

# Endodontic treatment of a mandibular premolar with three root canals: case report

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## ABSTRACT

**Introduction:** In addition to the use of materials and techniques to promote the endodontic treatment success, it is essential the knowledge of the internal anatomy of the pulp cavity because the changes in relation to the number, direction, appearance, size, and section may interfere with the cleaning and shaping process, including the mandibular bicuspid, which may have three canals, and its occurrence represents a very difficult clinical situation to the dentist.

**Objective:** The purpose of this clinical case report is the description of the endodontic treatment of a mandibular bicuspid with three root canals, which highlights the need for knowledge of the anatomic variations present at this dental group and the difficulties that this situation imposes for its realization. **Methods:** In the endodontic treatment

of a first mandibular premolar, with three root canals, was carried out, after the coronal opening, the exploration of the root canals and it was possible to identify the existence of three canals. Next, we proceeded to the biomechanical preparation through inverted mixed technique and the case was completed with the obturation by the lateral condensation technique. **Conclusion:** The complexity of the mandibular first premolar anatomy is responsible for many cases of clinical failure, whereas in some cases these teeth have more than two root canals, which are difficult to identify. In this respect, the knowledge of tooth anatomy and the use of diagnostic tools represent great importance regarding the efficiency of the treatment.

**Keywords:** Endodontics. Bicuspid. Root canal therapy.

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## Introduction

Along the years, endodontic techniques, instruments and products have advanced substantially, which has led to an elevation of the rates of canal treatment success.<sup>1</sup>

However, besides using materials and techniques that promote the success of endodontic treatments, endodontists should be thoroughly familiar with the internal anatomy of the pulp cavity. Variations in root and canal numbers, direction, aspect, caliber and section may affect cleaning and shaping, and result in ineffective removal of tissues, necrotic debris and bacteria, which may lead to the failure of canal treatments.<sup>2,3</sup>

Several studies have found anatomic variations in different teeth, including mandibular premolars, which usually have a single, mesiodistally-flattened conical root and a single, wide and straight canal.<sup>4,5</sup> However, more than one root and one canal have been found in several studies. Vertucci and Gegauff,<sup>6</sup> for example, analyzed the internal anatomy of 400 mandibular premolars and found one canal in 74%, two canals in 25.4% and three canals in only 0.5% of all first premolars.

A third canal is rare, but its presence imposes a very difficult clinical problem, as dentists do not routinely investigate this possibility. Therefore, preclinical radiographs should help define tooth anatomy.<sup>3,4</sup> However, radiographic images provide limited information, as a single radiographic view does not always detect all morphological variations. Additional radiographs taken at different angles are helpful, but the actual number of tooth canals will only be safely determined after access to the chamber and careful inspection of the pulp chamber floor.

This clinical case report describes the endodontic treatment of a mandibular premolar with three root canals and discusses the need to be familiar with anatomic variations of this group of teeth and the difficulties that this variation imposes to treatment.

## Case report

A 58-year-old man presented in the Dental Clinic of the Paranaense University (UNIPAR). His main

complaint was his smile esthetics, and he sought dental assistance to treat it.

In the first visit, his medical history was reviewed and he underwent an intraoral examination. After his dental chart was completed, he was referred to a service for a panoramic radiograph to support his treatment plan. The panoramic radiograph was suggestive of periapical abnormalities in the region of teeth #44 and #45. Further tests were performed, and the results of pulp sensitivity thermal testing, percussion and palpation were negative.

The initial radiograph (Fig 1) and the test results suggested the existence of a chronic periapical abscess in the region of teeth #44 and #45, and possibly more than one canal in the first premolar. Before treatment, the patient signed an informed consent term designed by our Ethics and Human Research Committee, registered under number 50930115.4.0000.0109 and approved under number 115432/2015.

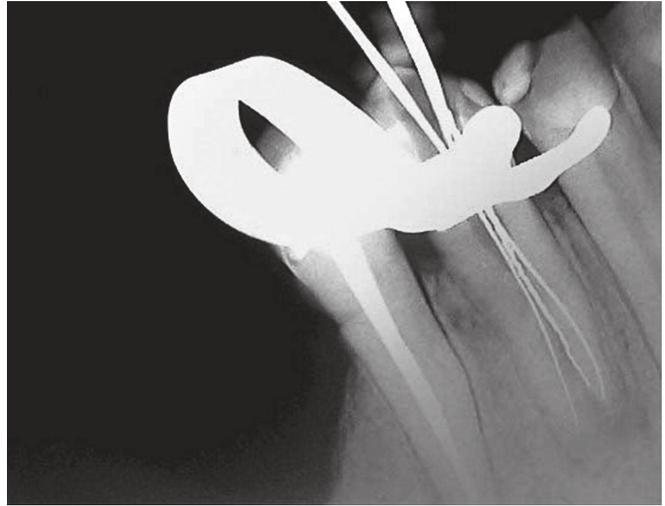
Access was obtained using a #1014 bur followed by a K-file #15. The exploration of root canals revealed the existence of three canals (Fig 2). At the end of the first treatment visit, cotton pellet with formocresol was placed in the cavity before provisional restoration with Coltosol®.

Seven days later, the canals were prepared using a mixed crown down technique and irrigation with 1% sodium hypochlorite between each instrument, as described in the Endodontic Instructions of the Araçatuba campus of Paulista State University (UNESP). Absorbent paper point, of the same size of the K-file used to prepare the apical stop, and para-chlorophenol with furacin were used as provisional intracanal medication.

During the last visit, intracanal medication was removed using saline solution irrigation, the master gutta-percha cone was selected (Fig 3) and the root canals were filled with Sealer 26 endodontic cement using a lateral condensation technique (Fig 4).



**Figure 1.** Preclinical radiograph of lower premolars shows the existence of more than one root canal.



**Figure 2.** Periapical radiograph confirms the existence of three canals.



**Figure 3.** Radiograph shows selected master gutta-percha cone.



**Figure 4.** Final radiograph.



**Figure 5.** Follow up radiograph obtained 8 months after the conclusion of the filling.

## Discussion

The main purpose of endodontic treatment is the preservation of oral health by elimination of organisms from the root canals after cleaning, shaping and filling. To achieve this objective, the internal anatomy of all teeth should be known, so that the endodontist is able to locate canals and treat them.<sup>3</sup>

According to Scaini et al,<sup>4</sup> dental practice demands knowledge of all the aspects that may have unwanted results and lead to the failure of endodontic treatment. Numerous difficulties found in clinic practice result from the existence of anatomic variations.

Vertucci<sup>6</sup> found eight types of internal canal morphology: Type I – one canal and one foramen; Type II – two canals that unite in the mid portion and end in one foramen; Type III – one canal that bifurcates in the mid portion and ends in only one foramen; Type IV – two canals that end in two foramina; Type V – one canal that bifurcates and ends in two separate foramina; Type VI – two canals that unite in the mid portion and bifurcate again, ending in two foramina; Type VII – one canal that bifurcates and then unites again, but bifurcate once more to finish in two foramina; Type VIII – three canals and three foramina. The analysis of the internal morphology of 400 mandibular first premolars in our study revealed the following percentages for each variation: Type I, 70%, Type III, 4%, Type IV, 1.5%, Type V, 24% and Type VIII, 0.5%; Types II, VI and VII were not found. According to this classification, we believe that the case reported is in the Type VIII morphology, in other words, three channels and three foramina, related only in 0.5% of the cases, which demonstrates the rarity of the described clinical situation.

Miyagaki et al<sup>2</sup> found that the lower first premolar has the highest endodontic failure rate, particularly because of its anatomy and possible variations, such as the one found in the clinical case described here, in which the tooth had three roots.

According to Bernardino Júnior et al,<sup>5</sup> three roots in mandibular first premolars is a rare finding, and when this is the case, the roots are two buccal and one lingual. This distribution is unusual for lower teeth, which usually have two mesial and one distal root, or two distal and one mesial root.

Portela et al<sup>3</sup> agree that a good preclinical radiograph may clearly define tooth anatomy. However, previous knowledge about the exact number of root canals is not always provided by diagnostic radiographs alone.<sup>7</sup>

As indicated by Breda et al,<sup>7</sup> the three-dimensional image provided by the Cone Beam computed tomography represents a major advance as an auxiliary method to establish the endodontic diagnosis.<sup>3</sup> However, such technology is not accessible to the clinician in general, which main diagnostic feature is the radiographic image. So as described by Scaini et al,<sup>4</sup> the descriptions of clinical cases, as presented in this report, are extremely important, serving as a

warning for the possibility of more than one or two channels in mandibular premolars. The author also points out that, due to the overlap of images, a single radiograph is not enough to detect the possible morphological variations, which makes it necessary to perform radiographic shots with variation of the horizontal angle of X-ray.<sup>2,3</sup>

Another feature of extreme value in the diagnosis and especially in the treatment of anatomical variations teeth is the optical microscope, which offers as resources the great illumination and the best visualization of the operative field, converting this technological innovation into a strong impact for the success of the endodontic treatment.<sup>2</sup> However, just like computed tomography, the advent of the optical microscope represents an auxiliary resource, and it is not possible to rule out the importance of knowing the anatomy, together with the tactile sensation of the operator.

It should be noted that in the present study, such resources were not used because it was a clinical case developed in an educational institution, that does not have the equipment, but it does not mean that these auxiliary environment did not have their possibility of application considered. However, the economic conditions of the patient made it impossible to carry out the exams, which would have to involve institutions outside the dental teaching practice, generating undesirable additional costs for the patient, whose economic characteristic is typical of the clientele who attend such surroundings.

Finding root canals in three-rooted premolars may be difficult and may require more sittings. In the case reported here, the treatment took longer due to anatomic complexity. In consequence, the use of tricresol formalin as dressing in the initial session was chosen, that according to Leonardo,<sup>8</sup> is a drug that acts at a distance through vaporization and it is indicated in very specific cases, as for a mediated neutralization of the septic-toxic content of root canals that have not been instrumented or have been partially used to avoid unpleasant post-operative periods.<sup>9</sup>

According to Soares and Goldberg,<sup>10</sup> tricresol formalin is a non-selective substance that can act on the periapical tissues, so when used, it should be applied in minimal amounts with a slightly humidified

cotton ball positioned only in the pulp chamber, procedure used in the execution of this clinical case.

Another consequence of the difficulty imposed by the anatomical complexity is the tendency of the dentists to enlarge coronary access to facilitate canal exploration, which may result in perforation of both the chamber floor and the lateral walls of the access cavity.<sup>1</sup>

An adequate temporary restoration is one of the key factors for the success or failure of root canal treatment because they are able to prevent the infiltration of saliva and infection into the root canals.<sup>11,12</sup>

According to Zancan et al<sup>13</sup> temporary coronary sealers are divided into: zinc oxide eugenol based pre-engineered cements, glass ionomer based cement and photo activated cements.

The pre-manipulated temporary cements have less marginal infiltration and better sealing capacity because they present less possibility of manipulation error in comparison to the cement with powder-liquid component.<sup>12</sup> Therefore, in the present case, Coltosol was used because it is a temporary premix restorative material and the good results have been attributed to its hygroscopic properties. Coltosol has a high coefficient of linear expansion due to the absorption of water and, for this reason, can adapt more firmly to the walls of dentin, promoting a good marginal seal.<sup>11-14</sup>

Coltosol does not present good mechanical resistance and it is indicated as a temporary restorative material for application in short periods of time, comprising a maximum of one or two weeks, which was respected in the conduct of this report.<sup>14</sup>

According to Cantatore, Berutti and Castellucci,<sup>15</sup> knowledge of the internal anatomy of roots and canals should ensure better cleaning, shaping and filling and should result in excellent endodontic treatments and reduction of the rates of iatrogenic problems.

## Conclusions

The case described here confirmed that the anatomical complexity of mandibular first premolars is responsible for several clinical failures. These teeth sometimes have more than two canals, and this variation is not easily detected. Therefore, knowledge of tooth anatomy and the use of diagnostic resources have an important role in treatment efficiency.

## References

1. Dotto SR, Pagliarin CML, Carvalho MGP, Travassos RMC, Rosa RA. Tratamento endodôntico de pré-molar inferior com três condutos radiculares: relato de caso clínico. *Rev Endod Pesq Ens On Line*. 2007 Jul-Dez;3(6):1-7.
2. Miyagaki DC, Lacerda AC, Cecchin D, Ferraz CCR. Mandibular first premolar with three canals and two roots: a case report. *Dental Press Endod*. 2013 Sept-Dec; 3(3):74-7.
3. Portela CP, Baratto Filho F, Tomazinho FSF, Correr GM, Moro A, Moresca RC. Estudo da anatomia interna dos pré-molares: revisão de literatura. *Odonto*. 2011;19(37):63-72.
4. Scaini F, Braga FL, Figueiredo Júnior IC, Ferreira RB, Baratto Filho F, Sousa Neto MD. Condições atípicas da anatomia de canais radiculares em pré-molares. *RSBO* 2005;2(1):39-43.
5. Bernardino Júnior R, Silva Júnior W, Lucas BL, Borges DP, Souza AC. Primeiro pré-molar inferior trirradiculado: um relato de caso. *Biosci J*. 2007 Oct-Dec;23(4):104-7.
6. Vertucci FJ, Gegauff A. Root canal morphology of the maxillary first premolar. *J Am Dent Assoc*. 1979 Aug;99(2):194-8.
7. Breda P, Ribeiro FC, Bortolotti MGLB, Barroso JM, Junqueira JLC. Análise in vitro da anatomia interna de pré-molares inferiores inseridos em mandíbulas humanas por meio de exame radiográfico e tomografia computadorizada Cone Beam. *RGO*. 2011 Jul-Set;59(3):405-9.
8. Leonardo MR. *Endodontia: tratamento de canais radiculares: princípios técnicos e biológicos*. São Paulo: Artes Médicas; 2005.
9. Miranda MA. *Atividade antimicrobiana da medicação intracanal em Endodontia. Revisão de literatura [monografia]*. Poços de Caldas (MG): Faculdades Integradas do Norte de Minas; 2010
10. Soares IJ, Goldberg F. *Endodontia: técnica e fundamentos*. Porto Alegre: Artmed; 2001.
11. Cardoso AS, Silva NC, Silva JM, Herrera DR, Neves AA, Leal Silva EJ. Assessment of coronal leakage of a new temporary light-curing filling material in endodontically treated teeth. *Indian J Dent Res*. 2014 May-Jun;25(3):321-4.
12. Jani K, Bagda K, Jani M, Patel P. Effect of storage in water on solubility and effect of thermocycling on microhardness of four different temporary restorative materials. *Natl J Integr Res Med*. 2015;6(2):75-8.
13. Zancan RF, Oda DF, Tartari T, Duque JA, Moraes IG, Duarte MAH, Vivan RR. Seladores coronários temporários usados em endodontia: revisão de literatura. *Salusvita*. 2015;34(2):353-70.
14. Naseri M, Ahangari Z, Shahbazi Moghadam M, Mohammadian M. Coronal sealing ability of three temporary filling materials. *Iran Endod J*. 2012 Winter;7(1):20-4.
15. Cantatore G, Berutti E, Catellucci A. Missed anatomy: frequency and clinical impact. *Endod Top*. 2009;15(1):3-31.