

Opis primera: Endodontsko zdravljenje prvega zgornjega stalnega kočnika s tremi koreninami in šestimi koreninskimi kanali

Case report: Endodontic treatment of a permanent maxillary first molar with three roots and six root canals

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Ključne besede:

anatomija zob, morfologija koreninskih kanalov, zobozdravniški mikroskop, strojni endodontski instrumenti

Key words:

dental anatomy, root canal morphology, dental operating microscope, rotary endodontic instruments

Članek prispel / Received

8. 1. 2021

Članek sprejet / Accepted

10. 10. 2022

Izvleček

Namen: Namen prispevka je predstaviti diagnostiko in zdravljenje prvega zgornjega stalnega kočnika (PZSK) z nenavadno zapleteno morfologijo kanalskega sistema.

Poročilo o primeru: V primeru predstavljamo 30-letnega pacienta, ki je bil v specialistično ambulanto napoten zaradi nadaljevanja endodontskega zdravljenja levega PZSK. Zobozdravniku ni uspelo vzpostaviti prehodnosti kanalov v meziobukalni in distobukalni korenini. Na rentgenskem posnetku so bile vidne tri skoraj ravne korenine s periapikalnimi radiolucencami, značilnimi za periapikalni parodontitis. Med pregledom dna pulpne komore z zobozdravniškim mikroskopom smo ugotovili šest

Abstract

Purpose: This study aimed to report the diagnosis and management of a permanent maxillary first molar (PMFM) with unusually complex root canal morphology.

Case report: A 30-year-old male patient was referred to the endodontic department to continue endodontic treatment of the left PMFM. The referring dentist could not establish the patency of the canals in the mesiobuccal and distobuccal roots. Radiographically, the tooth had three almost straight roots associated with periapical radiolucencies, indicating periapical periodontitis. The examination of the pulp chamber floor, using a dental operating microscope, revealed the presence of six root canal

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vhodov v koreninske kanale – tri v
meziobukalni, dva v distobukalni in
enega v palatinalni korenini. Z ele-
ktronskim določevalnikom apikalne
odprtine in K-iglami nismo ugotovili
medsebojnega združevanja multiplih
kanalov. Med endodontskim zdravlje-
njem smo koreninske kanale razširili
in očistili z reciprocirajočimi nikelj-ti-
tanovimi instrumenti ter zapolnili z
gutaperčnimi poeni in biokeramično
polnilno pasto. Po dveh letih je pa-
cient na ponovnem pregledu bil brez
simptomov ter brez kliničnih in rent-
genskih znakov prisotnosti vnetja ob
zdravljenem zobu.

Zaključek: Povečava in ustrezna
osvetlitev omogočata natančen pre-
gled dna pulpine komore, kar je
ključnega pomena pri obravnavi zob
z zapleteno morfologijo kanalskega
sistema. Med endodontskim zdravlje-
njem je treba upoštevati, da ima v
nekaterih primerih PZSK več kot štiri
koreninske kanale.

orifices, three in the mesiobuccal root,
two in the distobuccal root, and one
in the palatal root. No confluence of
multiple canals was detected using
the electronic apex locator and K-fi-
les. The canals were shaped and cle-
aned with reciprocating nickel-titani-
um instruments and obturated using
gutta-percha cones and a bioceramic
sealer. After 2 years, the patient was
asymptomatic and the tooth was cli-
nically and radiographically without
pathological findings.

Conclusion: Careful examinati-
on of the pulp chamber floor using
magnification and illumination is
important for successfully managing
complex canal morphologies. During
endodontic treatment, dentists must
consider that the PMFM may have
more than four root canals.

INTRODUCTION

The detection and management of variations in root canal morphology, especially in permanent maxillary first molars (PMFMs), present a constant challenge for a clinician (1, 2). Although PMFMs have three roots, four root canals have been found in more than half of the cases, in which the mesiobuccal (MB) root has two canals (3). Variants with more than four root canals are uncommon; however, a maximum of eight root canals have been detected clinically: three in the MB root, three in the distobuccal (DB) root, and two in the palatal (P) root (4). The present study provided insight into the internal anatomy of the PMFM with six root canals and suggestions for detecting and managing multiple root canals.

CASE PRESENTATION

A 30-year-old male patient presented for the continuation of the endodontic treatment of the left PMFM. The referring dentist was not able to establish patency of the canals in the MB and DB roots. After several sessions, the tooth was left open for more than a year. The patient did not report any other health problems. The tooth was asymptomatic, physiologically mobile, and not sensitive to percussion. Radiographically, the tooth had three apparently straight roots associated with periapical radiolucencies, indicating periapical periodontitis (Fig. 1).

The tooth was anesthetized using 2% mepivacaine with epinephrine and isolated using a rubber dam. Under a dental operating microscope (OPMI Pico,

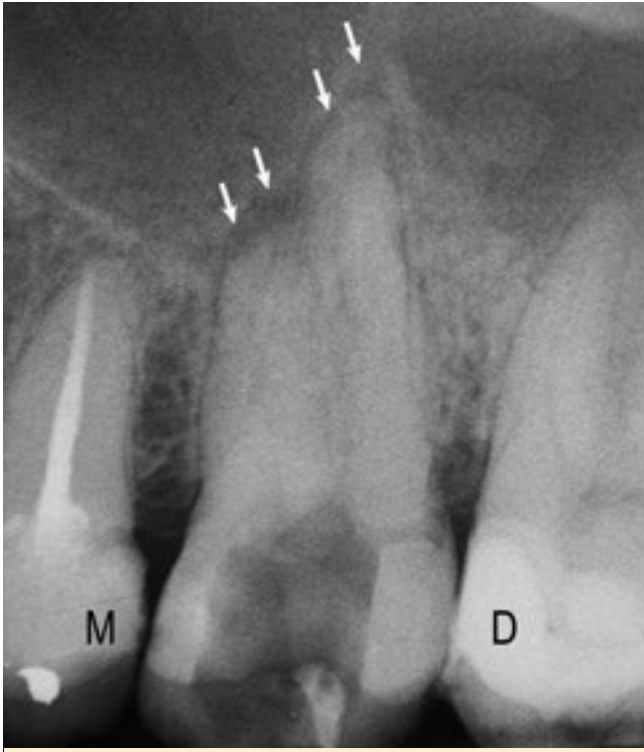


Figure 1. Preoperative periapical radiograph of the left maxillary first molar showing severe calcification of the root canals and periapical radiolucencies (arrows). M, mesial side; D, distal side.

Zeiss, Zaventem, Belgium), the access cavity was reshaped.

The inspection and probing of the pulp chamber floor with an endodontic explorer revealed the presence of one palatal (P), two DB, and three MB root canal orifices (Fig. 2). The patency of the canals was established manually using K-files of sizes 8 and 10. No confluence of multiple canals was detected using an electronic apex locator and K-files. The canals were shaped and cleaned using Reciproc nickel-titanium rotary instruments (VDW Dental, Munich, Germany). The R50 was suitable in size for the P canal and the R25 for all other root canals. Throughout the treatment, 2.5% NaOCl was used as an irrigant. After shaping, the canals were rinsed with 17% ethylenediaminetetraacetic acid and 2.5% NaOCl according to the protocol of manual dynamic activation described by Machtou (5). Finally, the canals were dried with sterile paper points and obturated using Reciproc gutta-percha cones and TotalFill BC

Sealer (FKG Dentaire, La Chaux-de-Fonds, Switzerland) (Figs. 3 and 4).

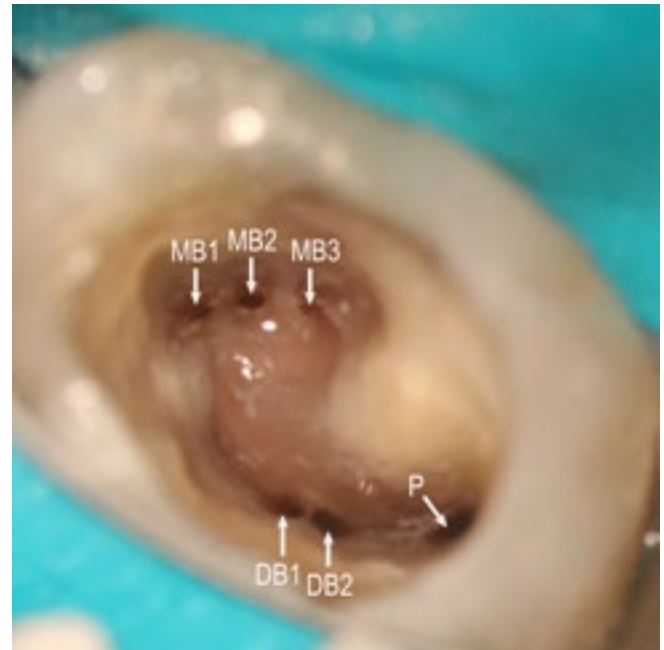


Figure 2. Access cavity during treatment. Arrows show one palatal (P), two distobuccal (DB1 and DB2), and three mesiobuccal root canal orifices (MB1, MB2, and MB3).

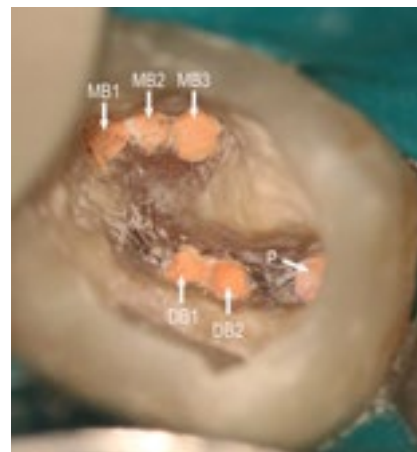


Figure 3. Access cavity after completed obturation. Arrows show endodontic fillings in all six root canals.

A composite restoration was placed (Fig. 5). After 2 years, the patient was asymptomatic and the tooth was clinically and radiographically without pathological finding (Fig. 6).

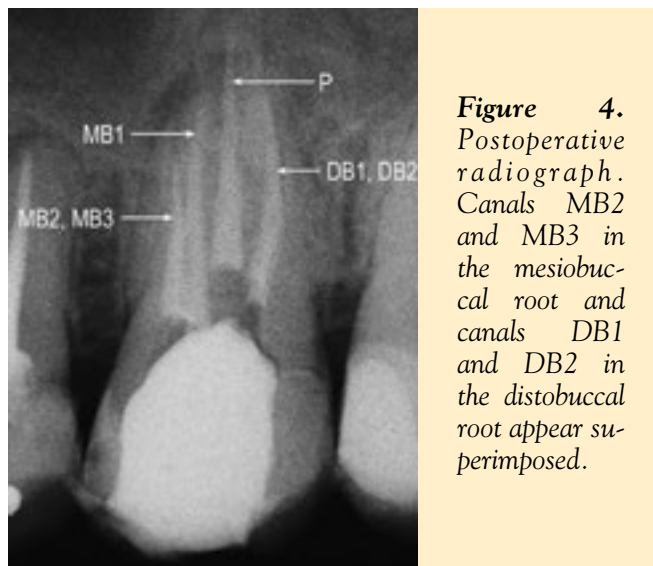


Figure 4. Postoperative radiograph. Canals MB2 and MB3 in the mesiobuccal root and canals DB1 and DB2 in the distobuccal root appear superimposed.

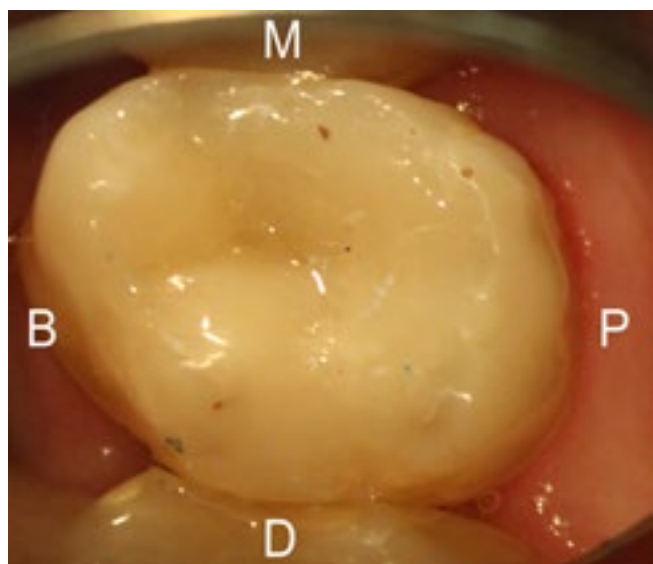


Figure 5. Restored crown after the endodontic treatment. M, mesial; D, distal; B, buccal; P, palatal.

DISCUSSION

The prevalence of PMFMs with six root canals is relatively small. A retrospective assessment of 338 endodontically treated PMFMs in Spanish patients identified three teeth (0.89%) with a root canal anatomy that matched the case in this study (6). In a similar Brazilian study of 291 PMFMs, one tooth (0.35%) had six root canals; however, contrary to the case discussed in this study, two canals were present in each of the three roots (7). A microcomputed tomography study



Figure 6. A 24-month recall radiograph.

of MB roots of 153 extracted PMFMs revealed three separate canals in one tooth (0.65%) (8).

The external crown morphology presents no clues to the presence of unusually complex canal anatomy when the number of roots is normal. In the patient discussed in this study, the size and external morphology of the crown and images of the roots on the preoperative radiograph were unremarkable. It is reasonable to take a cone-beam computed tomography (CBCT) scan when suspecting a complex morphology because 2D imaging is relatively inaccurate for the detection of additional canals (9). However, even in these cases, CBCT should not be used routinely, but only after

Careful consideration of the benefits and risks for the patient (9, 10). In our patient, CBCT was not indicated because periapical radiography and clinical aids provided all the key data necessary for the completion of the treatment.

Magnification and careful examination of the pulp chamber floor and wall anatomy can greatly increase the chances of uncovering additional root canals. Moreover, staining the pulp chamber floor with 1% methylene blue dye, performing the NaOCl “champagne bubble” test, and searching for bleeding points can aid in locating additional root canal orifices (11).

In addition to these technical advancements, knowledge of anatomical variations that might exist in the root canal system is crucial.

As Trope and Debelian (12) emphasized, a clinician will never find more root canals than he or she is looking for.

CONCLUSION

During endodontic treatment, dentists must consider that PMFM may have more than four root canals.

REFERENCES

1. Cleghorn BM, Christie WH, Dong CC. Root and root canal morphology of the human permanent maxillary first molar: a literature review. *J Endod.* 2006;32(9):813–21.
2. Caliřkan MK, Pehlivan Y, Sepetçiođlu F, Türkün M, Tuncer SS. Root canal morphology of human permanent teeth in a Turkish population. *J Endod.* 1995;21(4):200–4.
3. Vertucci FJ. Root canal anatomy of the human permanent teeth. *Oral Surg Oral Med Oral Pathol.* 1984;58(5):589–99.
4. Kottoor J, Velmurugan N, Surendran S. Endodontic management of a maxillary first molar with eight root canal systems evaluated using cone-beam computed tomography scanning: a case report. *J Endod.* 2011;37(5):715–9.
5. Machtou P. Manual Dynamic Activation (MDA) Technique. In: Basrani B, editor. *Endodontic Irrigation: Chemical disinfection of the root canal system.* Cham: Springer International Publishing; 2015. p. 149–55.
6. Martínez-Berná A, Ruiz-Badanelli P. Maxillary first molars with six canals. *J Endod.* 1983;9(9):375–81.
7. Baratto Filho F, Zaitter S, Haragushiku GA, de Campos EA, Abuabara A, Correr GM. Analysis of the internal anatomy of maxillary first molars by using different methods. *J Endod.* 2009;35(3):337–42.
8. Kim Y, Chang SW, Lee JK, Chen IP, Kaufman B, Jiang J, et al. A micro-computed tomography study of canal configuration of multiple-canal mesio-buccal root of maxillary first molar. *Clin Oral Investig.* 2013;17(6):1541–6.
9. AAE and AAOMR Joint Position Statement: Use of Cone Beam Computed Tomography in Endodontics 2015 Update. *Oral Surg Oral Med Oral Pathol Oral Radiol.* 2015;120(4):508–12.
10. Patel S, Durack C, Abella F, Shemesh H, Roig M, Lemberg K. Cone beam computed tomography in Endodontics – a review. *Int Endod J.* 2015;48(1):3–15.
11. Cantatore G, Berutti E, Castellucci A. Missed anatomy: frequency and clinical impact. *Endodontic Topics.* 2006;15(1):3–31.
12. Trope M, Debelian GJ. *Endodontics manual for the general dentist:* Quintessence Publishing Company; 2005.