Case reports and clinical guidelines for managing radix entomolaris

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ABSTRACT

Knowledge about the external and internal anatomy of the tooth is essential for successful dental practice. Anomalies in the tooth are often encountered which poses difficulties in dental treatments. As like any other tooth, mandibular first molars are also prone for anatomic malformations. One such anatomic variation is the presence of extra root distolinguually. This distolinguual root is called radix entomolaris (RE). The presence of an additional root can lead to difficulties during endodontic therapy. This article is a report of two cases describing the management of the first mandibular molars with an RE and clinical guidelines for its management.

As like any other tooth in the oral cavity, mandibular first molar is also prone for anatomic malformations and anomalies in its development. Mandibular first molars normally have two roots, the mesial and the distal ones. The major variant is the occurrence of a third root, which is often reported in the literature. If this additional root is located mesiobuccally, it is called radix paramolaris and if located distolingually, it is called radix entomolaris (RE). This was first described by Carabelli. The frequency of RE in Caucasians and Africans is <5%, whereas in populations with Mongoloid traits (like Chinese, Inuit, and Native Americans), it occurs with a frequency that ranges from 5% to >30%. In these populations, it is considered to be a normal morphological variant and can be seen as an Asiatic trait. Radix paramolaris is very rare and occurs with a prevalence of <0.5%.

The presence of this extra root may lead to missed canal, instrument separation due to severe curvature, aberrations in cleaning and shaping while doing endodontic therapy, and so on. Thus, a very accurate clinical and radiographic diagnostic procedures and meticulous canal preparation are necessary.

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In the following case reports, the endodontic treatment of mandibular first molar with an RE and clinical guidelines for successful management are explained.

Case Reports

Case 1

A 32-year-old female patient reported to the conservative Dentistry and Endodontics Department with pain on the left mandibular back teeth region. The pain was severe throbbing type associated with food impaction. The extraoral examination revealed mild swelling in the submandibular region of the left mandible which was tender on palpation and enlarged submandibular lymph nodes. Intraoral examination revealed a Class II disto-occlusal dental caries in tooth number 36 with a slightly increased mobility. The thermal and electric pulp sensitivity test of the tooth was negative.

On radiographic examination, [Figure 1a] the presence of an extra root between mesial and distal roots was seen. Angulated digital radiographs were taken to find whether the extra root is in the buccal or lingual side. Following the same lingual opposite buccal rule, it was confirmed that the extra root was located in the lingual aspect and hence RE. The tooth was diagnosed to be symptomatic apical periodontitis.

The patient was informed about the endodontic treatment as an attempt to save and retain the tooth. As the patient was willing to save the tooth, it was decided to proceed with endodontic therapy. An expert periodontal opinion was obtained from the Department of Periodontics, and the prognosis of the tooth was found to be good.

Local anesthesia was administered and rubber dam was applied. Caries was excavated and the distal missing marginal ridge was restored with resin composite as a preendodontic restoration. The access cavity was prepared with round and safe-end tapered fissure bur. After entirely removing the roof of the pulp chamber, two mesial canal orifices and one distal orifice were located. The orifice of the RE was located at the lingual aspect to the orifice of the distal root canal [Figure 1b]. The working lengths were determined electronically with Propex II (Dentsply/Maillefer, Ballaigues, Switzerland) apex locator. Thereafter, the readings of the apex locator were verified radiographically [Figure 1c]. The root canals were instrumented using K-files to create a glide path for the rotary instrumentation. During cleaning and shaping, the root canals were irrigated with copious amounts of 2.5% sodium hypochlorite solution (UPS Hygienics Pvt. Ltd., Mumbai, Maharashtra, India). The canals were then rinsed with EDTA (DeSmear, Ahmedabad, Gujarat, India). Mesiobuccal and mesiolingual canals were enlarged up to F2 ProTaper files (Dentsply, Maillefer, Ballaigues, Switzerland) and the distal canal was enlarged up to F3 ProTaper file. As the radix root was curved and narrow, it was enlarged only up to F1 ProTaper file corresponding to a tip size of ISO 20. The root canals were medicated with a calcium hydroxide dressing (Endocal, Albucu, Montreal, Canada) and the access cavity was temporarily sealed with temporary restoration (Coltene AG, Altstatten, Switzerland). One week later the root canals were obturated. Initially, the corresponding sized gutta-percha master cones for the four canals were selected. The selected gutta-percha cone was coated with AH Plus sealer (Dentsply, Maillefer, Ballaigues, Switzerland) and placed in the canal. The System B Heat Source (Analytic Technologies, Redmond, USA) was used to remove the coronal portion of the gutta-percha cone. The Obtura II system (Obtura Corporation, Fenton, MO, USA) was used for the back-filling with the application of gutta-percha in small increments. The access cavity was sealed with Filtek Z-350 (3M ESPE, USA) and the root canal filling was evaluated radiographically [Figure 1d].

Case 2

A 56-year-old, male patient without any relevant contributing medical history reported with severe pain in the mandibular right jaw region. On extraoral examination, no noticeable change related to the chief complaint was seen. Intraorally mandibular right first molar (46) had a Class II mesio-occlusal dental caries and the third molar was grossly decayed. Both the first and third molars were tender on percussion.

Preoperative radiograph [Figure 2a] revealed the widening of periodontal space and loss of lamina dura in tooth 46 and a partially impacted 48. Forty-six also revealed the presence of extra root located between the mesial and distal roots. It was not clearly visible because of the dense bone pattern. It was decided to remove tooth 48 and retain tooth 46 by doing root canal treatment. After getting consent, the patient was referred to the specialist oral surgeon to remove 48 and root canal treatment of 46 was scheduled after 1 week.

Under local anesthesia and rubber dam, access cavity was prepared and root canals were located. Two mesial orifices and one distal orifice were located. After using ultrasonics to remove the calcifications in the pulp chamber, lingual to the distal orifice, the orifice of RE was located. The working lengths were determined electronically with Propex II apex locator and confirmed with radiographs [Figure 2b]. The root canals were

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**Figure 1**: Radiographic and clinical procedure of case 1. (a) Preoperative radiograph, (b) root canal orifices, (c) working length radiograph, (d) postoperative radiograph
negotiated with 10 K files (Dentsply, Maillefer, Ballaigues, Switzerland). Step back technique was used for cleaning and shaping. The root canal preparation was performed up to ISO size 40 in the mesial root canals and up to 45 in distal canal. Because of the presence of curvature in the cervical one-third, RE root was enlarged only up to ISO size 30 at the apex and stepped back. Copious amounts of 2.5% sodium hypochlorite solution and EDTA were used as irrigants. Calcium hydroxide dressing was given as intracanal medicament and temporarily sealed with Cotolosol F (Cotec AG, Altstatten, Switzerland). At the check-up after 1 week, the patient was completely free of pain and symptoms. The gutta-percha master cones for the four root canals were selected. The root canals were obturated using AH‑Plus as a sealer and the lateral compaction technique. For the gutta-percha compaction, stainless steel finger spreaders (Mani, Tochigi, Japan) were used. For lateral compaction corresponding sizes of the gutta-percha points were used to match the size of the spreader used. Excess gutta-percha from the pulp chamber was removed and sealed at the orifice level [Figure 2c]. The access cavity was sealed with composite resin (Filtek Z 250, 3M ESPE, USA) and verified radiographically [Figure 2d]. After 3 weeks, the patient was advised for full coverage restoration.

Discussion

Knowledge of tooth and root canal anatomy is important for dental practice and for identifying/treating features of anthropologic significance. Permanent mandibular first molars usually have two roots placed mesially and distally and three root canals, but variations in the number of roots and in canal morphology are not uncommon. Variations in the root configuration can impose problems during endodontic treatment. RE is often not diagnosable because of overlapping by the distal root with ortho-grade radiographs. RE can only be discovered by a careful correlation between clinical and radiographical examination. A thorough examination of the preoperative radiographs and the presence of any questionable differences in the radiographs may suggest RE. Intraorally, an additional cusp (tuberculum paramolare) or a cervical convexity that is noticeable by probing can indicate RE. Cone beam computed tomography may be an ideal diagnostic aid in the management of RE as it provides a three-dimensional view of the extra root, length, and location. The location of the additional canal orifice may be difficult because of overlapping 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 endodontic 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. If the RE canal orifice is not clearly visible after removal of the pulp chamber root, a more thorough inspection of the pulp chamber floor and wall, especially in the distolinguinal region, is necessary with the help of ultrasonic troughing. A straight access to these root canals is crucial for adequate shaping and cleaning. It is likely that the root canal wall of the RE was very thin. To avoid perforation or weakening the root, the root canal was only enlarged up to F1 ProTaper in the first case and ISO 30 in the second case report.

Clinical guidelines for the management of radix entomolaris

The shape of the access cavity must be trapezoidal in order to ensure a straight line access to the apical one-third of the canal, locating the orifices, and preventing instrument separation.

The incidence of RE in the South Asian and Indian population is quite higher compared to populations of other ethnic groups. This mandates the endodontist to compare various angulations of the radiographs to confirm the presence or absence of RE. Instrument separation is often an unpleasant experience with the RE. This is because of the presence of acute curvature in the coronal third. This can be prevented by doing proper coronal preflaring and creation of glide path for rotary instruments. If rotary instruments are used, a flexible instrument with less taper is preferentially used to prevent the flexural failure of the instrument. A severe root inclination can also cause shaping aberrations such as straightening of the root canal or ledge configuration, resulting in root canal transportation and loss of working length.

Missed canal is the most often encountered failure of endodontic therapy in RE. This is because of the overlapping of the radix root with the mesial or distal roots in radiographs. Cone beam computed tomography is an ideal investigation in case RE is suspected. The location of the orifice is also unusual. This lets the endodontist to overlook the presence of this extra root.

The root length of RE is often inconsistent. It may vary from a few millimeters to equal lengths of the mesial and distal roots. Verification of the root lengths with apex locators is therefore essential before radiographic working length determination in order to avoid the inadvertent violation of apical foramen.
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