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CASE STUDY

RADIX ENTOMOLARIS: CASE SERIES

***Akash Agrawal, Ajay Saxena, Manoj Chandak, Madhur Kalra and Abhilasha Mishra**

Sharad Pawar Dental College, India

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ABSTRACT

The accomplishment of endodontic treatment depends on diagnosis of all the canals, thorough biomechanical preparation followed by three dimensional obturation with hermetic seal. Missing any of these steps may occur dueto bizarre tooth morphology. Usually mandibular molars have two roots with three canals (mesiobucccal, mesiolingual & distal) but in some teeth, the number of roots and canals vary. The variation in the number of roots is called radixentomolaris. This article presents three case reports of mandibular first molars with extra roots. Also mentioned are the modifications in the canal preparation, problems encountered during the treatment, common iatrogenic errors which occur during the treatment and factors which affect the prognosis.

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INTRODUCTION

The root canal treatment of a mandibular molar with anomalous canal configuration can be diagnostically and technically challenging. Success of endodontic treatment depends on the proper identification of all the canals, thorough chemo-mechanical preparation followed by three dimensional obturation with hermetic seal (Skidmore, 2012) Failure of any of these steps may occur due to unusual tooth morphology. This is mainly achieved by a thorough cleaning and shaping of the root canal, followed by a three-dimensional filling with a fluid tight seal. Establishing adequate access for cleaning and shaping is an integral part of this procedure (Pineda, 1972). Usually mandibular molars have two roots with three canals (mesiobucccal, mesiolingual & distal) but in few teeth, the number of roots and canals vary. The variation in the number of roots is called radix entomolaris (Filip, 1986). Many variations in root canal systems have been described. Fabra-Campos reported the presence of three mesial canals while Stroner reported three distal canals (Fabra-Campos, 1989 and Stroner, 1984). A major variant is the presence of three roots in mandibular first molar, first mentioned in the literature by Carabelli known as radix entomolaris located in distolingual position (Carabelli, 1844). When located on mesiobuccal surface, the anomaly is known as radix paramolaris. The external morphology of this anomaly having additional lingual or buccal root, are described by Carlsen and Alexandersen (Carlsen, 1990). Radiographic diagnosis plays a vital role in successful endodontic treatment of tooth. One of the main reasons for failure of endodontic treatment is incomplete removal of pulp tissue and microorganisms from all the root canals. So, radiographs taken at different angulations give information about extra canals or roots. Although both macrostructures are rare in our population, knowledge of their occurrence and location are important (Carlsen, 1990 and Carlsen, 1991). In this report such a case is presented. The prevalence, external morphological variations and internal anatomy of the radix entomolaris are described. The clinical approach to diagnosis and endodontic treatment are also discussed and illustrated.

CASE REPORT

Case 1

A 28 year-old female patient reported to department of conservative and endodontic in Sharad Pawer Dental College with a chief complaint of pain in lower- right posterior tooth region of jaw since one month . Clinically, the lower right side molar tooth had deep occusal caries and was tender on vertical percussion. Pulp vitalitytest was done in which Thermal test, Electric Pulp Tester was used and in both the test there was delayed response with 46. Radiographically, Deep Occusal Caires Seen towards approaching pulp (Figure 1a). A diagnosis of Chronic irreversible pulpitis with apical periodontitis in

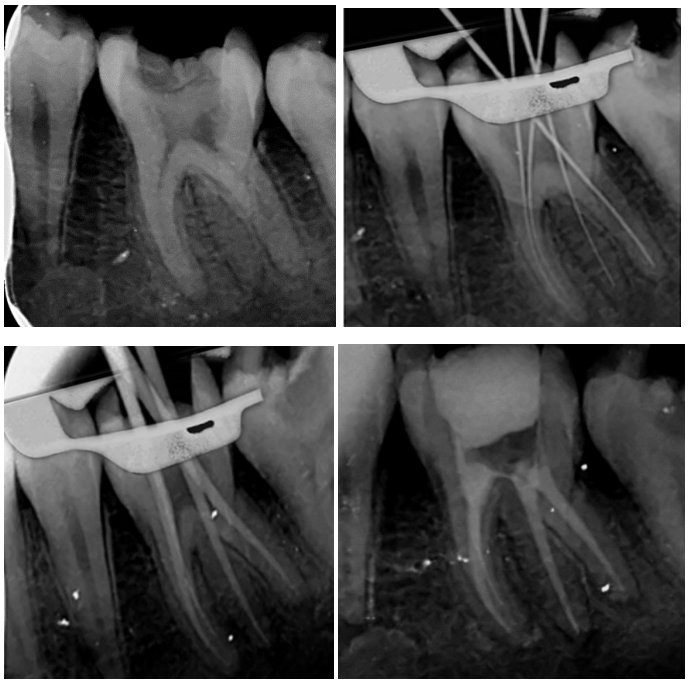
Corresponding author:* **Akash Agrawal
Sharad Pawar Dental College, India

relation to lower right first molar. The tooth is anesthetized. Access opening was done and two mesial canal orifices (mesiobuccal, mesiolingual) and one distal canal orifice (distobuccal) were initially located. Another orifice was located on distolingual part of the pulp. IOPA was taken which revealed an Extra canal (Disto lingual canal). Floor on further exploration. The root canals were explored with a K-file ISO number 15 and radiographic length of the root canals were determined (Figure 1b) and confirmed by apex locator. Biomechanical preparation was done with protapertill F1 files. (Dentsply, Switzerland) in all the canals and canals were irrigated with 5.25 % Sodium hypochlorite,17% EDTA and 2% Chlorhexidine. Was used as final irrigant and irrigation activation was done by endo activator (Dentsply) (Figure 1c) Radiograph was taken for accessing master cone and canals were obturated using Guttapercha and AH Plus sealer (Dentsply, Switzerland). The access preparation was sealed and the post enodontic restoration was done with composite (Figure 1d).

Figure. (a) Pre-op IOPA x-ray. (b) Working lenght Determination, (c) Master Cone. (d) Obturation

Case 2

A 30-year-old male patient was referred to the Sharad Pawar Dental College Department of Conservative Dentistry and Endodontics, with the complaint of painin the lower left back tooth region. The patient had a history of intermittent pain for the past one month, which aggravated on chewing food. On clinical examination, there was a carious mandibular left first molar and Which was tender on percussion. The involved tooth showed a negative response to electric pulp test. Diagnostic radiography showed a coronal radiolucent area involving the pulp (Figure 2a). Based on these findings, the tooth was diagnosed with symptomatic irreversible pulpitis with apical periodontitis. Endodontic treatment was planned for the involved tooth In the first visit profound anesthesia was achieved using 2% lidocaine for inferior alveolar nerve block. The tooth was isolated with a rubber dam and access cavity preparation was prepared and using DG 16 fourth canal was located (Hu-Friedy, Chicago, IL, USA). The fourth disto-lingual canal orifice was present lingual to distal root canal orifices Sx was uses to enlarge orifices. (Dentsply Maillefer, Ballaigues, Switzerland). ISO size 6, 8, and 10 files were used to createinitial glide path. Working length was determined using an apex locator (ProPexPiXi, Dentsply). The root canals were explored with a K-file ISO number 15 and radiographic length of the root canals were determined (Figure 2b). Biomechanical preparation was done using the Protaper Universal Rotary files. (Dentsply, Switzerland) in all the canals with intermittent irrigation using irrigated with 5.25 % Sodium hypochlorite, 17% EDTA and 2% Chlorhexidine. After that master cone was taken and confirmed by radiograph (Figure 2c).and then Canals were obturated using Guttapercha and AH Plus sealer (Dentsply, Switzerland). The access preparation was sealed and the post enodontic restoration was done by composite restoration (Figure 2d).



Case 3

A 44-year-old male was reported to Department of Conservative and Endodontic in Sharad Pawer Dental College with the chief complaint of pain in lower right back region of since 15 days. On Examination the pulp chamber was already opened, H/O of Root canal Treatment Two Months Back. Therefore Diagnosis was given as Pulpal Necrosis with 46 after that tooth was anesthetized. Access opening was modified and one distal and two mesial canal orifices were located using an endodontic explorer (DG-16 Endodontic Explorer, Ash Instruments, Dentsply, Gloucester, United Kingdom). Rubber Dam Placement done (Figure 3a). The root canals were explored with a K-file ISO 15 (DentsplyMaillefer, Ballaigues, Switzerland) and radiographical length was measured (Figure 3b). Biomechanical preparation was done with using the Protaper Universal Rotary till F2 (Dentsply, Switzerland) Instrumentation was done in all the canals and irrigation was done by using irrigated with 5.25 % Sodium hypochlorite, 17% EDTA and 2% Chlorhexidine. After that master cone was taken (Figure 3c). and then Canals were obturated using Guttapercha and AH Plus sealer (Dentsply, Switzerland). The access preparation was sealed and the post enodontic restoration was done by composite restoration (Figure 3d).

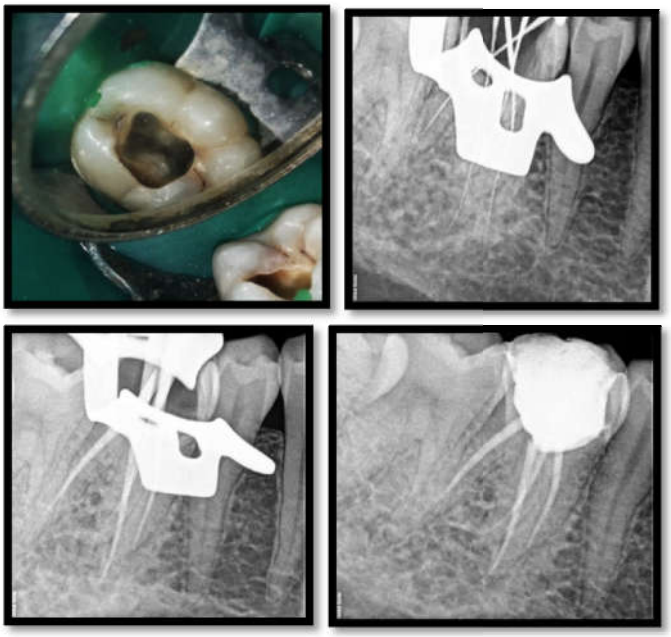


Figure (a) Rubber ram placement. (b) Working lenght Determination, (c) Master Cone. (d) Obturation

DISCUSSION

A thorough knowledge of the variations in root canal anatomy is absolutely imperative as diversities such as extra roots, extra canals, fins, and isthmuses may complicate the endodontic procedure (Attam, 2012). The majority of mandibular first molars are two-rooted (97.8%) with three canals (Barker, 1974). The presence of a separate RE in the first mandibular molar is associated with certain ethnic groups. In African populations a maximum frequency of 3% is found, while in populations with Mongoloid traits (such as the Chinese, Eskimo and American Indians) reports have noted that the RE occurs with a frequency that ranges from 5% to more than 30%. The etiology behind the formation of the RE is still unclear. In supernumerary roots, its formation could be related to external factors during odontogenesis, or to penetrance of an atavistic gene (atavism is the reappearance of a trait after several generations of absence) An RE can be found on the first, second and third mandibular molar, occurring least frequently on the second molar (Visser, 1948). Bolk *et al*. reported the occurrence of a buccally located additional root the RP (Bolk, 1914). This macrostructure is very rare and occurs less frequently than the RE. The prevalence of RP, as observed by Visser *et al*. was found to be 0% for the first mandibular molar, 0.5% for the second and 2% for the third molar. Other studies have, however, reported RP in first mandibular molars (Ribeiro, 1997). Morphology of 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. The cases in this articles are typical case of type B RE.

- 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 (Carlsen, 1990)
- 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.

According to the classification of De Moor *et al*., based on the curvature of the separate RE variants in bucco-lingual orientation, three types can be identified (De Moor, 2004)

- Type I refers to a straight root/root canal,
- Type II refers to an initially curved entrance which continues as a straight root/root canal.
- Type III refers to an initial curve in the coronal third of the root canal and a second curve beginning in the middle and continuing to the apical third.
- According to the classification of Song *et al*. (2010) further added two more newly defined variants of RE.
- Small type: length shorter than half of the length of the distobuccal root.
- Conical type: smaller than the small type and having no root canal within it.

RE Morphologically ranges from short, conical extension to normal mature root length with its coronal third partially or completely fixed to distal root. Generally, the radix entomolaris is smaller than mesio- and distobuccal roots and may contain pulpal tissue (Reichart 1981). Externally, the distal furcation is slightly lower (1 mm) than the furcation between mesial and distal (Gu, 2011), tooth with additional distolingual root may present amore bulbous crown outline, an additional cusp, a prominentdistolingual lobe or cervical prominence. These features can indicatethe presence of additional root. Radiographically, third root is visible in 90% of cases (Walke, 1985). Occasionally it may be missed because of itsslender dimension or overlapping with distal root. Radiographs should be carefully inspected to reveal the presence of hidden radix entomolaris which might present as unclear outline of distal root or root canal. Additional radiographs taken from different horizontal projections, 20 degree from mesial and 20 degree from distal reveals the basic information about the anatomy of additional third root (Ingle, 2002). In various emerging imaging system modality like CBCT has been beneficial in ruling out extra canal or not in the tooth morphology.

Conclusion

Clinicians should be aware of these unusual root morphologies in the mandibular first molars. The initial diagnosis of a radix entomolaris or paramolaris before root canal treatment is important to facilitate the endodontic procedure, and to avoid 'missed' canals. Preoperative periapical radiographs exposed at multiple different horizontal angles will help to identify these additional roots.

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