

CLINICAL CASE

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Endodontic Treatment of a Mandibular Second Premolar with Three Root Canals – Case Report

Leczenie endodontyczne drugiego dolnego zęba przedtrzonowego z trzema kanałami – opis przypadku

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Abstract

A thorough diagnosis of the anatomy of the root canal system is a prerequisite for successful root canal treatment. Careful observing of the preoperative radiographs and examination of the pulp chamber floor help the location of root canal orifices. It is especially important during endodontic treatment of lower premolars because of its aberrant anatomy. This clinical article presents and describes successful endodontic treatment of a mandibular second premolar with three root canals. After location of the canals the biomechanical preparation using rotary NiTi instruments was performed and they were obturated using cold lateral condensation of gutta-percha cones and AH plus sealer. The radiological control examination performed one-year after treatment showed healthy apical bone structure (**Dent. Med. Probl. 2009, 46, 4, 509–512**).

Key words: mandibular second premolar, endodontic treatment.

Streszczenie

Szczegółowe poznanie anatomii systemu kanałów korzeniowych jest warunkiem powodzenia leczenia endodontycznego. Wnikliwa analiza zdjęć radiologicznych wykonanych przed rozpoczęciem leczenia oraz badanie dna komory zęba pomagają umiejscowić ujścia kanałów korzeniowych. Jest to szczególnie ważne podczas leczenia endodontycznego dolnych zębów przedtrzonowych z powodu ich zmiennej anatomii. W pracy opisano udane leczenie endodontyczne drugiego dolnego zęba przedtrzonowego z trzema kanałami korzeniowymi. Po umiejscowieniu kanałów opracowano je biomechanicznie rotacyjnymi narzędziami niklowo-tytanowymi i wypełniono metodą kondensacji bocznej gutaperki i pasty AH+ jako uszczelniacza. Kontrolne badanie radiologiczne wykonane po roku od zakończenia leczenia wykazało prawidłową budowę kości w okolicy wierzchołkowej (**Dent. Med. Probl. 2009, 46, 4, 509–512**).

Słowa kluczowe: drugi dolny ząb przedtrzonowy, leczenie endodontyczne.

A morphological divergence of the root canal system, related to number of canals, their anatomy and interconnections is known to exist. The literature reveals wide variations in root canal morphology of mandibular second premolars. Usually, they have one root and one root canal. The occurrence of two root canals ranging from 1.2% reported by Pineda and Kuttler [1] to 11.7% founded by Zillich and Dowson [2]. The incidence of three root canals in mandibular second premolars is very rare and varied from 0.0% founded by

Vertucci [3] to 0.4% reported by Zillich and Dowson, as well as ElDeeb [2, 4]. A racial predisposition for the presence of more than one root canal in mandibular premolars is suggested. It was stated by Trope, Elfenbein and Tronstad [5], that the number of lower premolars with more than one canal is significantly higher in Negroids (32.8%) than in Caucasian (13.7%). Likewise, Amos [6] found the incidence of mandibular premolars with more than one canal to be 21.6% and 16% respectively. It seems that the frequency of mandibular

premolars with more than one root canal is highest in an Asian population. The frequency in Chinese population reported by Walker [7] was 34% for teeth with two separate canals and 2% for teeth with three root canals.

Before endodontic therapy is performed, knowledge of the number of roots and canals of the tooth to be treated is necessary. The knowledge of common variations from the normal is very important as well. Diagnostic means such as preoperative radiographs of good quality and careful examination of both the pulpal chamber and pulpal floor are of great importance as well [8]. False assumptions about root and canal morphology may lead to incomplete debridement and obturation of the canal space and in result to treatment failure. Hoen and Pink [9] stated that the clinical application of a thorough knowledge of canal anatomy and meticulous attention to treatment detail are essential to minimizing failure and the need for subsequent endodontic retreatment.

The present case report describes the successful endodontic treatment of a mandibular second premolar with three canals and three separate foramina.

Case Report

A 21-year-old Caucasian male patient was referred by his general dental practitioner to the Department of Conservative Dentistry, Pomeranian Medical University, Szczecin for root canal treatment of a mandibular left second premolar. The reason for endodontic treatment was irreversible pulp inflammation. The referring dentist initiated root canal treatment. Two canals were localized and the radiograph with the files inserted in canals was taken. The referring dentist noted that the tooth had a complex root canal system and position of the files suggested presence of the third root canal. Treatment was aborted, a calcium hydroxide dressing was placed in the tooth cavity and access was sealed.

On the presentation to the endodontic specialist, the tooth was symptom free. Clinical examination revealed a temporary filling in the mandibular left second premolar. The referring dentist's radiograph indicated the presence of two files in root canals: one of them was situated axially, and the other distally to the first one (Fig. 1). There was no evidence of periapical radiolucency. The tooth was anaesthetized (Ubistesin[®], ESPE, Seefeld, Germany), the temporary restoration was removed and the access cavity was enlarged. On the entry into the pulp chamber, one main canal was found which split at the mid-root level. Initial investiga-

tion of the root canal system was performed with a size 10 K-file. Two root canals were initially found on the same level of the end of main canal: one situated lingually and the other distobuccally. After careful examination, the third root canal, located mesiobuccally was detected. All the canals were negotiated without difficulties. Straight line access to the canals was performed by enlarging of the main canal to the level of trifurcation using Gates Glidden[®] drills with a brushing motion in a crown down fashion. Working lengths (WL) were established using apex locator Root ZX[®] (J. Morita, Kyoto, Japan), the canals were initially enlarged to a size 15 using hand K-file and the radiograph with files inserted to the WL was taken (Fig. 2). The canals were instrumented to a size 35 taper .06 using K3[®] rotary Ni-Ti files (Sybron Endo, Glendora, USA) powered by endodontic micromotor Endostepper[®] (S.E.T., Olching, Germany). During the instrumentation, copious irrigation with 2% sodium hypochlorite solution, distilled water and 2% chlorhexidine solution after each file change was performed. The File-Eze[®] (Ultradent, South Jordan, USA) was used as a lubricant. The final flushing was performed using 2 ml of a 15% EDTA and 5 ml of a distilled water for each canal. After completion of the chemomechanical preparation, root canals were dried with sterile standardized paper points. Obturation was realized using single-cone method with standardized gutta-percha cones taper .06 and AH Plus[®] (Dentsply/DeTrey, Konstanz, Germany) as a sealer. A radiographic control revealed the correctly obturated canals (Fig. 3). The main canal was obturated with thermoplasticized gutta-percha from Obtura II[®] (Obtura, Fenton, USA). The access cavity was restored with a light-cured composite resin Herculite[®] (Kerr, Scafati, Italy) using the acid-etch technique. At twelve-month recall, radiographic control revealed a continuous periodontal space without signs of periapical periodontitis (Fig. 4).

Discussion

The variability of the root canal system is an usual phenomenon and represents a challenge to endodontic diagnosis and treatment. The possible existence of extra canals must be considered before endodontic treatment takes place. The failure to identify every next extra canal might result in insufficient treatment and endodontic failure [10]. The clinician should have regard to it, specially treating lower premolars.

Accurate preoperative radiographs and their careful examination are essential to detect root



Fig. 1. Length determination radiograph of a second mandibular premolar taken by the referring dentist with two inserted instruments. An eccentric position of the distal file is visible

Ryc. 1. Pomiarowe zdjęcie radiologiczne z dwoma narzędziami wprowadzonymi w obręb kanałów korzeniowych, wykonane przez lekarza kierującego. Widoczne ekscentryczne ułożenie dalszego pilnika



Fig. 2. Length determination radiograph with three inserted instruments

Ryc. 2. Pomiarowe zdjęcie radiologiczne z wprowadzonymi trzema narzędziami

canal morphology and anatomy. The clinician should carefully trace the exterior and interior outlines of the tooth in the radiograph with adequate magnification [8]. The interpretation of the periodontal ligament space may suggest the presence of an extra root or canal [11]. The presence of sudden change in radiographic density of the root canal space or a sudden narrowing or disappearing of the pulp space indicates usually an additional canal or point of fragmentation of main canal, respectively [12].



Fig. 3. Radiographic control following definite obturation of the three canals

Ryc. 3. Kontrolne RTG wykonane po wypełnieniu trzech kanałów korzeniowych



Fig. 4. One-year recall radiograph indicating healthy apical bone structure

Ryc. 4. Kontrolne RTG wykonane po roku ukazują prawidłową strukturę kości w okolicy wierzchołkowej

The findings from the radiological examination should be confronted with clinical examination. The observation of anatomical landmarks in the pulp chamber floor may help to identify or to give an indication of supplementary root canals or root canal aberrations [12]. Lines on the floor of the pulp chamber connecting the canal orifices give some indications about locating of the root canals [8]. Use of an ocular loops or endodontic microscope, as well as additional lighting (fiber optic illumination) is very helpful and makes treatment easier [8, 10, 12]. Proper access into pulp chamber is necessary because it is relatively small in premolars, resulting in reduced visualization

[11, 12]. The visualization can be improved by enlarging of the main canal with the use of Gates Glidden drills or ultrasounds which are useful in removal of a dentin protuberance covering a canal orifices [11, 12].

In current case, careful examination of the radiograph and on its ground thorough initial investigation appeared to be very helpful in detection of root canals. The performing of the optimum

opening of the access cavity and accurate examination of the pulp chamber floor were deciding in localization of the mesiobuccal canal. Due to its good shaping ability rotary Ni-Ti files were used for instrumentation of all root canals, as it is recommended [13]. Because the prepared canals were of .06 taper, obturation was performed with the use of .06 taper single cone technique, which is simple, fast and effective [14].

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