sciendo
10.2478/AMB-2025-0031

CASE REPORT

AN UNUSUAL CLINICAL PRESENTATION OF A MAXILLARY MOLAR WITH TWO PALATAL CANALS

R. Mascarenhas, S. Hegde

Department of Conservative Dentistry and Endodontics, Manipal College of Dental Sciences Mangalore, Manipal Academy of Higher Education, Manipal – Karnataka, India

Abstract. *This clinical scenario describes a maxillary first molar with four canals that required endodontic treatment. The pulp space morphology of the upper molar is highly intricate. The most notable changes include the existence of lateral and auxiliary canals, two palatal canals of the maxillary molar. A literature search turned up very few case descriptions of maxillary first teeth with four canals. This case illustration details the successful endodontic therapy performed on a maxillary first molar with four canals using intraoral periapical radiograph.*

Key words: *four canals, maxillary first molar, root canal therapy, endodontic treatment*

Corresponding author: *Shreya Hegde, Associate Professor, Department of Conservative Dentistry and Endodontics, Manipal College of Dental Sciences Mangalore, Manipal Academy of Higher Education, Manipal, Karnataka, India, tel: 00919945272327, email: shreya.hegde@manipal.edu*

ORCID: *0000-0003-3407-8685 – Roma Mascarenhas*

ORCID: *0000-0003-0730-0914 – Shreya Hegde*

Received: *10 November 2024;* ***Revised/Accepted:*** *13 January 2025*

INTRODUCTION

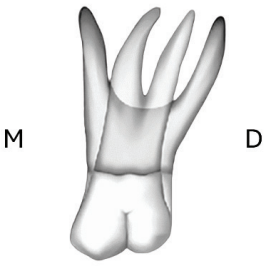
One of the most frequently treated and least understood teeth of dental arch is the maxillary first molar. Smadi and Khraisat report that orthograde root canal therapy has an increased rate of rejection in the maxillary first molar [1]. The failure is frequently brought on by the presence of additional canals that the clinician neglects to identify, instrument, and obturate. There have been reports of second mesiobuccal (MB) canals occurring between 33% and 96% ex vivo and 17-65% in vivo in the MB root of upper first molars [2-5].

In the uppermost first molars, three roots (mesiobuccal, distobuccal, and palatal) account for over 95% of the total. In 56.8% of instances, having more than two canals, the mesiobuccal root displays the largest anatomical heterogeneity [6]. The palatal root exhibits the least variability, with a 1-1 Vertucci's classification found in 99% and 98.8% of cases, respectively [6]. According to Stone and Stroner, molars of the maxilla with two palatal canals are incredibly uncommon [7].

The prevalence of a pair of palatal canals in the upper second molar ranged from 0.4% to 6.9%, based on conventional radiography assessment [8, 9]. A spectrum of 1.1-1.5% was reported by Kim et al. and Yang et al. using CBCT [10, 11]. A clinical example involving a Saudi female with a four-canalled second maxillary molar was recently described by Alenazy and Ahmad [12].

When Filho et al. gauged the internal anatomy of maxillary first molars using a variety of techniques,

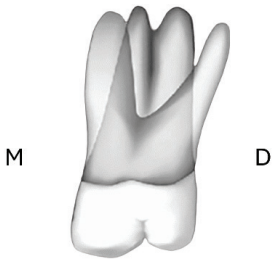
they discovered that the second palatal canal's incidence was 2.05% when assessed ex vivo, 0.65% when assessed clinically, and 4.55% when assessed using CBCT [13]. According to the level of divergence and root separation, they proposed the following classification:



TYPE I

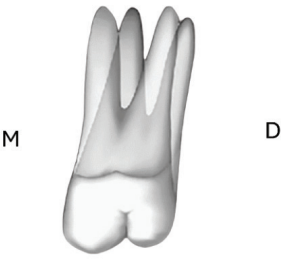
Type I molars have a cow horn form, two long, convoluted palatal roots, and significantly divergent buccal roots. They are also less divergent.

The characteristics of type II molars include buccal and lingual morphology, four independent, shorter roots running parallel to each other, and blunt tooth apices.



TYPE II

Dentin matrix is embedded in the mesiobuccal, distobuccal, and palatal type III molars. On its own, distobuccal root has the ability to split out and become distobuccal.



TYPE III

This case study focuses on the administration of the pulp space therapy of the upper first molar with a rare root anatomy, consisting of two palatal canals, one mesiobuccal, and one discobuccal canal.

CLINICAL CASE DESCRIPTION

The main problem of a 40-year-old male patient who presented to the conservative dentistry and endodontics department was decaying teeth in the upper right rear tooth region. The patient's medical record was not contributing. Upon clinical inspection, a large carious lesion was found on the mesial occlusal surface of the maxillary right first molar (#16), which was not sensitive to percussion. The existence of a deep mesio-occlusal carious lesion affecting the enamel, dentin, and approaching pulp with normal periapical architecture was discovered on the intraoral periapical radiograph of the patient (#16). Pulp vitality and pulp sensitivity testing on #16 was done to determine the health of a tooth's pulp and the results were deemed non-critical. Regarding #16, the diagnosis of pulp necrosis with asymptomatic apical periodontitis accepted after the clinical and radiographic evaluation. For #16 endodontic therapy was scheduled.

Management

Following the administration of local anaesthesia (2% lidocaine mixed with 1:80,000 epinephrine), caries was excavated, and Endoaccess bur no. 2 (Dentsply Maillefer) was employed to execute a traditional endodontic access cavity. The patient had bad gagging sensation, thus the rubber dam could not be secured and with a DG-16 endodontic explorer (HuFriedy, Chicago, IL, USA) for a clinical assessment, four distinct orifices were discovered: two palatal and two buccal (Figure 1). The working length was ascertained using a 10K file (Dentsply Maillefer, Switzerland) with apex locator Root ZX (J. Morita, USA) and radiographically established. To improve straight-line access, coronal extension was accomplished using Gates Glidden drills. Apical preparation of up to No. 25 K master files (Mani, Inc., Japan) was done of all the canals, and they were then heavily irrigated with either normal saline (0.9% wt/vol sodium chloride) or 3% sodium hypochlorite (Vishal Dentocare Pvt Ltd, India).

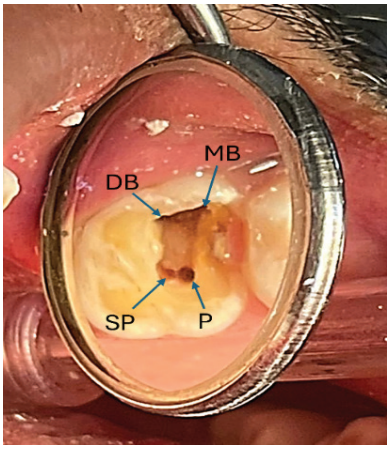


Fig. 1. Clinical photograph showing the presence of four canals: MB – Mesiobuccal canal, DB – Distobuccal canal, P – Palatal Canal and SP – Second Palatal canal in 16 after access cavity preparation

The crown down method with Protaper rotary system (Dentsply Inc, Maillefer, Dentsply India) was employed for pulp space preparation and enlarged – mesiobuccal, distobuccal up to F2 Protaper rotary file (Dentsply Inc, Maillefer, Dentsply India), palatal canal up to F3 Protaper rotary file and second palatal canal up to F1 Protaper rotary file. Irrigation protocol was followed with normal saline (0.9% wt/vol sodium chloride) and 3% sodium hypochlorite (Vishal Dentocare Pvt Ltd, India). To dry the pulp spaces, root canal

paper points (Dentsply Inc, Maillefer, Dentsply India) were used. Canals were then treated with non-setting calcium hydroxide (USP, Pulpodent, USA) after that. To temporarily close the access cavity, an intermediate restorative material (3M Cavit G Temporary Restorative – Gray, USA) was employed.

In the second visit, the pulp space was re-instrumented and irrigated with 3% sodium hypochlorite and saline 0.9% and then dried using paper points (Dentsply Inc, Maillefer, Dentsply India). Obturation was completed using lateral condensation technique with Protaper F2 Gutta Percha (Dentsply, Sirona, Dentsply India) and AH Plus sealer (Dentsply, Sirona, Dentsply India). The core build up was done with composite resin (Filtek Z 350 XT, 3M ESPE, St, Paul, MN, USA) (Figure 2). At all the course intervals, clinical and radiographic examinations were performed and the case was devoid of any symptoms clinically and radiographically.

DISCUSSION

Before beginning root canal therapy, it is usually necessary to consider the morphological variations of human teeth. The permanent dentition's most complex root canal structure is found in the upper second molars [14-16]. Because the pulp chamber has a conspicuously convex floor, the orifices have a slight funnel form. The canal orifices are also significantly more curved and shorter than those of the first molars. Stone and Stroner documented variations in the palatal canals of maxillary molar teeth [7]. Based on their assessment of 500 extracted teeth during a preclinical period, they explored whether the palatal root might display two canals with separated or bifurcated canals in a single root and two canals in separated roots.

For root canal treatment to be effective while dealing with cases with unforeseen pulp space morphology, an in-depth understanding of the dental architecture of each tooth and its numerous variations, a careful review of clinical radiographs, the application of the magnification, and a skilled assessment are all required [17,18]. Although there is considerable variation in the recorded root and canal morphology of upper molar teeth, it is generally believed that two palatal canals represent a rare occurrence. Most upper molars only have a single canal and one palatal root. Clinicians should consider this, despite its rarity, to diagnose and treat maxillary molars as effectively as possible. The precise inspection of the pulp chamber floor under magnification, thus the doctor's expertise, experience, and skill, and the evaluation of the periapical imaging at different angulations all played a part in the diagnosis and treatment of a second palatal canal in this particular case.

Before beginning treatment, variations in the pulp chamber morphology must always be taken into account. To accurately identify every root canal, thorough clinical and radiographic tests are also required. The pulp space anatomy of maxillary second molar teeth usually consists of three or four canals. The mesiobuccal root frequently contains the fourth canal [19]. However, in this instance, a fourth canal that runs from the pulp chamber to the root apex was discovered in the palatal root. Chen et al. have emphasized the necessity of more research when these kinds of discoveries arise [20]. The radiograph helped identify the location of the second canal by coincidentally revealing the bi-canal system. The fact that this case is thought to have had a single palatal canal emphasizes how important it is to remember that morphological variances are typically unanticipated and that we should react quickly to address any anomalies as they arise [21]. Cold lateral condensation as an obturation technique is widely applied because of its advantages of controlled placement of gutta percha in the root canal and low cost [22].

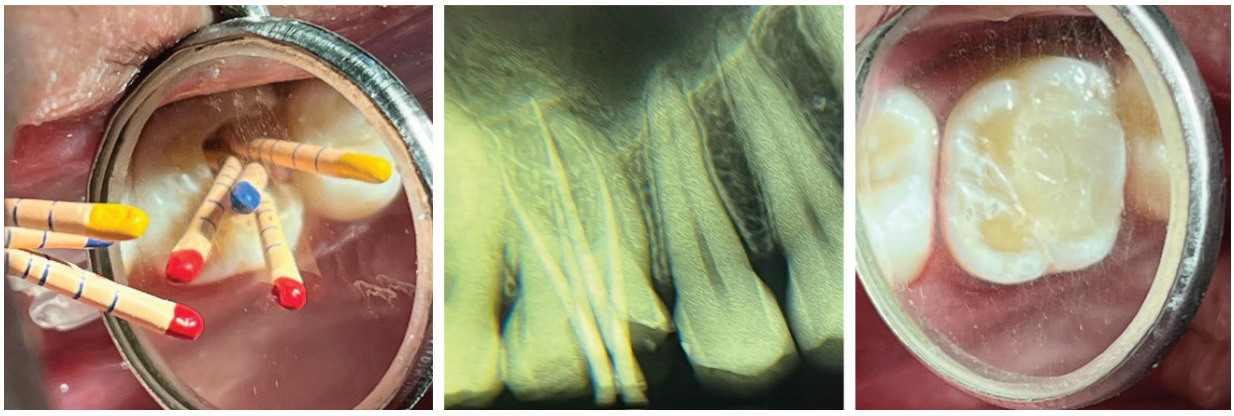


Fig. 2. Clinical and radiographic photograph showing the completed treatment in #16

CONCLUSION

Every tooth in the human dentition has a root canal morphology that includes several unusual features in addition to some common ones that can serve as a blueprint for successful endodontic procedures. Understanding that these variations exist is crucial for both treatment and diagnosis. To guarantee a successful endodontic outcome, it is imperative to highlight the need to look for distinct morphology and additional root canals.

CLINICAL SIGNIFICANCE

Every tooth has a different dental anatomy. Comprehending these variations is essential to the effectiveness of endodontic therapy, as misplaced and inadequately treated root canals can lead to complications. This is especially true with regard to the location and treatment of all canals. Successful clinical outcomes require a detailed understanding of the morphology of these teeth as well as a comprehensive clinical and radiographic assessment [23].

Authors Contribution Statement: *Concept, planning, supervision, and manuscript draft were done by RM and SH.*

Experimental work was completed by RM and SH.

The manuscript review and editing were done by the SH. All the authors have read, review and final approval for the completed manuscript.

Conflict of Interest Statement: *The authors declare that they have no conflicts of interest*

Funding: *The authors did not receive any financial support from any organization for this research work*

Ethical statement: *This study has been performed in accordance with the ethical standards as laid down in the Declaration of Helsinki*

Consent for publication: *Consent form for publication was signed by the patient and collected*

REFERENCES

1. Smadi L, Khraisat A. Detection of a second mesiobuccal canal in the mesiobuccal roots of maxillary first molar teeth. Oral Surg Oral Med Oral Pathol Oral Radiol Endod2007;103(3):e77-81.
2. Kobayashi C, Sunada I. Root canal morphology and its possibility for penetration. Part 3. maxillary molar. Jpn J Conserv Dent 1987;30:1674-83.
3. de Carvalho MC, Zuolo ML. Orifice locating with a microscope. J Endod 2000;26(9):532-4.
4. Hartwell G, Bellizzi R. Clinical investigation of in vivo endodontically treated mandibular and maxillary molars. J Endod 1982;8(12):555-7.
5. Stropko JJ. Canal morphology of maxillary molars: Clinical observations of canal configurations. J Endod 1999;25(6):446-50.
6. Cleghorn BM, Christie WH, Dong CC. Root and root canal morphology of the human permanent maxillary first molar: a literature review. Journal of Endodontics, 2006;32(9),813-821.
7. Stone H, Stroner WF. Maxillary molars demonstrating more than one palatal root canal. Oral Surgery, Oral Medicine, and Oral Pathology, 1981;51(6),649–652.
8. Libfeld H, Rotstein I. Incidence of four-rooted maxillary second molars: Literature review and radiographic survey of 1,200 teeth. J Endod 1989; 15:129-31.
9. Peikoff MD, Christie WH, Fogel HM. The maxillary second molar: Variations in the number of roots and canals. Int Endod J 1996; 29:365-9.
10. Kim Y, Lee SJ, Woo J. Morphology of maxillary first and second molars analyzed by cone-beam computed tomography in a Korean population: Variations in the number of roots and canals and the incidence of fusion.J Endod 2012;38:1063-8.
11. Yang B, Lu Q, Bai QX, et al. Evaluation of the prevalence of the maxillary molars with two palatal roots by cone-beam CT. Zhonghua Kou Qiang Yi Xue Za Zhi 2013; 48:359-62.
12. Alenazy MS, Ahmad IA. Double palatal roots in maxillary second molars: A case report and literature review. Saudi Endod J 2015; 5:56-60.
13. Filho B, Zaittar S, Haragushiku GA. Analysis of the internal anatomy of maxillary first molars by using different methods. J Endod 2009;35(3):337-342.
14. Alenazy MS, Ahmad IA. Double palatal roots in maxillary second molars: A case report and literature review. Saudi Endod J 2015; 5:56-60.
15. Badole GP, Bahadure RN, Warhadpande MM, Kubde R. A rare root canal configuration of maxillary second molar: A case report. Case Rep Dent 2012; 2012:767582.
16. Janeesha C, Priyadarshini H, Mithra NH, Ganssha T. Management of maxillary second molar with two palatal roots: A case report. Indian J Appl Res 2013; 3:518-9.
17. Ahmed H, Versiani M, De-Deus G, Dummer P. A new system for classifying root and root canal morphology. Int Endod J. 2017;50(8):761-770. doi:10.1111/iej.12685.
18. Al-Qudah A, Afaneh A, Hassouneh L. A Case Report of a Maxillary Second Molar with Two Distinct Palatal Canals, Confirmed by CBCT. Clin Cosmet Investig Dent. 2023; 15:199-203. https://doi.org/10.2147/CCIDE.S431563.
19. Pawar AM, Singh S. New classification for pulp chamber floor anatomy of human molars. J Conserv Dent. 2020 Sep-Oct;23(5):430-435. doi: 10.4103/JCD.JCD_477_20.
20. Chen K, Ran X, Wang Y. Endodontic treatment of the maxillary first molar with palatal canal variations: A case report and review of literature. World J Clin Cases. 2022 Nov 16; 10(32):12036-12044. doi: 10.12998/wjcc.v10.i32.12036.
21. Poorni S, Kumar A, Indira R. Maxillary first molar with aberrant canal configuration: A report of 3 cases. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2008 Dec; 106(6):e62-e65.19.
22. Bhandi S, Mashyakhy M, Abumelha AS, et al. Complete Obturation-Cold Lateral Condensation vs. Thermoplastic Techniques: A Systematic Review of Micro-CT Studies. Materials (Basel). 2021 Jul 18;14(14):4013. doi: 10.3390/ma14144013.
23. Singhal RK, Arora A, Arya A. Endodontic management of maxillary second molar with two palatal roots using cone-beam computed tomography. Endodontology 29(2):p 173-175, Jul–Dec 2017. | DOI: 10.4103/endo.endo_65_17.