

Mandibular first molar with three roots and four canals: A case study

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Abstract: Endodontic treatment requires a thorough knowledge of the anatomy of the teeth and their surrounding structures. Root canals may be left untreated during endodontic therapy if dentist fails to identify their presence, particularly in the teeth with anatomic variations or extra root canal. A major anatomical variation of the two rooted mandibular first molar is a tooth with an additional root located lingually (the radix entomolaris) buccally (radix paramolaris). The prevalence of these three rooted mandibular first molars appears to be less than 3% in African population, not to exceed 4.2% in Caucasians. To be less than 5% in Eurasian and Asian populations, and to be higher than 5% (even upto 40%) in populations with Mongolian traits. As far as the access was concerned, entering the root canal in RE required a modification of opening in a distolingual direction resulting in a trapezoidal opening cavity. None of the orifices was located midway between the mesial and distal component.

Key Words: Anatomic variations, Endodontic treatment, Mandibular first molar.

Introduction

The main objective of root canal treatment is thorough mechanical and chemical cleansing of the entire pulp cavity and its complete obturation with an inert filling material and a coronal filling preventing the ingress of micro-organisms. One of the main reasons for failure of root canal treatment in molars is because the clinician has not removed all the pulp tissue and micro-organisms from the root canal system (Cohen and Brown, 1974). It is of utmost importance that the clinician should be familiar with root and root canal anatomy. The majority of Caucasian first molars are two rooted with two mesial and one distal canal (Baker *et al.*, 1974 and Vertucci., 1984). The distal root has typically one kidney shaped root canal, although if the orifice is narrow and round, a second canal

may be present. The major variant in this tooth type is the presence of additional third root known as supernumerary root. This macrostructure which is reported for first time in the literature is called radix entomolaris. (Moor *et al.*, 2004).

Morphologically, the accessory root was always situated distolingually and had a bent appearance; it varied from small appendix like formation to a fully developed root, which was always smaller than the distobuccal root. Radiography revealed the existence of a pulpal extension into the accessory root as has been demonstrated in other studies. In this case study we report the case of radix entomolaris and attempts have been made to demonstrate the radiograph of mandibular first molar with three roots and four canals along with clinical approach to diagnosis and treatment modalities.

Materials and Methods

A total number of 100 patients have been treated in our clinic with the complaint of pain and decayed first molar. Out of 100 patients an 18 year old female was found with three root and four canal of the mandibular left molar for endodontic treatment. Clinical examination showed an extensive occlusal caries and molars were found to be tender on percussion. The medical history revealed no significant reports however dental history revealed pain in the molar since six months. The pain subsides temporarily on taking medicines but it persists as a dull pain after 5-6 hours of taking medication. Radiograph revealed a gross carious lesion and three roots (Fig. 1a and Fig. b). An access opening was made under local anesthesia and three canal orifices were initially identified. On further exploration a second distal and more lingually located canal was found.

The preoperative radiographs revealed the presence of an additional distolingual root (Fig c). The root canals were identified with

ROOTZX APEX LOCATOR and confirmed by means of a length determination radiograph. All canals were cleaned and shaped with protaper files (Dentsply Maillefer) up to the F2-Pro Taper. Instrumentation was completed using a size 30 K-File. An inter appointment calcium hydroxide dressing was placed in the canals and covered with Fuji IX.

The patient was recalled after one week interval for the complete treatment. The tooth was asymptomatic and was not tender on percussion. Instrumentation was repeated to a MAF size 30 K-File. Canals were filled with AH-26 root canal sealer and gutta-percha using the hybrid gutta-percha condensation technique (Fig d). The access cavity was sealed with FUJI IX and after one week permanent coronal restoration was completed.

Results and Discussion

The patient was followed for six months on regular appointment and there was no complaint reported regarding the treatment. The tooth was apparently healthy with no tender on percussion

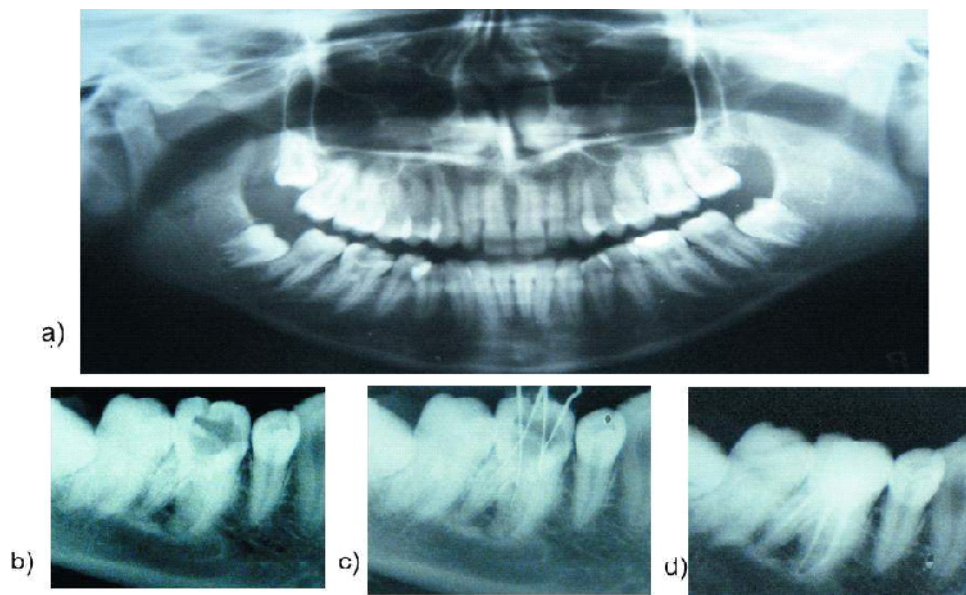


Fig. 1(a) : Panoramic radiograph showing mandibular left first molar tooth with an extensive caries.(b) Preoperative radiograph showing an additional distal root (c) working length radiograph. (d) Radiographic control following obturation of the four root canals.

after which a Porcelain Fused to Metal crown has been placed over it with no adverse consequences. Endodontic success in teeth with a number and morphology of canals above normally found requires a correct diagnosis and careful clinical radiographic inspection. Morphological variations in pulpal anatomy must be always considered beginning treatment. The case study presented showed an abnormal anatomic configuration of mandibular molar root canal.

Anatomical variations of mandibular molars are documented in the literature. Nonetheless, variations of the anatomy of the root canal system in molars are not appreciated by great number of general practitioner. (Hommez *et al.*, 2003; Slaus and Bottenberg 2002). Next to the second distolingual canal, a third distolingual root in mandibular molar teeth, with an incidence ranging from 0.9% to 20% is possible in some populations (Moor *et al.*, 2004).

The reported frequency of three-rooted mandibular first molars is high among the Mongoloids as opposed to the Caucasians and Negroids. It is highest among Eskimos. Although many studies have been carried out to explore the prevalence of three-rooted first molars, they have differed in methodology. The nature of this additional root is variable, and can be present as a full-length root or a short conical projection (which is always smaller than the distobuccal). It may present unilaterally but often is bilateral. Studies thus far have all used extracted teeth or radiographs of teeth to identify three-rooted lower first molars, for which reason their reported frequency may have been underestimated. Teeth with slender roots can easily be missed in radiographs or being fractured on extraction. Although there are no reported studies to identify the prevalence of three-rooted lower first permanent molars, CT has been used in many other dental morphological studies. There are clinical and *in vitro* studies on extracted teeth dealing with root

canal anatomy, especially in relation to C-shaped canals in lower second permanent molars. The presence of a third disto-lingual small third root in mandibular first molars means that there must be two distal root canals. This results in high rates of mandibular first molars with four roots canals and more than two thirds of cases with four root canals are three-rooted ones in which the fourth canal arises from the third root . The disto-lingual canal in first molars with three roots has a type 1 configuration; it may arise from the pulp chamber with a lingual direction and may have a buccal orientation at the apex. During endodontic treatment, it is important to be aware of the presence of third roots. (Ruwan and Thomas, 2007).

Middle mesial or multiple canals in the mesial root of mandibular molars have been reported in the literature as having an incidence of 2.07% up to 13.3%. The canals may be independent throughout their course in the root with an apical opening of their own, or they may join either of the two or more common main canals. Many authors agree on the presence of three foramens in the mesial root but few report three independent canals, which presents itself as a rare anatomical variant. Even though anatomical variations in mandibular first molars are documented in the literature, variations in the anatomy of these teeth are not recognized by a great many dentists. Variations in the mesial root of mandibular first molar can be identified through very careful observation of angle radiographs. Buccolingual views, 20° from mesial and 20° from distal, reveal the basic information on the tooth's anatomy and root canal system required for endodontic treatment. (Puri *et al.*, 2011).

Before root canal treatment is performed, the dentist ideally should know the morphology of the pulp chamber of the teeth he will treat. All root canals should be accessed, cleaned, and shaped to receive a hermetic filling of the entire root canal space. Incomplete cleaning, shaping,

and obturation of any root canal will lead to almost certain root canal treatment failure. Because of the frequency in the literature of reports dealing with anatomic variations of mandibular molars, the clinician should give particular attention to thoroughly observing the pulp chamber floor to locate possible accessory canal orifices. This will increase the chance for long-term successful endodontic therapy. (Plotino, 2008). Successful endodontic treatment depends on entering the pulp chamber, cleaning, shaping and obturating the canal in any of the teeth needed to be detected in order to avoid failure of the canal treatment.

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