Case Report

Endodontic Management of Maxillary First Molar with Five Root Canals, Including Two Distobuccal Root Canals: A Case Report

Dakshita Joy Sinha¹⁾, Ashish Amit Sinha²⁾, Prem Prakash¹⁾ and Natasha Jaiswal¹⁾

¹⁾ *Department of Conservative Dentistry and Endodontics, Kothiwal Dental College Research Centre and Hospital, Moradabad-244001, U.P, India*

²⁾ *Department of Pedodontics, Kothiwal Dental College Research Centre and Hospital, Moradabad-244001, U.P, India*

Received 3 August, 2015/Accepted for publication 10 September, 2015

Abstract

Multiple canals in the root are part of the normal morphology of the tooth. A canal may sometimes be overlooked, however, and this may lead to failure of treatment. The first step in successful endodontic treatment, therefore, is gaining access to the pulp chamber and locating all the canals. In order to achieve this goal, practitioners need to be familiar with all possible variations in root canal morphology, and should thoroughly explore roots to ensure that all canals are identified, debrided, and obturated. Here, we report the diagnosis, treatment planning, and endodontic management of a maxillary first molar with five root canals, including two distobuccal root canals, in a 22-year-old woman.

Key words: Endodontic treatment—Five root canals—Maxillary first molar

Introduction

The variable canal morphology of multi-rooted teeth represents a constant challenge in making an endodontic diagnosis and achieving success in subsequent treatment¹³⁾. The maxillary first molar has the largest volume of any tooth, and is the most complex in terms of the anatomy of its root and canal system¹⁸⁾. Studies of its morphology and anatomy have revealed great variation in anatomical configuration⁵⁾, with anywhere

between one to eight root canals¹¹⁾. The incidence of five canals has been reported to be as low as 2.25%⁹⁾ and 2.4%¹⁾. Distobuccal (DB) and palatal roots have been reported in 14 studies including a total of 2,576 teeth. The results revealed that 98.3% of DB root canal systems had a single canal, while 1.7% had two canals, with a single apical foramina observed in 98%; they also showed that 99% of palatal roots had a single canal, while 98.8% had a single apical foramina⁶⁾.

This case report describes a patient with

Fig. 1 Preoperative intraoral periapical radiograph of #16 showing distal coronal dentin deficit and radiolucency involving distal pulp horn

multiple root canals in the maxillary first molar, greatly increasing its anatomical complexity. We believe that this case should serve to reinforce the clinician's awareness of the potentially complex morphology of root canals.

Case Report

The patient was a 22-year-old woman who visited our clinic at the Department of Conservative Dentistry and Endodontics, Kothiwal Dental College and Research Center, Moradabad, with the chief complaint of pain in a maxillary right posterior tooth. She had been experiencing intermittent pain in the same tooth in response to hot or cold stimuli for 1 month. Her medical history was non-contributory. Clinical examination revealed gross decay of #16, with most of the distal aspect of the tooth already carious. The tooth was also tender to percussion. It was not mobile, however, and the results of periodontal probing were within normal physiological limits. Vitality testing with heated gutta-percha (Dentsply Maillefer, Ballaigues, Switzerland) and dry ice (RC Ice; Prime Dental Products Pvt. Ltd., Mumbai, India) caused intense lingering pain, and electronic pulp stimulation (Parkel Electronics Division, Farmingdale, NY) caused a premature response. An intra-oral periapical radiograph revealed coronal dentin deficit in the distal half of the tooth

Fig. 2 Clinical photograph (mirror image) of #16 showing five root canal orifices

and radiolucency involving the distal pulp horn with periapical radiolucency in the mesiobuccal (MB), DB, and palatal roots (Fig. 1). Based on these clinical and radiographic findings, a diagnosis of irreversible pulpitis with symptomatic apical periodontitis was made and endodontic treatment recommended to the patient. Root canal therapy was then initiated.

After administration of local anesthesia (2% Lignocaine with 1:100,000 epinephrine), access was gained to the pulp chamber under rubber dam isolation. After careful inspection under a surgical operating microscope (Global, India), an additional opening was found 1.5 mm from the MB canal along the fusion lines joining the MB and palatal canals. When the DB canal was located, its isthmus suggested the presence of a second canal. Probing with a DG 16 endodontic explorer (Hu-Friedy, Chicago, Illinois) revealed a small hemorrhagic pin-point opening, which led to the discovery of DB2. A conventional triangular endodontic access site was modified to a pentagonal shape with a slow speed diamond (Dentsply Maillefer). Five canal orifices were located and patency ascertained using a small size K-file (Kerr, Orange, California). The

Fig. 3 Working length intraoral periapical radiograph of #16

Fig. 5 One-year follow-up intraoral periapical radiograph of #16

Fig. 4 Intraoral periapical radiograph of #16 after post-obturation restoration

On the subsequent visit, the canals were thoroughly dried and obturation performed using F2 ProTaper Gutta-percha and AH Plus sealer (Dentsply Maillefer).

Post-endodontic permanent restoration was completed with amalgam (DPI Alloy Fine grain silver tin dental amalgam alloy, Deepdent products, Delhi, India) (Fig. 4). At a one-month follow-up visit, #16 was found to be asymptomatic. A radiograph obtained at a 1-year recall visit revealed satisfactory healing (Fig. 5).

Discussion

following five root canals were identified: palatal (P), MB 1 (MB1), MB 2 (MB2), DB 1 (DB1), and DB 2 (DB 2) (Fig. 2). The working length was established with the use of an apex locator (Root ZX, J. Morita Inc., Kyoto, Japan). A working length radiograph was then obtained and measurements taken (Fig. 3).

The canals were cleaned and shaped with hand K-files and nickel titanium rotary ProTaper files (Dentsply Maillefer). The canals were sequentially irrigated using 5.25% Sodium hypochlorite and 17% EDTA during the cleaning and shaping procedure. The canals were then filled with calcium hydroxide intracanal medicament and sealed with IRM cement (Dentsply Maillefer) for a week and the patient recalled.

The most frequent cause of endodontic failure, apical percolation and subsequent diffusion stasis into the canal, is mainly due to incomplete canal obturation or an untreated canal⁸. While several studies have reported only three roots in the majority of such teeth, others have noted four or five together with a corresponding number of root canals². Compression of three-dimensional anatomy into two-dimensional digital images by conventional radiography means that the amount of information obtainable from periapical radiographs is limited¹⁷. Here, we also therefore examined the pulp chamber floor using a dental operating microscope as this is reported to offer some advantages^{14,15}. Indeed, several studies have reported a significant difference

in the number of canals located when comparing examination of the pulp chamber between with and without magnification^{3,4,7,16}.

The laws of Krasner and Rankow are also useful in locating root canal orifices¹². The DB2 could have been predicted by the third law of orifice location, since the isthmus line extended from the DB1 canal. Clinical experience and histological studies have demonstrated that MB2 is commonly located within the developmental groove between MB1 and the palatal canal. To locate MB2, the clinician should prepare the access cavity mesially⁵.

Nowadays, a whole range of tools are used to locate canals, including canal explorers, magnification, dye, multiple obliquely angled radiographs, dental operative microscopy, wear loupes, fiberoptic hand pieces, piezoelectric ultrasonic units, and computed tomography. The most important factor in locating a hidden canal, however, is creating an opening which will allow complete access and accurately ascertaining the internal and external anatomy of the tooth¹⁰. No cone beam computed tomography was performed in the present case as the patient was not financially able to afford it, so we were unable to confirm the presence of extra root canals or roots by this method. However, we were able to locate all five canal orifices and successfully manage the problem by means of an obliquely angled radiograph, which revealed the two DB root canals, a dental operating microscope, which enabled us to view in minute detail, especially the isthmus line extending from the DB1 canal, proper access, obtained with the DG 16 explorer, and knowledge of how the morphology of the root canal system of the maxillary first molar may vary.

Reports of unusual morphologies have an important didactic value, facilitating the recognition and successful management of similar cases requiring endodontic therapy. Treating the extra canals in maxillary first molars may be challenging for clinicians. Inability to find or properly treat the root canals may cause failure.

Conclusion

The present case report discusses the endodontic management of an unusual case of a maxillary first molar with five root canals, including two DB canals. It also highlights the role of the surgical operating microscope as an objective analytic tool in ascertaining root canal morphology. Variation in the root canal morphology of the maxillary first molar is quite common. If the practitioner is unable to detect these variations during endodontic therapy, the root canals may be left untreated, which may result in treatment failure. Dental practitioners must make every effort to find and treat all canals if clinical outcomes are to be successful.

References

- 1) Acosta Vigouroux SA, Trugeda Bosaans SA (1978) Anatomy of the pulp chamber floor of the permanent maxillary first molars. *J Endod* 4:214–219.
- 2) Adanir N (2007) An unusual maxillary first molar with four roots and six canals: a case report. *Aust Dent J* 52:333–335.
- 3) Baldassari-Cruz LA, Lilly LP, Rivera EM (2002) The influence of dental operating microscope in locating the mesiolingual canal orifice. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 93:190–194.
- 4) Buhrley L, Barrows MJ, BeGole EA, Wenckus CS (2002) Effect of magnification on locating the MB2 canal in maxillary molars. *J Endod* 28:324–327.
- 5) Carlsen O (1987) *Dental Morphology*, 1st ed., p.154, Munksgaard, Copenhagen.
- 6) Cleghorn BM, Christie WH, Dong CC (2006) Root and root canal morphology of the human permanent maxillary first molar: a literature review. *J Endod* 32:813–821.
- 7) Coutinho Filho T, La Cerda RS, Gurgel Filho ED, de Deus GA, Magalhães KM (2006) The influence of the surgical operating microscope in locating the mesiolingual canal orifice: a laboratory analysis. *Braz Oral Res* 20:59–63.
- 8) European Society of Endodontology (2006) Quality guidelines for endodontic treatment: consensus report of the European society of Endodontology. *Int Endod J* 39:921–930.
- 9) Gray R (1983) The maxillary first molar, *Anatomy and Morphology of the Human*

- Teeth, Bjomdal A, Skidmore E eds., pp.31–40, University of Iowa College of Dentistry, Iowa City.
- 10) Islam MA, Alam MS (2012) Five root canals for a maxillary first molar tooth—a case report. *BSMMU J* 5:61–64.
 - 11) Kottoor J, Velmurugan N, Surendran S (2011) Endodontic management of a maxillary first molar with eight root canal systems evaluated using cone-beam computed tomography scanning: a case report. *J Endod* 37:715–719.
 - 12) Krasner P, Rankow HJ (2004) Anatomy of the pulp-chamber floor. *J Endod* 30:5–16.
 - 13) Maggiore F, Jou YT, Kim S (2002) A six canal maxillary first molar: case report. *Int Endod J* 35:486–491.
 - 14) Martins J, Saura M, Pagona A (2011) Dental operating microscope: benefits of its use on root canal treatment. *Cadernos Científicos Rev Ordem Méd Dent* 9:14–21.
 - 15) Martins J, Saura M, Pagona A (2011) Dental operating microscope: how does it work? *Cadernos Científicos Rev Ordem Méd Dent* 9:2–7.
 - 16) Martins JNR, Anderson C (2013) Endodontic treatments of the maxillary first molar with five root canals—three case reports. *Rev Port Estomatol Med Dent Cir Maxillofac* 54:37–42.
 - 17) Reddy YP, Karpagavinayagam K, Subbarao CV (2008) Management of dens invaginatus diagnosed by spiral computed tomography: a case report. *J Endod* 34:1138–1142.
 - 18) Vertucci FJ, Haddix JE, Britto LR (2006) Tooth morphology and access cavity preparation, *Pathways of the Pulp*, Cohen S, Hargreaves KM, 9th ed., pp.128–178, Mosby, St. Louis.

Correspondence:

Dr. Dakshita Joy Sinha
 Department of Conservative Dentistry
 and Endodontics,
 Kothiwal Dental College Research
 Centre and Hospital,
 Moradabad-244001, U.P, India
 E-mail: dvaghela52@gmail.com