Endodontic Management of Radix Entomolaris in Mandibular Second Molar - A Case Report and Ex-Vivo Evaluation

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(Received: April, 2015)     (Accepted: July, 2015)

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Abstract
Radix Entomolaris (additional lingual root) is commonly found in mandibular first and third molars. However, its prevalence in second molars is only 23% in Indian population. A thorough knowledge of root canal anatomy and its variations is mandatory for a clinician to successfully treat such cases. The aim of this paper is to report a mandibular second molar featuring three roots, which is a rare clinical entity. Also, an ex vivo evaluation of extracted second molars exhibiting radix entomolaris was done to have an insight into their external morphology and modifications required in the access cavity preparation to locate the extra canal.

Key Words: mandibular second molar, radixentomolaris, classification, variation

Introduction:

The success in root canal treatment depends on thorough cleaning and shaping of root canals followed by a three-dimensional root filling with a hermetic seal. Therefore, it is mandatory for the clinician to have thorough knowledge of root canal anatomy and its variations.

It is commonly acknowledged that both deciduous and permanent mandibular molars display several anatomical variations. The majority of mandibular second molars (96%) are two-rooted with two mesial and one distal canal. However, variations exist, i.e., one root in 9.3% and three roots in 4.3%. An additional third root, first mentioned in the literature by Carabelli, is called Radix Entomolaris (RE). RE is found on the first, second and third mandibular molars, is located distolingually and occurs least frequently in the second molar. The frequency of prevalence of radix entomolaris in second molar in Indian population is 23%. The identification and external morphology of these root complexes, containing a lingual or buccal supernumerary root, has been described in the literature.

The aim of this paper is to report a case of Radix Entomolaris in mandibular second molar with a simultaneous ex vivo evaluation.

Case Report:
A 25-year-old female patient was referred to the Department of Conservative Dentistry and Endodontics, with the chief complaint of continuous dull pain in lower right tooth region. An intraoral and radiographic examination revealed a deep carious lesion approaching pulp in the right mandibular second molar (Figure 1).

After anaesthetizing the tooth, endodontic access cavity preparation was done using an Endo Access bur (DentsplyMaillefer, Ballaigues, Switzerland) and mesiobuccal, mesiolingual and distobuccal orifices were located with DG 16 endodontic explorer (Hu-Friedy, Chicago, IL). On inspection of the pulp chamber floor with operating loupes, 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 (Figure 5-a). Canal patency
was established using a #10 K file. Radiographic length determination showed a separate distal root, identified as a RE (radix entomolaris) and working length was determined by intraoral periapical radiograph which was verified by electronic apex locator (PropexII; Dentsply, Maillefer) (Figure 2). Root canal instrumentation was performed with ProTaper Ni-Ti rotary files (Dentsply Maillefer, Tulsa, OK) using a crown-down technique up to F1 size for the mesial canals and F2 size for the distal canals. After each instrumentation, the root canals were disinfected with 3% sodium hypochlorite solution and saline simultaneously. After completion of biomechanical preparation, a closed dressing was given. On recall after a week, the patient was asymptomatic. Root canal obturation was done with corresponding protaper gutta-percha cones (Dentsply Maillefer) using AH Plus resin sealer (Dentsply, Maillefer). A postoperative radiograph was taken and subsequently

the access cavity was sealed with permanent coronal restoration (Figure 3).

**EX VIVO EVALUATION:**

Four extracted second molars exhibiting Radix Entomolaris were evaluated for morphology. Three out of four had extra root emerging from the lingual aspect of the root midway between the mesial and distal roots (Type AC) and one conformed to Type C. The roots were of variable length and tapered apically (Figure 4).

Access cavity was prepared on all the extracted molars which had to be modified to locate the supplemental orifice which was mostly located in the disto-lingual position nearing the external wall with a greater inter-orifice distance than usual. The dentinal map proved a useful guide to locate the extra canal (Figure 5-b).
DISCUSSION:

Etiology:
The exact cause of radix entomolaris is still not known. Some authors say that it may be due to disturbance during odontogenesis or may be due to an atavistic gene. De Moore RJ et al had given another classification based on the curvature of RE variants in the buccolingual direction. They are Type I referred to straight root canals, Type II referred to as having a curvature at the entrance of orifice. Type III refers to RE with two curvatures, one at the coronal level and the other at the middle third.

Prevalence:
A supernumerary root can be found on the first, second and third mandibular molars, occurring least frequently on the second molar. A study evaluating the canal anatomy of 149 extracted mandibular second molars using clearing technique showed that 22% of the mandibular second molars had single roots, 76% had two roots and 2% had three roots. Another study reported two cases of three rooted mandibular second molars, with one mesial and two distal roots. A further study evaluating racial variations of the mandibular second molar showed that the incidence of three rooted mandibular second molars was 2.8% in Mongoloid patients, 1.8% patients of Negro origin and 1.7% in Caucasian patients. A prevalence of 0.23% bilateral three-rooted mandibular second molars has been seen in Indian population.

Diagnosis:
Identification of an additional root can be facilitated by periodontal probing. Presence of Radix Entomolaris can also be indicated by presence of an extra cusp (tuberculum paramolare) or more prominent occlusal distal or distolingual lobe, in combination with a cervical prominence or convexity. To achieve a correct diagnosis, a minimum of two diagnostic radiographs are necessary using buccal object rule. An avid clinician should always be keen to explore the possibility of additional root canals whenever in doubt. Diagnostic aids such as CBCT, Dentascan, multiple preoperative radiographs, examination of the pulp chamber floor with a sharp explorer, troughing of the grooves with ultrasonic tips, staining the chamber floor with 1% methylene blue dye, performing the sodium hypochlorite “champagne bubble test,” and visualizing canal bleeding points are all important aids in locating additional root canal orifices in such cases.

A classification of Radix Entomolaris has been given by Carlsen O and Alexandersen V based on the location of the cervical part of RE which were divided into A, B, C, AC. Type A & B refers to a distally located cervical part. Type C refers to a mesially located cervical part. Type AC refers to the location of the cervical part in the central location in between the mesial and distal components.

Access cavity preparation should be modified usually from a triangular to a trapezoidal shape. The modification should be done following the dentinal map. Advanced diagnostic aids such as magnifying loupes or surgical microscope help in the better identification and visualization of all the canals. Using various instruments like endodontic explorer, path finder, DG 16 probe and micro-opener and the use of sodium hypochlorite for Champagne effect would help in identification of an additional orifice. A severe root inclination or canal curvature, particularly in the apical third of the root (as in a type III RE), can cause shaping aberrations such as straightening of the root canal or a ledge, resulting in root canal transportation and loss of working length. The use of flexible nickel-titanium rotary files allow a more centered preparation shapewith restricted enlargement of the coronal canal third and orifice relocation.

While treating RE, the knowledge of mean inter-orifice distances might help dentists to locate orifices and to achieve successful endodontic treatment. Tu et al. has reported that mean inter-orifice distances from the disto-lingual canal to the disto-buccal, mesio-buccal and mesio-lingual canals of the permanent three-rooted mandibular molars were 2.7, 4.4 and 3.5 mm, respectively.

CONCLUSION:
Understanding the variations in the root canal morphology is important for the successful outcome after conventional root canal therapy. A case of radix entomolaris may be challenging but can be easily diagnosed by a careful evaluation of pre-operative radiographs when taken at different angulations. A knowledge of such deviation and schematic treatment approach becomes mandatory for long term success in such cases.

REFERENCES:
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Source of Support: Nil, Conflict of Interest: None declared.