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Radix entomolaris and radix Paramolaris

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Abstract

Mandibular molars can have an additional root located lingually (the radix entomolaris) or buccally (the radix Paramolaris). If present, an awareness and understanding of this unusual root and its root canal morphology can contribute to the successful outcome of root canal treatment. This article presents successful endodontic treatment of two mandibular first molars with extra roots one is with radix entomolaris and other is with radix Paramolaris, both of which are rare microstructures.

Keywords: Anatomical variations, Endodontic treatment, Mandibular first molars, Radix entomolaris, Radix Paramolaris.

Introduction

The main aim of the endodontic procedure is through the elimination of microbes from the root canal system and prevention of further reinfection, which is achieved by biomechanical cleaning of the pulp space followed by hermetic sealing with obturating material. An awareness and comprehensive knowledge of the unusual root canal morphology can contribute to the success of the endodontic procedure. The majority of the mandibular first molars have one mesial and one distal root with two mesial canals and one distal canal.[1-2] The presence of a third root in the permanent first molar is the major variant

in this group.[3-4]

This additional third root, first mentioned in the literature by Carabelli (1844), is called the radix entomolaris (RE), located distolingually in the mandibular molars, mainly first molars. An additional root at the Mesiobuccal side is called the radix Paramolaris (RP).[5,6]The permanent mandibular first molar is the earliest permanent posterior tooth to erupt, responsible for development of occlusion and important physiologic functions like chewing. Commonly, it is the most frequently in need of endodontic treatment. Thus, it is of utmost importance that the clinician be familiar with variations in the root and root canal anatomy of the mandibular first molar.[7]

Incidence of Mandibular Molar with Three Roots

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 Eurasian and Indian populations the frequency is less than 5%. 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%. Because of its high frequency in these populations, the RE is considered to be a normal morphological variant (eumorphic root morphology). In Caucasians the RE is not very common and, with a maximum frequency of 3.4 to 4.2%, is considered to be unusual or dysmorphic root morphology.[8-10]

An RE can be found on the first, second and third mandibular molar, occurring least frequently on the second molar.[11]Some studies report a bilateral occurrence of the RE from 50 to 67%.[12]

Radix Paramolaris *(*RP*)*: This macrostructure is very rare and occurs less frequently than the RE.[13]RP is commonly observed in 1.5 to 3% of African population whereas RP is

less frequent in Indian population. Its frequency of existence is around 2%.

Case reports

Case 1

A 29-year-old female patient reported to the Department of Conservative Dentistry and Endodontics, Desh Bhagat Dental College, with a chief complaint of severe pain in the left lower back tooth region since last three days. The pain was intermittent in nature and aggravated on taking hot food and beverages, and lasted for 2–3 hours. A diagnostic radiograph of mandibular first molar showed caries close to pulp and presence of an additional root (Fig. 1A). Another radiograph was taken at mesial and distal angulation to confirm the same. Access cavity preparation was done under local anesthesia with an endo access bur (Dentsply, Switzerland). The first distal canal was located towards the buccal side indicating the presence of one additional canal on the lingual side. The shape of the access cavity was modified from triangular to a trapezoidal form to locate the fourth canal. DG-16 endodontic explorer was used to locate the root canal orifices and 15 # K file (Mani, Japan) was used to establish patency of the canals. Working length was determined using apex locator and reconfirmed radiographically (Fig.1B). Biomechanical preparation was done with rotary Protaper Next (Dentsply, Switzerland) file system. During instrumentation,1.3% sodium hypochlorite was used as an irrigant and 17% EDTA was used as final flush. Obturation was performed with gutta-percha points using cold lateral condensation technique (Fig. 1C). Restoration of access cavity was done with composite resin (Tetric-N-ceram, Ivoclar Vivadent) and a post-obturation radiograph was taken (Fig.1D).

Fig 1A: pre operative radiograph

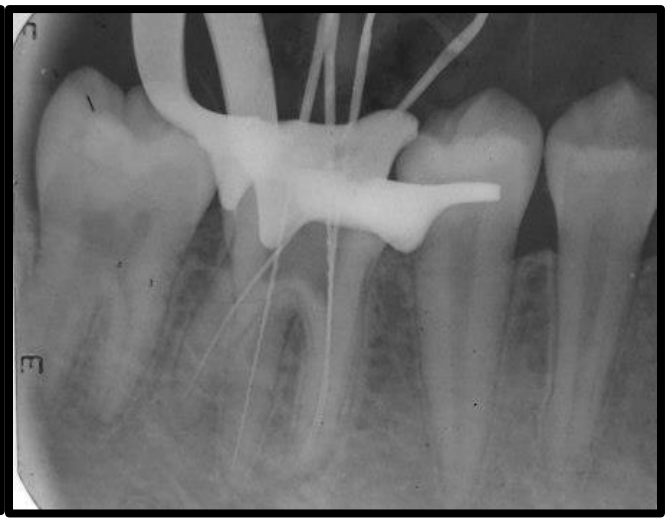

Fig 1b: working length radiograph

Fig 1C : master cone radiograph

Fig 1D:obturation radiograph

Case 2:

A 42-year-old female patient reported to the Department of Conservative Dentistry and Endodontics, Desh Bhagat Dental College with the complaint of pain in the lower left back tooth region. Patient gave a history of pain since 2 weeks. Diagnostic radiograph revealed that there was secondary caries associated with restored left mandibular first molar. A diagnostic radiograph of mandibular first molar showed restoration close to pulp and presence of an additional root (Fig. 2A). A diagnosis of a nonvital left mandibular first molar with apical periodontitis was made and endodontic treatment was planned. The tooth was anesthetized and isolated under rubber dam. The access cavity was prepared. On inspection of the pulp chamber floor centrally placed two canal orifices (one mesial and one distal) were detected initially. A small hemorrhagic spot was noted buccally between the distal and the mesial orifices on the pulp chamber floor. Bubbles were noted when a drop of sodium hypochlorite was placed on the hemorrhagic spot (Champagne bubble test) and the opening was confirmed as a buccal canal orifice. Working length determined using radiographs and an apex locater, cleaning and shaping was done using rotary Protaper files (Fig. 2B). Canals were irrigated with 2.5% sodium hypochlorite and 17%

EDTA. After selecting the master cones, (Fig.2C) canals were obturated with gutta-percha and AH plus sealer. The access cavity was restored with composite resin (Tetric-N-ceram, Ivoclar Vivadent) and a post-obturation radiograph was taken (Fig.2D).

Fig 2A: pre-operative radiograph

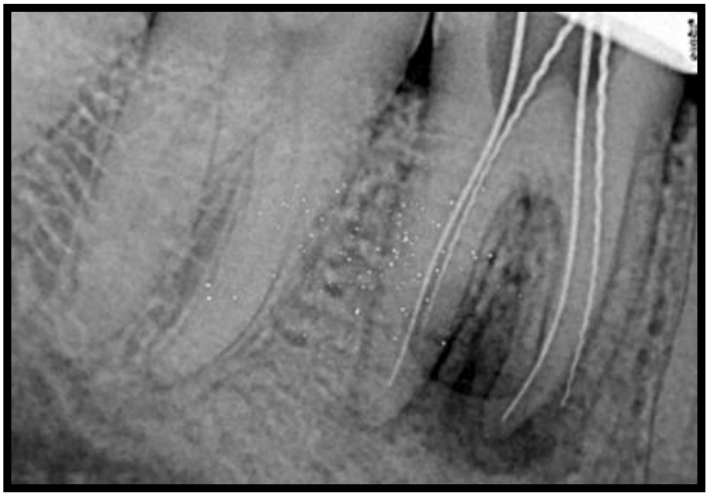

Fig 2B: working length radiograph

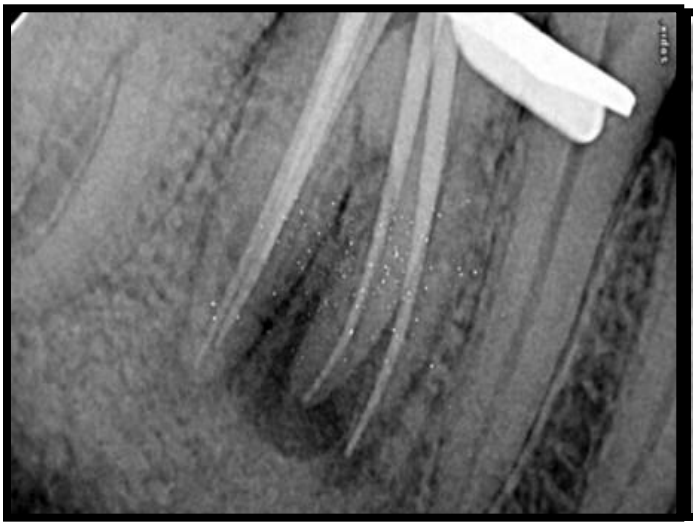

Fig 2C: master cone radiograph

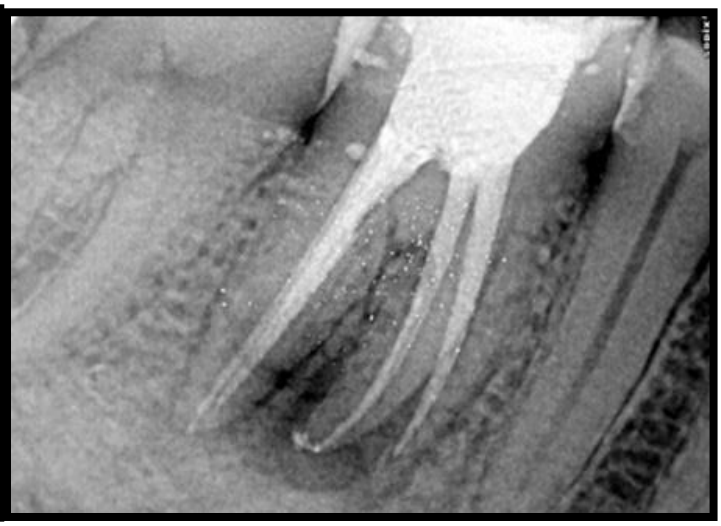

Fig 2D: obturation radiograph

Discussion

Clinical trial of diagnosis, adequate chemo mechanical preparation, and three dimensional obturation determine the success of root canal therapy. The first stage of endodontic triad, i.e., correct diagnosis is one of the most important steps towards the success of the endodontic procedure[14].One of the main reasons for the failure of root canal treatment is negligence in removing pulpal tissue and microbes from all the pulp canals. Hence, appropriate radiographic diagnosis play a crucial role in the successful outcome of endodontic therapy. So, radiographs were taken at different angulations to minimize the chances of "missed canals"[15]. Radix entomolaris has a prevalence rate of less than 5% in the Indian population and such cases are not commonly observed during dental treatment. The exact etiology of radix entomolaris is still not known but according to some authors it may be due to disturbance during odontogenesis or may be due to the high degree of genetic penetrance.[16]

The RP is located (mesio) buccally. As with the RE, the dimensions of the RP can vary from a 'mature' root with a root canal, to a short conical extension. This additional root can be separate or nonseparated. Carlsen and Alexandersen describe two different types: types A and B. Type A refers to an RP in which the cervical part is located on the mesial root complex; type B refers to an RP in which the cervical part is located centrally, between the mesial and distal root complexes.[17]

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 two different horizontal angles are required to identify these additional roots. Knowledge of the location of the additional root and its root canal orifice will result in a modified opening cavity with extension to the distolingual. The morphological variations of the RE in terms of root inclination and root canal curvature demand a careful and adapted clinical approach to avoid or overcome procedural errors during endodontic therapy.

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