ENDODONTIC RETREATMENT OF A MANDIBULAR FIRST MOLAR WITH FIVE ROOT CANALS: A CASE REPORT

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INTRODUCTION

Good knowledge of the endodontic anatomy and its variations from normal are the first requirements when performing root canal therapy. An unshaped and unfilled root canal will lead to failure of the endodontic therapy in a very short time.¹

The mandibular first molar is the first permanent posterior tooth to erupt on the dental arch. Because of its high rate of caries is often involved in endodontic therapy. It usually has two roots but occasionally three, with two canals in the mesial root and one or two canals in the distal root.²,³ Cleaning and shaping of this tooth can be complicated by the presence of the third root canal in the mesial or in the distal root.⁴⁻⁶

Skidmore & Bjorndal reported in 1971 that approximately one third of the mandibular first molars studied had four root canals.⁷ Molars with five root canals were also reported. In these cases, three mesial or three distal canals were described.⁸⁻¹²

The third mesial canal in human lowers first molars, also known as the middle mesial canal (MM), has an incidence varying from 1% to 15%.¹³⁻¹⁷ This supplementary canal is very hard to be detected without proper illumination and magnification, so the use of the dental operating microscope in exploring the pulp chamber floor is absolutely necessary.¹⁸

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present, the MM canal is found in the developmental groove between the mesiobuccal and the mesiolingual canals.\textsuperscript{19-21} Ultrasonic tips are very useful in removing the dentin which overlays on this groove and limits the visibility and the access to this canal.

This case report describes the orthograde endodontic retreatment performed on a first mandibular molar with five root canals, two distals and three mesials, situated in two roots, diagnosed with chronical apical periodontitis. This status resulted as a consequence of the failure of the first endodontic treatment performed, where the second distal and the third mesial (MM) canals were undetected and untreated.

CASE REPORT

A 30-years-old female patient was referred by a general practitioner (GP) for endodontic orthograde retreatment on tooth no. 46. Two preoperative angulated periapical radiographs were taken and examined before initiating any endodontic treatment. The X-Rays confirmed that the patient had a deficient previous root canal treatment on the first mandibular right molar, with incomplete root canal fillings on both mesial and distal roots, with chronic apical periodontitis, but with no clinical significant symptomatology. (Fig. 1) At a careful examination of the preoperative periapical X-rays, the distal root seemed to have two root canals. Also, the shape and size of the mesial root on the X-rays and that of the root canals fillings former performed, suggested that this root could also have a supplementary, untreated root canal.

The patient was informed about the procedure to be done and an informed consent has been signed.

First appointment - the retreatment

After local anaesthesia (local nerve-block) with articaine (Ubistesin forte, 3M Espe, Seefeld, Germany) the tooth no. 46 was isolated with rubber dam and clamp (Hygenic, Coltene Whaledent, USA). (Fig. 2) The access cavity was initiated with a round high speed diamond bur no. 4 (Dentsply Maillefer, Ballaigues, Switzerland), under the DOM (Opmi Pico, Carl Zeiss, Oberkochen, Germany), at a lower magnification. An Endo Access bur number A0164 (Dentsply Maillefer, Switzerland) and ultrasonic tips (CPR, Dentsply Maillefer, Switzerland) were used to refine the access cavity and to remove all the caries and the former composite coronal restoration material. When exposing the pulp chamber floor, a lot of debris, sealer and gutta-percha were observed. The pulp chamber was thoroughly rinsed with heated sodium hypochlorite (Chloraxid 5.25%, Cerkamed, Poland) and the pulpal floor was carefully examined under higher magnification with DOM using an endodontic probe (DG16, Hu Friedy, US), and afterwards with size 010 Micro-Opener instruments (Dentsply Maillefer, Switzerland).

In both roots, the canal fillings were former performed with gutta-percha and sealer, with the appearance of two master cones in the mesial root (one mesiobuccal and one mesiolingual), and one in the distal root. (Fig. 3) When exploring this area with a size 10 stainless steel K-files (VDW, Munich, Germany) attached to an apex locator (EIE/Analytic Technology, Orange, CA, USA), the presence of the second distal canal, the distolingual, was confirmed. This canal was undetected and unshaped by the GP.

Gutta-percha from the distobuccal, mesiobuccal and mesiolingual canal was removed with ProTaper Universal System (Dentsply Maillefer, Ballaigues, Switzerland) rotary instruments for retreatment,
without using solvents. These nickel-titanium rotary instruments were used in a crown-down manner in combination with a torque-controlled engine (X-Smart™ Endodontic Motor, Dentsply, UK) at 500 rpm, according to the manufacturer’s instructions. The root-filling material was gradually removed using light apical pressure, until the working length was reached with D3 size 20 instrument, 7% taper. The D1 instrument (9% taper, size 30) was first used to create a pilot hole into the filling material, then the D2 instrument (8% taper, size 25) was used in the middle third of the root canal and the D3 in the apical part of it. The working length was confirmed by electronic measurement with an apex locator (EIE/Analytic Technology, Orange, CA, USA) and stainless-steel K-files. Apical enlargement was then performed with ProTaper Universal instruments F1-F4, until instrument F4 (size 40, 6% taper) nearly reached the working length in the distal canal and instrument F3 (size 30, 9% taper) in the mesiobuccal and mesiolingual canals. Preparation was deemed complete when there was no filling material covering the instruments.

The distoltingual canal was shaped to an F4, after negotiating it with size 08 stainless steel K-files (VDW, Munich, Germany) and enlarging it by hand, using stainless-steel K-files, until instrument size 25 reached the entire working length. The preparation continued with ProTaper Universal rotary instruments S1-S2 and the finishing was made with F1-F4 according to manufacturer’s instructions. One set of ProTaper Universal for retreatment and one set of ProTaper rotary for treatment were used for all four root canals.

Root canals were intermittently and copiously irrigated with 5 mL of heated NaOCl 5.25% after each instrument change. Irrigation with NaOCl alternated with 17% EDTA solution during and after the instrumentation, to remove the smear layer. Patency was assured on each of the root canals with the K-file no 10 (VDW, Munich, Germany).

After completing cleaning and shaping of these four root canals, careful examination of the mesial root under higher magnification with the DOM was performed. (Fig. 4) A 08 K-file could be inserted on the isthmus between the mesiobuccal and mesiolingual canal, confirming the presence of the middle mesial (MM) canal in the mesial root. (Fig. 5) The dentin covering this root canal was removed using ultrasonic tips (CPR, Dentsply Maillefer, Switzerland) in order to insure straight line access. The negotiation started with a size 08 stainless steel K-file (VDW, Munich, Germany), in the presence of a viscous chelating agent placed on the file (Glyde File Prep, Dentsply Maillefer, Ballaigues, Switzerland) till it reached the working length, which was confirmed by electronic measurement with an apex locator (EIE/Analytic Technology). The middle mesial canal was shaped to a F2 ProTaper rotary (size 25, 8% taper).
Final irrigation with sodium hypochlorite, sterile saline and chlorhexidine solution 2% for 10 min in each root canal was performed. The canals were dried with sterile paper points and an interim dressing of calcium hydroxide and 1% chlorhexidine was placed as medication in each root canal for 2 weeks.

**Second appointment - the root canals filling**

In the second appointment, the calcium hydroxide dressing was removed, the canals were rinsed, and each of the five canals was gauged using NiTi hand K-files attached to an apex locator in the presence of an irrigant (EDTA 17% solution). The diameters of the apical foramen (and respectively that of the master gutta-percha cones) were established at size 40 for the distal canals, 35 for the mesiobuccal and mesiolingual canals, and 25 for the middle mesial canal. Apical finishing of all root canals was obtained by using hand stainless steel K-files in a step-back sequence. (Fig. 6)

The canals were irrigated again, dried with sterile paper points and the gutta-percha master cones (size 40, 10% taper for the distal canals, size 35, 6% taper for mesiobuccal and mesiolingual canals, and size 25, 6% taper for MM) were cut to fit at 0.5 mm of the working length for each root canal. Each selected master cone was then cemented into the corresponding root canal with AH Plus sealer (Dentsply Maillefer, Ballaigues, Switzerland). (Fig. 7) The master cones were shortened to the root canal orifice with the tip of a heated System B plugger (SybronEndo Corporation, Orange, CA, USA) attached to the System B heat source (SybronEndo) set at 200°C and full power mode. The technique used for obturation was the continuous wave of condensation.

After down-packing the gutta-percha master points with System B pluggers (SybronEndo), the phase of back-packing was completed with thermo-plasticized gutta-percha using the Obtura II gun (Obtura Spartan, Fenton, MO, USA) (Fig. 8). The pulp chamber was temporary sealed with glass ionomer cement and angled radiographs were taken to evaluate the quality of the performed endodontic treatment. (Fig. 9)

**DISCUSSION**

Although with a lower frequency, this case report describes the retreatment performed on a first mandibular molar with five root canals, two in the distal root and three in the mesial one. Several studies investigated the anatomy of mandibular first molars, so today is not unusual to discuss about supplementary canals in the distal or mesial root of these teeth, or even about more than two roots. The middle mesial canal is considered to be present in the mesial root in up to 15% of the cases reported. Rarely, three canals may be found in the distal root.

In the present case report, the endodontic retreatment was necessary because of the presence of apical periodontitis, as a consequence of an improper former root canal therapy performed several years ago. Cases of retreatment always begin with a careful examination...
of the endodontic anatomy of the involved tooth on preoperative radiographs, because many times the failure of the first performed therapy is caused by a missed and untreated root canal. The X-rays may reveal a special endodontic anatomy of the treated tooth.

Endodontic retreatment is much more difficult than primary root canal treatment because of the presence in the root canal of filling materials, broken instruments or even ledges that sometimes make the renegotiation of the root canal impossible on its entire working length. Although a lot of solvents can be used to remove the filling materials from the endodontic space, in this case only ProTaper Universal rotary instruments for retreatment were used, under copious irrigation with sodium hypochlorite and EDTA solution. Finishing of the root canals preparation was realised to the desired taper and apical diameter by using ProTaper rotaries and K-hand files.

The retreatment was performed in this case in two appointments only because of the complexity of the endodontic anatomy, which necessitated more time for instrumentation of the five root canals, so the working time was prolonged beyond patient’s tolerance. Between the two appointments, calcium hydroxide/1% chlorhexidine was placed as medication in the root canals for two weeks, in order to enable the life of micro-organisms un-destructed by the irrigation protocol. In teeth with uncomplicated root canal anatomy, when the diagnosis is chronic apical periodontitis and teeth have no clinical symptomatology endodontic retreatment can be performed in one appointment, as single visit endodontics.

CONCLUSIONS

Long term success of endodontic therapy depends on identifying, cleaning and shaping of all root canals, in order to ensure a tridimensional filling of the entire endodontic anatomy. Missing a supplementary canal, improper cleaning-shaping-obturation will lead to endodontic failure, which sooner or later will consist in an apical periodontitis. Good knowledge of the endodontic anatomy and of its variations, careful interpretation of preoperative periapical X-rays, magnification and illumination under the DOM, improve the predictability and the long term success of root canal treatment and retreatment.

REFERENCES


