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Case Report

Successful Endodontic Management of Complicated Radix Entomolaris: Report of Two Cases

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Abstract

An additional root can be present in mandibular molars that can be located lingually (the radix entomolaris) or buccally (the radix paramolaris). If present, the successful outcome of the root canal treatment depends upon the awareness and understanding of this unusual root and its root canal morphology. This case series discusses endodontic management of mandibular molars with a radix entomolaris (additional distolingual root) and their management using appropriate instruments and techniques. Achieving the endodontic success in the presence of an radix entomolaris requires knowledge about its prevalence, diagnosis, morphology, canal configuration, and clinical approach.

Keywords: *Endodontic Treatment; Mandibular Molar; Radix Entomolaris*

Introduction

The healing of an endodontic pathology depends upon thorough chemical and mechanical cleaning and shaping of the root canals before the final root canal filling.

Various studies have reported the mandibular first molar with several anatomical variations. Most of the mandibular first molars are two-rooted with two mesial and one distal canal [1,2]. In a majority of cases the mesial root has two root canals, ending in two distinct apical foramina or they can merge together at the root tip to end in a single foramen. The distal root most commonly has a single root canal, but if the orifice is narrow and round, a second distal canal may be present [3].

Various anatomical variations have been described in the mandibular first molar. Presence of three mesial canals [4-6] and three distal canals [7] in mandibular molars have also been reported.

Along with the number of root canals, a number of variations in the number of roots have also been reported [8]. Carabelli [8] first reported the presence of an additional third root, called the radix entomolaris (RE) [9]. Presence of this supernumerary root is mainly seen in mandibular first molars and is located distolingually. Carlsen and Alexandersen [10,11] described the identification and external morphology of these lingual supernumerary roots.

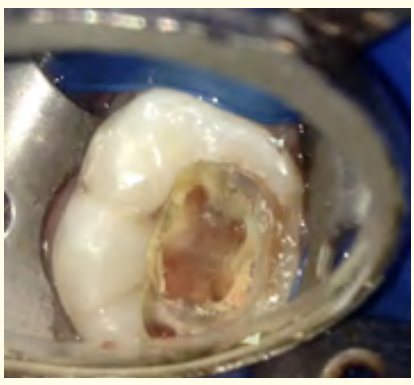
This case report discusses the clinical approach in diagnosis and endodontic management of two mandibular molars with a radix entomolaris.

Case Reports

Case 1

A 25-year-old male patient reported to the department of conservative dentistry and endodontics with the chief complaint of acute throbbing pain in lower right posterior tooth region since one week. The medical history was noncontributory. Dental history revealed that he had undergone restorations of tooth #36 (mandibular left first molar) and tooth #25 (maxillary left second premolar) six months previously. Intraoral examination revealed an extensive carious lesion that had caused fracture of the lingual part of the crown of mandibular right first molar. The tooth was tender on percussion and thermal and electrical pulp testing elicited a negative response. Radiographic examination showed signs of apical periodontitis (Figure 1A). With two preoperative radiographs taken at different horizontal angulations, the presence of an additional distolingual root was confirmed. Local anesthesia was administered and tooth was isolated with a rubber dam. Caries was removed and an access cavity was prepared (Figure 1B). The conventional triangular access cavity was modified into a more trapezoidal cavity in order to locate and open the orifice of the distolingually located RE using an endodontic explorer (DG-16 Endodontic Explorer, Ash Instruments, Dentsply, Gloucester, United Kingdom). The root canals were explored with a K-file ISO 15 (Dentsply Maillefer, Ballaigues, Switzerland). Working length was determined with the help of an apex locator which was later confirmed with a radiograph (Figure 1C). Four distinct canal orifices were coronally enlarged with Gates Glidden drills and all four root canals were prepared in a crown-down method using Protaper rotary instruments (Dentsply Maillefer). During root canal preparation, the four canals were disinfected with sodium hypochlorite solution (5.25%) and EDTA (Salvizol, Ravens, Konstanz, Germany). A temporary calcium hydroxide paste (UltraCal XS, Ultradent) and temporary filling (Ketac Fil) were put in place. Symptoms of pain disappeared and two weeks later the root canals were filled with gutta percha and AH26 sealer (De Trey Dentsply, Konstanz, Germany) (Figure 1E-1G) and the opening cavity was sealed with Fuji IX (GC Corp., Tokyo, Japan).

A



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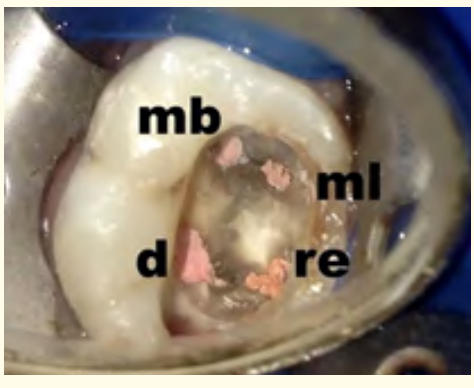

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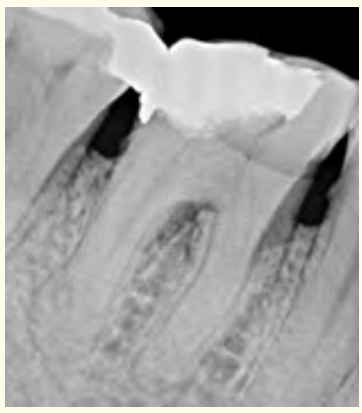
Figure 1: *A. Pre-operative radiograph B. Access opening photograph C. Working length determination radiograph D. Master cone radiograph E. Post obturation radiograph F. Post obturation photograph (ml, mesiolingual; mb, mesiobuccal; d, distal; re, radix entomolaris) G. Six month followup.*

Case 2

A 58-year-old male patient was referred with a chief complaint of dull aching pain while chewing food. A clinical examination revealed presence of a large amalgam restoration and the tooth was moderately tender on percussion. Radiographic examination revealed

a radiopaque restorative material involving the pulp (Figure 2A). The medical history was noncontributory. The endodontic treatment was carried out. Local anaesthesia was administered and rubber dam was applied. Amalgam restoration was removed and an access cavity was prepared (Figure 2B). The root canal orifices were enlarged using gates glidden drills (Mani Inc., Kiyohara industrial park, Utsunomiya, Japan) to obtain a straight line access which modified the access shape to a more trapezoidal form. The root canals were explored with precurved K-file ISO number 15 (Dentsply Maillefer, Ballaigues, Switzerland), and radiographic length measurement was performed (Figure 2C). The root canals were instrumented using the ProTaper rotary files (Dentsply Maillefer, Ballaigues, Switzerland) in all the canals. During instrumentation, adequate irrigation was performed using 5.25% sodium hypochlorite and lubricated using Glyde (Dentsply Maillefer, Ballaigues, Switzerland). Master cone selection done (Figure 2D) and obturation of the root canals was done using AH plus sealer (Dentsply, Maillefer, Ballaigues, Switzerland) and corresponding ProTaper gutta percha points (Figure 2E-2G) and the opening cavity was sealed with Fuji IX (GC Corp., Tokyo, Japan).



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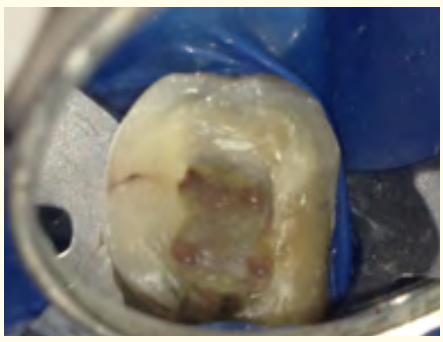

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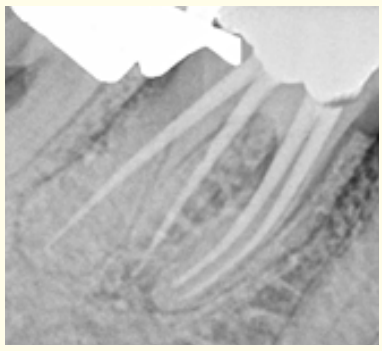

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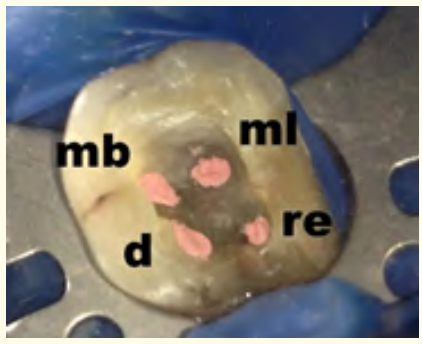

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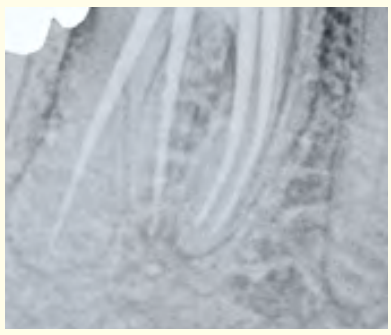

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Figure 2: *A. Pre-operative radiograph B. Access opening photograph C. Working length determination radiograph D. Master cone radiograph E. Post obturation radiograph F. Post obturation photograph (ml, mesiolingual; mb, mesiobuccal; d, distal; re, radix entomolaris) G. Six month followup.*

Discussion

Prevalence of Radix Entomolaris

The prevalence of RE in the first mandibular molar varies amongst different ethnic groups. In Africans, a maximum frequency to be found is 3% [12], while in Eurasian and Indian populations it is less than 5% [13]. In Mongoloid traits (such as the Chinese, Eskimo and American Indians) the frequency of RE ranges from 5% to more than 30% [13-19]. Because of high frequency of RE in these populations, it is considered to be a normal morphological variant (eumorphic root morphology). Whereas, in Caucasians its frequency ranges from 3.4 to 4.2% [20,21]. It's not very common in Caucasians and thus is considered to be an unusual or dysmorphic root morphology.

The etiology for the formation of the RE is still unclear. In dysmorphic, supernumerary roots, the external factors during odontogenesis can lead to its formation whereas in eumorphic roots, racial genetic factors influence the more profound expression of a particular gene resulting in its formation [18,22].

An RE can be found on the first, second and third mandibular molar, but least frequently is associated with the second molar [23]. Some studies reported a bilateral occurrence of the RE from 50 to 67% [17,24].

Clinical Approach

The presence of an RE has clinical implications in endodontic treatment. Proper and an accurate diagnosis of this root can avoid complications or a 'missed canal' during the procedure. RE is mostly present in the same buccolingual plane as the distobuccal root, so an inaccurate diagnosis can occur on the preoperative radiograph because of superimposition of both roots. To overcome this and reveal the RE, a second radiograph should be taken from a more mesial or distal angle (30 degrees).

Along with radiographical diagnosis, clinical examination of the tooth crown can also facilitate identification of an additional root. An extra cusp (tuberculum paramolare) or more prominent occlusal distal or distolingual lobe, can also be an indicative of the presence of an additional root.

The location of the root canal orifice of an RE has implications for the access opening. RE is located disto- to mesiolingually from the main canal. The conventional triangular opening cavity is extended to the (disto) lingual to a more rectangular or trapezoidal form. A dark line on the pulp chamber floor can be an indicative of the RE canal orifice location. For a better access to the RE, calcification above the orifice should be removed and a straight-line access should be achieved.

Mostly RE root are curved and a severe canal curvature, particularly in the apical third, can lead to shaping aberrations such as root canal straightening or a ledge, with canal transportation resulting in loss of working length. A more centered preparation can be achieved using flexible nickel-titanium rotary files. However, the severe curvature of RE can lead to unexpected complications such as instrument separation.

To avoid the procedural errors, the enlargement of the RE root canal orifice and initial root canal exploration with small files (size 10 or less) along with radiographically determined working length and the creation of a glide path before preparation, should be done.

Conclusion

Radix entomolaris has been reported to occur with a frequency of 0.2 - 32% in different populations. The high frequency of a fourth canal in mandibular first molars makes it essential to anticipate and find all canals during molar root canal treatment. To facilitate the endodontic treatment and to avoid missed canals, the initial diagnosis of radix entomolaris is important.

Radiographs taken from various angulations help to identify these extra roots. The conventional triangular access opening must be modified to a trapezoidal form in cases with radix entomolaris in order to better locate and access the distolingually located orifice of the additional root. As the majority of the radix entomolaris are curved, it's important to emphasize on straight-line access in order to achieve the successful treatment.

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