

## Radix entomolaris: A case report

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### Abstract

Root canals may be left untreated, if the dentist fails to identify their presence, leading to endodontic failure, particularly in teeth with anatomical variation in the form of extra roots or canals. Permanent mandibular first molars usually have 2 roots placed mesially and distally and 3 root canals. However, radix entomolaris (RE), an anatomical variant of permanent mandibular first molar, is characterized by the presence of additional or extra distolingual root. The prevalence of radix entomolaris in permanent mandibular first molars differs significantly with race but found to be very low among the Indian population. This case report is about the radiographic identification and endodontic management of radix entomolaris in a mandibular right first molar.

**Key words:** Radix entomolaris, Anatomic variation, Permanent three-rooted mandibular first molars, Distolingual root

### Introduction

A thorough knowledge of dental anatomy and an understanding of the potential for variations from the norm are required to achieve success in endodontics. Incomplete instrumentation and cleaning of the root canal space and faulty obturation are the main reasons for failure of endodontic treatment. Root canals are often left untreated because the operator fails to recognize their presence, especially in teeth exhibiting anatomic irregularities or accessory or aberrant root canals<sup>1,2</sup>.

Anatomical variations are an acknowledged characteristic of mandibular permanent molars. Permanent mandibular first molars usually have 2 roots placed mesially and distally and 3 root canals, but variations in the number of roots and in canal morphology are not uncommon.

The presence of a third root in the permanent first molar is the major variant in this group<sup>2,3</sup>.

Radix entomolaris (RE), first described by Carabelli, is an anatomical variant found in the permanent mandibular first molar. Radix entomolaris (RE) is characterized by the presence of additional third root (i.e. the supernumerary root or extra distal root), which is typically distributed

lingually. This extra distolingual root is generally smaller than the distobuccal root and is usually curved. RE has not been reported for the mandibular second molar, but it is found (rarely) in the mandibular third molar<sup>2,3</sup>.

Tu et al reported that the prevalence of RE in permanent mandibular first molars differs significantly with race. Endodontic literatures on RE in permanent mandibular first molars reveals its incidence ranging from 0%-43.7%, with highest prevalence among the Mongolian and Eskimo traits. Based on different methods of investigation, the prevalence of RE is also found to be high among Taiwanese (Chinese) population and found to be ranging from 21.1% to 33.33%, with a bilateral incidence ranging from 53.65% to 68.57% in them. Further, there was a significantly greater incidence of RE on the right side of the mandible than on the left, but gender did not show a significant relationship with this variant prevalence<sup>3,4,5</sup>.

In spite of high prevalence of RE in certain races, its incidence among the Indian population is found to be very low and only 0.2%<sup>3</sup>. This case report is about the detection and management of radix entomolaris (RE) in a mandibular first molar during its root canal treatment.

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### Case report

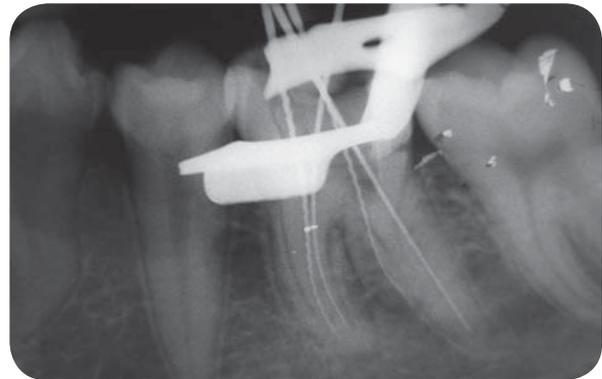
A 22-year-old female patient reported with pain in right mandibular first molar i.e. 46, since a week. The pain aggravated on taking cold and hot food items and upon mastication. Her medical history was noncontributory. Clinical examination of 46 revealed deep occlusal carious lesion and it was tender to both percussion and apical palpation. The periodontal examination of 46 was within the normal limits. Thermal and electric pulp test on 46 showed intense and prolonged response. Intraoral periapical radiographic examination of 46 revealed deep caries approximating the pulp space and slight widening of the periodontal ligament space around the apical area of the mesial root.

Apart from this, close inspection of the radiograph also revealed the presence of an additional periodontal ligament space crossing over the distal root leading to an impression of double periodontal ligament space on the distal aspect. This led to the suspicion of additional or extra root entity (Fig 1). Based on the clinical and radiographic examination, a diagnosis of symptomatic irreversible pulpitis with acute apical periodontitis in 46 was made and the patient was suggested to undergo root canal treatment.

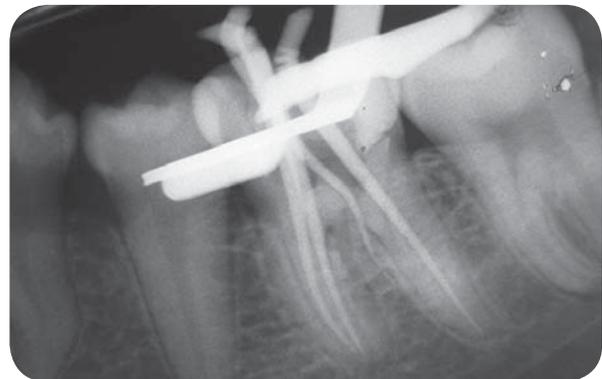
Root canal treatment in 46 was initiated under rubber dam, following local anesthesia and access opening in it. Careful exploration of the pulp chamber floor revealed four canal orifices (2 mesial & 2 distal), confirming the presence of additional distal canal. The pulpal tissue remnants were extirpated from the canals using K-file no.10 & no.15 (Dentsply Maillefer, Switzerland). Coronal flaring was accomplished with Gates Glidden drills (Dentsply Maillefer, Switzerland). Working length was determined using an apex locator (Root ZX, Morita, Tokyo, Japan). The radiograph taken with a mesial angulation to verify the working length confirmed the presence of extra distolingual root (Fig 2). All the canals of 46 were cleaned and shaped using rotary Nickel-Titanium Protaper files (Dentsply Maillefer, Switzerland) in a crown down manner and irrigated using 3% sodium hypochlorite and 2% chlorhexidine solutions. Calcium hydroxide (Dentokem, India) was used as an intracanal medicament and access opening was sealed with Zinc oxide- eugenol cement (DPI, India). Two weeks later, when the tooth was asymptomatic, the obturation was carried out by selecting Protaper gutta-percha (Dentsply Maillefer, Brazil) master cones (Fig 3), AH Plus sealer (Dentsply De Trey, Konstanz, Germany) and lateral compaction method. Following the obturation, the access opening was filled with Zinc oxide eugenol cement (DPI, India) and patient was scheduled for follow-up visits (Fig 4).



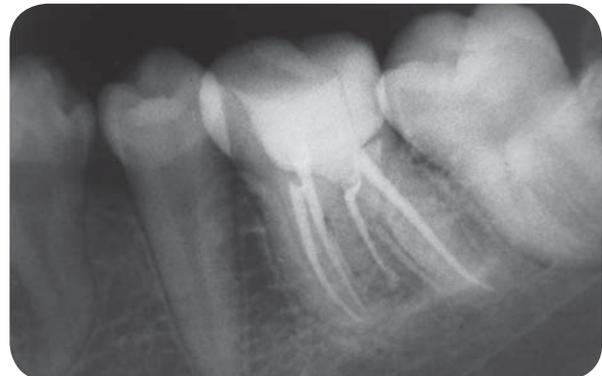
**Fig 1:** Preoperative radiograph of 46 depicting the additional PDL space crossing over the distal root and possibility of RE.



**Fig 2:** Working length radiograph of 46 revealing the existence of RE.



**Fig 3:** Master cone radiograph of 46.



**Fig 4:** Post obturation radiograph of 46 showing the outline of RE.

## Discussion

Radix entomolaris (RE), in this patient, characterized by the presence of an additional distolingual root was detected in the preoperative radiograph itself. This signifies the importance of preoperative radiograph in the endodontic treatment<sup>2,6</sup>. The 3-rooted mandibular first molar reported here had 1 mesial root with 2 canals and 2 distal roots with one canal each. This structure is the same as that of the other 3-rooted mandibular first molars described previously. The roots and canals of mandibular permanent first molars have several typical anatomical features, as well as a great number of anomalies. Studies focusing on canal morphology in mandibular first molar have assessed that the presence of 2 roots (1 mesial & 1 distal) with 3 canals (2 in mesial root and 1 in distal root) is the most common finding. Nevertheless, the presence of 2 roots (1 mesial & 1 distal) with 4 canals (2 in mesial root and 2 in distal root) is also relatively frequent, particularly with both the distal canals terminating in a single foramen. However, RE characterized by the presence of 2 distal roots, the second one being the extra distolingual root, is not very common as a morphologic variant<sup>1,2,3</sup>.

In this patient, the additional fourth canal orifice led into the extra distolingual root which displayed Vertucci type 1 canal configuration. This is in accordance to the general finding related to the canal configuration in RE<sup>2</sup>.

Calberson et al described 4 types of RE, and De Moor et al classified REs evaluated from extracted teeth into types I–III. RE or extra distolingual root of permanent mandibular first molars is curved buccolingually and typically smaller than the distobuccal root which could be confirmed in this patient during working length determination<sup>3,5,7,8</sup>.

It has been reported that RCT in mandibular first molars have a significantly lower success rate than the other teeth. One of the reasons for non healed root canal treatment is persistent infection caused by a missing canal and failure to remove all microorganisms and pulp remnants in the root canal system. Therefore a better awareness of root canal anatomy is essential for improving the healing rate of root canal treatment of mandibular first molars<sup>6</sup>.

Apart from the awareness about the possible existence and the racial prevalence of RE, it can be detected by thorough inspection of pretreatment radiographs, especially those taken from different angles. Intra-oral periapical radiographs may serve as an important aid in identifying RE. It is suggested that the radiographs were successful in over 90% of the cases while identifying additional roots<sup>9</sup>. Radiographic features like

double periodontal ligament images or unclear view of distal root/canal indicate the possibility of RE<sup>6</sup>. In the present case, all the radiographs taken during the root canal procedure were clearly suggestive of RE and prevented the need for further investigations like cone-beam computed tomography and 3-dimensional reconstruction which are useful to study the morphology of RE in a noninvasive manner<sup>3</sup>.

Clinically, the possibilities of detecting and managing RE can be enhanced by obtaining straight line access and modifying typical triangular shape of access preparation to a trapezoidal form. The values based on the mean interorifice distance between extra distolingual canal and remaining canals, as found in a study by Tu et al, may also serve as a useful guideline to locate and treat RE<sup>3,10</sup>. Further, good illumination and the use of accessories like magnifying loupes, microscopes etc are also valuable in locating and managing RE<sup>11</sup>.

## Conclusion

Unlike in other races, radix entomolaris (RE) in mandibular first molar is not a frequent finding in the Indian population. However, Dental clinician should be aware of the occurrence of RE as an anatomical variant. The detection of RE and its thorough cleaning, shaping and obturation would contribute significantly towards the success of primary endodontic treatment. Further, mandibular first molars have lower success rate following root canal treatment due to factors like missed canal etc, and awareness about RE helps in the diagnosis and to better the overall prognosis for endodontic retreatment. For the above reasons, molars also have high rate of extraction and early identification of extra distolingual root will minimize complications related to exodontia like root breakage. This case report also highlights the role of radiographs alone in the early identification and endodontic management of RE.

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