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Endodontic Management of Radix Entomolaris in Mandibular First Molars – Two Case Reports

Medical Science

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ABSTRACT

Knowledge and understanding of the presence of an additional root and unusual root canal morphology can be a determining factor in the success of endodontic treatment. Unusual root canal anatomy is a common phenomenon, so a comprehensive knowledge of basic root canal anatomy and its variations is necessary for successful completion of endodontic treatment. Here, we describe two radix entomolaris case reports to illustrate the techniques required to visualize and diagnose this anatomical variation. The first of these was a 22-year-old patient with deep caries and irreversible pulpitis in the left mandibular first molar. The second was a 45-year-old patient with chronic irreversible pulpitis and acute apical periodontitis involving the right mandibular first molar. Both patients were found to have a second distal root and root canal in the lingual area. The reports focus particularly on the radiographic techniques necessary to clarify whether such a root is present and on cavity modifications that facilitate the access and instrumentation of these extra canals. We also discuss the importance of locating any additional roots and canals in the context of increased risk of root canal treatment failure if these are not recognized by the clinician.

INTRODUCTION

For successful endodontic treatment outcomes, it is of utmost importance that a clinician be familiar with the root and root canal anatomy of the tooth in question. According to Barrett, "Of all the phases of anatomic study in human systems, one of the most complex is that of pulp cavity morphology"[1]..Knowledge of the internal root anatomy, correct diagnosis and appropriate cleaning and shaping of the root canal system are all key components of achieving a successful outcome[2]. There are several known anatomic variations in the root patterns of mandibular molars, and the presence of extra roots and root canals is more common than previously thought[3]. The prevalence of these three-rooted mandibular first molars is <3% in African populations, <4.2% in Caucasians, and <5% in Eurasian and Asian populations, but is more than 5% (even up to 40%) in populations with Mongolian traits and 5.97% in the Indian 2The presence of an additional third root in the lingual area of the mandibular molar was first described in the literature by Carabelli in 1844, and was termed 'radix entomolaris' by Bolt in 1915. A similar term, "radix paramolaris", is used when this third root is located buccally. The dimensions of both radix entomolaris and radix paramolaris can vary from a short conical extension to a mature root with normal length and root canal anatomy[5].

This case report describes the successful endodontic management of two cases of radix entomolaris.

CASE REPORTS

Figure 1

Case Report 1

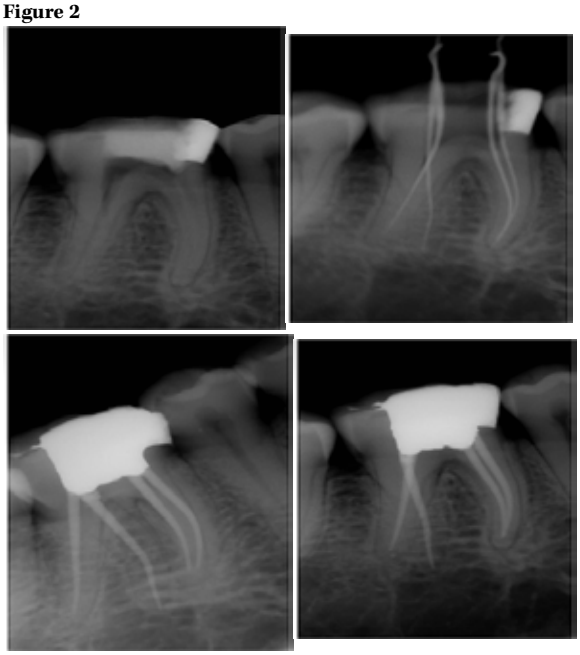
A 22-year-old male patient with no contributory medical history reported to our clinic complaining of pain in the lower left posterior region. On clinical examination, deep caries involving the pulp and tenderness on percussion were noted in relation to the lower left first molar. The tooth was sensitive to hot and cold stimuli but with no referred pain. Radiographic examination revealed a radiolucency involving the pulp (Fig. 1A). The definitive diagnosis was chronic irreversible pulpitis. It was decided, in consultation with the patient, to treat the tooth endodontically and informed consent for this procedure was acquired.

After adequate anesthesia, the tooth was accessed under a rubber dam. Two mesial and one distal canal orifices were located immediately. The overlying dentin was removed with a safe-ended diamond bur (Diamendo; Dentsply Maillefer, Ballaigues, Switzerland), revealing a second distal canal orifice accessible to an endodontic explorer (DG-16 endodontic explorer; Dentsply Maillefer). Coronal enlargement and relocation of the canal orifices allowed straight-line access in the three main canals.

However, insertion of a file into the distolingual canal revealed a more lingually oriented access inclination. Upon removal of the file, the tip was deformed, with a pronounced curvature in the mesial direction. The different access inclinations between the two distal canals suggested that two separate distal roots were present. The canal was explored with a K-file ISO 10 (Mani; Prime Dental, Mumbai, India). The canal lengths were measured electronically with a Root ZX II apex locator (J Morita) and radiographically exposed at 30 degrees from the mesial to confirm the presence of an extra root (Fig. 1B).

The root canals were shaped with ProTaper rotary instruments (Dentsply Maillefer, Tulsa, OK, United States of America). During preparation, 17% EDTA was used as a lubricant, with 5.25% sodium hypochlorite as a disinfectant. Canals were copiously irrigated intermittently with normal saline. A master cone radiograph was taken (Fig. 1C) and canals were obturated using ProTaper gutta percha points (Fig. 1D) and AH-Plus sealer (Dentsply). The coronal cavity was sealed with glass ionomer cement and later replaced with amalgam. The treated tooth was followed up after 6 months (Fig. 1E).

Figure 2



Case Report 2

A 45-year-old male patient was referred for endodontic treatment of the mandibular right first molar. Access of the pulp chamber and a temporary coronal filling had been performed by the referring dentist to relieve acute throbbing pain (acute pulpitis). The tooth was symptomatic and tender to percussion. A diagnostic radiograph revealed an attempted access opening containing intermediate restorative material; there was also evidence of periodontal ligament widening. Careful examination of the radiograph also revealed a shadow of an additional root (Fig. 2A).

On clinical examination after removal of the temporary restoration, we concluded that only a pulpotomy had been performed, leaving the radicular pulp vital. Based on the subjective and objective findings, a diagnosis of chronic irreversible pulpitis with apical periodontitis in the lower right first molar was made. Endodontic treatment of the involved tooth was planned, the procedure for which was explained to the patient with possible complications. Informed consent was acquired.

Local anesthesia was administered and the intermediate restorative material was removed. The existing conventional triangular access cavity was modified into a more trapezoidal cavity to locate and open the orifice of the disto-lingual radix entomolaris. The canal orifices were located using an endodontic explorer (DG-16; Dentsply) and the root canals explored with a K-file ISO 15 (Mani; Prime Dental). Working length was determined with a Root ZX II apex locator (J Morita) and confirmed radiographically (Fig. 2B). Cleaning and shaping was performed under rubber dam isolation using Hyflex NiTi rotary instruments (Coltene Whaldent). During canal preparation, Glyde (Dentsply Maillefer) was used as a lubricant. The canals were irrigated alternately with 5.25% sodium hypochlorite and 2% chlorhexidine gluconate during instrumentation, and finally with normal saline. The canals were dried with absorbent paper points (Dentsply Maillefer). Master cones were placed and a master cone radiograph taken. Obturation was performed with further gutta percha points and AH Plus sealer (Dentsply Maillefer). The access cavity was sealed with amalgam (Fig. 2C) and the tooth followed up after 6 months (Fig. 2D).

DISCUSSION

Anatomical variation in mandibular molars has been well documented in the literature, but the diverse anatomy of the root canal system in molars is under-appreciated by most general practitioners[6]. De Moor et al. classified radix entomolaris into three types based on the curvature of the supernumerary root in the bucco-lingual direction. A Type I refers to a straight root or root canal; a Type II has an initially curved entrance continuing to a straight root or root canal; and a Type III curves initially in the coronal third of the root canal and has a second curve beginning in the middle and continuing to the apical third[5].

An accurate diagnosis can avoid the complications of a 'missed canal' during root canal treatment. Tooth crowns with an extra cusp or more a prominent distolingual lobe should be carefully examined.

Analysis of cervical morphology of the root by careful periodontal probing is essential because radix entomolaris is mostly situated in the same buccolingual plane as the distobuccal root, leading to superimposition of the two roots on the preoperative radiograph and resulting in inaccurate diagnosis. The preoperative radiograph should be thoroughly inspected and interpreted for the presence of characteristic features of radix entomolaris, such as indistinct distal root contours or root canal morphology.

To reveal the radix entomolaris, the parallax technique should be used, in which a second radiograph is taken from a more mesial or distal angle (30 degrees)5. An accurate diagnosis can be made this way in the majority of cases. Access cavity refinements are required to obtain straight line access to the supernumerary root; extension of the triangular cavity into the distolingual corner results in a more rectangular or trapezoidal outline form7. Meticulous inspection of the pulp chamber floor is required in the distolingual region using visual aids such as loupes, an intra-oral camera, and/or a dental microscope. Evidence of a dark line can precisely indicate the location of a miscellaneous canal orifice5. The distal and lingual pulp chamber wall must be explored with an angled probe. Calcification above the orifice needs to be removed for improved vision and access to the radix entomolaris[8].

The use of flexible nickel-titanium rotary files allows a more centered preparation, lessening the risk of enlarging the coronal third of the canal and allowing more control over orifice relocation. After relocation and enlargement of the orifice, initial root canal exploration with small files (size 10 or less) together with radiographic and electronic root canal length determination is necessary. It is essential to create a glide path before preparation and to follow the above step-by-step actions to avoid procedural

errors[5].

CONCLUSION

For successful endodontic therapy, the clinician should be aware of potential variation in the root canal anatomy. The science of identifying an extra root is important in endodontics because failure to locate and treat extra canals is a major cause of failure in root canal treatments. In addition, morphological variation of the radix entomolaris in terms of root inclination and root canal curvature demand a careful and adapted clinical approach to avoid procedural errors during endodontic therapy.

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