



Case Report

Radix Entomolaris: Clinical Approach in Endodontics

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ABSTRACT

Mandibular molars can have an additional root located lingually (the radix entomolaris). If present, an awareness and understanding of this unusual root and its root canal morphology can contribute to the successful outcome of root canal treatment. This report discusses endodontic treatment of two mandibular molars with a radix entomolaris, which is rare macrostructures in the Caucasian population. The prevalence, the external morphological variations and internal anatomy of the radix entomolaris are described. Avoiding procedural errors during endodontic therapy demand an adapted clinical approach to diagnosis and root canal treatment.

Key Words: Radix entomolaris, Endodontics, Mandibular molar, Paramolaris.

INTRODUCTION

The prevention or healing of endodontic pathology depends on a thorough chemo-mechanical cleansing and shaping of the root canals before a dense root canal filling with a hermetic seal. An awareness and understanding of the presence of unusual root canal morphology can thus contribute to the successful outcome of root canal treatment. It is known that the mandibular first molar can display several anatomical variations. The majority of Caucasian first molars are two-rooted with two mesial and one distal canal.^[1,2] In

most cases the mesial root has two root canals, ending in two distinct apical foramina or sometimes, these merge together at the root tip to end in one foramen. The distal root typically has one kidney-shaped root canal, although if the orifice is particularly narrow and round, a second distal canal may be present.^[3] A number of anatomical variations have been described in the mandibular first molar: Fabra-Campos^[4,5] and Bond^[6] reported the presence of three mesial canals and Stroner^[7] noted the presence of three distal canals. Like the number of root canals, the

number of roots may also vary. An additional third root, first mentioned in the literature by Carabelli,^[8] is called the radix entomolaris (RE).^[9] This supernumerary root is located distolingually in mandibular molars, mainly first molars (Fig. 1(a) and 1(b)). The identification and external morphology of these root complexes, containing a lingual or buccal supernumerary root, are described by Carlsen and Alexandersen.^[10,11] Although

both macrostructures are rare in the Caucasian population, knowledge of their occurrence and location are important. In this report three such cases are presented. The prevalence, external morphological variations and internal anatomy of the radix entomolaris and paramolaris are described. The clinical approach to diagnosis and endodontic treatment are also discussed and illustrated.



Fig. 1. (A) First molar with a radix entomolaris [distolingual view (left) lingual view (right)]

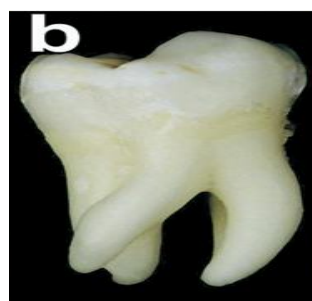


Fig.1. (B). Radix entomolaris on a third molar (lingual view).

CASE REPORTS

Case 1

A 20 year female reported to Dept of Endodontics, with occlusal carious lesion and complained of spontaneous pain and sensitivity to hot and cold in mandibular left first molar. Radiographical examination revealed deep occlusal carious lesion (Fig. 2(a) and 2(b)). The tooth was anaesthetized, isolated with rubber dam and access cavity made. Four distinct canal orifices were found and initial negotiation of the root canals was performed with a 15 # K-file.

Horizontal angulation radiograph clearly confirmed an additional distolingual root. The canal length was determined electronically using Root ZX apex locator (J. Morita) and the root canals were ProTaper rotary instruments (Dentsply Maillefer) (Fig. 2(c) and 2(d)). During preparation, File Eze (Ultradent Products Inc., South Jordan, UT) was used as a lubricant and the root canals were disinfected with a sodium hypochlorite solution (2.5%).



Fig. 2. (A). Preoperative radiograph.



Fig. 2. (B). Access opening.

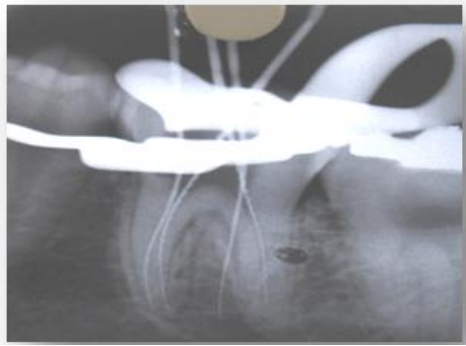


Fig. 2. (C). Working length determination.



Fig. 2. (D). Obturation.

Case 2

A 22 year male, was referred for root canal treatment of mandibular left first molar by the Dept of Periodontology. On clinical examination the tooth showed severe proximal caries along with grade I mobility. Patient had spontaneous pain and sensitivity to hot and cold. Tooth was anaesthetized and access cavity made. Initially one distal and two mesial canals were located. Working length radiograph

was made by using slight horizontal angulation. Distobuccal canal orifice was then located and explored after extending the access distobuccally (Fig. 3(a) and 3(b)). The lengths of these canals were measured electronically. The canals were cleaned with sodium hypochlorite solution (5.25%) and EDTA (Salvizol, Ravens, Konstanz, Germany), and shaped with ProTaper instruments. All canals were filled with gutta-percha and AH26 sealer (Fig. 3(c)).

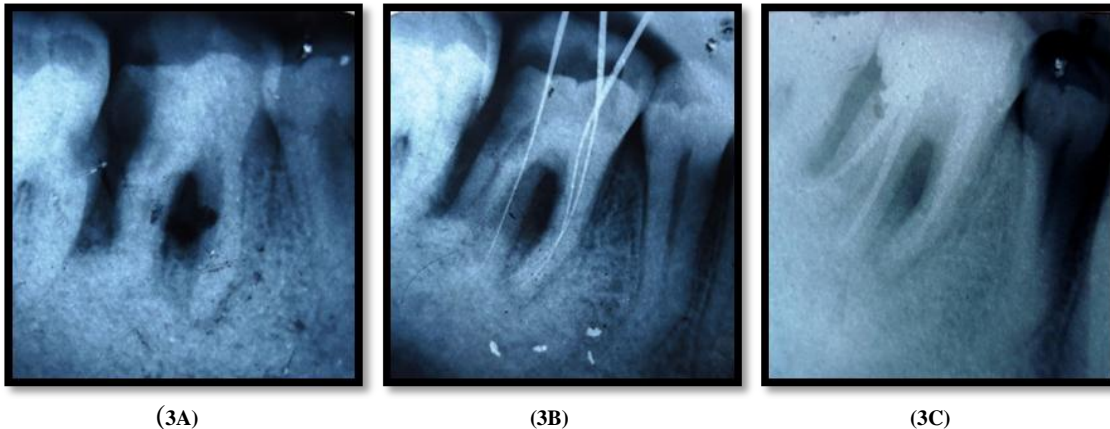


Fig. 3. (A) Preoperative radiograph
(B) Working length IOPA with slight horizontal angulation. (C) Postobturation.

DISCUSSION

The presence of a separate RE in the first mandibular molar is associated with certain ethnic groups. In African populations a maximum frequency of 3% is found, while in Eurasian and Indian populations the frequency is less than 5%.^[12-14] In

populations with Mongoloid traits (such as the Chinese, Eskimo and American Indians) reports have noted that the RE occurs with a frequency that ranges from 5% to more than 30%.^[15-20] Because of its high frequency in these populations, the RE is considered to be a normal morphological variant (eumorphic

root morphology). In Caucasians the RE is not very common and, with a maximum frequency of 3.4 to 4.2% is considered to be an unusual or dysmorphic root morphology.^[21,22] The etiology behind the formation of the RE is still unclear. Curzon suggested that the 'three-rooted molar' trait has a high degree of genetic penetrance as its dominance. An RE can be found on the first, second and third mandibular molar, occurring least frequently on the second molar.^[23] Some studies report a bilateral occurrence of the RE from 50 to 67%.^[18,24]

Morphology of the Radix Entomolaris

The RE is located distolingually, with its coronal third completely or partially fixed to the distal root. The dimensions of the RE can vary from a short conical extension to a 'mature' root with normal length and root canal. In most cases the pulpal extension is radiographically visible. In general, the RE is smaller than the distobuccal and mesial roots and can be separate from, or partially fused with, the other roots. A classification by Carlsen and Alexandersen^[10] describes four different types of RE according to the location of the cervical part of the RE: types A, B, C and AC. Types A and B refer to a distally located cervical part of the RE with two normal and one normal distal root components, respectively. Type C refers to a mesially located cervical part, while type AC refers to a central location, between the distal and mesial root components. This classification allows for the identification of separate and nonseparate RE. In the apical two thirds of the RE, a moderate to severe mesially or distally orientated inclination can be present (Fig. 1(a) and 1(b)). In addition to this inclination, the root can be straight or curved to the lingual. According to the classification of De Moor et al.,^[25] based on the curvature of the separate RE variants in bucco-lingual orientation, three types can be identified. Type I refers to a

straight root/root canal, while type II refers to an initially curved entrance which continues as a straight root/root canal. Type III refers to an initial curve in the coronal third of the root canal and a second curve beginning in the middle and continuing to the apical third.

Clinical Approach

An accurate diagnosis of these supernumerary roots can avoid complications or a 'missed canal' during root canal treatment. Because the (separate) RE is mostly situated in the same buccolingual plane as the distobuccal root, a superimposition of both roots can appear on the preoperative radiograph, resulting in an inaccurate diagnosis. A thorough inspection of the preoperative radiograph and interpretation of particular marks or characteristics, such as an unclear view or outline of the distal root contour or the root canal, can indicate the presence of a 'hidden' RE. To reveal the RE, a second radiograph should be taken from a more mesial or distal angle (30 degrees). This way an accurate diagnosis can be made in the majority of cases.

Apart from a radiographical diagnosis, clinical inspection of the tooth crown and analysis of the cervical morphology of the roots by means of periodontal probing can facilitate identification of an additional root. An extra cusp (Tuberculum paramolare) or more prominent occlusal distal or distolingual lobe, in combination with a cervical prominence or convexity, can indicate the presence of an additional root. If an RE is diagnosed before endodontic treatment, one knows what to expect or where to look once the pulp chamber has been opened. The location of the orifice of the root canal of an RE has implications for the opening cavity (Fig. 5). The orifice of the RE is located disto- to mesiolingually from the main canal or canals in the distal root. An extension of

the triangular opening cavity to the (disto) lingual results in a more rectangular or trapezoidal outline form. If the RE canal entrance is not clearly visible after removal of the pulp chamber roof, a more thorough inspection of the pulp chamber floor and wall, especially in the distolingual region, is necessary. A dark line on the pulp chamber floor can indicate the precise location of the RE canal orifice.

CONCLUSION

Clinicians should be aware of these unusual root morphologies in the mandibular first molars in Caucasian people. The initial diagnosis of a radix entomolaris or paramolaris before root canal treatment is important to facilitate the endodontic procedure, and to avoid 'missed' canals. Preoperative periapical radiographs exposed at two different horizontal angles are required to identify these additional roots. Knowledge of the location of the additional root and its root canal orifice will result in a modified opening cavity with extension to the distolingual. The morphological variations of the RE in terms of root inclination and root canal curvature demand a careful and adapted clinical approach to avoid or overcome procedural errors during endodontic therapy.

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