

Mandibular first molar with four canals in the mesial root

Hamed Karkehabadi¹, Ricardo Machado² and Lucas da Fonseca Roberti Garcia³

Abstract

A 35-year-old female patient with intermittent pain in the lower right jaw was referred to the dental practice. The right mandibular first molar did not respond to thermal testing and the patient reported moderate pain to percussion and palpation in the region of this tooth. Radiographic findings confirmed the presence of periradicular disease and previous root canal treatment. Initially, only four treated canals were found (two mesial and two distal) Two extra canals were found in the mesial root. The treatment was performed and the success confirmed after 12 months. This case report reiterates the complexity of mandibular first molar variation and is intended to reinforce the clinicians' need to be aware of the variable morphology of root canals in this tooth.

Introduction

The goal of endodontic treatment is to clean and shape the root canal system and obturate it in all its dimensions (Almeida et al, 2015). Before starting treatment, aberrant root or root canal morphology should be investigated, detected and adequately treated (Lea et al, 2014). Failure to recognise any unusual canal configuration could eventually lead to an unsuccessful treatment outcome (Almeida et al, 2015; Lea et al, 2014; Ghoddusi et al, 2007). Thus, the proper knowledge of the root and root canal morphology, along with any related anatomical variations, is essential to achieve a successful treatment (Almeida et al, 2015; Lea et al, 2014; Ghoddusi et al, 2007).

Mandibular first molars are the teeth that most require endodontic treatment, as they are the first posterior teeth to erupt in permanent dentition (Ghoddusi et al, 2007). Although mandibular first molars usually have two canals in the mesial root, named as mesiobuccal and mesiolingual canals, the presence of a middle mesial canal in the developmental groove has been widely reported in 1 % (Vertucci, 1964), 1.5% (Martinez-Berna and Badanelli, 1983), 2.1 % (Fabra-Campos, 1985), 2.6% (Fabra-Campos, 1989), 12% (Pomeranz et al, 1981), 14.7% (Akbarzadeh et al, 2017), 15% (Goel et al, 1991) and 18.6% (Versiani et al, 2016) of the cases. In addition, mandibular first molars may have one or two canals in the distal root (Ghoddusi et al, 2007).

As reported in several studies, the prevalence of a middle mesial canal in mandibular first molars may significantly range among researches. Clinical studies and case reports that demonstrated the presence of negotiable middle mesial canals present different data from studies which used extracted teeth model (Vertucci, 1984; Martinez-Berna and Badanelli, 1983; Fabra-Campos, 1985; Fabra-Campos, 1989; Pomeranz et al, 1981, Akbarzadeh et al, 2017; Goel et al, 1991; Versiani et al, 2016).

To the best of the authors' knowledge, just one case has ever been reported in the scientific literature of a mandibular first molar with four canals in the mesial root (Reeh, 1998) In this particular case, the author reported a successful endodontic retreatment of a mandibular first molar with seven canals, where the other three canals were located

¹ Hamed Karkehabadi
Department of endodontics, dental school, Hamadan University of Medical Sciences, Hamadan, Iran

² Ricardo Machado
Clinical practice limited to endodontics in Navegantes, Santa Catarina, Brazil

³ Lucas da Fonseca Roberti Garcia
Department of dentistry - endodontics division, Federal University of Santa Catarina, Florianópolis, Santa Catarina, Brazil

Case Report 1

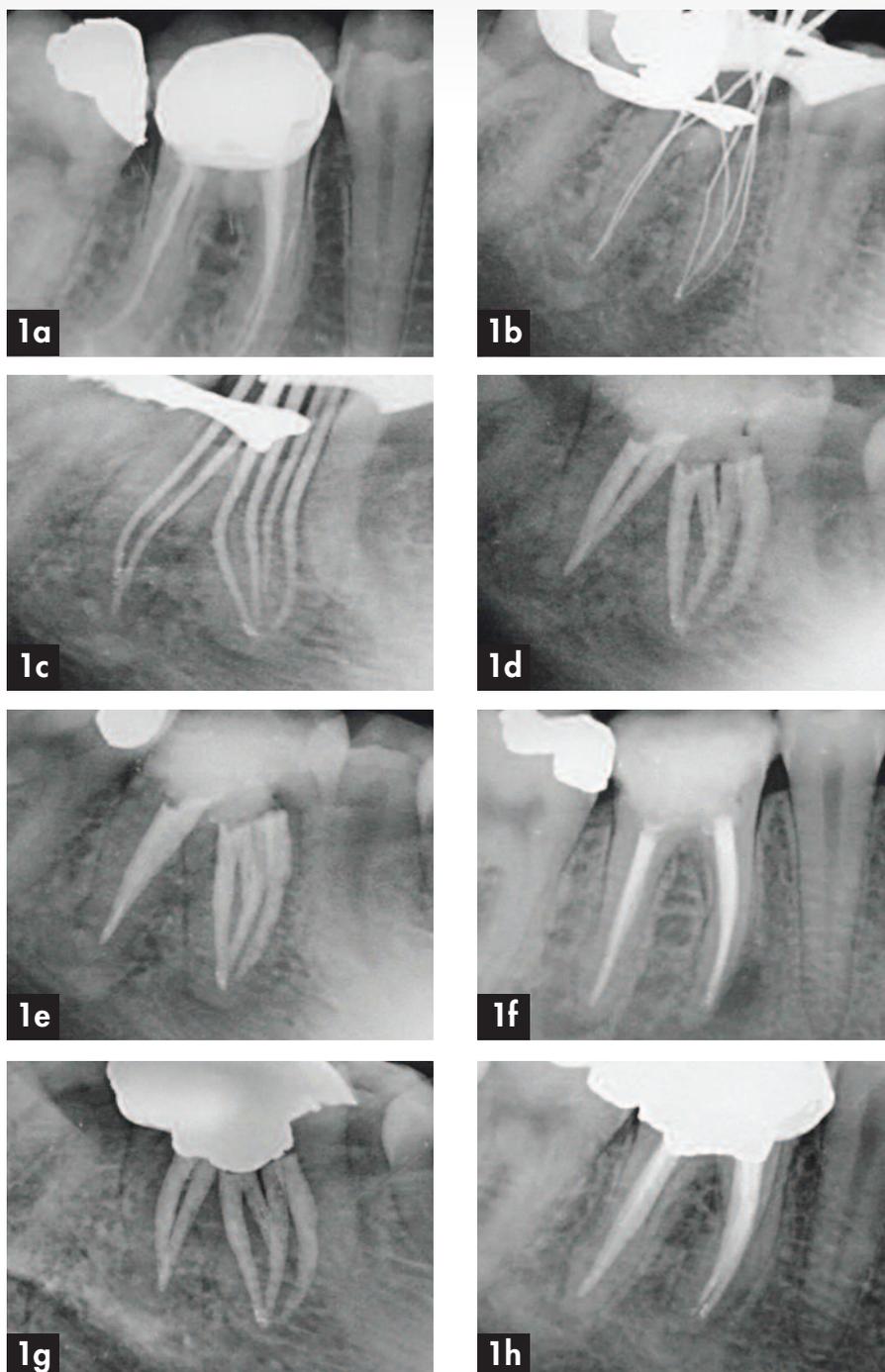


Figure 1: Initial radiograph (a); Radiographic working length confirmation (b); Radiograph of main cones (c); Final radiographs (d-f); Radiographs of 12-month follow-up (g and h).

in the distal root. Initially, the clinician failed to detect the complexity of the root canal system of this tooth, and only

three canals were treated endodontically. Such factors demonstrate the importance of knowing the root canal system

morphology and its anatomical variations (Reeh, 1998). Furthermore, according to the author of the case report, looking for additional canals was crucial for a successful outcome (Reeh, 1998).

Therefore, the aim of this article is to report a clinical case of a mandibular first molar with four canals in the mesial root, and two canals in the distal root. All canals were properly prepared and filled, and the success of the treatment was confirmed after 12 months by clinical and radiographic findings.

Case report

A 35-year-old female patient, with a history of intermittent prior to being seen, was referred to the dental practice. Medical history was non-contributory. The right mandibular first molar did not respond to thermal testing (heated gutta percha and dry ice), and the patient reported moderate pain to percussion and palpation in the region of this tooth. Furthermore, the tooth had a total crown and there was no significant probing depth. Radiographic findings confirmed the presence of periradicular disease and previous root canal treatment (Figure 1a). Correlation of clinical and radiographic findings led to a diagnosis of a chronic periradicular abscess due to previous unsuccessful endodontic treatment. Therefore, a nonsurgical root canal retreatment was recommended.

After administering infiltration anaesthesia (Lidocaine 2% 1:80.000 epinephrine), the crown was removed, and rubber dam isolation of the operative area was performed. An endodontic access cavity was prepared by using 1016HL and Endo Z burs (Dentsply Sirona), and four previously treated root canals were found. Removal of root canal filling was performed using a Neoniti Al size 20 file (Neolix, Châtres-la-Forêt, France). After careful analysis of the floor of the pulp chamber, two additional root canals were found in the mesial root, totalling four canals in this root. Initially, extra canals were explored with a size 10 k-file (Mani, Inc; Tochigi, Japan) under copious irrigation with 5.25% sodium hypochlorite solution (Chloraxid, Cerkamed, Poland). Next, the working length of each root canal was established 1mm up to the apical foramen, using an electronic apex locator (Root ZX, Morita, Tokyo, Japan). A radiograph was then taken to confirm the measurements (Figure 1b). The chemo-mechanical preparation was performed using the crown-down technique, with the Neoniti system (Neolix). The first four root canals found (MB1, MLI, DB and DL) were prepared up to a Neoniti Al size 25 file (Neolix). The two additional root canals found in the mesial root (MB2 and ML2) were prepared up to a Neoniti Al size

20 file. Irrigation was performed with 2.5 ml of 5.25% sodium hypochlorite solution (Chloraxid) at each change of file, using a 30-gauge, open-ended needle (Navitip; Ultradent, South Jordan, UT, USA) placed slightly short of the binding point. After a final rinse with MTAD (Dentsply Tulsa, USA), the root canals were dried with sterile absorbent paper points (Dentsply Sirona, Ballaigues, Switzerland) and a radiograph was taken of the main cones to confirm if they reach the working length (Figure 1c). Afterwards, the canals were filled with gutta percha (Dentsply Sirona, Ballaigues, Switzerland) and AH Plus sealer (Dentsply Sirona, Ballaigues, Switzerland), using the lateral condensation technique. The pulp chamber was properly cleaned to remove the excess of gutta percha and sealer, and was temporarily restored with a provisional material (Figures 1d -1f).

Clinical and radiographic findings, as no painful symptomatology and regression of the periapical lesion, confirmed the success of the proposed therapy. Continued follow-up over 12 months has shown a positive outcome from endodontic perspective (Figures 1g and 1h).

Discussion

The prevention and treatment of apical periodontitis are the main objectives of endodontic therapy (Siqueira and Rôças, 2008). An adequate biomechanical preparation and filling of the root canal system, associated to the placement of a proper coronal sealing, are crucial and should be taken to achieve this goal (Gillen et al, 2011). Furthermore, all these steps performed during the treatment require a good understanding of root canal anatomy to attain a successful outcome (Reeh, 1998).

The purpose of this article was to present the case report of a mandibular first molar clearly showing the presence of four canals in the mesial root, and two canals in the distal root. The patient was referred to the dental practice, because of the persistent symptoms after the first endodontic treatment, at which time, only four root canals were located and treated (two in the mesial root and two in the distal root).

The clinician should keep in mind that the internal morphology of the teeth does not always follow the known standards (Almeida et al, 2015; Lea et al, 2014). In this clinical case, the incomplete debridement of the six root canals probably was the cause for the occurrence and perpetuation of the periradicular disease (Reeh, 1998). Once all the root canals were located and could be properly negotiated, shaped and cleaned, the symptoms disappeared, and a 12-month follow-up X-ray showed the

consistent healing of the periapical alveolar bone. To locate additional root canals can be a challenging procedure for professionals. For this reason, the findings reported in this clinical case highlight how important it is to have a good understanding of the canal anatomic complexities to achieve effective disinfection of the root canal system (Siqueira and Rôças, 2008).

The clinician should always suspect the presence of additional root canals, and investigate further when examining radiographs and/or locating and exploring the canals (Johal, 2001). Although there are inherent limitations, radiographic examination provides a clue to the type of canal configuration present (Hildebolt et al, 1990).

Previous reports have continuously used imaging technologies, such as spiral computed tomography (SCT) (Gopikrishna et al, 2006; Aggarwal et al, 2009) and conebeam computed tomography (CBCT) (Almeida et al, 2015; Lea et al, 2014), as an adjunctive tool for detection and management of variable root canal morphology. These imaging technologies may be helpful in detecting variations of root canals in doubtful circumstances related to unusual root canal anatomy (Gopikrishna et al, 2006; Aggarwal et al, 2009; Almeida et al, 2015; Lea et al, 2014). Although these imaging modalities offer an insight into the anatomical variations of the root or root canal configuration, they also potentially increase the effective dose of radiation exposure for the patient, often limiting their use (Patel et al, 2009).

The ALARA (as low as reasonably achievable) principle states that every effort should be made by professionals to keep the patient's exposure to ionising radiation as low as practically possible (Farman, 2005). As reported in the present clinical case, the use of radiographic examination associated to an adequate clinical inspection of the floor of the pulp chamber were enough to depict the variable anatomy clearly. For this reason, advanced imaging techniques (SCT and CBCT) did not have to be used to solve this clinical case.

It is also valid to emphasise that several other types of equipment, such as operative microscopes, may be used to facilitate the location and negotiation of additional root canals, significantly improving the quality of the endodontic the successful endodontic treatment of a maxillary first premolar with three root canals, with the aid of an optical microscope. The authors stated that the use of such technology was fundamental to detect the location of the third root canal, due to the complex internal anatomy of the tooth (Relvas et al, 2013).

This article provides useful clinical information for performing endodontic therapy in a very complex case, thus contributing to the awareness of another anatomic variant of mandibular molars.

Conclusions

Reports of cases with unusual morphology have an important didactic value. Their documentation may facilitate the recognition and successful management of similar cases, which may require endodontic therapy. This case report reiterates the complexity of mandibular first molar variation and is intended to reinforce the clinicians' need to be aware of the variable morphology of root canals in this tooth.

References

- Aggarwal VL, Singla M, Logani A, Shah N (2009). Endodontic management of a maxillary first molar with two palatal canals with the aid of spiral computed tomography: a case report. *Endod* 35;137-9
- Akbarzadeh N, Aminoshariae A, Khalighinejad N, Palomo JM, Syed A, Kulild JC, Sadeghi G, Mickel A (2017) The Association between the Anatomic Landmarks of the Pulp Chamber Floor and the Prevalence of Middle Mesial Canals in Mandibular First Molars: An In Vivo Analysis.) *Endod* 43: 1797-1801
- Almeida G, Machado R, Sanches Cunha R, Vansan LP, Neelakantan P (2015). Maxillary first molar with 8 root canals detected by CBCT scanning a case report *Gen Dent* 63:68-70
- Fabra-Campos H (1985) Unusual root anatomy of mandibular first molars.) *Endod* 11 :568-72
- Fabra-Campos H (1989) Three canals in the mesial root of mandibular first permanent molars: a clinical study. *Int Endod* 22:39-43
- Ghodduji J, Naghavi N, Zarei M, Rohani E (2007) Mandibular first molar with four distal canals. *JEndod* Dec 33: 1481-3
- Goel NK, Gill KS, Taneja JR (1991). Study of root canals configuration in mandibular first permanent molar.) *Indian Soc Pedod Prev Dent* 8: 12-4
- Lea C, Deblinger J, Machado R, Nogueira Leal Silva EJ, Vansan LP (2014). Maxillary premolar with four separate canals.) *Endod* 40:591-3
- Martínez-Berna A, Badanelli P (1983). Investigación clínica de molares inferiores con cinco conductos. *Boletín de InformaCion Dental* 43:27-31
- Pomeranz HH, Eidelman DL, Goldberg MG (1981). Treatment considerations of the middle mesial canal of mandibular first and second molars.) *Endod* 7:565-8
- Reeh ES1998. Seven canals in a lower first molar.) *Endod* 24:497-9

Siqueira JF Jr, Rôças IN (2008). Clinical implications and microbiology of bacterial persistence after treatment procedures.) Endod 34:1291-301

Gillen BM, Looney Sw, Gu LS, Loushine BA, Weller RN, Loushine RJ, Pashley DH, Tay FR (2011) Impact of the quality of coronal restoration versus the quality of root canal fillings on success of root canal treatment: a systematic review and meta-analysis.) Endod 37:895-902

Gopikrishna VL, Bhargavi N, Kandaswamy D (2006). Endodontic management of a maxillary first molar with a single root and a single canal diagnosed with the aid of spiral CT: a case report.) Endod 32:687-91

Hildebolt CF, Vannier MW, Pilgram TK, Shroot MK (1990). Quantitative evaluation of digital dental radiograph imaging systems. Oral Surg Oral Med Oral Pathol 70:661-8

Johal S (2001). Unusual maxillary first molar with 2 palatal canals within a single root: a case report. Can Dent Assoc 67:211-4

Patel S, Dawood A, Whaites E, Pitt Ford T (2009). New dimensions in endodontic imaging: part 1. Conventional and alternative radiographic systems. Int Endod) 42:447-62

Farman AG (2005) ALARA still applies. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 100:395-7

Relvas JB, de Carvalho FM, Marques AA, Sponchiado EC Jr, Garcia Lda F (2013) Endodontic treatment of maxillary premolar with three root canals using optical microscope and NiTi rotatory files system. Case Rep Dent 2013:71 0408

Versiani MA, Ordinola-Zapata R, Keles A, Alcin H, Bramante CM, Pecora JD, Sousa-Neto MD (2016) Middle mesial canals in mandibular first molars: A micro-CT study in different populations. Arch Oral Biol 61: 130-7

Vertucci FJ (1984). Root canal anatomy of the human permanent teeth. Oral Surg Oral Med Oral Pathol 58:589-99

Reprinted with permission from ENDODONTIC PRACTICE August 2018