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Endodontic Treatment of a Mandibular Second Premolar with Type XVII Sert and Bayirli's Canal Anatomy

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ABSTRACT

For a successful root canal treatment, it is critical for the clinician to have a complete knowledge of the root canal morphology, interprets radiographs critically and properly assesses the pulp chamber floor. Anatomical variations are critical in diagnosis and a successful treatment outcome in endodontics. Knowledge of root canal morphology and anomalies is essential to succeed in root canal therapy. Mandibular premolars are famous for their atypical morphology. But the occurrence of type XVII Sert and Bayirli's root canal type is very rare in them. The purpose of this case report is to present treatment of a seldom root canal system in a mandibular second premolar. Reports of unusual cases cause clinicians to do an accurate clinical examination and radiographic interpretation and consider atypical root canal configurations.

Keywords: Anatomy; Mandible; Root Canal; Second Premolar

Introduction

A thorough knowledge of tooth morphology, careful interpretation of radiographic documentation, adequate access to explore the pulpal space and tactile examination of both pulpal chamber and pulpal floor are prerequisites for all root canal procedures [1] which is completed with finding all the canals, instrumentation, disinfection, shaping and a three-dimensional obturation of the root canal space [2, 3]. Variations in root canal morphology and missed canals have been suggested as the most likely reasons for the high frequency of endodontic flare-ups and failures [4].

Vertucci in the 1970s and 1980s in a set of studies on extracted teeth established canal numbers and configurations by percentages for each of the teeth [5]. Vertucci's data may not be exactly archetypal of different locations and ethnicities, but it is a good starting point for comprehending root canal anatomy. The root canal morphology can be variable and complex. The variations may be attributable to factors such as age, gender, ethnicity and trauma [6].

Mandibular premolars have always proven to be the most difficult teeth due to various root canal configurations that have been reported in several studies [3, 6, 7]. In a systematic review of root canal morphology of permanent mandibular premolars in Iranian population, among mandibular second premolars, 82.86% were *type I*, 6.25% *type III*, 5.32% *type II*, 4.27% *type IV* and 0.69% *type V*. They concluded that these results indicated that the morphology of mandibular premolars of Iranian population have ethnical characteristics compared to other populations; and highlighted the necessity of searching for additional possible root canals by clinicians [8].

The first classification for two canals in one root was explained by Weine *et al.* [9] in 1969. Vertucci *et al.* [5] developed a classification system with eight canal system types (I-VIII). Sert and Bayirli [10] added 14 new types to Vertucci classification (IX-XXIII).

When a clinician wants to treat mandibular premolar teeth with three canals, it is obligatory to be aware that these teeth may have variations and they may also require special shaping and obturating techniques.

This case report explains the root canal treatment of a mandibular second premolar with an atypical canal system. Type XVII (1-3-1) in Bayirli and Sert classification.

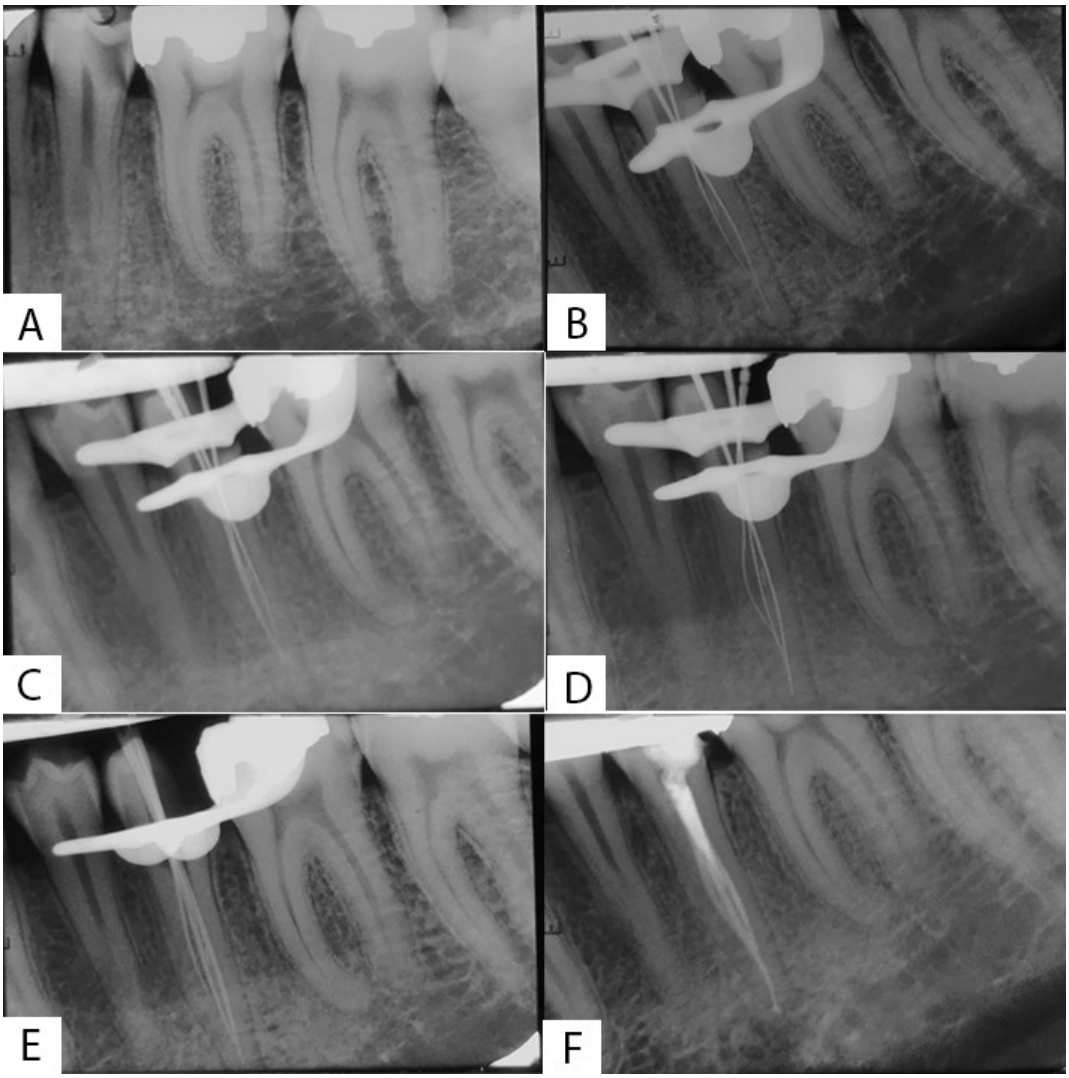

Figure 1. Periapical radiographs of tooth #20; *A)* The initial radiograph reveals carious disto-occlusal lesion and atypical canal configuration of tooth #20; *B)* First working length radiograph suggests that there is another canal which is located mesially; *C)* Unsuccessful attempt to find the third canal; *D)* The third canal has been found, and the working length is confirmed; *E)* Master cones confirmation radiograph; *F)* Post-operative radiograph

Case Report

A 35-year-old male patient with no history of any systemic diseases referred by his general dental practitioner for root canal treatment on a mandibular left second premolar. Tooth #20 did not respond to vitality tests and was tender to percussion, with no periodontal pockets and was in the physiologic range of mobility. Pre-operative radiography showed a disto-occlusal carious lesion in tooth #20 with atypical root canal configuration and widening of the periodontal ligament (Figure 1A). Based on these findings, the pulp was diagnosed with necrosis and chronic apical periodontitis. Treatment of choice was non-surgical root canal therapy. The treatment plan was explained to the patient, and informed consent was obtained for endodontic treatment of the involved tooth.

An access cavity was prepared after administration of inferior alveolar nerve block using 2% lidocaine and 1:100,000 epinephrine (Darupakhsh, Tehran, Iran), under rubber dam isolation. An oval shape orifice was observed, and two #10 K-file (Dentsply Maillefer, Ballaigues, Switzerland) was inserted buccally and lingually. Following determination of working length by an electronic apex locator (Apex id, SybronEndo, Orange, CA, USA) and confirmation by radiography, another canal was revealed in the middle third of the root radiographically. A #8 C-Pilot file (VDW, Munich, Germany) was used to find the third canal in mesiobuccal direction, and working length radiography was taken again (Figures 1B to 1D).

Figure 2. Periapical radiograph of tooth #20 at the second appointment (after six months)

All canals were explored, and a glide path was established using #10 and #15 K files, and rotary path files M3 13/0.02, 16/0.02, 19/0.02 (M3 Pro-Gold Path File, United Dental, Shanghai, China). ProTaper gold Shaper X (Dentsply Maillefer, Ballaigues, Switzerland) was used in a crown-down method for enlarging the main orifice to the level of the furcation to achieve straight line access to all the three canals. Then each canal instrumented with Hero Shaper rotary files (Micro-Mega, Besancon, France) to size 25/0.04 with a crown-down technique. Copious irrigation with 5.25% NaOCl was carried out after using each file and final irrigation was performed with distilled water. Master cones confirmation radiography was taken (Figure 1E). After drying the canals with paper points lateral cold condensation was done with gutta-percha and AH-26 sealer (Dentsply, De Trey, Konstanz, Germany). In the end, the access cavity was filled with Cavit (3M ESPE, St. Paul, Minnesota, USA). A radiograph was taken to evaluate the quality of obturation (Figure 1F) and the patient was referred to an operative dentist for a coronal restoration.

The tooth was clinically and radiographically asymptomatic at recall appointment after six months (Figure 2).

Discussion

Mandibular premolars are the most difficult teeth for endodontic treatment due to varieties in the anatomy of pulp such as accessory canals, lateral canals and apical delta [11-13]. Vertucci *et al.* [14] reported that the occurrences of three canals are 0.5% and 0.0% in mandibular first and second premolars respectively, whereas Zillich and Dowson [15] reported the prevalence of three canals to be 0.4% in mandibular second premolar.

There are several methods to diagnose premolars with three canals radiographically such as one large canal which disappears or constricts traveling in an apical direction and a radiolucent line located mesial or distal to the main canal [16]. A second radiograph which is taken at a horizontal angle of 20 degrees from the mesial or distal of the tooth can help the clinician to find accessory canals [16, 17]. Cone-beam computed tomography (CBCT) constructs undistorted, three-dimensional images of the area under examination and overcomes many of the limitations of conventional radiography [18]. Balakasireddy *et al.* [19] contended that CBCT is necessary to understand the anatomy of mandibular premolars.

The root canal system of premolars with three root canals usually have one large lingual canal and two smaller mesiobuccal and distobuccal canals. Magnification (ocular loops, microscope) and illumination (fiber optic) are recommended. When the pulp chamber does not align in its expected buccal-lingual relationship or it is deviated from the normal configuration and seems to be either triangular in shape or too large in the mesiodistal plane the third canal should be expected [20]. England *et al.* [16] insisted that even in those cases which appear to have only one canal radiographically, it is critical to examine the walls of the major canal with a small precurved file tip.

In this case, initial radiograph illustrated the presence of more than one canal and tactile examination helped the clinician to find the third canal in mesiobuccal direction.

Combination of radiography and electronic apex locator was used to confirm the working length of this case as Kim *et al.* [18] concluded in their study that this method is recommended for the determination of the working length.

Conclusion

The present case shows the rare anatomy of mandibular second premolar reminding us to keep in mind during endodontic treatment these variations can be encountered and understanding of atypical canal configurations of mandibular premolars is a prerequisite to success in endodontic therapy. Horizontal parallax radiographs, CBCT, dental operating microscope, and tactile examination are means of reaching this goal.

Conflict of Interest: 'None declared'.

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