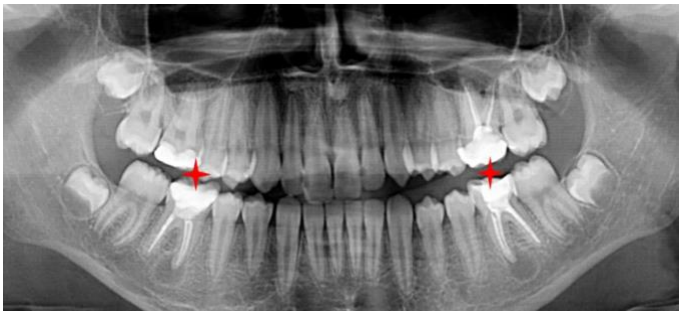

**Figure 1.** A pre-operative radiograph. Previous RCTs and radiolucencies were observed at the periradicular regions of mesial roots of teeth 36 and 46.

The access cavity was prepared, and a rubber dam was applied. We detected an MMC at the isthmus connecting both mesiobuccal (MB) and mesiolingual (ML) canals under an endodontic loupe magnification (Keeler Instruments, Broomall, PA, USA). MB, ML, distolingual (DL), and distobuccal (DB) canals were found to be filled with gutta-pecha and an unknown root canal sealer previously. The newly detected canals (MMC) were negotiated with 10 and 15 stainless-steel K-files (Dentsply Maillefer, Ballaigues, Switzerland), the necrotic pulp tissue was extirpated, and the working length determination was performed with an Apex ID electronic apex locator (SybronEndo, Glendora, CA, USA) and confirmed radiographically. These canals were shaped with VDW.ROTATE rotary files (size 25.04) (VDW, Munich, Germany) according to the manufacturer's instructions. Unlike these, the previously filled root canals (MB, ML, DB, and DL) were shaped firstly with ProTaper Universal Retreatment D1-D3 files (Dentsply Sirona), and additionally ProTaper Next X1-X4 files were used. The working lengths of these canals were

determined radiographically. During the shaping, the canals were irrigated copiously with 2.5% NaOCl using a 5 mL syringe and a 27 G needle throughout the treatment. The final irrigation was accomplished with NaOCl, EDTA, and chlorhexidine. At this stage, an irrigation activation was performed using a sonic device (EndoActivator; Dentsply Sirona, Dentsply Tulsa Dental Specialties, Tulsa, OK, USA) for 30 sec per each irrigant. Among these irrigants, the saline was used for additional irrigation without activation. After drying the canals with sterile paper points, they were dressed with calcium hydroxide (Kalsin; Aktu, Izmir, Turkey) using a lentulo file. Sterile cotton pellets were placed into access cavities before sealing with a temporary filling material (Cavit; 3M ESPE, Seefeld, Germany).

When the patient returned after two weeks, the teeth were asymptomatic. The canals were irrigated with 2.5% NaOCl, and a CanalBrush (Coltene Whaledent, Langenau, Germany) was used to remove the calcium hydroxide. After that, the root canals were dried with sterile paper points and filled with gutta-percha (Dentsply Sirona) and a resin-based root canal sealer (Diaproseal; DiaDent, Chongchong, Korea) using a single cone filling technique. Glass ionomer cement (Ketac-Molar Easymix; 3M ESPE) was placed over the gutta-percha, and restoration of tooth was completed with a composite resin (Arabesk; Voco, Cuxhaven, Germany). A post-operative radiograph was taken to ensure the quality of the filling (Fig. 2).

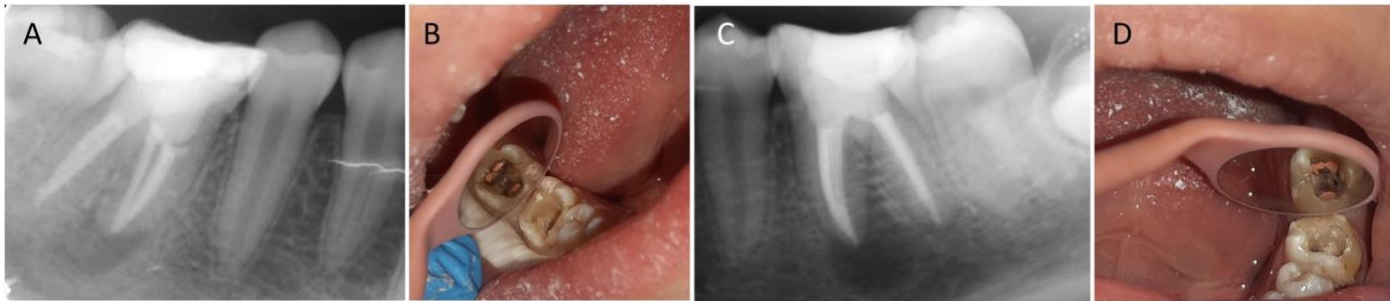


Figure 2. A post-operative radiograph. (A) after filling of tooth 46, (B) clinical view of tooth 46, (C) after filling of tooth 36, (B) clinical view of tooth 36.


Figure 3. After 3- (A-B) and 6-month (C-D) follow-up, radiographs showed further bony healing. At 12-month follow-up (E-F), the patient was completely asymptomatic, and periapical radiography showed resolution of the periapical lesion.

After 3- and 6-month follow-up, radiographs showed further bony healing (Fig. 3 A&B for 3 months; C&D for 6 months). At 12-month follow-up, the patient was completely asymptomatic, and periapical radiography showed resolution of the periapical lesion totally (Fig. 3 E&F). Clinical examination showed no sensitivity to percussion or palpation, and the soft tissues were healthy.

## Discussion

The requirement for a successful RCT is the elimination of all irritants from the root canal system completely utilizing appropriate shaping and irrigation, followed by its three-dimensional filling with a biocompatible material. It is known that the teeth demonstrate a variety of canal morphologies with additional canals, dips, concavities, intracanal communications, inaccessible fins, apical ramifications, and other regions that files cannot reach (13). Of course, these complex and variable structures are very difficult to treat in an ideal way.

The clinician should master a variety of techniques or materials and choose the most appropriate one for the removal of necrotic tissue and bacteria. However, to

date, researchers or clinicians cannot develop a new method or protocol that can completely clean and fill root canals.

Mandibular molars traditionally have two main canals in the mesial root (MB and ML) and one or two main canals in the distal root; however, a third MMC that is situated in the developing groove between the two main canals of the mesial root may also be seen (4, 14). MMC may have its own orifice, branch off of the MB or ML canals, and finish separately or merge with one of these main canals (15). Earlier studies using conventional analytical tools have reported that the frequency of the MMC varies from 0.26-6% (15). However, new studies (16, 17) using advanced imaging techniques have shown that its incidence may be as high as 53.8%. Therefore, locating an existing MMC in order to decrease the microbial load in it, is of the utmost importance when aiming to increase the RCT success. According to Cantatore et al. (18), missing canals resulted in a high percentage of apical periodontitis and failed endodontically treated teeth. Furthermore, the frequency of post-treatment disease was greater in multirooted molars, where the likelihood of missing an additional canal was higher (4, 18).

Costa et al. (19) investigated the frequency of post-treatment apical periodontitis in root-filled teeth with at least one untreated root canal and discovered that the frequency of apical periodontitis in teeth with at least one untreated canal was significantly higher (98%) than in teeth with all canals treated. Ng et al. (20) reported a pooled success rate of 85% for retreatment of mandibular molars and also stated that the presence of preoperative apical lesions, apical extrusion of root canal filling, and quality of coronal restoration were significant prognostic factors that would, in fact, compromise the retreatment outcomes.

Several studies (21-23) found that MMC preparation may enhance the risks of fracture or perforation in the mesial roots of mandibular molars. Nawar et al. (23) researched the optimum shaping parameters of the MMC in mandibular first molars using a finite element analysis test and stated that progressive mechanical enlargement of the MMC was associated with a reduction in tooth life expectancy, but the minimal shaping size used in this study (25/.04) caused the least reduction. This is in agreement with Keles et al. (21) and Kiliç et al. (22), despite differences in methodology. Keles et al. (21) stated that preparation of the MMCs up to size 30 with a .07 taper significantly decreased the fracture strength. As a result, we utilized the VDW.ROTATE rotary files (size 25.04) for MMC, but ProTaper Universal retreatment and ProTaper Next X1-X4 files for the other canals in this case.

Using magnification and illumination are important to perform a RCT, especially in complicated cases; because, this advanced diagnostic equipment provides more definitive visibility of root canal anatomy. In this case, as we have used a dental loupe, no canal was overlooked in the related tooth.

## Conclusion

Mandibular molars have a complex root canal morphology. Adequate knowledge and clinical thoroughness are essential for successful endodontic treatment, as they play a key role in managing abnormal anatomic configurations. Careful exploration between canal orifices is essential to prevent missed canals and adverse clinical outcomes. Magnification and illumination are essential for accurate reading. This case report illustrates that the two mandibular first molars with periapical lesions of their mesial roots, which have previously unnoticed MMCs can be managed with nonsurgical root canal retreatment, which can result in satisfactory periradicular healing.

## Disclosures

**Patient Consent for Publication:** Written informed consent was obtained from the patient.

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Conception – A.B.; Design – A.B.; Supervision – K.E.; Materials – A.B., H.H., K.E.; Data Collection and/or Processing – H.H.; Analysis and/or Interpretation – A.B., H.H.; Literature Review – A.B., K.E.; Writer –A.B.; Critical Review –K.E.

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## References

1. Baruwa AO, Martins J, Meirinhos J, Pereira B, Gouveia J, Quaresma SA, Monroe A, Ginjeira A. The influence of missed canals on the prevalence of periapical lesions in endodontically treated teeth: a cross-sectional study. J Endod. 2020;46(1):34-39. https://doi.org/10.1016/j.joen.2019.10.007
2. Keles A, Keskin C. Deviations of mesial root canals of mandibular first molar teeth at the apical third: a micro-computed tomographic study. J Endod. 2018;44(6):1030-1032. https://doi.org/10.1016/j.joen.2018.02.028
3. Weinberg EM, Pereda AE, Khurana S, Lotlikar PP, Falcon C, Hirschberg C. Incidence of middle mesial canals based on distance between mesial canal orifices in mandibular molars: a clinical and cone-beam computed tomographic analysis. J Endod. 2020;46(1):40-43. https://doi.org/10.1016/j.joen.2019.10.017
4. Gonçalves N, Pereira B, Meirinhos J, Domingos Pires M, Vasconcelos I, NR Martins J, Ginjeira A. Mandibular first molar root canal retreatment with the presence of a

missed middle mesial root canal: a report of two cases. G Ital Endod. 2021;35(1):13-20. https://doi.org/10.32067/GIE.2021.35.01.03
5. Taşdemir T, Er K, Yildirim T, Celik D. Efficacy of three rotary NiTi instruments in removing gutta-percha from root canals. Int Endod J 2008;41(3):191-196. https://doi.org/10.1111/j.1365-2591.2007.01335.x
6. Ordinola-Zapata R, Martins JNR, Plascencia H, Versiani MA, Bramante CM. The MB3 canal in maxillary molars: a micro-CT study. Clin Oral Investig. 2020; 24(11):4109-4121. https://doi.org/10.1007/s00784-020-03284-7
7. Hoen MM, Pink FE. Contemporary endodontic retreatments: an analysis based on clinical treatment findings. J Endod. 2002;28(12):834-836. https://doi.org/10.1097/00004770-200212000-00010
8. Karabucak B, Bunes A, Chehoud C, Kohli MR, Setzer F. Prevalence of apical periodontitis in endodontically treated premolars and molars with untreated canal: a cone-beam computed tomography study. J Endod. 2016;42(4):538-541. https://doi.org/10.1016/j.joen.2015.12.026
9. Costa FFNP, Pacheco-Yanes J, Siqueira JF Jr, Oliveira ACS, Gazzaneo I, Amorim CA, Santos PHB, Alves FRF. Association between missed canals and apical periodontitis. Int Endod J. 2019;52(4):400-406. https://doi.org/10.1111/iej.13022
10. Vertucci FJ, Williams RG. Root canal anatomy of the mandibular first molar. J N J Dent Assoc. 1974;45(3):27-28.
11. Barker BC, Parsons KC, Mills PR, Williams GL. Anatomy of root canals. Permanent mandibular molars. Aust Dent J. 1974;19(6):408-413. https://doi.org/10.1111/j.1834-7819.1974.tb02372.x
12. Pomeranz HH, Eidelman DL, Goldberg MG. Treatment considerations of the middle mesial canal of mandibular first and second molars. J Endod. 1981;7:565-568. https://doi.org/10.1016/S0099-2399(81)80216-6
13. Er K, Kuştarci A, Ozan U, Tasdemir T. Nonsurgical endodontic treatment of dens invaginatus in a mandibular premolar with large periradicular lesion: a case report. J Endod. 2007;33(3):322-4. https://doi.org/10.1016/j.joen.2006.09.001
14. Nosrat A, Deschenes RJ, Tordik PA, Hicks ML, Fouad AF. Middle mesial canals in mandibular molars: incidence and related factors. J Endod. 2015;41(1):28-32. https://doi.org/10.1016/j.joen.2014.08.004
15. Versiani MA, Ordinola-Zapata R, Keles A, Alcin H, Bramante CM, Pécora JD, Sousa-Neto MD. Middle mesial canals in mandibular first molars: a micro-CT study in different populations. Arch Oral Biol. 2016;61(1):130-137. https://doi.org/10.1016/j.archoralbio.2015.10.020
16. Azim AA, Deutsch AS, Solomon CS. Prevalence of middle mesial canals in mandibular molars after guided troughing under high magnification: an in vivo investigation. J Endod. 2015;41:164-168. https://doi.org/10.1016/j.joen.2014.09.013
17. Bansal R, Hegde S, Astekar M. Morphology and prevalence of middle canals in the mandibular molars: a systematic review. J Oral Maxillofac Pathol. 2018;22(2):216-226. https://doi.org/10.4103/jomfp.JOMFP_194_17
18. Cantatore G, Berutti E, Castellucci A. Missed anatomy: frequency and clinical impact. Endod Top. 2009;15(1):3-31. https://doi.org/10.1111/j.1601-1546.2009.00240.x
19. Costa FFNP, Pacheco-Yanes J, Siqueira JF, Oliveira ACS, Gazzaneo I, Amorim CA, Santos PHB, Alves FRF. Association between missed canals and apical periodontitis. Int Endod J. 2019;52(4):400-406. https://doi.org/10.1111/iej.13022
20. Ng Y, Mann V, Gulabivala K. Outcome of secondary root canal treatment: a systematic review of he literature. Int Endod J. 2008;41(12):1026-1046. https://doi.org/10.1111/j.1365-2591.2008.01484.x
21. Keles A, Keskin C, Karataslıoglu E. Middle mesial canal preparation enhances the risk of fracture in mesial root of mandibular molars. J Endod. 2020;46(9):1323-9. https://doi.org/10.1016/j.joen.2020.05.019
22. Kılıç Y, Karatasxlıoglu E, Kaval ME. The effect of root canal preparation size and taper of middle mesial canals on fracture resistance of the mandibular molar teeth: an in vitro study. J Endod. 2021;47(9):1467-71. https://doi.org/10.1016/j.joen.2021.06.002
23. NN, Elkholy MM, Ha WN, Saber SM, Kim H. optimum shaping parameters of the middle mesial canal in mandibular first molars: a finite element analysis study. J Endod. 2023;49(5):567-74