

Clinical Approach to Radix in Endodontics : A Case Series

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Abstract

Mandibular molars can have an additional root located lingually (the radix entomolaris) or buccally (the radix paramolaris). 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 three mandibular molars with a radix entomolaris or paramolaris, both of which are rare macrostructures in the Caucasian population. The prevalence, the external morphological variations and internal anatomy of the radix entomolaris and paramolaris are described. Avoiding procedural errors during endodontic therapy demand an adapted clinical approach to diagnosis and root canal treatment

Key-words: Anatomical Variations; Mandibular first molar; Radix Entomolaris, Radix 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. 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⁽¹⁾. Like the number of

root canals, the number of roots may also vary. An additional third root, first mentioned in the literature by Carabelli⁽²⁾, is called the radix entomolaris (RE)⁽³⁾. This supernumerary root is located distolingually in mandibular molars, mainly first molars. An additional root at the mesiobuccal side is called the radix paramolaris (RP).

Knowledge of their occurrence and location is important hence with this aim in this report four such cases are presented. The prevalence, classification and external morphological variations of radix entomolaris and paramolaris are described along with the clinical approach and endodontic treatment for radix entomolaris. (Fig. A, B & C, D)

Case Reports

Case Report-1

An 18-year-old female patient was referred for endodontic treatment of the mandibular right first molar with chief complaint of pain and food lodgment. Clinical and radiographic examinations reveal signs of apical periodontitis. Root canal treatment was planned, the pulp chamber was opened, and canal orifices were located using an endodontic DG-16 explorer (Dentsply), under dental operating microscope. A dark line was observed between the distal canal orifice and the distolingual corner of the pulp chamber floor. At this corner overlying dentin was removed with a diamond bur with a non-cutting tip and a second distal canal orifice located. The canal length was determined electronically with the help of apex locator and the root canals were shaped with protaper hand instruments (Dentsply maillefer). Initially radio graphically the outlines of the distal root(s) were unclear; however, the unusual location of the orifice far to the disto-lingual

indicated a supernumerary root, and the presence of additional root was confirmed on the radiograph. The root canals were irrigated with sodium hypochlorite, dried and obturated with gutta-percha and Ah plus sealer. The access cavity was sealed with silver amalgam.

Case Report-2

A 32 year old female patient reported to endodontic department with chief complaint of pain and swelling at lower right posterior region of the jaw. Clinical examinations reveal swelling extending from lower right first premolar to right second molar. Clinical sign, symptoms and radiological examination confirmed acute exacerbation of chronic periapical abscess. The pulp chamber was opened, and all three canal orifices were located using an endodontic DG-16 explorer (Dentsply), the distal canal orifice was located more on buccal side. Following law of symmetry access opening directed more toward distolingual corner of tooth with a diamond bur with a noncutting tip revealed presence of canal orifice at the distolingual corner of the pulp chamber floor and presence of radix entomolaris was confirmed. Treatment part performed in the same way as case one.

Case Report-3

A 22 year old female patient undergoing orthodontic treatment reported to endodontic department with the chief complaint of pain and swelling at left posterior region of lower jaw. Clinical examinations reveal swelling extending from lower left first premolar to left second molar, mandibular first molar was tender on percussion with history of root canal treatment with the same tooth. Clinical sign, symptoms and radiological examination confirmed acute periapical abscess due to inadequate obturation and missed extra root



Fig. A, B Radix Entomolaris

Fig. C, D Radix Paramolaris.

present on distolingual side of tooth root. Non-surgical root canal re-treatment was decided and the orthodontic band and previous metal crown removed, pulp chamber was re-opened, and all previously filled canal orifices were located using an endodontic DG-16 explorer (Dentsply), a fourth canal found in third root of same tooth under dental operating microscope at distolingual corner of the pulp chamber floor. At this corner overlying dentin was removed with a diamond bur with a noncutting tip. The canal length was determined using apex locator. Radio graphically the outlines of the distal root(s) were unclear; however, the unusual location of the orifice far to the distolingual indicated a supernumerary root, and the presence of a radix entomolaris was confirmed on the postoperative radiograph the root canals were filled with gutta-percha and AH-plus sealer. The access cavity was sealed with glass ionomer cement.

Case Report-4

A 24 year old female patient reported to endodontic department with the chief complaint of pain in left posterior region of lower jaw. Clinical and radio graphical examinations reveal caries involving the pulp of mandibular first molar. Clinical sign and symptoms confirmed irreversible pulpitis. Root canal treatment was planned. Access opening was done and all canal orifices were located using endodontic DG-16 explorer (Dentsply) A additional fourth canal was found in third root of same tooth under dental operating microscope at distolingual corner of the pulp chamber floor. At this corner overlying dentin was removed with a diamond bur with a noncutting tip. The canal length was determined using apex locator. Radio graphically the outlines of the distal root(s) were unclear; however, the unusual location of the orifice far to the disto-lingual indicated a supernumerary root, and the presence of a radix entomolaris was confirmed on the postoperative radiograph the root canals were filled with gutta-percha and Ah-plus sealer. The access cavity was sealed with silver amalgam followed by stainless steel crown.

Discussion

Prevalence of Radix Paramolaris & Entomolaris

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⁽⁴⁾, while in Eurasian and Indian populations the frequency is less than 5%⁽⁵⁾. 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%⁽⁵⁻¹¹⁾. Because of its high frequency in these populations, the RE is considered to be a normal morphological variant (eumorphic root morphology).

The aetiology behind the formation of the RE is still unclear. In dysmorphic, supernumerary roots, its formation could be related to external factors during odontogenesis, or to penetrance of an atavistic gene or polygenetic system (atavism is the reappearance of a trait after several generations of absence). In eumorphic roots, racial genetic factors influence the more profound expression of a particular gene that results in the more pronounced phenotypic manifestation⁽¹²⁾. An RE can be found on the first, second and third mandibular molar, occurring least frequently on the second molar⁽¹³⁾. Some studies report a bilateral occurrence of the RE from 50 to 67%⁽¹⁴⁾.

Morphology of the Radix Entomolaris & Paramolaris

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⁽¹⁵⁾ 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 non separate RE.

The RP is located (mesio) buccally. As with the RE, the dimensions of the RP can vary from a 'mature' root with a root canal, to a short conical extension. This additional root can be separate or non separate. Carlsen and Alexandersen⁽¹⁶⁾ describe two different types: types A and B. Type A refers to an RP in which the cervical part is located on the mesial root complex; type B refers to an RP in which the cervical part is located centrally, between the mesial and distal root complexes.

Clinical Approach

The presence of an RE or an RP has clinical implications in endodontic treatment. 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 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

Photographs : Case-1



Pre-Operative X-ray

Working length-X ray

Post-operative X-ray

Photographs : Case-2

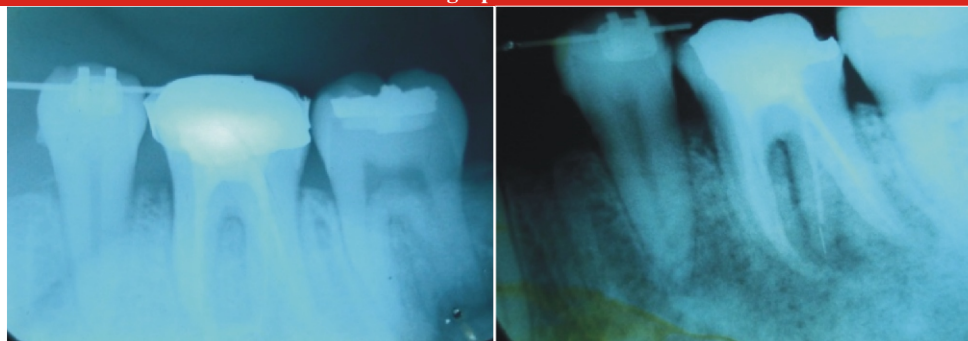


Pre-Operative X-ray

Working length-X ray

Post-operative X-ray

Photographs : Case-3



Pre-Operative X-ray

Post-operative X-ray

Photographs : Case-4



Pre-Operative X-ray

Working length-X ray

Post-operative X-ray

thorough inspection of the pulp chamber floor and wall, especially in the distolingual region, is necessary. Visual aids such as a loupe, intra-oral camera or dental microscope can, in this respect, be useful. 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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