Extra Canals In Mandibular 1st Molar – An Endodontic Enigma

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Abstract

A meticulous knowledge of tooth anatomy and morphology of the pulp space is imperative for successful endodontic treatment. This knowledge helps to interpret variously angulated radiographs, gain proper access to the pulp chamber, locate the canals and also help to clean and shape the radicular canal space. This article reports the rare finding of middle mesial canal in the mandibular first molar and points out the importance of looking for additional canals and unusual canal morphology because knowledge of their existence might occasionally enable clinicians to treat a case successfully that otherwise might have ended in failure.

Introduction

A thorough knowledge of both, internal and external anatomy of a tooth is an important aspect of root canal treatment[1].

A major reason for a failed root canal treatment is undetected extra roots and canals.[2]

One promising non - invasive method of detecting additional canals involves the use of magnifying visual aids. One such aid is the operating microscope, which offers various high and low power magnifications. Operating microscopes offer homogeneous illumination without shadows and a three - dimensional view, which combine to allow a clear visualization of the examination site.[3]

The mandibular first molars are the first permanent teeth to erupt and most often, they require endodontic treatment. The mandibular first molars normally have two roots, one mesial and one distal, with two canals in the mesial root and with one or two canals in the distal root. The literature is replete with a number of reports on the anatomic variations and the abnormalities which are associated with the first mandibular molars. The variations in the canals include C - shaped canals, 5 canals, 6 canals and 7 canals.[4-8]

Case Report

A 20 years old male patient presented with dull pain in the lower right posterior region, which was there for the past 1 month at the clinic. This pain aggravated on chewing and lingered for a few minutes. His clinical examination revealed a deep carious lesion in the mandibular left first molar. The tooth was extremely tender to percussion. Medical history of the patient was non – contributory.

Investigations

A pre - operative radiographic evaluation

Fig. 1 Pre - Operative radiograph.

Fig. 2 Access cavity.

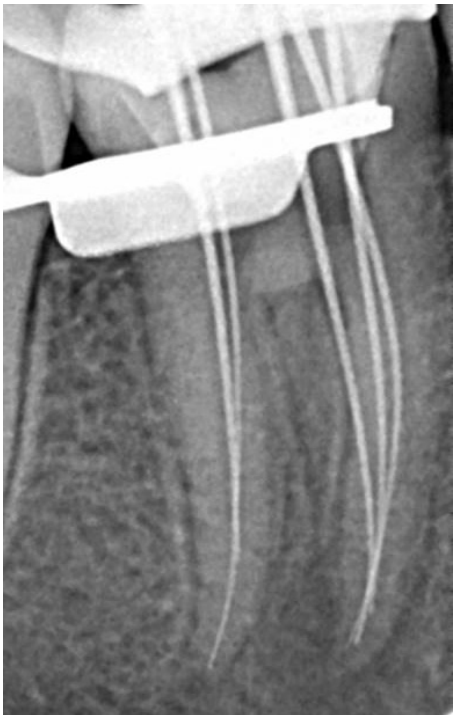

Fig. 3 Working length determination.

of the involved tooth indicated caries which approximated the pulp. Normal root canal anatomy was observed with widening of the periodontal ligament space. Peri - apical radiolucency was observed in relation to the mesial root. (Fig. 1)

The tooth showed delayed response to Electric Pulp Testing [EPT].

Diagnosis

The clinical and radiographic investigation led us to diagnose the condition of the tooth as Symptomatic Irreversible Pulpitis [AAE Classification 2013], with Apical Periodontitis.

Treatment Plan

Root Canal Treatment was planned in relation to 36, followed by placement of Glass Fibre Post in the distal canal. A porcelain fused to metal crown was planned after post endodontic restoration with **LuxaCore**.

Treatment Protocol

The tooth was anaesthetised using 2% Lignocaine with 1 : 80,000 Adrenaline **(Lignox, Indoco Remedies Ltd, India)** and isolated using rubber dam. A pre-Endodontic restoration had to be done as the tooth structure was compromised. Endodontic access cavity was established with Endo Access Burs. The pulp chamber was frequently flushed with 5.25% sodium hypochlorite to remove debris. Inspection of the pulp chamber under microscope **(Seiler, Germany)** was done, which revealed five canal orifices; three mesial and two distal (Fig. 2). Interferences to the mesial canal orifices were removed using LN Burs **(Dentsply, Maillefer)** and Ultrasonic Endodontic tips **(ProUltra, Dentsply, Tulsa)**. Canal patency was checked with number 10 K - file **(Mani, Inc; Japan)**. Working length radiograph was taken (Fig. 3) and the presence of five canals was confirmed. The middle mesial canal was equidistant from the mesiobuccal as well as the mesiolingual canal. All the three mesial canals eventually merged at the apical third of the mesial root. Cleaning and shaping was performed using a standardised technique with Mtwo files (VDW, Germany) under abundant irrigation with 5.25% sodium hypochlorite solution in a 5 ml syringe and EDTA **(Glyde, Maillefer, Dentsply, Switzerland)**. After completing the cleaning and shaping Calcium Hydroxide dressing was placed in the canal followed by temporization of the pulp chamber. Patient was then recalled after two weeks. The root canals were irrigated with saline, followed by manual dynamic irrigation with 5.25% sodium hypochlorite, then dried with paper points; appropriate size master-cone was selected (Fig. 4). Cleaned canals obturated with vertically compacted gutta percha using Machtou Pluggers **(Dentsply, Maillefer)**, followed by backfill using thermoplasticized gutta percha pellets **(Obtura II, Obtura Spartan)** (Fig. 5). The sealer used was AH plus resin sealer **(Maillefer, Dentsply, Switzerland)**. Post space preparation was done in the disto -

Fig. 4 Master cone selection.

Fig. 5 Obturation completed using down pack followed by backfill.

lingual canal using peeso reamer #4 (Fig. 6). Fit of glass fibre post #2 **(ReforPost, Angelus)** was checked. Post was luted using self-adhesive dual cure resin cement, **RelyX U200 (3M ESPE)**. Core Build-up was completed using LuxaCore **(DMG)** composite resin (Fig. 7).

Discussion

In the past two decades numerous studies have been conducted to describe various canal morphologies. These studies also describe the unusual, complex and difficult canal configurations of the mesial roots of mandibular first molar. The presence of the middle mesial canal in the mandibular first molar has been shown to have an incidence of 0.95 – 15%.[5] Whenever a middle mesial canal is present, it typically joins either the mesio - buccal or the mesio - lingual canal. It is rare to find three independent canal systems with three separate apical foramens in the mesial root.[5-15]

The mesial roots of the mandibular first molars show one large canal until 11 – 15 years of age. It is only between 30 – 40 years of age that separate canals develop due to secondary dentin formation.[16-17] Aminsobhani et al. have found that in 44.5% cases the middle mesial canals join the mesio - buccal canal at the apical third and 14.8% cases it joins the mesio - lingual canal.[18] These findings were corroborated in Campos et al study which showed that in most cases the middle mesial canal joined the mesio - buccal canal at the apical third. In the present case however, the middle mesial canal joins the mesio - buccal and the mesio - lingual canal, to exit as a single apical foramen.[5]

Nosrat et al studied the frequency distribution of middle mesial canals in mandibular molars and according to them there were no significant differences in the incidence of middle mesial canals based on sex, ethnicity or molar type[19].

Prevention of missed anatomy starts with good pre - operative radiographs, even though radiographs have limitations in assessing the number of canals, radiographs taken from at least two different horizontal angles along with careful interpretation, which will aid in the detection of extra canals[20]. In most of the cases, middle mesial canal is hidden by a dentinal projection in the mesial aspect of pulp chamber walls and this dentinal growth is usually located between the two main canals (mesiobuccal-mesiolingual). Ultrasonic systems provide a breakthrough for exploring and identifying the extra canals and also eliminate the bulky head of the conventional hand piece that frequently obstructs the vision. The working tips of the specific ultrasonic instruments are ten times smaller than the smallest round bur and their abrasive coating aids in a controlled and delicate removal of calcifications and other interferences of the canal orifices[14].

Baumann was the first to report the benefit of using an operating microscope for conventional endodontics. The nature of

Fig. 6 Post space preparation.

Fig. 7 Glass Fibre Post Cementation And Core Built-Up.

magnification in endodontic treatment ranges from 3X to 30X. The microscope brings minute details into clear view and helps distinguish microstructures that are not visible to the naked eye. The operating microscope allows the operator to understand the subtleties of pulp chamber anatomy, visualize the pulpal floor and locate root canal orifice. Furthermore, the microscope enhances the operator's ability to selectively remove dentine with great precision, minimizing the procedural error. Studies have shown that the microscope increases the ability of the dentist to locate and negotiate the canal.[21 & 22]

Conclusion

Previous literature has shown the middle mesial canal to be more of an anomaly but this should be considered as expected anatomy. It is important that the Dentist looks for these extra canal systems on the developmental groove between the mesio - buccal and mesio - lingual canals to ensure success of the endodontic treatment. Clinically extra canal systems need to be carefully found using Ultrasonic Endodontic tips and long neck burs. The dentinal tissue covering the orifice of the middle mesial canal should be removed only under the view of the dental operating microscope.

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