CASE REPORT

ENDODONTIC THERAPY IN A 3-ROOTED MANDIBULAR SECOND MOLAR: A CASE REPORT

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Abstract
A rare case of a three-rooted mandibular permanent second molar in a 21-year-old male patient is reported. After clinical and radiographic examination, four separate root canal orifices were detected. A mesial shift radiograph confirmed the presence of an additional disto-lingual root. The tooth was treated by orthograde endodontic treatment in two visits. The case report underlines the importance of complete knowledge about root canal morphology and possible variations that exist in mandibular molars; coupled with full clinical and radiographic examination, in order to increase the ability of clinicians to treat root canal aberrancies.

Aim: Clinicians should be aware of these unusual root morphologies in the mandibular second molars. The initial diagnosis of a third root before root canal treatment is important to facilitate the endodontic procedure, and to avoid ‘missed’ canals.

Keywords: Dental Anomalies, Mandibular molars, Radix Entomolaris, Three rooted mandibularmolar
Introduction

Orthograde endodontic treatment comprises of meticulous cleaning & shaping, disinfection of the entire root canal space followed by a three dimensional obturation. Root canals may be left untreated during endodontic therapy if the clinician fails to identify their presence, particularly in teeth with anatomical variations or extra root canals.\(^1\,\text{,}\,2\) Comprehensive knowledge of the presence of unusual root canal anatomy and morphology is important for successful dental practice and for identifying features of anthropological significance.

It is commonly acknowledged that both deciduous and permanent mandibular molars display several anatomical variations. The majority of mandibular second molars are two-rooted with two mesial and one distal canal.\(^3\) However, the number of roots and root canals may vary. An additional third root, first mentioned in the literature by Carabelli, is called the Radix Entomolaris (RE).\(^4\) 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).\(^1\,\text{,}\,4\,\text{,}\,6\) The identification and external morphology of these root complexes, containing a lingual or buccal supernumerary root, are described by Carlsen and Alexandersen.\(^6\)

This supernumerary root (RE) has a frequency of less than 4% in Caucasians, 2.8% in African populations, whereas in populations with Mongoloid traits (Chinese, Indians and Eskimos) this macrostructure occurs with a frequency between 5% and 30%.\(^1\,\text{,}\,2\,\text{,}\,6\) In these populations, RE is considered to be a normal morphological variant and can be seen as an Asiatic trait.\(^1\) The aim of this paper is to report a mandibular second molar featuring with three roots, which is a rare clinical entity.

Case Report

A 21-year-old southeast-Asian male patient reported to the Department of Conservative Dentistry and Endodontics, Ragas Dental college & Hospital, Chennai with the chief complaint of spontaneous dull pain in the lower right region for the preceding few months. His medical history was noncontributory. An intraoral clinical examination revealed a deep carious lesion in the right mandibular second molar (tooth #31) with tenderness on percussion. Radiographic and sensitivity tests were performed that led to a diagnosis of irreversible pulpitis with apical periodontitis, necessitating endodontic treatment (Fig. 1). The tooth was anesthetized using 2% lignocaine with 1:100,000 adrenalin (Lignox; Indoco Remedies, Mumbai, India) and isolated under rubber dam (Hygenic Dental Dam, Coltène Whaledent, Germany). Caries was excavated, and an adequate endodontic access cavity was made using an Endo Access bur (Dentsply Maillefer, Ballaigues, Switzerland). The chamber was flushed with 3% sodium hypochlorite (Dentpro, Chandigarh, India) to remove the debris. Observation via a conventional access cavity revealed the presence of 3 canal orifices, 2 mesial and 1 distal. The dentinal map on the floor of the chamber was traced and explored using a DG 16 endodontic explorer (Hu-Friedy, Chicago, IL) following which the pulp tissue was extirpated using barbed broaches (Dentsply Maillefer, Tulsa, OK). On inspection with 2.5 magnification prismatic loupes (Seiler, St. Louis, MO), 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). Canal patency was established using a #10 K file (Mani, Tochigi, Japan). The canal length was determined electronically using an electronic apex locator (Root ZX II; J. Morita, Tokyo, Japan) and subsequently verified with an intraoral periapical radiograph. Root canal instrumentation was performed with ProTaper Ni-Ti rotary files (Dentsply Maillefer, Tulsa, OK) using a crown-down technique. During preparation, EDTA (Glyde File Prep, Dentsply Maillefer, Tulsa, OK) was used as a lubricant and the root canals were disinfected with 3% sodium hypochlorite solution (Dentpro, Chandigarh, India). The canals were finally rinsed with saline (Marck Biosciences, Gujrat, India), dried with sterile absorbent paper points (Dentsply Maillefer), and an intra canal medicament of calcium hydroxide was place. 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. The patient was recalled after a week and the canals were obturated with cold laterally condensed gutta-percha (Dentsply Maillefer) using AH Plus resin sealer (Dentsply Maillefer). A postoperative radiograph (Fig. 3) was taken; the opening cavity was sealed with posterior composite (Solare, GC Fuji, Japan) and the patient was scheduled for a permanent coronal restoration.

Discussion

Anatomical variations of mandibular molars are documented in the literature. Nonetheless, variations of the anatomy of the root canal system in molars are not appreciated by a great number of general practitioners. A supernumerary root can be found on the first, second and third mandibular molar, occurring least frequently on the second molar.1 There are various case reports of mandibular first molars featuring an RE. On the contrary, RE in the mandibular second molars has been seldom reported. Poorni et al. reported a case of mandibular second molar featuring an RE confirmed using spiral CT.7

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.1 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 describes four different types of RE according to the location of the cervical part of the RE: types A, B, C and AC.6 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.

The etiology behind the formation of the RE is still unclear.1 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.5,6 Curzon suggested that the ‘three-rooted molar’ trait has a high degree of genetic penetrance as its dominance was reflected in the fact that
the prevalence of the trait was similar in both pure Eskimo and Eskimo/Caucasian mixes.

The location of the orifice of the root canal of an RE has implications for the opening cavity. 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. Visual aids such as a surgical loupes, or dental microscope can be useful. A dark line on the pulp chamber floor can indicate the precise location of the RE canal orifice. The distal and lingual pulp chamber wall can be explored with an angled probe to reveal overlying dentin or pulp roof remnants masking the root canal entrance. The calcification, which is often situated above the orifice of the RE, has to be removed for a better view and access to the RE. An initial relocation of the orifice to the lingual is indicated to achieve straight-line access.

These anatomic variations in distal root anatomy may be identified through careful reading of angled radiographs. Slowley has demonstrated how difficult it is to detect extra roots, let alone extra canals. On the contrary, completing a thorough radiographic study of the involved tooth with exposure from three different horizontal projections, the standard buccal-to-lingual projection, 20° from the mesial, and 20° from the distal reveals the basic information regarding the anatomy of the tooth in order to perform endodontic treatment. However, using the buccal object rule with two radiographs with different horizontal angulations may suffice to determine the position of a lingual root. One of these radiographs is taken in the orthoradial position and the other taken either 30° mesially or distally. This buccal object rule has also been called Clark’s rule, the same lingual, opposite buccal (SLOB rule) and Walton’s projection. It is imperative that a comprehensive pre-operative radiographic evaluation is done prior to initiation of endodontic therapy.

**Conclusion**

Knowledge of both normal and abnormal anatomy of the mandibular molars dictates the parameters for execution of root canal therapy and can directly affect the probability of success. Therefore, practitioners must be familiar with all molar abnormalities, as well as their prevalence.

**References**

6. Carlsen O, Alexandersen V. Radix entomolaris: identification and

Legends

Fig. 1 Pre-operative radiograph
Fig. 2 View of Pulp chamber
Fig. 3 Post operative radiograph

Fig. 1