

A Neglected Confluent Middle Mesial Canal in an Infected Pretreated Mandibular First Molar - A Case Report

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ABSTRACT:

In terms of root canal treatments, it is mandatory to detect all the orifices found on the pulp chamber floor in order to diminish the bacterial load ensuring proper chemo-mechanical debridement of the root canals and creating a three-dimensional space for an inert filling material preventing further infections; therefore, All clinicians must be aware of the Middle Mesial Canal (MMC), as these canals correlate significantly with apical periodontitis and failure of treatment representing a challenge in diagnosis. A female patient presented with throbbing pain and swelling in the lower left side of her face; after clinical and radiographic examinations, an infected, pretreated mandibular left first molar was found to be responsible for the symptoms. A neglected confluent middle mesial canal was discovered, cleansed, and treated. To date, the tooth has not developed renewed symptoms or any signs of failure. Since detecting and treating all root canals in multi-rooted teeth are fundamental in terms of endodontic therapy to minimize bacterial growth, provide proper sealing of root canal systems, and increase the success rate of root canal treatments, clinicians must always have a clear conscience and take sufficient time to seek all root canals present in the tooth, not only the well-known and recurrent ones.

KEYWORDS:

Case report, Middle mesial canal, Root canal treatment, Missing canals, Retreatment.

1. Introduction

In terms of root canal treatments, it is mandatory to detect all the orifices found on the pulp chamber floor to diminish the bacterial load ensuring proper chemo-mechanical debridement of the root canals and creating a three-dimensional

space for an inert filling material preventing further infections [1]; however, it is important not to excessively prepare the canals using rotary files in order to maintain fracture resistance [2, 3].

The root canal anatomy is diverse and complex consisting of numerous foramina, isthmuses, fins, apical deltas, loops, and intercanal passages [4]. A low-dose Cone Beam Computed Tomography radiograph could be necessary for obtaining the root anatomy, facilitating decisions, sparing time, detecting complications and difficulties improving future outcomes [5].

The mandibular first molar is the most root canal-treated tooth [6], where in 90% of cases, the mesial root contains two main canals that end in two separate foramina; whereas, in the rest (10%), the two canals fuse just before the foramen. The distal root contains one large oval or kidney-shaped canal (65%) or two canals (35%) [7, 8]. Overall, the mandibular first molar possesses a variety of abnormalities, for instance, Middle Mesial Canal (MMC), Middle Distal Canal (MDC), Radix Endomolaris, Radix Paramolaris, and Taurodontism, which all clinicians should be aware of before performing root canal therapies [9].

The presence of MMC differs according to ethnicity and ranges from 0.26 to 45.8 % [10] and was first reported in 1974 [11]. This canal is always present in younger and middle-aged patients and is significantly more relevant in younger ones [12]. In the mandibular first molar, the MMC incidence on both sides and in both genders is insignificant [13].

MMCs can be classified into three types: Type (I) fin, an isthmus is present between the MMC and

the mesiobuccal canal from the orifice to the apex or an instrument can pass easily between the MMC and ML or MB canal; type (II) confluent, a separate orifice that joins the MB or ML canal through intracanal connection and isthmuses; type (III) independent, three independent canals from the orifices to the foramina [14].

2. CASE PRESENTATION

On 11th December 2024, a 20-year-old mentally healthy married female patient was referred by a colleague, accompanied by her mother. In terms of medical history, she had no systemic disorders, allergies, or infections, and takes no medications that could interfere with future dental treatments. Intraorally, she had good oral hygiene with no relevant caries or restorations visible; however, she still had an orthodontic appliance on the upper teeth. She had a chief complaint of throbbing pain and a focal swelling on the lower left side of her mandible for over three weeks. She started using an analgesic (paracetamol 500 mg) three times a day and a broad-spectrum antibiotic (Cefix 400 mg) once a day for 5 days, trying to relieve the acute and disturbing symptoms, yet she experienced stomachache as a side effect. Clinical and intraoral radiographic examinations were performed to detect the tooth responsible for the chief complaint.

Clinically, the mandibular left first molar was previously restored with composite resin (MO) and was hypersensitive on both palpation and percussion with a negative cold test result, along with a hard palpable swelling localized on the buccal mucosa with no fistula; in addition, signs of micro-leakage around the restoration were also observed. No significant findings were observed on the other teeth on the same side. The combination of hypersensitivity, swelling, and micro-leakage strongly suggests that the mandibular left first molar may be experiencing periapical issues. A preoperative diagnostic periapical radiograph was warranted to assess the extent of any underlying pathology and guide appropriate treatment. Surprisingly, the radiograph displayed well-condensed root canal fillings with full working lengths in all four canals with a large J-shaped radiolucent lesion on the mesial root apex and a small lesion on the distal one (figures 1 and 2).



Figure 1. Preoperative radiograph of the first molar

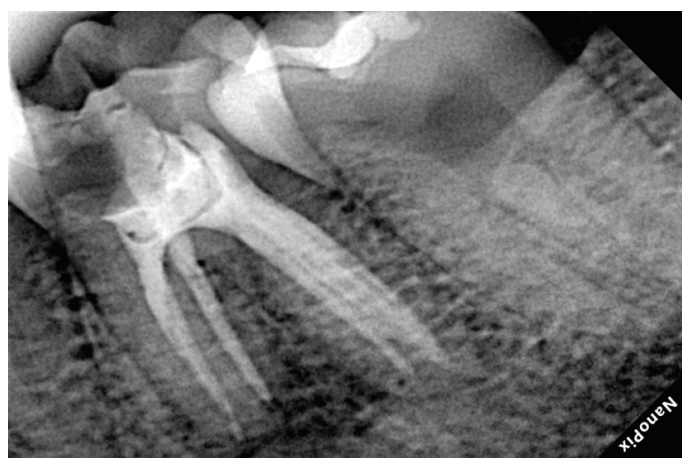


Figure 2. Angulated preoperative radiograph of the molar

After diagnosis was established, the treatment plan was to retreat the first molar by non-surgical endodontic intervention, seeking the possible cause of failure as follows: The restoration and base layer were completely removed using a size 023 coarse round diamond bur (DIASWISS, Switzerland), and the pulp chamber was examined with a sharp endodontic explorer #DG16 (Nordent, USA) to eliminate accidental perforations and to ensure all orifices are accessible. Since the middle mesial canal is mostly present in the first molar in younger individuals [13] and the lesion is focalized on the mesial root, this undetected and neglected canal was thought to be responsible for the failure.

The patient was a little concerned and uncooperative, refusing to put the rubber dam during sessions as she was a mouth breather and was concerned about having the orthodontic appliance damaged by the clamp. Cotton rolls and a saliva ejector were used as alternatives. The root fillings were dissolved and removed manually by injecting Sep Xylol

(Septa, Syria) for 2 minutes, and the canals were carefully negotiated with #25 H files (MANI, Japan) to provide a safe path to the apices and remove the fillings and remnants of the sealer. The MMC was detected by the explorer and found to be neither negotiated nor treated. The working lengths were determined for the four pretreated canals using #10 K files (MANI, Japan) for the mesial canals and #15 for the distal ones. These working lengths were determined to be (17 mm) for the mesial canals and (19 mm) for the distal ones; unfortunately, the radiograph of working lengths could not be retrieved from the system; finally, the two mesial canals were cleaned and prepared by M3 Pro Gold rotary files taper 0.04% (Bondent, Germany) mounted on a rotary handpiece (Cicada, China) up to #25 for the medial canals and up to #30 the two distal canals under 5.25% sodium hypochlorite irrigation. The MMC was negotiated gently with #6 K files to the full working length (17 mm), then mechanically prepared up to #25 taper 0.04%. Clinically, the MMC appeared to have a separate orifice located equidistant between the MB and ML canals, as shown in Figure 3 (Figure 4), and its path joins the MB canal, ending in the same apex, forming a confluent type, whereas the ML canal had a separate path from the orifice to a different apex.



Figure 4. The three mesial orifices under the rubber dam

Each canal was irrigated with 5 mL of sodium hypochlorite, dried with paper points, and then filled with CaOH dressings with iodoform (Calplus™, India) with the help of a lentulo spiral; this process was performed once a week for 4 weeks in a row to ensure disinfection of all canals before obturation. After the final dressing, a thorough evaluation of the canals was conducted to confirm the absence of any purulent or serous exudates. Mastercones (Dia-ProISO.04, Diadent, South Korea) corresponding to the size of the prepared canals were fitted and assessed radiographically with mesial angulations to ensure full working lengths and the feeling of tug-back. The radiograph of mastercones of the distal canals was also lost from the system.

The patient was convinced to put the rubber dam only during the session of filling the distal canals (Figure 4). After ensuring dryness of all canals by paper points and excluding any serous or purulent exudate, the obturation was established in two separate sessions by cold lateral compaction technique using Gutta-percha mastercones taper 0.04 % compacted with secondary cones taper 0.02 % along with epoxy-based resin sealer system (Dia-proseal, Diadent, South Korea) to provide proper and better sealing for the three thirds of each canal. Restoration of the access and MO cavities was achieved using bulk-fill composite resin (ESPE Filtek™ Bulk-Fill, 3M, USA) on 22nd February 2025 (Figure 5). Postoperative instructions were provided to the patient, emphasizing the importance of follow-up visits to monitor the healing process and the overall success of the treatment. The patient was scheduled for reassessment after at least 3 months to evaluate the lesion and for Retreatment.

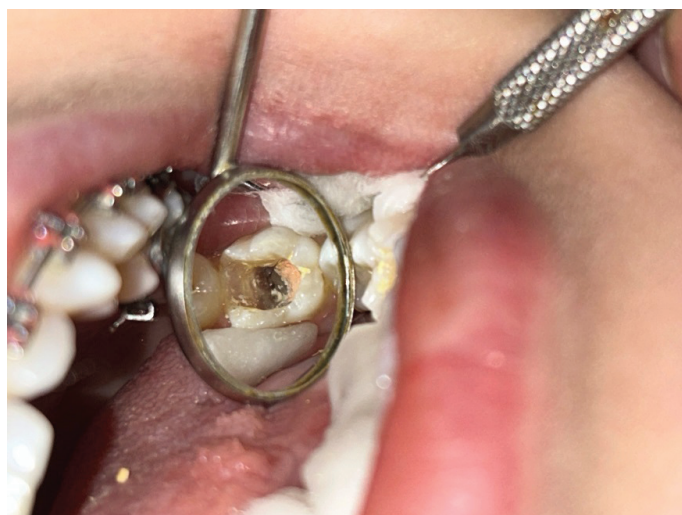


Figure 3. The three mesial orifices

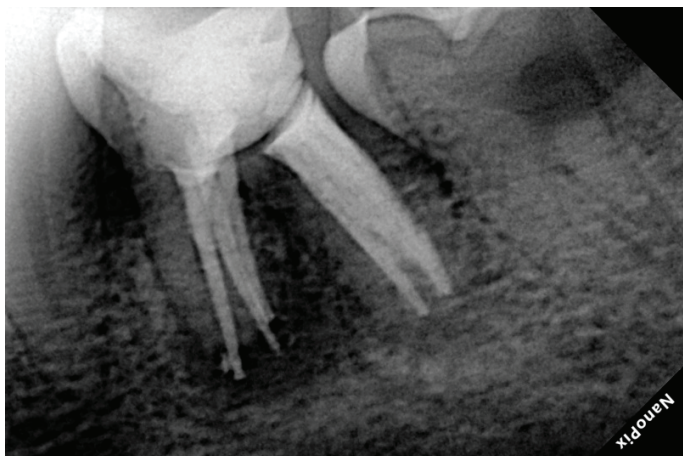


Figure 5. Postoperative radiograph of the first molar

So far, on 20th May 2025, the tooth has not developed any further symptoms or signs of failure, and the prognosis seems to be good so far. No adverse and unanticipated events were observed. The patient was satisfied with the treatment offered, as the disturbing symptoms subsided gradually and became asymptomatic; in addition, the patient could preserve the tooth without having to undergo an extraction procedure, as she was planning to have a fixed orthodontic appliance on the lower jaw.

A reevaluation radiograph was obtained on 29th June 2025, where no further resorption of the mesial root or increase in the size of the lesion was observed. A metal band for a fixed orthodontic appliance was applied to the molar by the patient's orthodontist, as shown in Figure 6.

Apologies to the readers for the accidental loss of some radiographs.

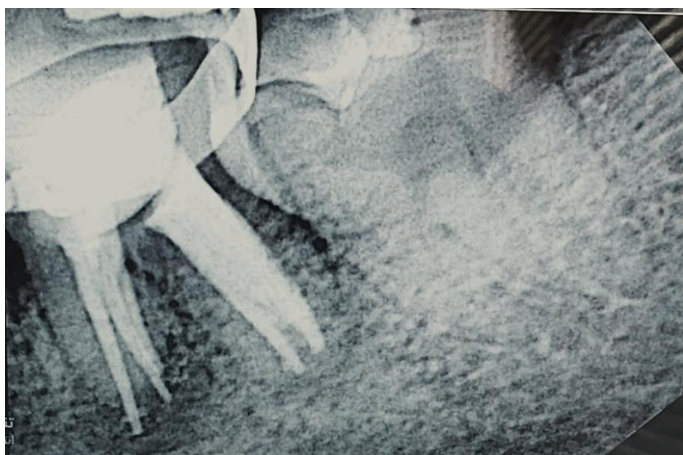


Figure 6. Reevaluation radiograph of the molar

3. DISCUSSION

This case highlights the crucial role of the MMC in the success rate of root canal treatments in mandibular molars and, in particular, the first molars. According to Fabra-Campos, 2.6% of lower molars have three passages in the mesial root, 1.7% of which have merged canals [15]. The mesial root of the mandibular first molar has one large canal until the age of 11, but due to secondary dentin deposition, the root canal system alters in the apical two-thirds at the age of 30–40 [16]; therefore, acknowledging these age-related differences in configuration assists in locating and negotiating all canals present [17].

In the patient's case, no dentinal projection along the mesial flange of the pulp chamber was observed because it was probably removed by the previous clinician; however, this projection is present in the majority of cases [18]. No dental loupes or any other magnification methods were used in managing this case; nevertheless, the dental operating microscope could have provided better illumination and visibility as it detects slight color alterations and enhances comprehension of pulp chamber floor anatomy [18].

All clinicians must be aware of MMC variations to provide complete cleaning and sealing of the canals, as these missing canals correlate significantly with apical periodontitis [19]; these findings were observed in the patient's case, where a large radiolucent lesion formed on the mesial root apex.

A little deliberate extrusion in the mesial canals was intended, as a case series of 220 root canal treatments reported that overfilling does not negatively affect the long-term performance of root canal treatments if adequate disinfection and three-dimensional seal of the apical one-third were provided [20].

As strengths associated with this case report, no surgical interventions or novel diagnostic methods were resorted to in diagnosing and treating this case. Some limitations were encountered during the manipulation of this case report, for instance, the rubber dam was applied only during the obturation process, as the patient normally suffers from renal disorders; no MTA plugs were applied at the apices of the absorbed mesial root, as a time-sparing procedure was mandatory to avoid further contamination.

4. CONCLUSIONS

Since detecting and treating all root canals in multi-rooted teeth are fundamental in terms of endodontic therapy to minimize bacterial growth, provide proper sealing of root canal systems, and increase the success rate of root canal treatments, clinicians must always have a clear conscience and take sufficient time to seek all root canals that may be present in a tooth, not only the well-known and recurrent ones.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest concerning the patient's case, authorship, and/or publication of this case report.

INFORMED CONSENT AND ETHICAL APPROVAL

Written informed consent was obtained from the patient. Ethical approval was not required.

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