CASE REPORT

Maxillary first molar with five canals

Fahad Umer

Department of Surgery, Aga Khan University Hospital, Karachi, Pakistan

Correspondence to
Dr Fahad Umer,
fahadumeris@yahoo.com

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SUMMARY

Root canal treatment is a technically demanding procedure especially in the case of maxillary first molar where the anatomy is extremely variable. Failure to recognise and treat these variations may lead to unpredictable outcomes. This case report describes non-surgical endodontic treatment of a maxillary first molar with two palatal and two mesiobuccal canals. It also highlights the need for good anatomical knowledge of root canal morphology and its variations in order to achieve consistently successful results.

BACKGROUND

The maxillary first molar is one of the most common teeth requiring root canal treatment. Therefore, it is not surprising to come across a plethora of literature describing its morphology and canal anatomy. Commonly, it has three roots and three to four canals, the fourth canal is a common finding in the mesiobuccal (MB) root; the distal and palatal root usually have one canal.^{1 2} Rarely, however, it has been reported that the distal root may have two canals; locating a second palatal canal is unique.³

Failure of root canal treatment can be attributed to a number of reasons. Inability to identify and negotiate missed canals remains a primary reason for retreatment and can be in as many as 19% of cases.⁴

For this reason clinicians are expected to have sound knowledge of root canal anatomy and must have a keen eye for recognising variations and develop the required skills to treat these natural variations. This paper describes successful endodontic treatment of a maxillary first molar presenting with two palatal canals. It is a highly uncommon morphological variation associated with this tooth.³

CASE PRESENTATION

A 40-year-old man presented to our dental clinic, in a tertiary care hospital, with history of mild discomfort on chewing on the left upper tooth for 1 week. The patient did not give any history of spontaneous or nocturnal pain and there was no history of any swelling or fever associated with the pain.

Intraoral examination revealed mesio-occlusal caries in tooth #26. This tooth was slightly tender on percussion and did not show any response on thermal testing. Periapical radiograph (figure 1) revealed mesio-occlusal caries with pulp involvement in tooth #26. The mesial and distal roots were associated with localised well-circumscribed radiolucency.

Therefore, a diagnosis of pulpal necrosis associated with chronic periapical periodontitis was performed.

INVESTIGATIONS

- Periapical radiograph
- Vitality testing

TREATMENT

After a thorough discussion about the treatment and its outcome, root canal was initiated with patient's consent. Profound local anaesthesia was achieved with one cartridge infiltration (Xylestesin-A 2% epinephrine lidocaine 1.7 mL), rubber dam was applied and disinfected with chlorhexidine. All the caries were removed with the help of a round bur using a slow-speed handpiece, after which the pulp chamber was opened and mesiobuccal (MB) distobuccal (DB) and palatal (P) canals were negotiated. Some troughing was performed with the help of an ultrasonic tip (sonic scaler tip #1 universal, American Distance Education Consortium (ADEC), USA) after which MB2 was also negotiated. It was at this point that another palatal canal was noted and therefore the access opening was further modified and the second palatal canal was successfully instrumented (figure 2).

A combination of electronic apex locator (Root ZX, J. Morita Corp, Tustin, California, USA) and periapical radiographs were used to determine the working length, which was 19.5 mm in MB and

Figure 1 Preoperatively X-ray showing the maxillary first molar with well-circumscribed radiolucencies associated with mesial as well as distal roots.

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Figure 2 Shows isolated maxillary first molar with mesiobuccal (MB) distobuccal (DB), mesiobuccal 2 (MB2), mesiopalatal (MP) and distopalatal (DP) canals.

DB, and 21 mm in MP and DP. MB2, however, could not be negotiated further than 10 mm.

The canals were then filled with non-setting calcium hydroxide (Calcipulp, Specialites Septodont, Saint-Maur, France) and the tooth temporised (Cavit, ESPE, Seefeld, Germany). After a week, the patient returned to the dental clinic for completion of treatment, without any discomfort.

All canals were then prepared with Protaper nickel titanium rotary instruments (Dentsply-Maillefer, Ballaigues, Switzerland) and RC-Prep (Hawe Neos Dental, Bioggio, Switzerland). Copious irrigation with 5% sodium hypochlorite was performed during the shaping and cleaning procedure. A preobturation radiograph was taken, which showed that the length in all canals needed improvement (figure 3). Canal preparation was then modified to achieve the corrected length. Canals were dried with paper points, coated with Sealapex (Kerr Manufacturing Co) and obturation was performed using cold lateral technique (figure 4).

Subsequently, the tooth was again temporised and post-treatment radiograph was taken (figure 5).

OUTCOME AND FOLLOW-UP

The outcome was successful and the patient was advised a full coverage crown.

DISCUSSION

The literature is full of countless in vitro, in vivo studies and case reports, a testimony to the anatomical variation in the human maxillary molar; consequently, the clinician should not only expect these variations but in fact look for them.⁵⁻⁸

Recently, it has become quite fashionable to use various modern techniques such as illumination, surgical microscopes and microendodontic instruments to locate extra canals. Although these instruments are important aids, it is the author's opinion that a keen eye, philosophical belief and firm resolve

Figure 3 Preobturation radiograph showing that length needs improving in all canals.

are far more important tools for negotiating and treating extra-canals, as was demonstrated in the presented case where no such modern equipment was available. This was also demonstrated by Sempira and Hartwell.^{9 10}

Preoperatively, availability of two angled X-rays should be mandatory. Especially in the case of maxillary molars, there is superimposition of roots on one another, making radiographic assessment of additional canals impossible on a single projection. The presence of a palatogingival groove can also be a clue towards the presence of extra palatal canals or two palatal roots.¹¹ After accessing the chamber, careful evaluation of

Figure 4 Postobturation view showing mesiobuccal (MB), distobuccal (DB), mesiobuccal 2 (MB2), mesiopalatal (MP) and distopalatal (DP) canals.

Figure 5 Postobturation X-ray depicting the two palatal canals. MB, mesiobuccal; DB, distobuccal; MP, mesiopalatal; DP, distopalatal canals.

developmental grooves, meticulous use of DG 16 explorer and use of magnification, if available, should be used. Any remaining dentine projections should be removed carefully with the help of ultrasonic devices.¹² The presence of an eccentrically placed file on radiograph should also raise suspicion of presence of an extra canal. The effervescence of sodium hypochlorite on the pulp at the orifices of these extracanals may help to localise them.¹³

The canal configuration found in our case can be classified as type IV, that is, one root with two canals having separate apical foramen;⁶ the literature case reports mainly mention the presence of type IV and type V canal configuration if two orifices are present in the maxillary palatal root.¹⁴

In our case, we also found MB2, the incidence of which ranges from 56.8% to as high as 90% in some studies; it had a type II morphology, which is the more common canal configuration of the mesial root of the maxillary molar.³

Dental Operating Microscopes (DOM) improve the light and magnification in the operating field, thereby increasing the ability to locate missed a canal and decreasing the risk of procedural errors. Several studies have demonstrated their advantages. Consequently, DOM should be considered as an important aid in contemporary endodontic practice.^{15 16}

We used a piezoelectric ultrasonic device to remove the dentinal ledge over the MB2. Yoshioka *et al*¹⁶ demonstrated increased ability to detect and negotiate MB2 when ultrasonics are used in conjunction with magnification.

Recently, the Cone Beam CT (CBCT) was introduced. The CBCT counteracts many disadvantages that the traditional

periapical radiograph is subjected to; it creates a geometrically correct three-dimensional image without anatomic noise. This can be especially useful in the maxillary molar area where periapical radiographs are sometimes difficult to interpret. Therefore, CBCT use in modern endodontic therapy where comprehensive endodontic evaluation is required cannot be disputed.¹⁷

This article demonstrates the successful management of a five canal maxillary first molar with two palatal canals. It also highlights the need for the clinician to look for anatomical variations that may occur in a tooth that might otherwise seem normal.

Learning points

- This article highlights the highly variable anatomy of the maxillary first molar.
- It emphasises the need to locate and treat anatomical variations that may be encountered in practise.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 Hartwell G, Appelstein CM, Lyons WW, *et al*. The incidence of four canals in maxillary first molars a clinical determination. *J Am Dent Assoc* 2007;138:1344–6.
- 2 Baratto Filho F, Zaitter S, Haragushiku GA, *et al*. Analysis of the internal anatomy of maxillary first molars by using different methods. *J Endod* 2009;35:337–42.
- 3 Cleghorn BM, Christie WH, Dong C. Root and root canal morphology of the human permanent maxillary first molar: a literature review. *J Endod* 2006;32:813–21.
- 4 Song M, Kim H-C, Lee W, *et al*. Analysis of the cause of failure in nonsurgical endodontic treatment by microscopic inspection during endodontic microsurgery. *J Endod* 2011;37:1516–19.
- 5 Sert S, Bayirli GS. Evaluation of the root canal configurations of the mandibular and maxillary permanent teeth by gender in the Turkish population. *J Endod* 2004;30:391–8.
- 6 Vertucci FJ. Root canal anatomy of the human permanent teeth. *Oral Surg Oral Med Oral Pathol* 1984;58:589–99.
- 7 Wasti F, Shearer AC, Wilson NHF. Root canal systems of the mandibular and maxillary first permanent molar teeth of South Asian Pakistanis. *Int Endod J* 2001;34:263–6.
- 8 Hasan M, Umer F. Endodontic retreatment of a mandibular first molar with five root canal systems: an important clinical lesson. *BMJ Case Rep* 2014;2014:bcr2013201402.
- 9 Iqbal M, Fillmore E. Preoperative predictors of number of root canals clinically detected in maxillary molars: a PennEndo database study. *J Endod* 2008;34:413–16.
- 10 Sempira HN, Hartwell GR. Frequency of second mesiobuccal canals in maxillary molars as determined by use of an operating microscope: a clinical study. *J Endod* 2000;26:673–4.
- 11 Shojaeian S, Ghoddusi J, Hajian S. A case report of maxillary second molar with two palatal root canals and a furcal enamel pearl. *Iran Endod J* 2013;8:37–9.
- 12 Norman Weller R, Hartwell GR. The impact of improved access and searching techniques on detection of the mesiolingual canal in maxillary molars. *J Endod* 1989;15:82–3.
- 13 Rajalbandi S, Shingte SN, Sundaresh KJ, *et al*. Aberration in the palatal root of the maxillary first molar. *BMJ Case Rep* 2013;2013:pil: bcr2013008641.
- 14 Holderrieth S, Gernhardt CR. Maxillary molars with morphologic variations of the palatal root canals: a report of four cases. *J Endod* 2009;35:1060–5.
- 15 Stropko JJ. Canal morphology of maxillary molars: clinical observations of canal configurations. *J Endod* 1999;25:446–50.
- 16 Yoshioka T, Kikuchi I, Fukumoto Y, *et al*. Detection of the second mesiobuccal canal in mesiobuccal roots of maxillary molar teeth ex vivo. *Int Endod J* 2005;38:124–8.
- 17 Scarfe WC, Levin MD, Gane D, *et al*. Use of cone beam computed tomography in endodontics. *Int J Dent* 2009;2009:634567.

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