**Radix entomolaris in children – A challenge to pedodontist: A report of case series with literature review**

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**Abstract**

Permanent mandibular molars exhibit numerous variations pertaining to root or canal numbers. Vary rarely a supernumerary or extra root is found distolingually, which is given the term radix entomolaris in the literature. Thorough knowledge of this root variation is highly essential to provide ultimate success following root canal treatment. This paper describes three case reports of permanent mandibular first molar with three roots (one mesial and two distal) and four canals (two in mesial and one in each distobuccal and distolingual root).

**Keywords:** Anatomical variation, children, endodontic therapy, mandibular first molar, radix entomolaris

**Introduction**

The major intention of the root canal treatment is thorough debridement of root canals and their disinfection before obturation and sealing. One of the main reasons for failure of root canal treatment in molars is because the clinician has not removed all the pulp tissue and micro-organisms from the entire root canal system. Therefore, the knowledge of anatomy as well as the variations in the number and shape of canals is of utmost importance for the clinician.

It is known that the permanent mandibular first molar can display several anatomical variations and, like the number of root canals, the number of roots may also vary. A major anatomical variant of the two-rooted mandibular first molar is the third root known as radix entomolaris (RE), first mentioned in the literature by Carrabelli. This supernumerary root is located distolingually in mandibular molars, mainly the first molars and most of the time it displays Vertucci Type I canal configuration. Sometimes an extra root is seen at the mesiobuccal side of main mesial root, and it is called radix paramolaris.

The occurrence of RE associated with first mandibular molars is found in some ethnic population of the world. The prevalence of its occurrence in Mongoloid populations including Chinese, Eskimo and American Indians is 5-30%. As the frequency is high in these populations some authors consider it as normal morphological entity or eumorphic root variation. However, in Caucasians, as RE is not common, it is considered unusual or dysmorphic root morphology. In dysmorphic supernumerary roots, their formation is related to external factors during odontogenesis, or due to penetration of an atavistic gene or polygenetic system. In eumorphic roots, racial genetic factors influence the most profound expression of a particular gene that results in a more pronounced phenotypic manifestation.

There are reports showing RE occurs more commonly on the right side. However, some reports also reported that RE occurred on the left side in some individuals. With respect to gender predilection Loh and Colak did not found any significant difference for occurrence of RE with either sex. Whereas, Tratman has stated that it is more common on the right side for males and bilateral for females. However, there are reports showing prevalence of RE is similar in both sexes.

Midtbø and Halse studied root length, crown height and root morphology using an intra-oral and panoramic radiographs in Turner syndrome patients and identified RE in several first molars. They concluded that X-chromosome deficiency...
influences root formation. Curzon suggested that certain traits such as the "three-rooted molar" was genetically dominant as was reflected in the fact that pure Inuit and Inuit/Caucasian mixes had similar prevalence of the trait. The prevalence of this extra root is equally manifested in males and females. However, the anomaly is more frequent on the left side and some studies report a bilateral occurrence of RE from 50 to 67%.

Carlsen and Alexandersen have classified the RE into four types according to its cervical part: Type A and Type B, distally located cervical part of RE with two normal mesial and one normal distal component respectively; Type C is mesially located cervical part; and Type AC, central location, between distal and mesial root components. De Moor et al. classified the RE into three types according to the curvature of RE: Type I, straight root/root canal; Type II, initial curve in the coronal third and a second curve beginning in the middle and continuing to the apical third. Recently, Song et al. categorized RE into five types such as Type I, II, III, small and conical type based on the curvature of RE. The purpose of this article is to report three such cases who presented with this variation in morphology and its subsequent treatment.

Case Reports

Case 1

A 14-year-old male patient reported to the Department of Pedodontics and Preventive Dentistry, College of Dental Sciences, Davangere, India with a chief complaint of pain in his left lower back tooth region of mouth since 1 month. On clinical examination both permanent mandibular right and left first molars (36, 46 - FDI tooth notation) had deep caries on distoproximal surface. Both were tender on percussion and showed no response to electric or thermal testing.

Radiographic evaluation with intra oral periapical radiograph showed radiolucency involving the pulp with widening of periodontal ligament space in 46, and periapical radiolucency in periapical region in relation to 36 [Figure 1a and 2a]. Based on clinical and radiographic findings a diagnosis of chronic periapical abscess with 36 and chronic reversible pulpitis with 46 was made treatment plan was decided as endodontic treatment for both the teeth followed by core build up, metal post and finally with stainless steel crown.

An anesthesia was achieved for tooth number 36 by means of inferior alveolar nerve and buccal nerve block with 1.8 ml of 2% lignocaine with 1:80,000 adrenaline. Conventional root canal treatment was started, and all carious part was removed and a trapezoidal access preparation was done with endo-access bur and canal orifices were located with DG 16 endodontic explorer. Initial negotiation of the root canals was confirmed with K-file 10. The fourth distolingual canal orifice was present far from distal root canal orifices. The canal lengths were determined radiographically with K file ISO 15 size [Figure 1b] and electronically with root ZX. They were cleaned with 2.5% sodium hypochlorite along with saline. Calcium hydroxide powder mixed with saline was used as an intra-canal medicament. At next appointment, patient was asymptomatic. Master cone radiograph revealed proper fitting of cones [Figure 1c]. Canals were dried with paper point and obturation was done by lateral condensation technique using AH-26 sealer [Figure 1d]. The access cavity was then temporarily sealed with intermediate restorative material (IRM) and after 1 month post space was prepared on the distobuccal canal space and metal post was cemented followed by core build-up of the tooth using vitremer.

Similar treatment was done for mandibular right first molar [Figure 2]. Finally, both teeth were restored with stainless steel crown [Figure 3]. The patient remained asymptomatic after 1 year post treatment and is continued to be under active follow-up.
Case 2

A 15-year-old female patient reported to the same Department with a chief complaint of pain in his left lower back tooth region since 10 days. On clinical examination mandibular right first molar (46 - FDI tooth notation) was deeply carious, tender on percussion and radiographically there was widening in the periodontal ligament space. We also noticed the presence of a third root between the mesial and distal roots [Figure 4a]. Diagnosis was made as apical periodontitis with 46. Treatment plan was decided to do endodontic treatment for the same tooth followed by cast metal crown.

Conventional root canal treatment was started with 46. After access opening the cavity was modified from triangular to trapezoidal in order to locate the RE. The root canal length determination was done with files [Figure 4b] and step back method was used for biomechanical preparation, teeth were cleaned with 2.5% sodium hypochlorite along with saline and closed dressing was given. Calcium hydroxide powder mixed with saline was used as an intra-canal medicament. At next appointment, patient was asymptomatic. Master cone radiograph revealed proper fitting of cones [Figure 4c]. Canals were dried with paper point and obturation was done by lateral condensation technique using AH-26 sealer [Figure 4d]. The access cavity was then temporarily sealed with IRM.

After root canal treatment, the tooth was prepared for receiving cast metal crown and subsequently the metal crown was delivered. The patient is asymptomatic and is under active follow up from past 1 year.

Case 3

A 10-year-old patient came with a chief complaint of pain in his lower left back tooth region since 30 days. On clinical examination, deep occlusal caries was present in permanent left mandibular first molar (36 - FDI tooth notation) and was tender on percussion. Radiographic examination showed widening of periodontal ligament space [Figure 5a]. A diagnosis of apical periodontitis was made, and treatment plan was decided to do a conventional root canal treatment. Access cavity was prepared, and four distinct canal orifices were found. The canal lengths were determined radiographically with K file ISO 15 size [Figure 5b] and electronically with root Z x. They were cleaned with 2.5% sodium hypochlorite along with saline. Calcium hydroxide powder mixed with saline was used as an intra-canal medicament. At next appointment patient was asymptomatic. Master cone radiograph revealed proper fitting of cones [Figure 5c]. Canals were dried with paper points and obturation was done by using AH-26 sealer [Figure 5d]. After 1 week, the tooth was prepared and a stainless steel crown was delivered to the patient. The patient is asymptomatic and is under active follow up from past 6 months.

Discussion

Ingle(23) stated that the most frequent cause of endodontic failure is a canal that is left untreated because a clinician fails to recognize
it. Vertucci[24] studied the internal and external anatomy of teeth and has shown that anatomical variations can occur within each group of teeth, within each person and, in general, within each racial group.

Few authors showed that RE was found in association with an additional cusp on the buccal side that is usually called protostylid. Sometimes it is also seen with tuberculum paramolare or cervical prominence or convexity. Hence, it has been stated that the presence of extra root or canals is always associated with increased number of cusps.[3]

The presence of RE has clinical implications during endodontic treatment. An accurate diagnosis of the supernumerary roots can avoid complications or a missed canal during root canal treatment. Apart from complicating the root canal procedures, RE has been found to be a contributing factor to localized periodontal destruction.[2] In addition, reports demonstrated significantly higher probing depths with attachment loss at the distolingual aspect of three-rooted molars.[25] During extraction procedure, if rotational movements are used, there are chances of RE root fracture due to its divergent morphology.[3] Presence of RE has orthodontic implications also. This root can make the orthodontic movement difficult.[17] However, few authors also hypothesized that RE being an extra root gives additional support and stability for molars by increasing the surface area of attachment to the alveolar bone.[26] Addition to this, RE has forensic value in identifying the people of Mongoloid races.[5,12,26]

The RE is usually situated in the same buccolingual plane as the distobuccal root, so a superimposition of both roots can appear on the preoperative radiograph and result in an inaccurate diagnosis. The proper application of Clark’s rule or the buccal object rule facilitates locating additional canals or roots, and distinguishing between objects that have been superimposed.[3,27] Hence, to reveal an RE, additional radiographs should be taken from a more mesial or distal angle (20°). In 1985, Walker and Quackenbush[10] concluded that panoramic radiographs reveal 90% accuracy in diagnosing RE. Along with this thorough interpretation of some particular marks like an unclear view or outline of the mesial or distal root/canal, contour can reveal the hidden RE.[3,27] Recently, the use of advanced techniques like spiral computed tomography clearly shows the entire anatomy of the extra roots or canals.[28] The location of the additional canal orifice may be difficult because of overhanging dentine. If the orifice is not found, the root canal remains untreated and infected, or necrotic tissue remnants may remain in the root canal, leading to treatment failure.

With the distolingually located orifice of RE, a modification of the classical triangular access cavity to a trapezoidal form, so as to better locate and access the root canal is essential.[3,21] After access opening if the canal orifice of the RE root is not evident, clinician must carefully inspect the pulpal floor or wall at the distolingual region. As most of the RE root show severe inclination especially at the apical third part (like in Type III RE) chances of formation of ledge in the root canal or loss of working length are possible.[21,24,29] Moreover, in these roots use of nickel titanium rotary files are of more useful to provide a more centered preparation and also to avoid procedural errors during root canal preparation.[3,21,28,29]

### Conclusion

An accurate diagnosis of RE is essential to prevent procedural complications during endodontic treatment. Correct radiographic techniques and interpretation of radiographs is highly essential in identifying RE in mandibular molars.

### References

16. Colak H, Ozcan E, Hamidi MM. Prevalence of three-rooted


