# MANAGEMENT OF AN ENDODONTICALLY TREATED 2-ROOTED MANDIBULAR FIRST MOLAR WITH 3 DISTAL CANALS. A CASE REPORT

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## Abstract

This case report describes the endodontic re-treatment management of a two-rooted mandibular first molar with five canals (two mesial and three distal canals). The author also demonstrates the importance of using cone beam computed tomography (CBCT) for diagnosis and treatment planning.

**Keywords:** *five orifices, first mandibular molar, cone beam computed tomography*

## 1. INTRODUCTION

The main goal of endodontic treatment is 3-dimensional cleaning and shaping of the entire root canal system, followed by complete obturation with a root filling material [1]. Missing a root canal space during the initial endodontic treatment is one of the main reasons of endodontic failure [2,3]. Thus, clinicians should carefully consider the different anatomy of all types of teeth. However, anatomical variation is not uncommon, and it is necessary that clinicians assess every single case with a different morphology. Magnification and adequate access are important in the endodontic treatment, helping clinicians to thoroughly visualize the floor of the pulp chamber and locate all orifices of the root canal system. Also, a meticulous radiographical examination prior to any endodontic treatment is very important to predict the root canal anatomy and treatment plan of the case.

The success rate of endodontic re-treatment varies according to different factors, such as pre-operative diagnosis, presence of peri-apical radiolucency and of iatrogenic mishapes, while the motivation for endodontic re-treatment is one of the main outcome predictors [4,5]. For example, when the initial endodontic treatment failed due to a perforation, the success rate of non-surgical endodontic re-treatment will be around 60%, however, when the reason of the initial endodontic treatment failure is the presence of untreated canal, the success rate of non-surgical endodontic re-treatment will be approximately 80% [5].

Several studies have shown that the first mandibular molar is sometimes associated with an uncommon root canal anatomy, so that the purpose of this case report is to present a successful endodontic re-treatment of a 2-rooted mandibular first molar with three separate distal orifices.

## 2. CASE REPORT

A 57 year-old male was referred to the Endodontic Post-Graduate Clinic in the University at Buffalo School of Dental Medicine, Buffalo, United States of America, for evaluation and management of tooth #19. The patient was complaining of pain and discomfort when he chews in the left side of the jaw. Tooth #19 received RCT and full-coverage restoration more than 3 years earlier. Review of medical history revealed hypertension, type II *diabetes mellitus*, and allergy to penicillin.

Clinical examination of tooth #19 revealed a full-coverage restoration with clinically acceptable margins. Vitality tests resulted in a negative response to cold and electric pulp sensibility tests. The tooth was sensitive to percussion and normal to palpation and bite

tests. Periodontal probing revealed a 10 mm deep pocket in the disto-buccal area. The preoperative peri-apical (PA) radiographs (Fig. 1) and cone-beam computed tomography scan (CBCT) (J Morita, Osaka, Japan) (Fig. 2) taken showed that tooth #19 has been previously endodontically treated with full-coverage restoration, the mesial root has widened the periodontal ligament (PDL) space and the distal root has a J-shaped peri-radicular radiolucency with intact cortical plates, while a disto-buccal canal not treated is also observed in CBCT. The tooth was diagnosed as previously treated with symptomatic apical periodontitis.

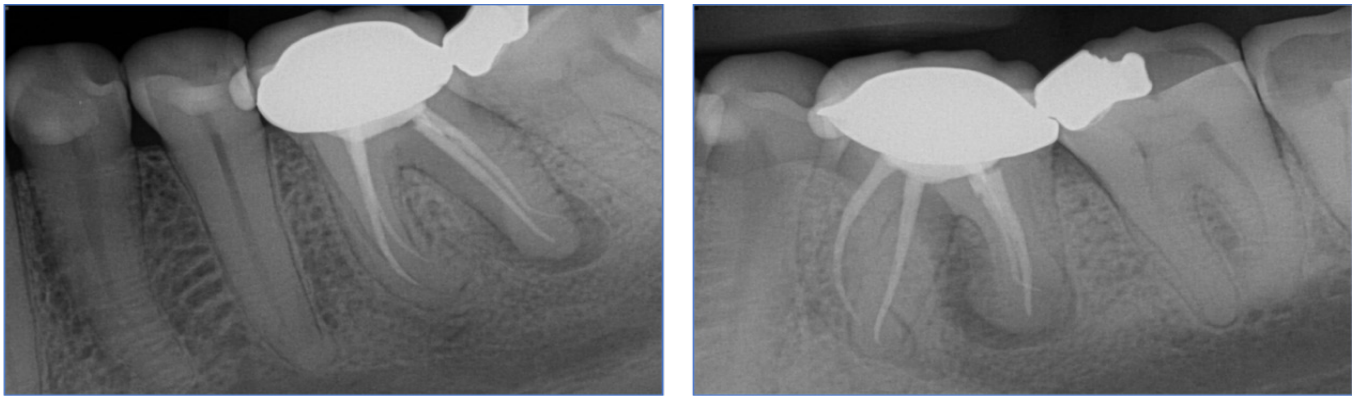

**Fig.1. Pre-operative PA radiographs with different angles show that tooth #19 has been previously treated with full-coverage restoration, the mesial root has widened PDL space and the distal root has a J-shaped peri-radicular radiolucency**

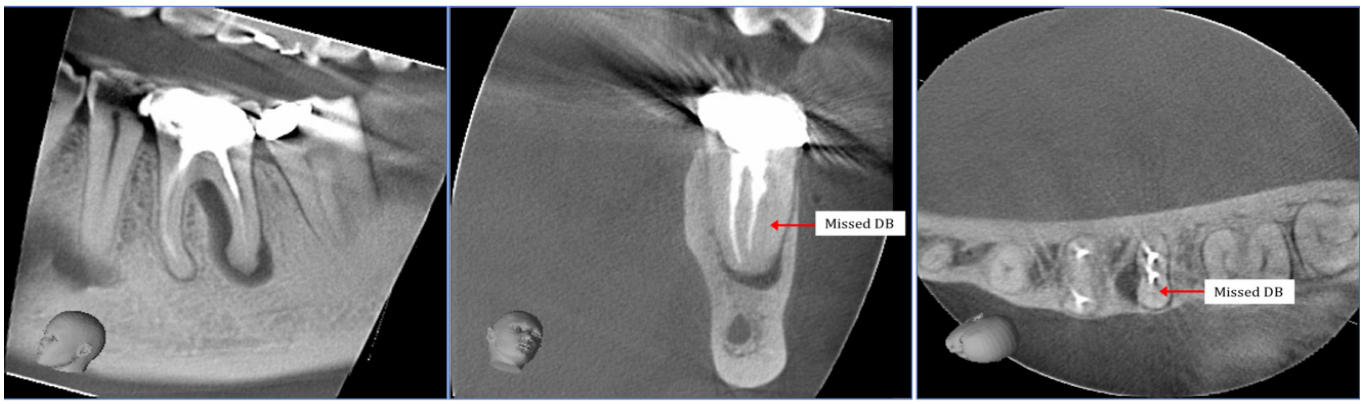


**Fig. 2. Pre-operative CBCT images show that the distal root of tooth #19 has a J-shaped peri-radicular radiolucency with intact cortical plates and also the missed DB canal (arrow)**

All possible treatment options were explained to the patient. The possibility of vertical root fracture (VRF), potential complications, risks and benefits were fully discussed, and informed consent was signed by the patient.

During the first visit, local anesthesia was administered and tooth #19 was isolated with rubber dam and Opaldam (Ultradent Products Inc, South Jordan, Utah, USA). A dental operating microscope (Opmi Pico, Zeiss, Germany) was used throughout the procedure. Access was opened through the existing crown using a size 4 round diamond bur for the porcelain part and carbide bur for the metal part. Initially, 4 canals were located: mesio-buccal (MB), mesio-lingual (ML), mid-distal (Mid-D), disto-lingual (DL). Munce discovery burs (CJM Engineering, Santa Barbara, CA) were used for troughing in the buccal area to the Mid-D orifice, and the disto-buccal (DB) canal was located (Fig. 3).

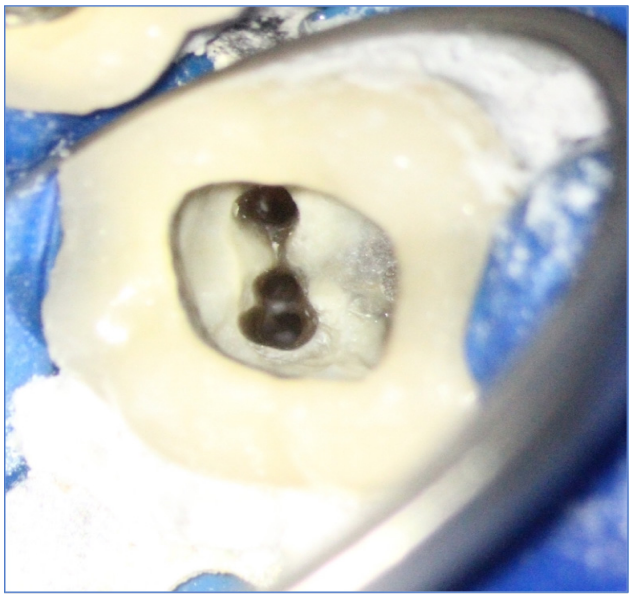

**Fig. 3. Clinical picture shows the three distal orifices**

The existing gutta percha (GP) was removed using 0.5 ml of chloroform and Vortex rotary files (Dentsply Tulsa Dental Specialties, Tulsa, OK, USA) in MB, ML, DL. Only hand K-files were used with chloroform to remove the existing GP in the Mid-D canal, due to the severe curvature in the apical third. Then, all canals with size 8 and 10 C-files were negotiated until patency was achieved. The working length (WL) was determined using an electronic apex locator (Root ZX II, MORITA, Kyoto, Japan), and the canals were completely instrumented with Vortex (MB, ML, DB, DL) and Vortex Blue rotary files (Dentsply Tulsa Dental Specialties, Tulsa, OK, USA) (Mid-D) by the crown-down technique. Irrigation with 5.25% NaOCl was performed throughout the procedure. Canals were dried with sterile paper points, and $Ca(OH)_2$ (AH Temp, Dentsply, York, PA) was placed in all canals. Access was restored with cotton pellet and Cavit (3M ESPE, Seefeld, Germany), and post-operative instructions were given.

After eight weeks, the patient was asymptomatic. Intra-oral examination revealed that the deep periodontal pocket in the DB area was reduced to 4 mm. However, it was noticed that a small peri-apical radiolucency was developed around the mesial root. Findings were presented to the patient and the treatment was completed. During this visit, local anesthesia was administered, the tooth was isolated and re-accessed, and $Ca(OH)_2$ was removed with 5.25% NaOCl, followed by 1 minute irrigation with 17% EDTA and final irrigation with 5.25% NaOCl using sonic activation. Patency was confirmed, a PA radiograph was taken to confirm the cone fit at WL (Fig. 4), and the canals were obturated by the warm vertical compaction technique.

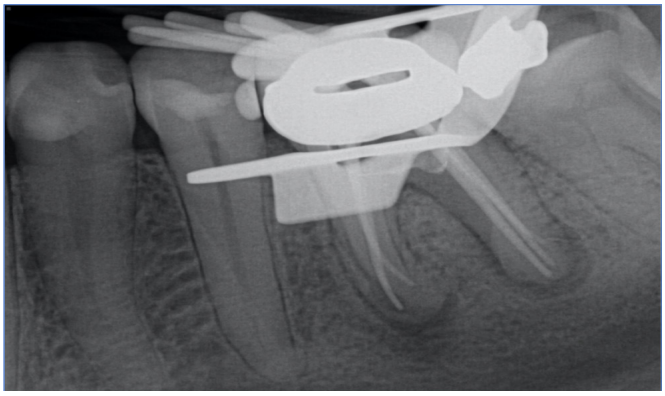

**Fig. 4. Intra-operative PA radiograph shows the master apical cones**

The pulp chamber was cleaned with alcohol-soaked cotton pellets, the access cavity was restored with permanent composite restoration, and a post-operative PA radiograph was taken (Fig. 5).

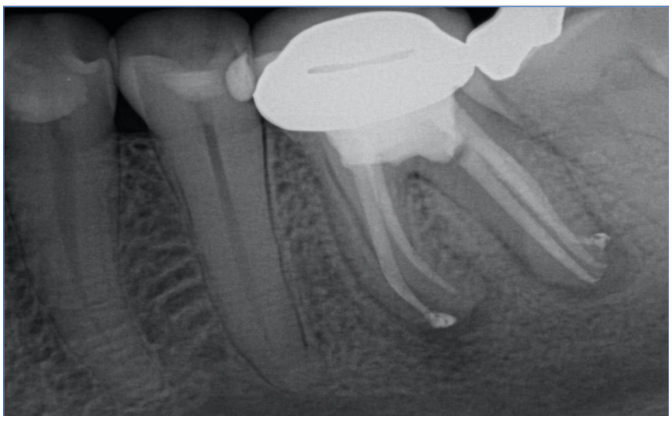

**Fig. 5. Post-operative PA radiograph shows the final obturation**

At 12 months follow-up appointment, the patient was asymptomatic, reporting that he can chew without any discomfort. Clinical examination revealed a normal response to percussion and palpation, the deep periodontal pocket present in the DB area was resolved, and

periodontal probing was within 1-3 mm all around the tooth. PA radiograph (Fig. 6) showed that the peri-radicular radiolucency present around the distal root is completely healed with intact lamina dura and normal PDL space. The peri-apical radiolucency developed around the mesial root during the treatment showed a significant reduction in size compared to the post-operative PA radiograph. These findings were explained to the patient, and 1-year follow-up was recommended.

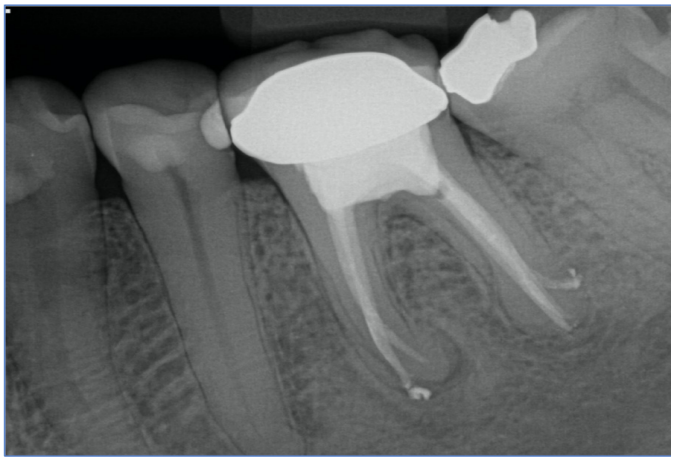

**Fig. 6. A 12-months follow-up PA radiograph shows that the peri-radicular radiolucency present around the distal root is completely healed with intact lamina dura and normal PDL space.**

## 3. DISCUSSION

Several studies have investigated the root canal anatomy of various teeth types using different methods [6-10]. In most of the cases, the mandibular first molars have one mesial root with two canals, and one distal root with one canal. It was reported that 87% and 70% of the mandibular first molar has 2 canals in the mesial root and 1 canal in the distal root, respectively [11]. Also, Skidmore & Bjorndal showed that the first mandibular molar has only one canal in the distal root in 88% of the cases, whereas two canals are present in 28% of them (12).

In the present case report, tooth #19 had 2 canals in the mesial root, and 3 canals in the distal root. This tooth presented with clinical and radiographical signs that may indicate a VRF, which can lead the clinician to extract it. However, the use of pre-operative CBCT played a major role in the decision-making process for the management of this tooth, as it clearly showed a not treated third distal canal, which suggested that failure of the initial endodontic treatment is due to missed anatomy. Consequently, VRF was excluded, and endodontical re-treatment was recommended as the best treatment option. Rodriguez *et al*. (13) investigated the effect of using CBCT imaging in the treatment plan by different specialists. The results showed that clinicians actually altered their treatment plans when CBCT was used *versus* a 2-dimensional radiograph alone in about 30-50% of the cases [13].

Also, the use of a dental microscope served clinicians to better see the floor of the pulp chamber and accurately locate the root canal orifices, thus increasing the success rate of root canal treatment (14). In the present case, the microscope use, together with munce burs greatly helped in detecting the untreated third distal canal.

## 4. CONCLUSIONS

Pre-operative CBCT imaging can provide important diagnostic information and may influence the decision-making process. Careful clinical inspection of the floor of the pulp chamber under dental microscope or at high magnification is very important to perform decent endodontics.

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