

**Radix Entomolaris – A Case Series**

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**Citation of this Article:** Sushil Pandey, Bonny paul, Mantri Shivkumar, Kavita Dube, Akruiti Jain, “Radix Entomolaris – A Case Series”, IJDSIR- January - 2022, Vol. – 5, Issue - 1, P. No. 458 – 464.

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**Type of Publication:** Case Report

**Conflicts of Interest:** Nil

**Abstract**

The main objective of endodontic treatment is to get rid of the infection. Inability to attain thorough cleaning and shaping followed by 3D obturation of the root canal system usually causes treatment failure. Mandibular first molars usually contain two roots. The mesial root mostly contains two root canals, and the distal root may contain one to two root canals. However, anatomical variant of permanent mandibular first molar radix entomolaris (RE), is characterized by the presence of additional or extra distolingual root. Incidences of Mandibular first molar with extra distolingual root has a frequency of <5% in white Caucasian, African, Eurasian, and Indian

populations. The presence of an additional third root in permanent mandibular first molars may affect the prognosis of the tooth if it is misdiagnosed. Thus, an accurate diagnosis and thorough understanding of variation in root canal anatomy are essential for treatment success. This case report is about the radiographic identification and endodontic management of radix entomolaris in a mandibular right first molar.

**Keywords:** radix entomolaris (RE), mandibular first molars, distolingual root.

**Introduction**

Variations from the normal are very common with the root canal system. A thorough knowledge and an

understanding of the potential for variations are required to achieve success in endodontics. The main reasons for failure of endodontic treatment are incomplete instrumentation and cleaning of the root canal space and faulty obturation. In teeth exhibiting anatomic irregularities or accessory root canals, the operator fails to recognize their presence which lead to endodontic failure.<sup>[1],[2]</sup>

The aim of root canal therapy is to effectively remove the bacteria from the canals and to prevent recontamination of the canals, which are mainly achieved by following proper cleaning and shaping protocols and by achieving 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.<sup>[3]</sup>

Anatomical variations are an acknowledged characteristic of permanent mandibular molars. Permanent mandibular first molars usually have 2 roots (1 mesial and 1 root distal) and 3 root canals but variations in number of roots and canal morphology are not uncommon.<sup>[2]</sup> In a mandibular first molar, an additional third root may be present, first mentioned in the literature by Carabelli called as the radix entomolaris (RE). This supernumerary root is located distolingually.<sup>[4]</sup>

This extra distolingual root is typically smaller than the distobuccal root and is usually curved.<sup>[5]</sup> Incidences of Mandibular first molar with three roots has a frequency of <5% in white Caucasian, African, Eurasian, and Indian populations.<sup>[6]</sup> In those with Mongoloid traits, such as the Chinese, Eskimos, and Native American populations, it occurs with a frequency of five to more than 30%.<sup>[7]</sup> RE has an occurrence of less than 5% among the Indian population.<sup>[8]</sup>

This case report is about the detection and management of radix entomolaris (RE)

### Case 1

A 21-year-old male patient reported with pain in his right mandibular first molar i.e., 46, since 5 days. The pain aggravated on taking cold and hot food items and on mastication. Clinical examination of 46 revealed a deep occlusal carious lesion and it was tender to percussion. Periodontal examination was found to be within normal limits.

Radiographic examination revealed deep occlusal caries involving the pulp space and widening of the periodontal ligament space around the mesial root and radiolucency in apical area of distal root (Fig 1)

Apart from this, close inspection of the radiograph also revealed the presence of an additional periodontal ligament space crossing over the distal root resulting in an impact of double periodontal ligament space on the distal aspect. This led to the suspicion of additional or extra root entity.

A diagnosis of acute irreversible pulpitis with apical periodontitis was made and endodontic treatment was advised.

Root canal treatment in 46 was initiated under rubber dam, following local an aesthesia and an access opening (Fig 2) was done. 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).

Working length was determined using an apex locator (E-pex Pro by Orikam). A working length radiograph (Fig 3) was taken which also confirmed the presence of extra distolingual root. All the canals of 46 were cleaned and shaped using rotary Nickel Titanium Neoendo flex

files (Orikam) in a crown down manner and irrigated using 3% sodium hypochlorite. All canals were prepared till 30 4%.

Calcium hydroxide was used as an intracanal medicament and the access opening was sealed with temporary filling cement (NEOTEMP by ORIKAM).

Two weeks later the tooth was asymptomatic and a master cone radiograph (Fig 4) was taken. Obturation was carried out using 30.4% GP (Dia- dent) and Bio ceramic sealer (Bio Root RCS) with single cone method (Fig 4). Following obturation (Fig 5), the access opening was filled with temporary filling cement (NEOTEMP by ORIKAM). The patient was scheduled for follow-up after 2 weeks and was found to be asymptomatic.



Figure 1: Pre-Operative



Figure 2: Access Opening



Figure 3: Working Length



Figure 4: Master Cone

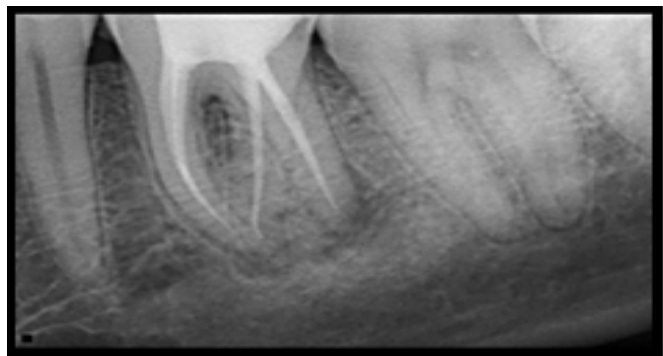


Figure 5- Obturation

### Case 2

A 36 -year-old female patient reported with pain in her left mandibular first molar i.e., 36, for the past 3 days. The pain aggravated on having hot and cold food and on lying down. Clinical examination of 36 revealed a deep occlusal carious lesion and was tender to percussion. Radiographic examination revealed a deep occlusal carious lesion involving the pulp space and widening of the periodontal ligament space around the distal root and radiolucency in apical area of distal root. A diagnosis of

acute irreversible pulpitis with apical periodontitis was made and endodontic treatment was advised.

After an informed consent, root canal treatment in 36 was initiated under rubber dam, following local anaesthesia. An access opening was done and careful exploration of the pulp chamber floor revealed four canal orifices (2 mesial & 2 distal). The pulpal tissue remnants were extirpated from the canals using K file no.10 & no.15 (Dentsply Maillefer, Switzerland).

Working length was determined using an apex locator (E-pex Pro by Orikam). A working length radiograph (Fig 6) was taken which also confirmed the presence of an extra distolingual root. All the canals of 36 were cleaned and shaped using rotary Nickel Titanium Neoendo flex files (Orikam) in a crown down manner and irrigated using 3% sodium hypochlorite. The canals were prepared till 25.4% and then Calcium hydroxide was placed as an intracanal medicament. The access opening was sealed with temporary filling cement (NEOTEMP by ORIKAM).

After 2 weeks the patient was found to be asymptomatic and a master cone radiograph was taken (Fig 7). Obturation was carried out by 25.4%GP (Día- dent) and Bio ceramic sealer (Bio Root RCS) by lateral condensation method. (Fig 8). The access opening was filled with temporary filling cement (NEOTEMP by ORIKAM) and patient was scheduled for follow-up visit after 2 weeks. The patient was found to be asymptomatic and was scheduled for further treatment.

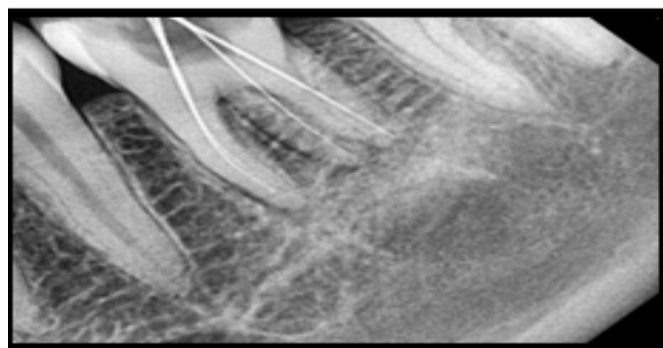


Figure 6: Working Length

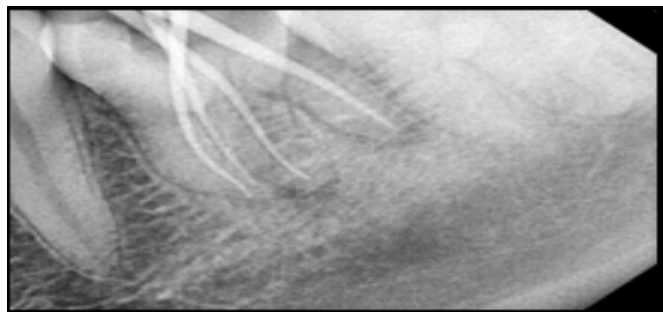


Figure 7: Master Cone.



Figure 8: Obturation

## Discussion

The aetiology behind the formation of the RE is still not clear. Its formation could be attributed to external factors during odontogenesis, or due to atavistic gene or polygenetic system (atavism is the reappearance of a trait after several generations of absence).<sup>[13]</sup>

Radix entomolaris (RE), in this case is characterized by the presence of a distolingual root which was detected in the preoperative radiograph itself. This signifies the importance of preoperative radiograph in the endodontic treatment

The 3-rooted mandibular first molar reported here had 1 mesial root with 2 canals and 2 distal roots with one

canal each. Studies focusing on canal morphology in mandibular first molar have assessed that the presence of 2 roots (1 mesial & 1 distal) with 3 canals (two in mesial root and one in distal root) is the most common finding. Nevertheless, the prevalence 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 ending in a single foramen. However, RE is characterized by the presence of 2 distal roots, the second one being the extra distolingual root, which is not very common as a morphologic variant. It has been reported that RCT in mandibular first molars have a significantly lower success rate than the other teeth.<sup>[1],[2],[3]</sup> The RE is located distolingually, with its coronal third completely or partially fixed to the distal root. The dimensions of the RE can differ from a short conical extension to a “mature” root with normal length and root canal. In most cases, the pulpal extension is visible radiographically. In general, the RE is smaller than the distobuccal.<sup>[9]</sup>

De Moor et al. (2004) classified RE based on the curvature of the root or root canal.<sup>[10]</sup>

1. Type 1: A straight root or root canal<sup>[4]</sup>
2. Type 2: A curve in the coronal third which becomes straighter in the middle and apical third
3. Type 3: An initial curve in the coronal third of canal with a second curve which is buccally oriented begins in the middle or apical third.

Song et al. (2010) further added 2 more newly defined variants of RE.<sup>[11]</sup>

1. Small type: Half of the length of the distobuccal root
2. Conical type: small type and having no root canal within it.

One of the reasons for non-healed endodontic treatment is persistent infection because of missed canal and failure to eliminate 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>[12]</sup>

Clinical inspection of crown structure and analysis of the cervical morphology of the roots by means of periodontal probing can help in identification of an additional root.<sup>[13]</sup> Using various instruments such as endodontic explorer, DG 16 probe, pathfinder, micro – opener and use of sodium hypochlorite for champagne effect can help in recognition of an additional canal orifice.<sup>[14]</sup> Advanced diagnostics aids such as surgical microscope or magnifying loupes helps in better visualization and identification of all canals.

The most important basic principle for successful endodontic treatment is the principle of “straight-line access.”<sup>[2]</sup> Ultimate objective is to provide access to the apical foramen. As the orifice of RE is distolingually located, the shape of access cavity should be transformed from classical triangular form to trapezoidal or rectangular form to better locate the orifice of distolingual root. The root canal orifices follow the laws of symmetry which help in locating the RE.<sup>[13]</sup>

True morphology of an RE can be studied by three-dimensional imaging techniques based on computed tomography (CT) and cone beam computed tomography (CBCT), a non-invasive manner using less radiation. However, cost and access to them are said to be the limiting factors.<sup>[12],[15]</sup>

In the present case series, the radiographs alone, including preoperative ones, clearly revealed the presence of RE in all the cases, thus signifying the importance of radiographs in their detection. From the patient's point of view, it prevented the need for expensive investigation such as CBCT.<sup>[17]</sup>

Using radiographic examination, Steelman<sup>16</sup> found that 10 (6.4%) of 156 Hispanic children had an accessory distal root in the mandibular permanent first molar. The prevalence of an extra root is almost equal among males and females, but it is more common on the left side.<sup>[11]</sup>

Despite these morphological variations in canal configuration wise, RE is reported to be typically round in shape with Vertucci type I configuration which may be considered to be the simplest canal anatomy of all types. In confirmation of this, all the RE detected in the present case series radiographically showed only Vertucci type I canal configuration.<sup>[12],[18]</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.

In teeth with variations in number and morphology of root canals; this success in turn depends upon a correct diagnosis and careful clinical as well as radiological inspection. An accurate diagnosis, followed by a modified access cavity preparation, location of orifice and preparation of canals with a careful and adapted method may avoid mishaps during endodontic therapy. Application of skilled endodontic therapy will improve the prognosis of the tooth irrespective of file system used.

This case report highlights the role of radiographs alone in the early identification and endodontic management of RE.

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