Radix Entomolaris in Mandibular First Molar: An Endodontic Challenge

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Abstract

Success of endodontic therapy depends on the proper identification of all the canals, thorough chemo-mechanical preparation followed by three dimensional obturation with fluid tight seal. Failure of any of these steps may occur due to unusual tooth morphology. Proper knowledge of root canal anatomy is a basic prerequisite for the endodontic treatment successful. Mandibular molars may have an additional root located lingually (radix entomolaris) or buccally (radix paramolaris). Awareness and understanding of the presence of unusual external and internal root canal morphology contributes to the successful outcome of the root canal treatment.

Key words: *extra roots, radix entomolaris, variations.*

Introduction

A thorough understanding of root canal anatomy and morphology is required for achieving high level of success in endodontic treatment. Inability to recognize variations in root or root canal anatomy can result in failures in endodontic treatment. Hence, it is very important that the clinician be well informed and alerted to the commonest possible variations. Incomplete instrumentation and cleaning of the root canal space and faulty obturation are the main reasons for failure of endodontic treatment.

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Root canals are often left untreated because the operator fails to locate them accurately, especially in teeth exhibiting anatomic irregularities or accessory or aberrant root canals [1,2].

Anatomical variations are acknowledged characteristics of mandibular permanent molars. Permanent mandibular first molars usually have 2 roots placed mesially and distally and 3 root canals, but variations in the number of roots and in canal morphology are not uncommon. The presence of an extra root in the permanent first molar is the major variant in this group [2,3].

Radix entomolaris (RE), first described by Carabelli, is an anatomical variant found in the permanent mandibular first molar. Radix entomolaris (RE) is characterized by the presence of additional third root (i.e. the supernumerary root or extra distal root), which is typically distributed lingually. This extra distolingual root is generally smaller than the distobuccal root and is usually curved. Radix entomolaris (RE) has not been reported for the mandibular second molar, but it is found (rarely) in the mandibular third molar [2,3]. Tu et. al. reported that the prevalence of radix entomolaris (RE) in permanent mandibular first molars differs significantly with race [3,4].

Endodontic literatures on radix entomolaris (RE) in permanent mandibular first molars reveal its incidence ranging from 0%-43.7%, with the highest prevalence among the Mongolian and Eskimo traits. Based on research data, the prevalence of RE is also found to be high among Taiwanese(Chinese) population and found to be ranging from 21.1% to 33.33%, with a bilateral incidence ranging from 53.65% to 68.57% in them. Further, there was a significantly greater incidence of radix entomolaris (RE) on the right side of the mandible than on the left, but gender did not show a significant relationship with this anatomic variation [3-5].

In spite of high prevalence of radix entomolaris (RE) in certain races, its incidence among the Indian population is found to be very low and only 0.2% [3]. This case report is about the detection and management of radix entomolaris (RE) in a mandibular first molar during its root canal treatment.

Case Report

A 50-year-old female patient reported with pain in right mandibular first molar i.e. 46, since a week. The pain aggravated on taking cold and hot food items and upon mastication. Her medical history was non contributory. Clinical examination of 46 revealed deep occlusal carious lesion and it was tender to percussion. The periodontal examination of 46 was within the normal limits. Thermal and electric pulp test on 46 showed intense and prolonged response. Intraoral peri-apical radiographic examination of 46 revealed deep caries approximating the pulp space and slight widening of the periodontal ligament space around the apical area of the mesial root.

Apart from this, close inspection of the radiograph also revealed the presence of an additional periodontal ligament space crossing over the distal root leading to an impression of double periodontal ligament space on the distal aspect. This led to the suspicion of additional or extra root entity (Fig. 01). Based on the clinical and radiographic examination, a diagnosis of symptomatic irreversible pulpitis with acute apical periodontitis in 46 was made and the patient was suggested to undergo root canal treatment.

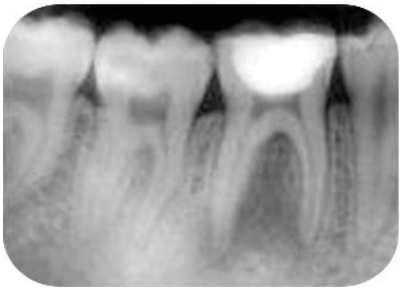

Fig. 01: Preoperative

Root canal treatment in 46 was initiated under rubber dam, following local anesthesia and access opening in it. Careful exploration of the pulp chamber floor and when viewed under operating microscope, revealed four canal orifices (2 mesial & 2 distal), confirming the presence of additional distal canal (Fig. 02). The pulpal tissue remnants were extirpated from the canals using K-file no.10 & no.15 (Dentsply Maillefer, Switzerland).

Fig. 02: View under Operating Microscope

Coronal flaring was accomplished with Gates Glidden drills (DentsplyMaillefer, Switzerland). Working length was determined using an apex locator (Root ZX, Morita, Tokyo, Japan). The radiograph taken with a mesiala ngulation to verify the working length confirmed the presence of extra distolingual root (Fig. 03).

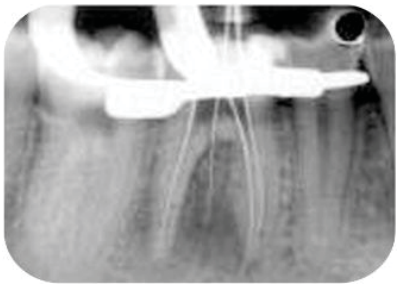

Fig. 03: Working Length

All the canals of 46 were cleaned and shaped upto apical size 30 using step-back technique and irrigated using 3% sodium hypochlorite and 2% chlorhexidine solutions. Calcium-hydroxide (Dentokem, India) was used as an intra-canal medicament and access opening was sealed with Zincoxide- eugenol cement (DPI, India). Two weeks later, when the tooth was asymptomatic, the obturation was carried out by selecting gutta-percha (Dentsply Maillefer, Brazil) master cones (Fig. 04), AH Plus sealer (Dentsply De Trey, Konstanz, Germany) and lateral compaction method (Fig. 05).

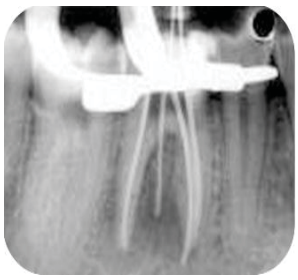

Fig. 04: Master Cone

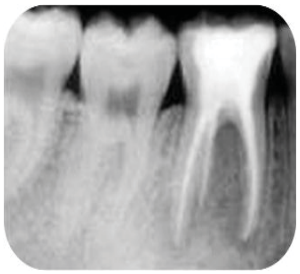

Fig. 05: Postoperative

Discussion

Radix entomolaris (RE), in this patient, characterized by the presence of an additional distolingual root was already detected in the preoperative radiograph. This signifies the importance of preoperative radiograph in the endodontic treatment [2,6]. The 3-rooted mandibular first molar reported here had 1 mesial root with 2 canals and 2 distal roots with one canal each. This structure is the same as that of the other 3-rooted mandibular first molars described previously. The roots and canals of mandibular permanent first molars have several typical anatomical features, as well as a great number of anomalies. Studies focusing on canal morphology in mandibular first molar found that the presence of 2 roots (1 mesial & 1 distal) with 3 canals (2 in mesial root and 1 in distal root) is the most common finding.

Nevertheless, the presence of 2 roots (1 mesial & 1distal) with 4 canals (2 in mesial root and 2 in distal root) is also relatively frequent, particularly with both the distal canals terminating in a single foramen. However, radix entomolaris (RE) characterized by the presence of 2 distal roots, the second one being the extra distolingual root, is not very common as a morphologic variant [1-3].

Calberson et al described 4 types of radix entomolaris (RE), and De Moor et al classified radix entomolaris (RE)s evaluated from extracted teeth int otypes I–III. Type I: a straight root/root canal; type II: initially curved entrance of the root canal and the continuation as a straight root/root canals; type III: initial curve in the coronal third of the root canal and a second buccally orientated curve starting from the middle third. Radix entomolaris (RE) or extra distolingual root of permanent mandibular first molars is curved buccolingually and typically smaller than the distobuccal root which could be confirmed in this patient during endometrics [3,5,7,8].

It has been reported that RCT in mandibular first molars have a significantly lower success rate than the other teeth. One of the reasons for non healed root canal treatment is persistent infection caused by a missing canal and failure to remove 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 [6].

Apart from the awareness about the possible existence and the racial prevalence of radix entomolaris (RE), it can be detected by thorough inspection of pretreatment radiographs,especially those taken from different angles. Intra-oral periapical radiographs may serve as an important aidin identifying radix entomolaris (RE).

It is suggested that the radiographs were successful in over 90% of the cases while identifying additional roots [9]. Radiographic features like double periodontal ligament images or unclear viewof distal root/canal indicate the possibility of radix entomolaris (RE) [6]. In the present case, all the radiographs taken during the root canal procedure were clearly suggestive of radix entomolaris (RE) and prevented the need for further investigations like cone-beam computed tomography and 3-dimensional reconstruction which are useful to study the morphology of radix entomolaris (RE) in a noninvasive manner [3].

Clinically, the possibilities of detecting and managing radix entomolaris (RE) can be enhanced by obtaining straight line access and modifying typical triangular shape of access preparation to a trapezoidal form. The values based on the mean inter orifice distance between extra distolingual canal and remaining canals, as found in a study by Tu et. al. may also serve as a useful guideline to locate and treat radix entomolaris (RE) [3,10]. Further, good illumination and the use of accessories like magnifying loupes, microscopes etc. are also valuable in locating and managing radix entomolaris (RE) [11].

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 radix entomolaris (RE) as an anatomical variant. The detection of radix entomolaris (RE) and its thorough cleaning, shaping and obturation would contribute significantly towards the success of primary endodontic treatment. Further, mandibular first molars have lower success rate following root canal treatment due to factors like missed canal etc, and awareness about radix entomolaris (RE) helps in the diagnosis and to better the overall prognosis for endodontic retreatment. For the above reasons, molars also have high rate of extraction and early identification of extra distolingual root will minimize complications related to exodontias like root breakage. This case report also highlights the role of radiographs alone in the early identification and endodontic management of radix entomolaris (RE).

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