
Endodontic management of a maxillary first molar with two palatal roots and a single fused buccal root diagnosed with spiral computed tomography - a case report

Velayutham Gopikrishna, MDS,^a Joseph Reuben, BDS,^b and
Deivanayagam Kandaswamy, MDS,^c Chennai, India

DEPARTMENT OF CONSERVATIVE DENTISTRY AND ENDODONTICS, MEENAKSHI AMMAL DENTAL
COLLEGE

The aim of this case report is to present an endodontically managed maxillary first molar with an unusual morphology of 2 palatal roots and a single fused buccal root. An accurate assessment of this morphology was made with the help of spiral computerized tomography, which revealed that the contralateral tooth also had a similar morphology. (*Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2008;105:e74-e78)

Variations in the root and root canal morphology, especially in multirouted teeth, is a constant challenge for diagnosis and management.¹ The dentist needs to be familiar with the various root canal configurations and their variations for successful endodontic therapy.² Vertucci³ proposed a standardized method for categorizing known root canal anatomic variations, and a more clinically relevant classification of the root canal anatomy was described by Weine.⁴ However, many variations exist, and it is important to evaluate each individual case for variations.⁵ Therefore, it is of utmost importance that all the canals are located and treated during the course of endodontic therapy.

The literature describes wide variations in root canal morphology of maxillary first molars. Cleghorn et al.⁶ did a comprehensive review of the root and root canal morphology of the maxillary first molar. Several cases of maxillary first molars with 2 palatal roots (Table I) and cases with fused buccal roots have been reported in the literature.⁷ The present case report presents the endodontic management of a maxillary first molar with 2 palatal roots and a single fused buccal root present bilaterally, a morphology that has not been reported so far. This unusual morphology was confirmed with the help of spiral computerized tomography (SCT).

Department of Conservative Dentistry and Endodontics, Meenakshi Ammal Dental College

^aReader.

^bPost-graduate student.

^cProfessor.

Received for publication Nov 19, 2007; accepted for publication Nov 20, 2007.

1079-2104/\$ - see front matter

© 2008 Mosby, Inc. All rights reserved.

doi:10.1016/j.tripleo.2007.11.022

CASE REPORT

A 25-year-old female patient reported to our clinic with a complaint of pain in the posterior right maxillary region for the preceding week. She gave a history of intermittent pain in the same region for the preceding 3 months. Her medical history was noncontributory. Clinical examination revealed a carious maxillary right first molar (tooth #3) with tenderness to percussion. The clinical and radiographic findings led to a diagnosis of acute apical periodontitis of the first right maxillary molar (#3), necessitating endodontic therapy.

Radiographic evaluation of the involved tooth indicated an unusual complex root canal anatomy (Fig. 1, A) with the roots superimposed on each other. The superimposition of the roots in the radiograph made the accurate assessment of the root anatomy unclear. Access opening was done after rubber dam isolation. Clinical examination revealed 3 distinct orifices: 2 palatally with 1 large buccal orifice (Fig. 1, B). Probing the buccal canal with a #10 K-file revealed the presence of 2 canals diverging from a single buccal orifice. Multiple working-length radiographs taken at different angulations (Fig. 1, C and D) with 1 file placed in each of the palatal orifices and 2 inside the single buccal orifice revealed the presence of 4 distinct canals superimposing on each other. However, the radiographs did not reveal the number and morphology of the roots clearly.

Therefore, to ascertain this rare and complex root canal anatomy of the tooth in a 3-dimensional (3D) manner, dental imaging with the help of a SCT was planned. Informed consent from the patient was obtained, and a multislice SCT of the maxilla was performed using the dental software Dentascan (GE HealthCare, Milwaukee, WI). A 3D image of the maxilla was obtained. The involved tooth was focused and the morphology was obtained in transverse, axial, and sagittal sections of 0.5 mm thickness (Fig. 2), along with 3D reconstructed images (Fig. 3). The images revealed that the right maxillary first molar had 2 palatal roots and a single fused buccal root with 2 canals. Incidentally, even the left maxillary first molar had a similar morphology with 2 palatal roots and a single fused buccal root with only 1 canal (Fig. 2). The

Table I. Review of case reports of extra palatal root in maxillary first molar

Reference	Study type	Key information
Barbizam et al. ¹⁵	Clinical RCT	1MB, 1DB, 2 palatal roots
Barbizam et al. ¹⁵	Clearing	2MB, 1DB, 2 palatal roots
Baratto-Filho et al. ¹⁶	Clinical RCT	1MB, 1DB, 2 palatal roots
Carlsen and Alexandersen ¹⁷	Study of extracted teeth	7 radix mesiolingualis
Christie et al. ¹⁸	Clinical RCT	1MB, 1DB, 2 palatal roots
Stone and Stroner ¹⁹	Clinical RCT	2 palatal roots
Thews et al. ²⁰	Clinical RCT	2 palatal roots
Slowey ²¹	Clinical RCT	2 palatal roots

RCT, root canal treatment.

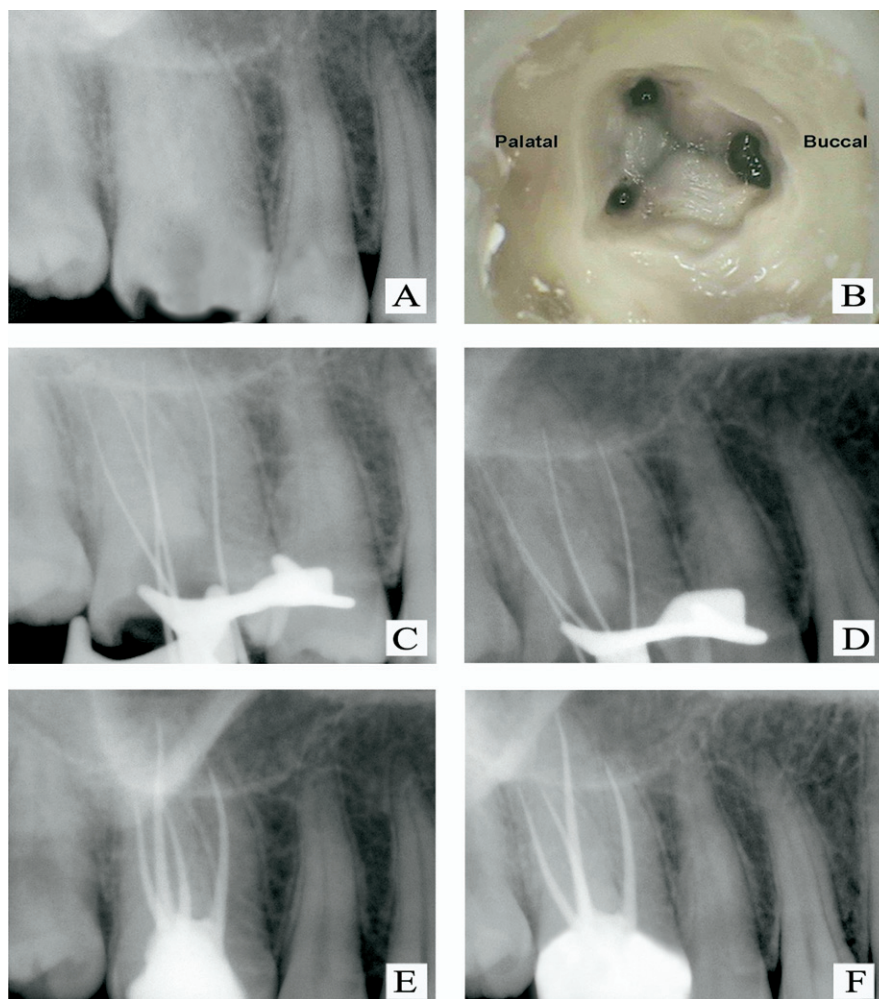


Fig. 1. **A**, Preoperative radiograph. **B**, Access opening of tooth #3. **C, D**, Multiple angulation working length radiograph of tooth #3. **E**, Postobturation radiograph of tooth #3. **F**, Recall radiograph of tooth #3 after 1 year.

working length was determined with the help of an apex locator (Root ZX; Morita, Tokyo, Japan) and later confirmed with a radiograph (Fig. 1, C and D). Cleaning and shaping was done using Protaper NiTi rotary instrumentation (Dentsply Maillefer, Ballaigues, Switzerland). Irrigation be-

tween each instrument was done using 2.5% sodium hypochlorite solution and 17% EDTA. The root canal space was obturated using cold lateral compaction of gutta-percha and a resin-based sealer, Topseal (Dentsply Maillefer; Fig. 1, E). The tooth was then restored. Subsequent follow-up revealed

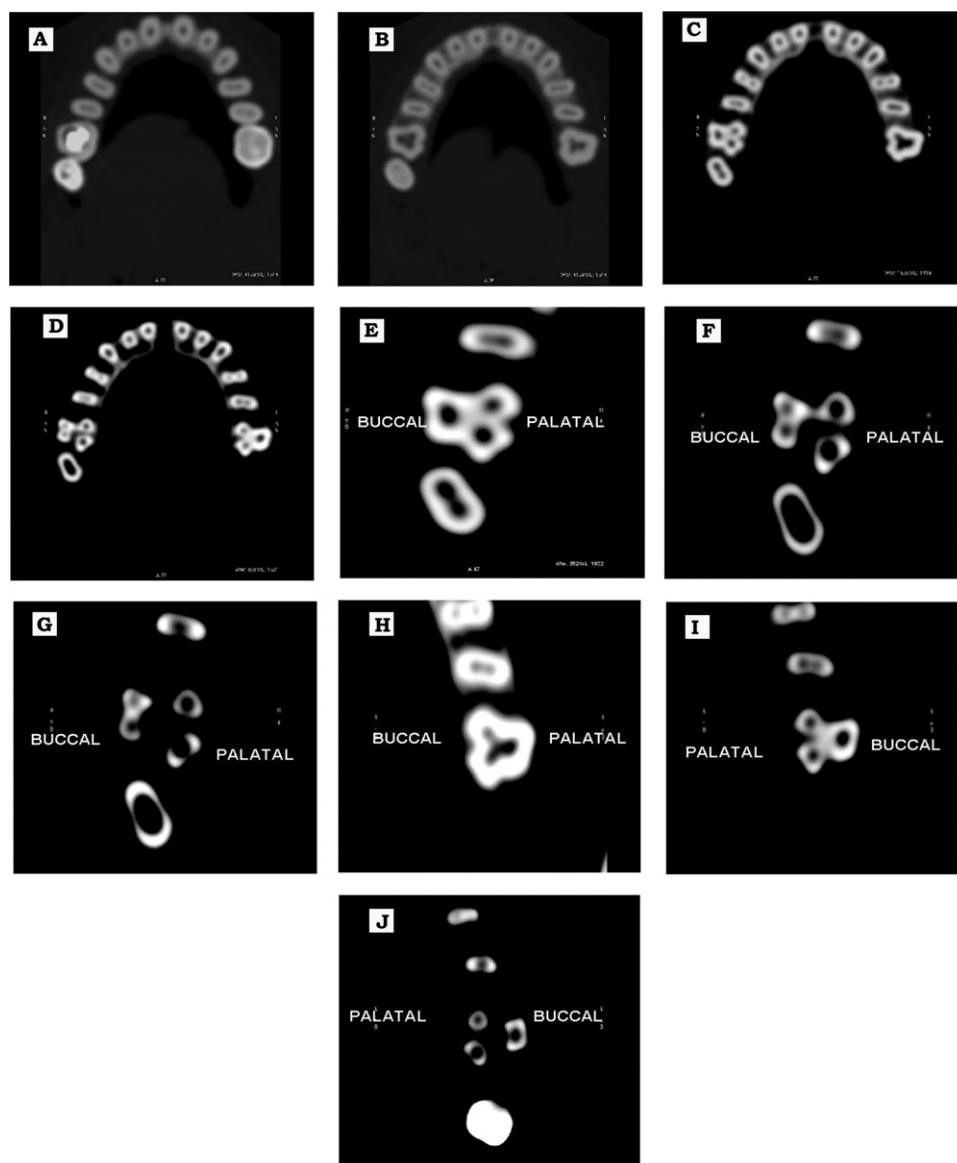


Fig. 2. **A-D**, Axial section spiral computerized tomography (SCT) image of the maxillary arch. **E-G**, Enlarged axial section SCT image of tooth #3 showing 2 palatal roots and 2 canals in the fused buccal root. **H-J**, Enlarged axial section SCT image of tooth #14 showing the 2 palatal roots and a single canal in the fused buccal root.

the patient to be clinically asymptomatic. Figure 1, F, shows the recall radiograph after 1 year.

DISCUSSION

Successful endodontic therapy requires thorough knowledge of the root and root canal morphology.^{2,5} Some of the common iatrogenic access opening errors, such as perforations and excessive removal of tooth structure, are caused during the search for missing or extra canals.⁸ A good knowledge of the general location and dimensions of the pulp chamber can reduce such iatrogenic errors. Krasner and Rankow in 2004

studied the relationship of the pulp chamber to the clinical crown and the pulp chamber floor.⁹ However, the literature is replete with cases that have extra canals/roots and cases with fused roots and fewer numbers of canals too.^{6,8}

It is generally accepted that the maxillary first permanent molar has 3 roots and 3 canals with an MB2 canal seen in 54.7% of the cases.⁶ The common deviation from this morphology is either fusion of roots or variation in the root/canal morphology of the mesiobuccal, distobuccal, or palatal root. Various



Fig. 3. A, B, 3-D reconstruction of tooth #3. C, D, 3-D reconstruction of tooth #14. E, F, 3-D reconstruction of the maxillary arch clearly showing the 2 palatal roots and the single fused buccal root of teeth #3 and #14.

case reports have enumerated the presence of an extra palatal root in the maxillary first molar (Table I). Other case reports have also dealt with the variations in the mesiobuccal and the distobuccal roots.⁶ The fusion of the 2 buccal roots of the permanent maxillary first molars has also been described in the literature. Sabala et al.⁷ reported fusion of the 2 buccal roots as the most common aberration of maxillary molars. They reported a 0.4% prevalence in the maxillary first molars and that when present it was bilateral in all cases.

However, in the present case report we suspected the presence of an extra palatal root in a maxillary first molar but instead found a maxillary first molar with 2 palatal roots and a single fused buccal root having 2 distinct canals. Interestingly, even the contralateral maxillary first molar showed a similar unusual morphology of 2 palatal roots. However, the fused buccal root in that tooth showed only a single canal.

Radiographs produce only a 2D image of a 3D object, resulting in superimposition of images. Therefore, they are of rather limited value in cases with complex root canal anatomy. Interpretation and appraisal based

upon a 2D radiograph may alert the clinician to the presence of aberrant anatomy but would not be able to present the variable morphologic structure of root canals and their interrelations.¹⁰ It is extremely important that clinicians use all of the armamentaria at their disposal to locate and treat the entire root canal system.¹¹ Based on previous studies done by Ballal et al.,¹² Gopikrishna et al.,⁸ Robinson et al.,¹³ and Sponchiado et al.,¹⁴ where SCT was used for the confirmatory diagnosis of morphologic aberrations in the root canal anatomy, SCT of the involved tooth was planned in the present case.

Table I summarizes the cases of 2 palatal roots that have been reported so far; the fusion of the 2 buccal roots is one of the most common aberrations of the maxillary first molar, with a 0.4% prevalence and 100% present bilaterally.⁷

Cleghorn et al.⁶ did a comprehensive review of the root and root canal morphology of the maxillary first molar. A thorough literature search revealed that the present case is the first reported incidence of a maxillary first molar with 2 palatal roots and a single fused buccal root present bilaterally.

CONCLUSION

We conclude that the present case report presents the endodontic management of an unusual case of a maxillary first molar with 2 palatal roots and a single fused buccal root with two canals and also highlights the role of SCT as an objective analytical tool to ascertain root canal morphology.

REFERENCES

1. Malagnino V, Gallottini L, Passariello P. Some unusual clinical cases on root anatomy of permanent maxillary molars. *J Endod* 1997;23:127-8.
2. Sert S, Bayirli GS. Evaluation of the root canal configuration of the mandibular and maxillary permanent teeth by gender in Turkish population. *J Endod* 2004;30:391-8.
3. Vertucci FJ. Root canal anatomy of the human permanent teeth. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1984;58:589-99.
4. Weine FS. *Endodontic therapy*. 6th ed. St. Louis: Mosby; 2004: 109-10.
5. Slowey RR. Root canal anatomy, road map to successful endodontics. *Dent Clin North Am* 1979;23:555-73.
6. Cleghorn BM, Christie WH, Dong CCS. Root and root canal morphology of the human permanent maxillary first molar: a literature review. *J Endod* 2006;32:813-21.
7. Sabala CL, Benenati FW, Neas BR. Bilateral root or root canal aberrations in a dental school patient population. *J Endod* 1994;20:38-42.
8. Gopikrishna V, Bhargavi N, Kandaswamy D. 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. *J Endod* 2006;32:687-91.
9. Krasner P, Rankow HJ. Anatomy of the pulp-chamber floor. *J Endod* 2004;30:5-16.
10. Holtzman L. Root canal treatment of mandibular second premolar with four root canals: a case report. *Int Endod J*. 1998;31:364-6.
11. Vertucci FJ. Root canal morphology and its relationship to endodontic procedures. *Endod Topics* 2005;10:3-29.
12. Ballal S, Sachdeva GS, Kandaswamy D. Endodontic management of a fused mandibular second molar and paramolar with the aid of spiral computed tomography: a case report. *J Endod* 2007;33:1247-51.
13. Robinson S, Czerny C, Gahleitner A, Bernhart T, Kainberger FM. Dental CT evaluation of mandibular first premolar root configurations and canal variations. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2002;93:328-32.
14. Sponchiado EC Jr, Ismail HA, Braga MR, de Carvalho FK, Simoes CA. Maxillary central incisor with two root canals: a case report. *J Endod* 2006;32:1002-04.
15. Barbizam JV, Ribeiro RG, Tanomaru Filho M. Unusual anatomy of the permanent maxillary molars. *J Endod* 2004;30:668-71.
16. Baratto-Filho F, Fariniuk LF, Ferreira EL, Pecora JD, Cruz-Filho AM, Sousa-Neto MD. Clinical and macroscopic study of maxillary molars with two palatal roots. *Int Endod J* 2002;35:796-801.
17. Carlsen O, Alexandersen V. Radixmesiolingualis and radix distolingualis in a collection of permanent maxillary molars. *Acta Odontol Scand* 2000;58:229-36.
18. Christie WH, Peikoff MD, Fogel HM. Maxillary molar with two palatal roots: a retrospective clinical study. *J Endod* 1991;17:80-4.
19. Stone LH, Stroner WF. Maxillary molars demonstrating more than one palatal root canal. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1981;51:649-52.
20. Thews ME, Kemp WB, Jones CR. Abberations in the palatal root and root canal morphology of the two maxillary first molars. *J Endod* 1979;5:94-6.
21. Slowey RR. Radiographic aids in the detection of extra root canal. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1974;37:762-72.

Reprint requests:

Dr. V. Gopikrishna
Department of Conservative Dentistry and Endodontics
Meenakshi Ammal Dental College
Alapakkam Main Road
Maduravoyal
Chennai-600 095
Tamil Nadu
India
hi_gopikrishna@hotmail.com