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Case Report

A Case of Mandibular Second Molar with Four Canals

Aws H. Al-Kadhim*

Lecturer, Conservative Department, Faculty of Dentistry, Islamic Science University of Malaysia

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Abstract

Success in root canal treatment is dependent on thorough cleaning, shaping and complete obturation of root canal system. It fundamental that such a procedure be performed in root canal systems that do not comply with the normal anatomical features described in standard textbooks. This article describes the conventional root canal treatment on an unusual mandibular second molar with four root-canals.

Keywords: Anatomy, Endodontics, Root canal filling, Root canal system

Introduction

Consistently high levels of success in endodontic treatment require an understanding of root canal anatomy and morphology. To achieve endodontic success, the entire root canal system must be adequately debrided and filled. The clinician must have a thorough understanding of normal anatomy and of common variations from the norm. The clinician must also be competent to identify those teeth that exhibit unusual anatomical configurations [1].

Cleaning and shaping root canal systems are essential steps in root-canal treatment [2]. The goal of root canal treatment is to clean the root canal systems as thoroughly as possible and to fill it in all its dimensions [3]. In depth knowledge of the root canal anatomy of each tooth is crucial in order to reach this goal [4-6]. Thus, it is necessary for the clinician to have knowledge of dental anatomy and its variations [7].

According to Vertucci [8], the mandibular second molar is similar to the first, except that the roots are shorter, the canals more curved, and the range of the variations broader. Very often (64%) the mesial root has two canals, approximately 38% incidence for type II and 26% incidence for type IV. In the distal root, there is almost always only one independent canal (92%) (type I), rarely type II (3%) or type IV (4%). When type I is a single canal extends from the pulp chamber to the apex; type II are two separate canals leave the pulp chamber and join short of the apex to form one canal and the type IV are two separate and distinct canals extend from the pulp chamber to the apex. The purpose of this clinical report is to describe an anatomic abnormality that was detected during routine root canal treatment in a mandibular second molar.

Although the mandibular second molar resembles the first molar, it is more variable than the first and the roots are often fused [9]. Meanwhile, an in vitro investigation of mandibular second molar root canal morphology has reported that 73% of mesial roots have one canal at the apex and 27% have two canals at the apex. In the distal root, 95% have one canal at the apex [10]. More recently, C-shaped (gutter-shaped) root and canal configurations have been reported in different populations. Although seldom found in Caucasians, these variations have a relatively high prevalence in mandibular second molars of Chinese and other northern and eastern Asian populations [10,11]. However, there are variations that endodontists should be aware of to obtain good treatment results. Unusual root and root canal morphologies associated with the mandibular second molar have been recorded in several studies in the literature. Castelluci [12] observed two cases of three-rooted mandibular second molars with one mesial and two distal roots in both specimens. Furthermore, root canal anatomy showed three canals, one mesial and two distal in one tooth, and four canals, two mesial and two distal, in the other. *In vivo* investigation of mandibular second molars in a Mexican population showed four root canals with four apical for amina in 3.5% of cases. Vertucci [8] showed by in vitro work that the prevalence of four-root canals was 5% in an American white population. Walker [13] found a prevalence of 1% in a southern Chinese population. In

***Corresponding author:** Aws H. Al-Kadhim, Lecturer, Conservative Department, Faculty of Dentistry, Islamic Science University of Malaysia, Malaysia, Tel: 603-42892430, Fax: 603-42892522, Email: awshashim@usim.edu.my

addition, Beatty and Krell [14] documented a mandibular second molar with five canals, three canals in the mesial root and two in the distal root. However, these canal variations have commonly been found in two-rooted mandibular second molars.

Case Report

A 19 year-old malay female was referred for root-canal treatment of her right mandibular second molar. The clinical diagnosis was necrotic pulp with apical lesion (Figure 1).

A pre-treatment radiograph was taken, and after placing a rubber dam, conventional coronal access was performed. After removing tissue located in the pulp chamber, four orifices were observed, two mesial and two distal (Figure 2). Sodium Hypochlorite (4.5%) and EDTA (17%) solutions were used as endodontic irrigant. Cleaning and shaping was initiated using the step back technique. The canal was negotiated to the working length, as indicated by an apex locator (Raypex, Endodontic synergy, VDW, Munich, Germany), with a stainless steel size 15 hand file. During root canal length confirmation by X-ray image (Figure 3) the master apical file was size #30 for all the root canals except for disto-buccal canal was #50, while the working length of the canals was as the following: mesio-buccal and mesio-lingual is 19 mm, the disto-buccal was 20 mm, while for the disto-lingual was 17 mm.

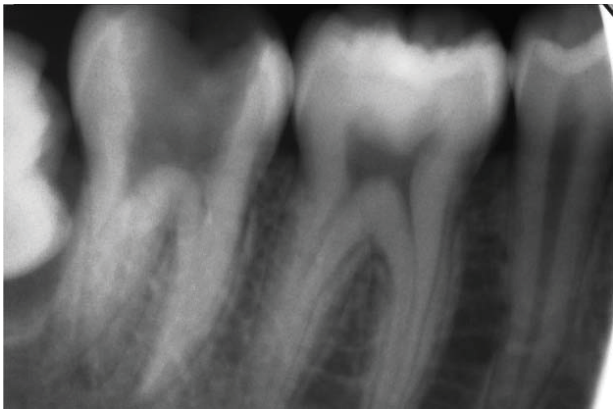

Figure 1: Periapical radiograph of right mandibular second molar showing four roots.

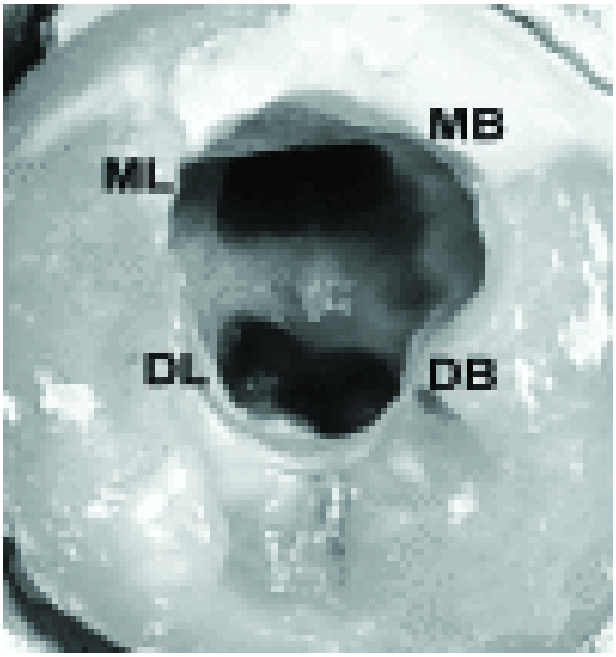

Figure 2. Occlusal view of the access opening of the right mandibular second molar under the microscope showing four canals orifices MB, ML ,DB, DL.

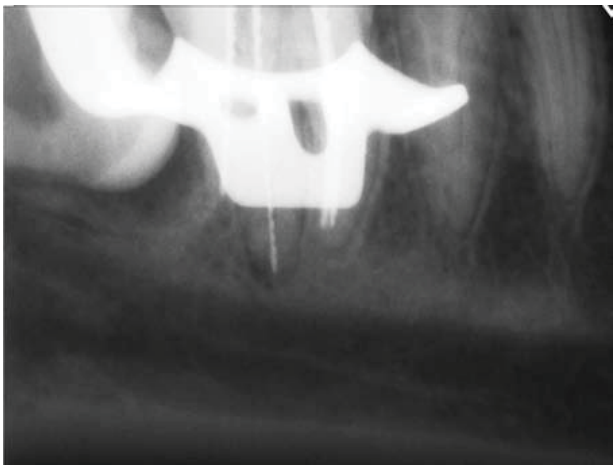

Figure 3. Periapical radiograph of mandibular right second molar to estimate the working length of the 4 canals.

Figure 4. Post obturation periapical radiograph.

Obturation of root canal system was performed by cold lateral condensation Technique using gutta-percha points (Dentsply, Ballaiguess, Switzerland) and Pulp Canal Sealer (AH 26, Dentsply, Kontanz, Germany) (Figure 4).

Discussion

The four root canals, two each in the mesial and distal roots, found in two-rooted second molars in previous studies [8,9,13] could be interpreted as indicating that there can be instances where the radicals are not separated externally but the canals are separated internally owing to incomplete division of the radicals. Thus, there can be different possible variations in the root and

root canal number and morphology of the mandibular second molar, which clinicians should bear in mind.

When anatomic variations are detected clinically, treatment can be performed with conventional or rotary instrumentation an root canal system filling techniques respecting technical and biological principles. The use of apex locator can be important to determine the working length. Additional anatomic information about the root canals can be obtained by careful observation of the positioning and deformation of instruments [15].

In 1988, Walker RT examined the morphology of mandibular second molar among Chinese population, and he reported the possibility of having 4 canals in madibular 2nd molar among the Chinese race.

Endodontic success in teeth with a number and morphology of canals above that normally found requires a correct diagnosis and careful clinical radiographic inspection. Morphological variations in pulpal anatomy must be always considered beginning treatment. The case presented show that an abnormal anatomic configuration of mandibular molar root canal. The case presents a mandibular second molar with four canals.

Step-back method of cleaning and shaping of the canals and cold lateral condensation method of obturation was used, due to instruments and materials limitation at the time of treating this patient. Unfortunately patient failed to attend for review after 6 months to determine the healing of the apical area around the tooth.

Conclusions

When root canal treatment is to be performed the clinician should be aware that both external and internal anatomy may be abnormal. Knowledge of possible variations in internal anatomy of human teeth is important for successful endodontic treatment. Root canal treatment was carried out successfully and the prognosis should be good [16].

This case shows the importance of having a thorough knowledge of the developmental aspects of the tooth root canals, which ultimately help in the working out the possible root canal variations of a particular tooth. Although the incidence of these variations is not common, it is important for clinicians to be aware of unusual root morphologies and their canal configurations. This can assist them to better debride and obturate the teeth and to avoid uncompleted canal obturation and failure of treatment.

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