Endodontic Management of Mandibular Molar With Five Canals

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Abstract

The primary objective of endodontic therapy is to achieve three-dimensional obturation of the root canal space after adequate preparation and removal of the tissue debris, microorganisms, and their byproducts. Anatomical variations have frequently been encountered in endodontic practice and have to be adequately managed by the clinician. Missed roots and canals are a major reason for failure of therapy. Technological advances have given the clinician ample opportunity to identify and treat these aberrations successfully. The present report describes a left mandibular first permanent molar requiring root canal treatment, found to have three separate canals in the mesial root. This case demonstrates a rare anatomical configuration and emphasizes the need for the clinician to be aware of and look out for such variations and use adequate diagnostic methodologies prior to and during therapy to detect such variations. The possibility of additional canals, whenever in doubt, should be explored with the assistance of technologies such as those of magnification and illumination and various diagnostic aids. Operator experience has also shown to be a key factor in negotiation and management of these aberrant canal configurations.

Key Words

Elusive canal, mandibular first molar, middle mesial canals, missed canals, root canal anatomy

The primary objective of root canal therapy is to obtain a hermetic seal of the root canal space. Missed canals and spaces within the root canal system may contain microorganisms and their byproducts and may contribute to failure of therapy. A missed canal is neither debrided nor thoroughly sealed, and thus may result in the development or persistence of periapical inflammation.[1]

Therefore, the aim of successful endodontic therapy is to thoroughly debride the canal system anmic-roorgani sms and to three-dimen-sionally seal the root canal space. Various diagnostic aids and procedures allow us to thoroughly address the complexities of the root canal system.

There are reports of unusual canal anatomy associated with all teeth, and the mandibular first molars are no exception. Literature on mandibular first molar teeth indicates a variety of different patterns, ranging from single canal with single apical foramen to five canals with four apical foramina.[2] C-shaped canal systems in mandibular molars have also been reported by various authors.[3–6] The middle mesial canal has been more commonly located in mandibular first molars[7–9] and rarely in mandibular second molars.[10] The clinician must have a thorough understanding of the anatomy of the root canal system and of common variations from normal for a given tooth.

Pomeranz et al. reported the incidence of three canals in the mesial root of the mandibular molars.[7] Reubenet al.[1] evaluated root canal morphology of 125 extracted mandibular first molars in an Indian population by using spiral computed tomography (SCT) and they did not find mandibular molar mesial roots with three canals. Ahmed et al. did a study in Sudanese population using a clearing technique and found that the prevalence of three mesial canals was 4% in mandibular first molars and 10% in mandibular second molars.[11]

Case Report

A 30-year-old female patient reported to the Department of Conservative Dentistry and Endodontics with decayed tooth and associated pain in her left mandibular region. Intraoral examination revealed deep carious lesion in 36. The tooth exhibited no mobility, was mildly tender to percussion, and gave a negative response to heat test and a mild reaction to an electric pulp tester. Clinically it revealed a deep carious lesion involving the pulp with widening of the apical periodontal ligament space. A provisional diagnosis of necrotic pulp with apical periodontitis was made and endodontic treatment was scheduled.

After administration of local anesthesia and rubber dam isolation, the carious lesion was removed and an adequate endodontic access made. Inspection of the pulp chamber floor showed orifices corresponding to mesiobuccal, mesiolingual, and distal canals.On careful examination under dental operating microscope , the middle mesial canal orifice was identified and the canal subsequently negotiated. [Figure 1]

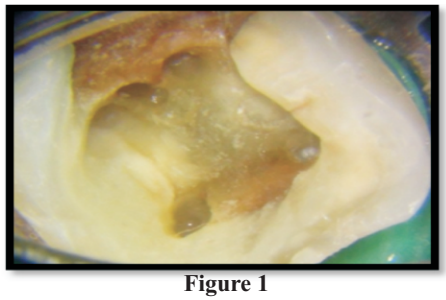

Figure 1

Intraoral mirror image of 36 with three canals in mesial root under dental operating microscope

The working lengths were established with an electronic apex locator, and size 10 K files of 21 mm length (Dentsply, Maillefer, Ballaigues, Switzerland) were used to confirm three canals in the mesial root radiographically [Figure 3]. The working length measurement radiograph showed three independent mesial root canals. The canals were instrumented with stainless steel hand instruments – K files of 21 mm length (Dentsply, Maillefer) – and the orifices were shaped with Gates Glidden drills.

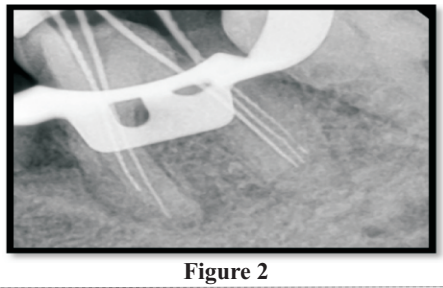

Figure 2

Working length radiograph

Irrigation was done with copious amounts of 3% sodium hypochlorite (Nice chemicals Pvt. Ltd., Cochin, India) and 17% Ethylenediaminete traacetic acid (EDTA; Pulpdent Corporation, Massachusets, USA). The canals after preparation were finally flushed with sterile saline, dried with sterile paper points, and a calcium hydroxide dressing was given. At the subsequent visit after a week, the tooth was asymptomatic and was obturated with gutta percha cones (Dentsply, Maillefer) using AH-Plus sealer (Dentsply DeTrey GmbH, Konstanz, Germany) [Figures 3].

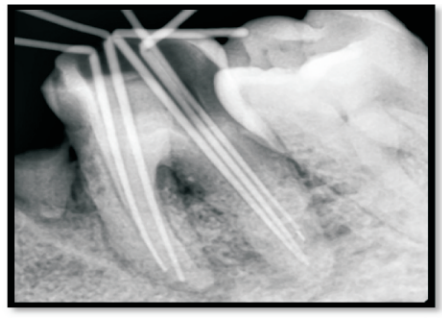

Figure 3

36 With master cone

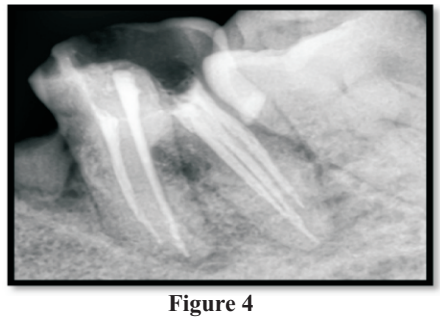

Figure 4

Post-obturation radiograph of 36

The patient experienced no postoperative sequelae and an appropriate post-endodontic restoration was performed in a subsequent appointment to ensure an adequate coronal seal.

Discussion

There are number of reports that reveal the anatomic variations of root canals in mandibular molars.[1] The presence of a third canal (middle mesial) in the mesial root of the mandibular molars has been reported to have an incidence of 0.95–15%.[1,10,11,14] Although many authors have agreed on the presence of three foramina in the mesial root, only a few have reported the presence of three independent canals, which presents itself as a rare anatomic variant.[15] This additional canal may be independent with a separate foramen or the additional canal may have a separate foramen and join apically with either the mesiobuccal or the mesiolingual canal.[16,17] The clinician should accurately observe the pulp chamber floor to locate possible canal orifices. Pulp chamber floor and wall anatomy provide a guide to determine the root canal morphology. Krasner and Rankow[–21] made a rational approach to study the relationship of the pulp chamber to the clinical crown and the pulp chamber floor. Their observations, presented in the form of laws, are valuable aids to the clinician searching for elusive canals. Failure to identify extra canals and to recognize any unusual canal configuration is implicated as one of the most common reasons for the failure of endodontic therapy[22–24] A round bur or an ultrasonic tip can be used for removal of any protuberance from the mesial axial wall, which would prevent direct access to the developmental groove between mesiobuccal and mesiolingual orifices. This developmental groove should be carefully checked with the sharp tip of an endodontic explorer. If depression or orifices are located, the groove can be troughed with ultrasonic tips at its mesial aspect until a small file can negotiate this intermediate canal (Vertucci, 2005).[1,25,26]

Radiographic examination using conventional intraoral periapical views is important for the evaluation of the canal configuration. However, it has its inherent limitation to assess the root canal system completely. Digital radiography at different angles with subsequent image analysis can be used effectively.

Various diagnostic aids like dyes, champagne bubble test, ultrasonics, micro openers and trans-illumination aids, irrigators to improve pulp chamber visibility (Stropko) and observing the chamber for bleeding spots could be used by the clinician as an effective means to locate additional canal orifices.

Newer technologies, such as the dental operating microscope and dental loupes, offer magnification and illumination of the operating field and substantially improve the visualization of root canal orifices (De Carvalho).[28] The present report confirms that the third canal in the mesial root of mandibular first molar does occur and must be sought along the line between the two mesial canals after accessing the pulp chamber and any cervical stenosis in this zone that might cover the opening of the canals, using burs or ultrasonic tips.[30–33]

Conclusion

Identification of extra canals and their instrumentation is one of the key factors in the prevention of unsuccessful treatment outcomes. In addition to the various diagnostic aids, operator experience has also been identified as a key factor in locating these aberrant canals.Thorough knowledge of canal anatomy and its variations are a must. The clinician should be aware of the incidence of any type of variation in the mandibular first molar tooth. A good preoperative radiological assessment from different angles, a proper access preparation, and thorough examination of the pulp chamber to locate and debride all the canals are mandatory. An accurate clinical evaluation of root canal number and morphology in mandibular first should be done using various diagnostic methodologies with magnification and illumination, which would pave the way for long-term success of endodontic therapy.

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