Endodontic Management of Radix Entomolaris with A Middle Mesial Canal : A Case Report

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Abstract –
Aim To present a case of mandibular first molar with an additional distolingual root (radix entomolaris), a mesial root with three canals (an extra middle mesial canal) and its endodontic management.
Summary The awareness and identification of anatomical variations is vital to achieve endodontic success. Radix entomolaris(RE) was detected by identifying the presence of a double or extra root outline in the preoperative radiograph and a middle mesial(MM) canal by modifying the access opening and closely inspecting the pulp chamber and was endodontically treated following cleaning, shaping, and obturation of the canals.

Introduction

The main objective of root canal therapy is to eliminate all irritants from the root canal system through a thorough chemomechanical cleansing and shaping of the root canals before a dense root canal filling with a hermetic seal. The irritants include necrotic pulp tissue, microorganisms, and their byproducts.

A detailed knowledge of the root canal anatomy is necessary to effectively clean and shape the root canal system. Mandibular molars are the most frequent tooth type to be endodontically treated1. Traditionally, mandibular molars are described as two-rooted teeth with two canals in the mesial root and one or two canals in the distal root2,3. The major anatomical variations of the two-rooted mandibular first molar include a separate distolingual root4, C-shaped anatomy of the roots and/or canals5, an isthmus between the mesiobuccal (MB) and mesiolingual (ML) canals6, and a third canal in the mesial root known as the middle mesial (MM) canal7. Methods of detection include plastic casts8, clearing9, scanning electron microscopy10, micro–computed tomographic (mCT) imaging11, and use of a file under magnification12.

An additional third root; is first mentioned in the literature by Carabelli (1844)13, known as radix entomolaris (RE)14 and is typically found disto-lingually. The incidence of RE among the Indian population is found to be very low and only 0.2%15. Pomeranz et al7 classified the middle mesial canal into 3 possible canal configurations: (1) Fin: The file passes freely between the main mesial canal (ML or MB) and the MM canal (transverse anatomies), (2) Confluent: The MM canal originates as a separate orifice but apically joins the MB or ML canal, and (3) Independent: The MM canal originates as a separate orifice and terminates as a separate apical foramen. Despite reports of a high prevalence of intercanal communications in mandibular molars, reaching 83%, success in locating and accessing a middle mesial canal has been very low, ranging between 1% and 25%. Failure to locate, cleanse, and shape these root canals may result in persistent apical periodontitis.

Case Report

A 25 year old female patient with a non contributory medical history presented with a chief complaint of pain in right lower back tooth region since five days. Clinical examination revealed the presence of deep caries on the distal side of right mandibular first molar. The tooth was sensitive to percussion. The tooth showed a lingering response to pulp testing. A radiographic prospective evaluation of tooth from two different angulations revealed deep caries close to the distal pulp horn and periapical radiolucency around the roots. On keen observation, there appears to be an additional root indicating the evidence of radix entomolaris [Figure 1a]. A diagnosis of irreversible pulpitis with chronic apical periodontitis was made. The patient was suggested to undergo root canal treatment.

Local anesthesia was administered and rubber dam isolation was achieved. After removal of caries the pulp chamber was accessed. Then, the main canals (mesiolingual, mesiobuccal, distal and distolingual) were located. After negotiating these canals with a size #8 or #10 K-file (Dentsply Maillefer, Ballaigues, Switzerland), coronal flaring was done with Gates Glidden drills (sizes 2, 3, and 4 [Dentsply Maillefer]). The pulpal floor isthmus was probed using either #8 or #10 size files (Dentsply Maillefer) or an endodontic explorer. Tip of the explorer detected a catch in the isthmus area, on further exploration middle mesial canal is negotiated with a watch-winding motion and slight apical pressure. Then, the working length of the canals was determined with an electronic apex locator (Dentaport; J Morita MFG Corp, Kyoto, Japan) and confirmed by means of a length determination radiograph [Figure 1b]. To be recorded as a middle mesial canal, the canal had to be negotiable to within 5 mm of

the radiographic apex. Root canal preparation was done using a crown-down technique and ending with a master apical rotary size 30/04. During root canal preparation EDTA gel(Glyde) was used and the root canals were irrigated by flooding them with 2.5% sodium hypochlorite (NaOCl) between each file size. Canal disinfection was carried out using calcium hydroxide [Calcicur, VOCO, Germany] as an intracanal medicament between the visits.

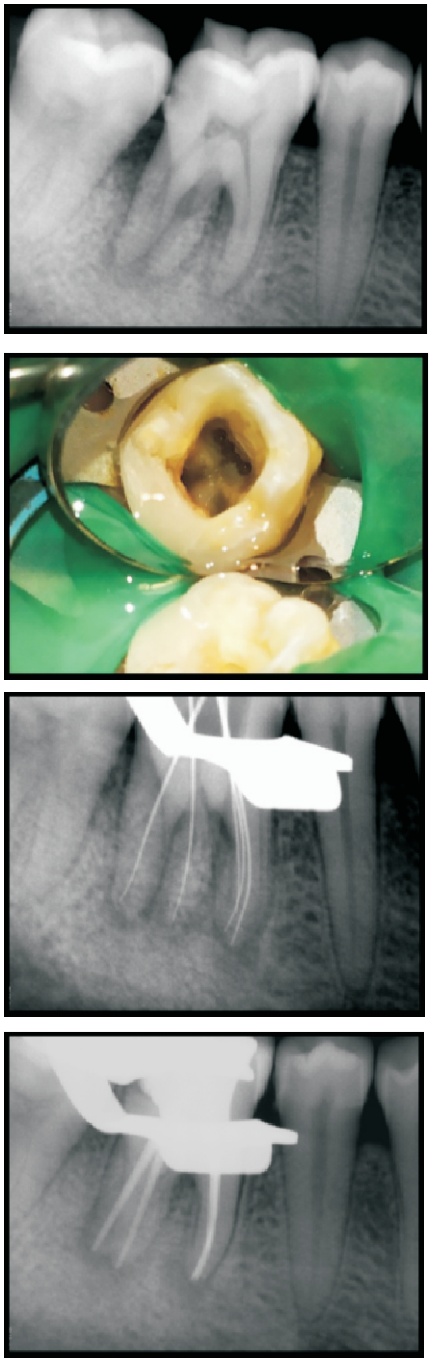

Figure (A) A preoperative radiograph of tooth # 30. (B) A working length radiograph. (C) A photograph of tooth showing the middle mesial canal orifice. (D) A radiograph

After Obturation.

After completion of instrumentation of the main canals, in the follow up visits, when the patient was found asymptomatic, an appropriate horizontally angled radiograph with gutta percha points placed in the root canals was taken. Then, all canals were obturated using gutta-percha cones(30/04) and AH 26 sealer [De Trey Dentsply, Konstanz, Germany]. The access opening was restored with composite. Final radiographs from 2 different angles were taken.

Discussion

Predictably successful root canal treatment is dependent on following the basic principles: access, cleansing and shaping, and obturation of the entire root canal system. These principles have evolved from clinical concepts established through clinical practice and basic research16.

Failure of root canal treatment is related to the presence of bacterial biofilm in the root canal system17. If the aim of root canal treatment is to remove all irritants from the root canal system, a missed canal or an unclean root canal system can be a cause for treatment failure. Detection of RE can be based on clinical examination, radiographic and imaging techniques and other accessories18. Clinically, factors such as an extra cusp, prominent distolingual lobe, cervical convexity, complex external contour of the furcation can indicate the presence of an RE. Radiographically, double periodontal ligament images or an unclear view or outline of the distal root contour or the root canal can hint to the presence of an RE. An angled radiograph (25-30°) can be more useful in this regard and it is said that a mesial angled radiograph is better than a distal angled radiograph for RE detection. Modification of the conventional triangular access to obtain rectangular or trapezoidal outline form assists in locating the orifice of RE. Further, following a dark line on the floor of the pulp chamber may act as a visual aid to indicate the position of an RE canal orifice. It is generally smaller than the distobuccal and mesial roots and can be classified into separate and non-separate categories depending on the amount of its fusion with the other roots.

Persistent endodontic infection can also be attributed to difficulties in removing a bacterial biofilm from root canal ramifications, including isthmuses19. Harris et al studied the internal anatomy of 22 mandibular molars using mCT reconstructions. An isthmus was present in 100% of the specimens, and 36% had more than two canals. The negotiation of MM canals with hand/rotary files provides access for irrigating solutions into the otherwise inaccessible isthmus.

Studies have shown an overall prevalence of 13% for distolingual root in mandibular first molars20. Completing a thorough radiographic study of the involved tooth with exposure from three different horizontal projections, the standard buccal-to-lingual projection, 20º from the mesial, and 20º from the distal reveals the basic information regarding the anatomy of the tooth in order to perform endodontic treatment21. However, using the buccal object rule with two different horizontal angulations radiograph may suffice to determine the position of a lingual root22,23. This buccal object rule has also been called Clark's rule, the same lingual, opposite buccal (SLOB rule) and Walton's projection.

Pomeranz et al reported that the orifice of the MM canal was always located close to the ML canal. Only 2 of 10 (20%) of teeth had the orifice of the MM canal located near the MB canal. A separate apical foramen for an MM canal was a rare finding. He reported that the most prevalent anatomy was a "fin" (67%). Karapinar-Kazandag et al found that all MM canals showed a "confluent" anatomy. No "independent" or "fin" anatomy was found. It has been proposed by Hess that the mesial roots of mandibular molars develop as one root canal, which tend to compress at the middle portion, forming two root canals that are often communicating.

Conclusion

The possibility of an extra root and an extra canal should be considered and looked for carefully. Failure to identify and treat them can significantly affect the outcome of an endodontic treatment. Proper angulation and interpretation of radiographs help to identify chamber and root anatomy. In the case of an RE the conventional triangular opening cavity must be modified to a trapezoidal form in order to better locate and access the distolingually located orifice of the additional root.

References

References are available on request at editor@healtalkht.com