The Radix Entomolaris and Paramolaris: Clinical Approach in Endodontics

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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. *(J Endod 2007;33:58–63)*

Key Words

Anatomical variations, endodontic treatment, mandibular molar, radix entomolaris, radix paramolaris

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The prevention or healing of endodontic pathology depends on a thorough chemomechanical 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*, *B*). An additional root at the mesiobuccal side is called the radix paramolaris (RP) (Fig. 1*C*, *D*). 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.

Case Reports

Case 1

A 34-year-old Caucasian male was referred for endodontic treatment of the mandibular right first molar before the replacement of a large amalgam restoration with a ceramic crown. The tooth was free of symptoms and radiographical examination showed no signs of apical periodontitis. The pulp chamber was opened, and one distal and two mesial canal orifices were located 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) and radiographical length measurement was performed with the Rinn set (Dentsply Rinn, Elgin, IL) (Fig. 2*C*).

Upon visual inspection with a microscope (OPMI Pico, Zeiss, Zaventem, Belgium), 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 noncutting tip (Diamendo, Dentsply Maillefer) and a second distal canal orifice was detected (Fig. 2*A*, *B*). The canal length was determined electronically using an AFA Apexfinder (EIE Analytic Technology, Orange, CA) and the root canals were shaped with ProTaper rotary instruments (Dentsply Maillefer). 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%).

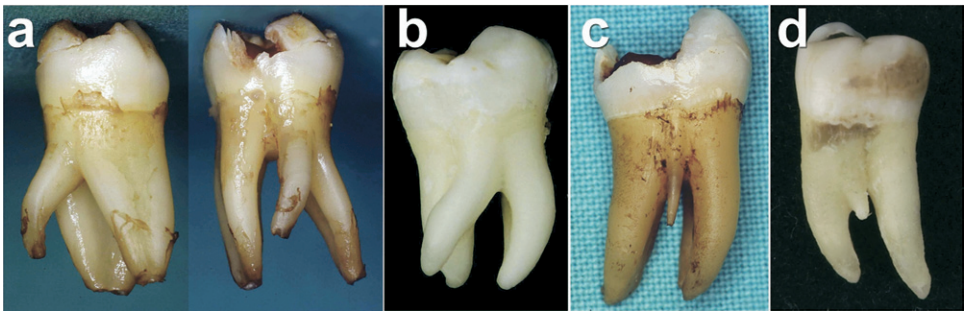

Figure 1. Clinical images of extracted mandibular molars with a radix entomolaris or paramolaris. (*A*) first molar with a radix entomolaris [distolingual view (left), lingual view (right)]. (*B*) radix entomolaris on a third molar (lingual view). (*C*) first molar with a separate radix paramolaris (buccal view). (*D*) first molar with a fused radix paramolaris (buccal view).

Initially, the distolingual root canal was thought to be a second canal in one distal root. Radiographically 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 an RE was confirmed on the postoperative radiograph (Fig. 2d). The root canals were filled with gutta-percha and AH26 (De Trey Dentsply, Konstanz, Germany) using hybrid condensation with gutta-percha condensers (Dentsply Maillefer) according to De Moor and Hommez (12). The opening cavity was sealed with glass ionomer cement (Ketac Fil, 3M ESPE, Seefeld, Germany) and the patient was referred to his general dental practitioner for the permanent coronal restoration.

Case 2

A 35-year-old Caucasian male was referred for endodontic treatment of the mandibular right first molar. An initial opening of the pulp chamber had already been performed by the referring dentist to relieve acute throbbing pain (acute pulpitis). Radiographical examination showed no signs of apical periodontitis. No distinct distal root was visible, but tiny projection lines of the periodontal ligament indicated a strong curvature of (one of) the distal root(s) to the mesial (Fig. 3*D*). On adjusting the opening cavity, four distinct canal orifices were found (Fig. 3*A*, *B*), and were coronally enlarged with Gates Glidden drills. Initial negotiation of the root canals was performed with a K-file ISO 15. Although the coronal enlargement and relocation of the canal orifices allowed straight-line access in three canals, insertion of the file in the fourth, distolingual canal showed a more lingually oriented access inclination. Upon removal of the file, the tip was deformed with a strong curvature to the mesial. This, together with the different access inclinations between the two distal canals, indicated the presence of two separate distal roots.

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. A second distal canal was found (Fig. 3*C*) and prepared. The two distal canals merged at the mid-root level. Ultrasonic tips (ProUltra, Dentsply Maillefer) were used to remove the isthmus between the distal canals. The gutta cone fit, with radiographical exposure 30 degrees from the mesial, confirmed the presence of an RE (Fig. 3*E*). All canals were filled with gutta-percha and AH26 sealer (hybrid condensation) (Fig. 3*F*, *G*) and the opening cavity was sealed with Fuji IX (GC Corp., Tokyo, Japan). The patient was then referred to the general practitioner for restoration of the crown.

Case 3

A 50-year-old Caucasian male was referred for endodontic treatment of the lower left second molar before restoration of the crown. The tooth was sensitive to percussion and extensive tooth decay had caused fracture of the distal part of the crown. A temporary coronal filling was placed by the referring dentist. An extra cusp was present on the buccal side of the crown (Fig. 4*A*). Radiographically, no signs of periapical pathosis were observed (Fig. 4*D*). Upon opening the pulp chamber, three root canals were found; these were enlarged coronally with Gates Glidden burs. The distal part of the temporary filling was left in place, to allow proper rubberdam clamp placement and to prevent leakage during endodontic treatment.

Inspection of the pulp chamber wall with a microscope and an angled probe revealed an overlying edge of the pulp chamber roof on the mesiobuccal. The opening cavity was enlarged and another root canal orifice was found (Fig. 4*B*, *C*). Radiographical length determina-

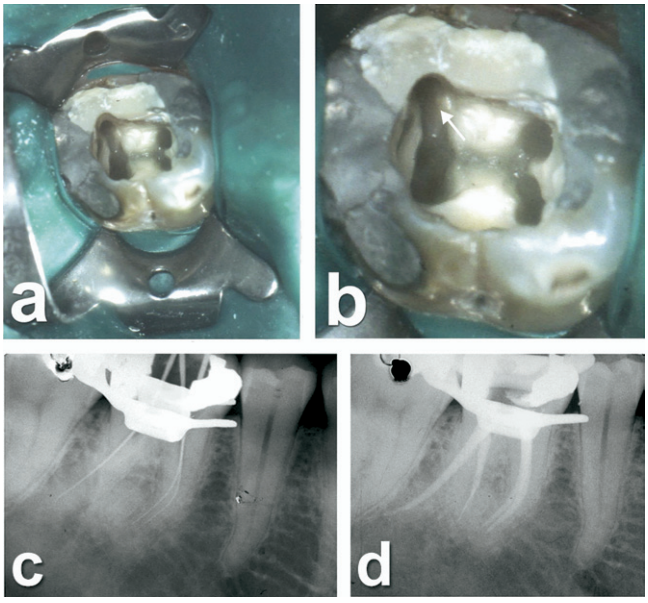

Figure 2. (*a*, *b*) occlusal view of the pulp chamber floor with the orifice of the radix entomolaris (arrow). A distolingual extension of the opening cavity is made for better access and vision of the additional canal. (*c*) Length determination radiograph. The radix entomolaris is invisible because of superposition of bone. (*d*) Postoperative radiograph with the radix entomolaris in the middle.