

A RARE CASE OF THREE ROOTED MAXILLARY SECOND PREMOLAR: DIAGNOSIS AND TREATMENT

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ABSTRACT: Although the possibility of three canals in maxillary second premolars is quite small, it must be taken into consideration in clinical and radiographic evaluations during endodontic treatment. This case report describes an unusual morphology of the three canals and two separated roots in maxillary second premolar in a Brazilian patient. A thirty-two year old male patient was referred to our clinic complaining of sensitivity to cold and pain at night in the second right upper premolar. The clinical examination revealed extensive distal caries. Percussion and cold tests were positive. The radiographic examination showed the presence of two roots. The diagnosis was an irreversible pulpitis. Root inspection revealed the existence of a third vestibular-palatal canal. The endodontic treatment was completed in a single session using manually serial instrumentation technique under sodium hypochlorite irrigation. Canals were obturated with thermoplasticized gutta-percha and sealed with zinc oxide and eugenol by lateral condensation technique. The presence of extra roots as a possible feature in maxillary second premolar should be considered during endodontic treatment. The instrumentation presented in this case report and the diagnosis methods were effective in successful three rooted second premolar treatment.

KEY WORDS: Maxillary Second Premolar; Root Canal Anatomy; Extra Root Canal.

CASO RARO DA PRESENÇA DE TRÊS CANAIS EM UM SEGUNDO PRÉ-MOLAR SUPERIOR: DIAGNÓSTICO E TRATAMENTO

RESUMO: A possibilidade da existência de três canais no segundo pré-molar superior é considerada mínima; contudo, esta possibilidade deve ser levada em consideração durante as avaliações clínicas e radiográficas do tratamento endodôntico. Este relato de caso descreve uma morfologia incomum, com a presença de três canais e duas raízes separadas em um segundo pré-molar superior em paciente brasileiro. Um paciente do sexo masculino, 32 anos de idade, foi encaminhado à nossa clínica, com queixa de sensibilidade à dor e frio durante à noite no segundo pré-molar superior direito. O exame clínico revelou extensas cáries na região distal. Percussão e testes ao frio foram positivos. O exame radiográfico mostrou a presença de duas raízes. O diagnóstico foi de uma pulpite irreversível. A inspeção das raízes, revelou a existência de um terceiro canal vestibulo-palatal. O tratamento endodôntico foi concluído em uma única sessão utilizando-se a técnica de instrumentação manual e irrigação com hipoclorito de sódio. Os canais foram obturados com guta-percha termo plastificada e selados com óxido de zinco e eugenol pela técnica da condensação lateral. A presença de raízes extras como uma possível característica em

segundos pré-molares superiores deve ser considerada durante o tratamento endodôntico. A instrumentação apresentada neste relato de caso, bem como o método diagnóstico utilizados foram eficazes no tratamento de um pré-molar com três canais.

PALAVRAS-CHAVE: Segundo Pré-Molar Superior; Anatomia do Canal Radicular; Canal Radicular Extra.

INTRODUCTION

A thorough understanding of root canal anatomy and morphology is required for achieving high levels of success in endodontology. Failure to recognize variations in root or root canal anatomy can result in unsuccessful endodontic treatment. Extra roots are an additional challenge, which begins at case assessment and involves all

Operative stages, including cavity design, canal access, localization, cleaning and shape of the root canal system. Therefore, it is imperative that the clinician be well informed and alerted to the commonest possible variations. Hoen and Pink (2002), in their analysis on teeth requiring re-treatment, found a 42% incidence of missed roots or canals. One of the most causes of endodontic treatment failure is the incomplete obturation of the root canal system (BARATTO-FILHO et al., 2002).

Anomalous root and root canal morphology can be found associated with any tooth with varying degrees and incidence (CLEGHORN; CHRISTIE; DONG, 2008). In the case of the maxillary second premolar, studies have demonstrated that they can have one, two or three roots and canals in the same range, which shows a complex anatomy of these elements (CHRISTIE, 1993). However, the most common root configuration is a single root and a single canal, occurring in approximately 85% of cases, 15% in two separated roots, each with single canal and an extremely rare variation of three separated roots. Considering the layout of the canals, studies have shown that this group of teeth has a canal in 75% of cases, two canals in 24% of cases and three canals in 1% of cases (ATIEH, 2008; FERREIRA; MORAES; BERNARDINELLI, 2000;). Shahi and Sharifzadeh (2007) in their in vitro

study analyzing 138 second premolars, confirmed these results by showing the presence of a canal in 50% of teeth and two canals on the other elements. Variations in the anatomy of the inner root of the second premolars have been described presenting three root canals with a single entry in the pulp chamber and three individual apical foramens (ALMEIDA-GOMES, 2009). These variations require professional dental meticulous knowledge of external and internal root anatomy, since an extra canal become an additional challenge for professionals (ALMEIDA-GOMES, 2009).

Morphologic variations of the pulp cavity have been documented and diagnosed by computed tomography and optical microscopy, but most variations in tooth anatomy can be identified radiographically (SHOKOUHINEJAD, 2009; SOARES, 2009). The combination of two or more X-rays at different angles can become clinical procedures safer by showing the presence of curves, junctions or any other limitation that may add risk to the endodontic treatment (KARTAL; ORZELIK; CIMILLI, 1998). Based on the rare presence of three canals in the second premolars and the lack of studies describing clinical procedures when presenting the third canal in the second premolar, the purpose of this study was to describe a maxillary second premolar with three root canals and the same foramen and to report a successful clinical treatment to this unusual root anatomy.

2 METHODOLOGY

Clinical study procedures were conducted according to Federal Fluminense University–School of Medicine Research Ethical Board recommendations (Registration Number CMM/HUAP 0061.0.258.000-07). A thirty-two-year-old-male-patient was referred to our clinic complaining of sensitivity to cold and pain at night in the second right upper premolar for three days. Extensive caries on the distal was observed under intraoral clinic examination without pulp exposure. Pulp vitality (cold) test was positive as well as pain on percussion. The preoperative periapical radiograph showed the presence

of caries reaching the pulp tissue revealing two roots (one buccal and one palatal and their respective canals). The probable diagnosis was an irreversible pulpitis and the endodontic treatment was indicated.

2.1 ROOT CANAL TREATMENT

The patient received local anesthesia and the tooth was isolated. The coronal access was prepared together with carious lesion removal which consequently made the visualization of the entrance of the buccal canals possible (figure 1). During root inspection, it was observed the existence of the third canal, vestibule-palatal, which was separated from the vestibular canal, but leaving the pulp chamber together it and converging into a single foramen at the apex. The periapical region appeared radiographically normal.



Figure 1. Occlusal view of the access cavity and the two distinct inputs of root canals.

The pulp was extirpated by using Gates Glidden drill (Dentsply Maillefer-Petrópolis/RJ) and length of tooth was established under irrigation with sodium hypochlorite a 2,5% (Ind. Farm. Rioquímica LTDA - BR). Subsequently, a new radiograph was performed in order to confirm the working length of 21 mm for the palatal canal and 22 mm for the buccal canal and the vestibule-palatal (figure 2).

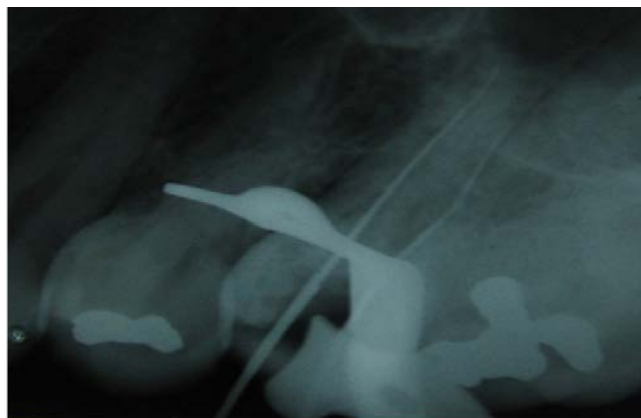


Figure 2. Radiographic images of the sequence of clinical treatment applied. Files indicating positioned buccal and palatal canals and between them the vestibule-palatal canal.

The canals were prepared manually by using serial instrumentation technique, under copious irrigation with 1% sodium hypochlorite, increasing at least four files from the original one: Palatine (20-40), vestibular-palatal (10-35) and vestibular (20-45), considering file 10 as memory file and patent. Radiograph was performed as evidence of the cone, in order to verify whether they were within the limits of -1mm from the apex (figure 3). The canals were then dried with paper cone (Dentsply-BR) and obtured with thermo plasticized gutta-percha according to the last files (Dentsply Maillefer-BR) and sealed with zinc oxide and eugenol (sealer base Endofil / Dentsply - BR) by lateral condensation technique using gutta-percha and cement. This treatment was executed in a single session.



Figure 3. Mesiorradial radiograph, proof of the cone, showing three canals: vestibular, vestibule-palatal and palatal.

3 RESULTS

After completing its full, was verified by a periapical X-Ray no irregularities in the sealing of root canals (figure 4) and then the shutter had completed cutting the cones. The occlusal access was sealed with temporary cement and after a week, restored with direct composite (APH-A3-dentin and Z250 Dentsply-BR- A2 for enamel-3M).



Figure 4. Obturation three canals filled - Filling the channels with final gutta-percha and laterally condensed Endofill folder, showing a single foramen for the vestibular canals and vestibule-palatine.

The three roots of the second premolar can be appreciated well in this post-obturation radiograph (figure 5). The patient reported no postoperative symptoms. Periapical radiographic examination was conducted one year after treatment confirming the success of treatment (figure 6).



Figure 5. Post-obturation radiograph showing the three roots of the second premolar



Figure 6. Radiographic image showing the success of treatment after one year of follow-up.

4 DISCUSSION

Textbooks describe in detail the typical morphology of any tooth, but fail in point to case reports presenting variations and/or irregularities in pulp space. Moreover, studies on maxillary second premolars show a low incidence of three canals (ALEX; RAO; NARAYANAN, 2000). This case report illustrates unusual morphology of the roots and root canal systems of the rare maxillary second premolar in a Brazilian patient.

One fact associated of this low related incidence of three canals in maxillary premolars can be attributed to the difficult of radiographic diagnostic. Therefore, whenever there is an indication of different anatomy, additional periapical x-rays should be exposed at a mesial or distal horizontal angle. This should be followed by detailed examination of the radiographies (SOARES; LEONARDO, 2003). However, interestingly, in our case report, coronal anatomy and dimensions were within normal limits and provided no indication of the complex morphology of the radicular portion of the premolars. The differential diagnostic was achieved by local inspection associated with specific parallel technique radiography, called Clark technique procedure (CLARCK, 1910) used for the localization of impacted teeth and still the preferred radiographic method today, which is useful for detecting the third root canal. Many times the presence of extra canals is observed only after canal treatment, due to continuing postoperative discomfort. This fact makes root canal treatment unsuccessful due to failures such as

an incomplete instrumentation of root canals, improper cleaning, and poor filling of the canals (FERREIRA; MORAES; BERNARDINELLI, 2000; POORNI; KARUMARAN; INDIRA, 2010). Studies suggest different methods to identify extra canal in maxillary premolar tooth. According to Soares and Leonardo, (2003) whenever there is an abrupt straightening or loss of a radiolucent canal in the pulp cavity, an extra canal should be suspected that could be in the same root or in other, independent roots. Barros, Tanamaru e Tanomaru-Filho (2009) report that, clinically, three-rooted, three-canal premolars present crowns with greater dimension and greater mesiodistal width when compared with premolars with single roots. The authors claim that the best radiographic imaging of maxillary second premolars with three canals and three independent roots is achieved using a radiographic technique in a facial projection, which minimises the risk of superimposition of the roots and canals. We suggest that when the roots are fused or partially fused, and therefore hard to be dissociated, the radiographs should be exposed with small horizontal angle variations.

However, this canals root disassociation cannot be achieved by conventional x-ray. From three cases reported by Velmurugan et al. (2005), presenting three roots and three canals in a maxillary second premolar, just one was correctly diagnosed by radiography. Visual inspection and exploration were considered to identify extra canals. Therefore, the use of the computerized X-ray microtomography (CT) in reconstructing root anatomy has been suggested by Bjorndal et al. (1999) as an attempted to identify root variations and a strong correlation was found between the external morphology of the roots and the internal shape of the root canal systems using this method. The research value of micro CT is in its ability to accurately represent the internal and external morphology without destruction of the tooth. Nielsen et al (1995) have used an early micro CT technique to show canal systems and apical foramen shapes before and after instrumentation and filling. A study by Matherne et al. (2008), found that cone beam computed tomography was better than other digital radiography techniques in identifying multiple root canal systems in mandibular incisor, mandibular first premolar and maxillary first molar teeth.

Microcomputed tomography reconstruction could be a valuable research tool not only to study tooth anatomy, but also to evaluate and compare instrumentation techniques (GRANDE et al., 2012; PETERS et al., 2003). In addition, volumetric or cone beam CT may eventually have routine in vivo clinical applications in endodontics diagnosis and treatment (FARMAKIS, 2008; NAIR; NAIR, 2007).

Endodontic success in teeth with a number of canals above that normally found requires a correct diagnosis and careful clinical radiographic inspection. Morphological variations in pulpal anatomy must be always considered before beginning treatment and can be identified by different clinical, radiographic and computadorized techniques in association. The long term success in endodontics treatment depends on this correct diagnosis (FARMAKIS, 2008). The instrumentation presented in this case report as well as diagnosis method were effective in three rooted second premolar treatment in long-term since after one year the patient present no signs of inflammation or pain clinically and no signs of periapical lesion in radiographic analysis. The presence of extra roots can be considered as a possible feature in maxillary second premolar which if left untreated, can contribute to failure of treatment. We encourage future studies to explore different and reliable techniques to identify anatomic variations in root canals in order to minimize the necessity of retreatment in endodontics procedures and the failure of treatment.

5 FINAL THOUGHTS

The incidence of three canals in the second premolars is rare ranging from 0.3% to 1.1% of cases. However, the presence of extra roots as a possible feature in maxillary second premolar which if left untreated, can contribute to failure of treatment. Therefore, careful evaluation and interpretation about morphology and numbers of canal in premolars should be considered in order to achieve endodontic success. The instrumentation presented in this case report as well as diagnosis method were effective in three rooted second premolar treatment in long-term.

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