

## Diagnosis and Retreatment of a Two-Rooted Maxillary Central Incisor with the Aid of Cone Beam Computed Tomography

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### ABSTRACT

To successfully perform root canal therapy, the practitioner must have a thorough knowledge of the tooth anatomy both internally and externally. The maxillary central incisor is known to have only one root and one root canal. This case report describes the retreatment of a failing maxillary central incisor and how computerized tomography is of benefit in identifying additional canals in the tooth.

**Keywords:** Maxillary central incisor; Tooth morphology; Retreatment; Cone beam computed tomography

### INTRODUCTION

It is well known that successful endodontic treatment depends on the thorough cleaning, shaping, and disinfection of the entire root canal system, complete obturation and coronal seal. Knowledge of tooth and root canal morphology is essential to obtain successful treatment. Being aware that every so often there are variations from the norm. Therefore, careful radiographic evaluation and interpretation are critical.

Permanent maxillary central incisors have one root canal almost 100% of the time [1]. This report presents a clinical case of the retreatment of a maxillary central incisor with two roots and two root canals, with the aid of cone beam computer tomography (CBCT).

### CASE REPORT

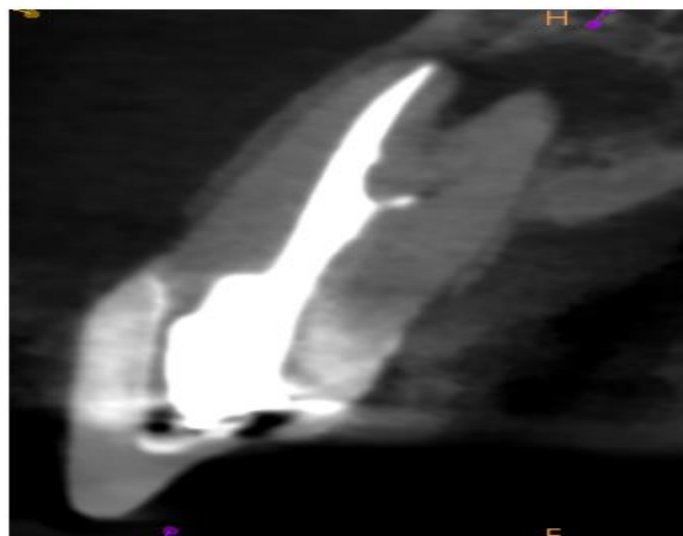
A 47-year-old Caucasian female patient with a suspicious radiolucency associated with tooth #9 (maxillary left central incisor) was referred to our graduate endodontic clinic for evaluation. The tooth was sensitive to percussion, and no swelling was noted. All probing depths were within normal limits with no mobility. Several periapical radiographs were taken along with a small field CBCT image. The CBCT images confirmed the suspicion of unusual root anatomy and periapical radiolucency associated with the palatal root of tooth #9. After clinical examination, it was decided to

attempt to retreat and locate the untreated palatal canal. Apical surgery was not ruled out. The patient was informed of possible complications.

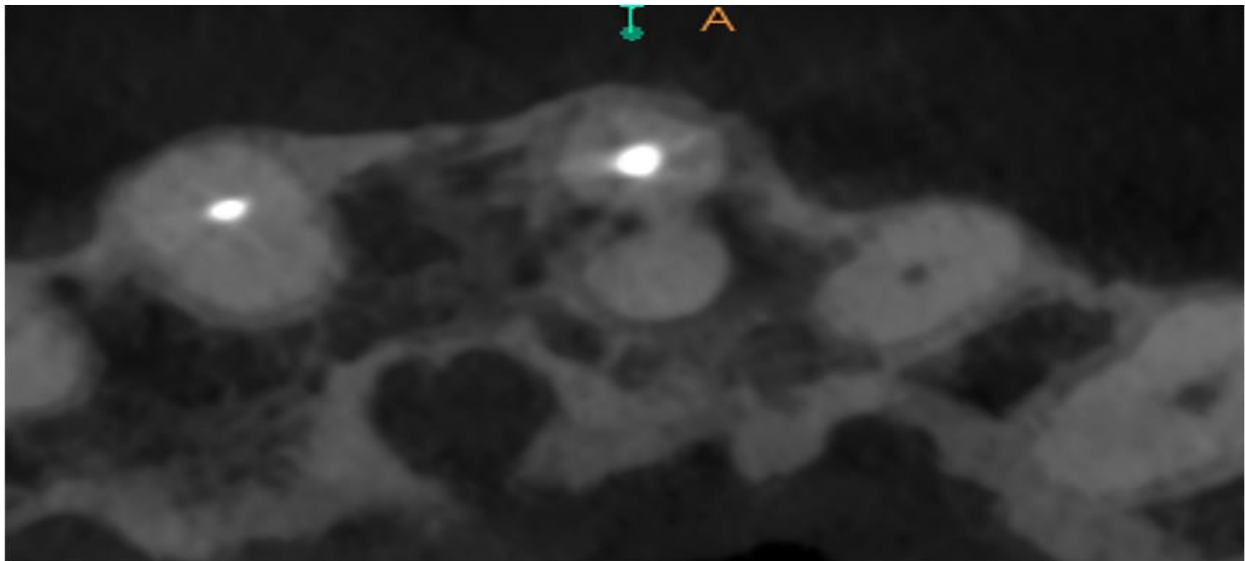
The existing root canal appeared to be filled with a carrier base obturation. Tooth #9 had a permanent full-coverage crown. The tooth was isolated using the rubber dam technique. Number 4 round diamond burs were used to gain access in a highspeed handpiece along with copious water spray. After access, two carrier fillings were removed from the facial canal using a braided technique (#25 Hedstrom hand-files were coiled around the carrier after chloroform was used to soften the gutta-percha). The palatal canal space was located after the removal of the existing gutta-percha. Canal lengths were determined with an electronic apex locator. The canals were shaped using rotary files. During the shaping procedure, sodium hypochlorite was used continuously. The canals were then dried with small tip suction and paper points. The canals were filled using a bio-ceramic sealer (BC Sealer, Brasseler, Savannah, GA, USA) and single cone ISO gutta-percha. The access was filled with a composite filling material (Build-It, Pentron/Kerr, Orange, CA, USA).



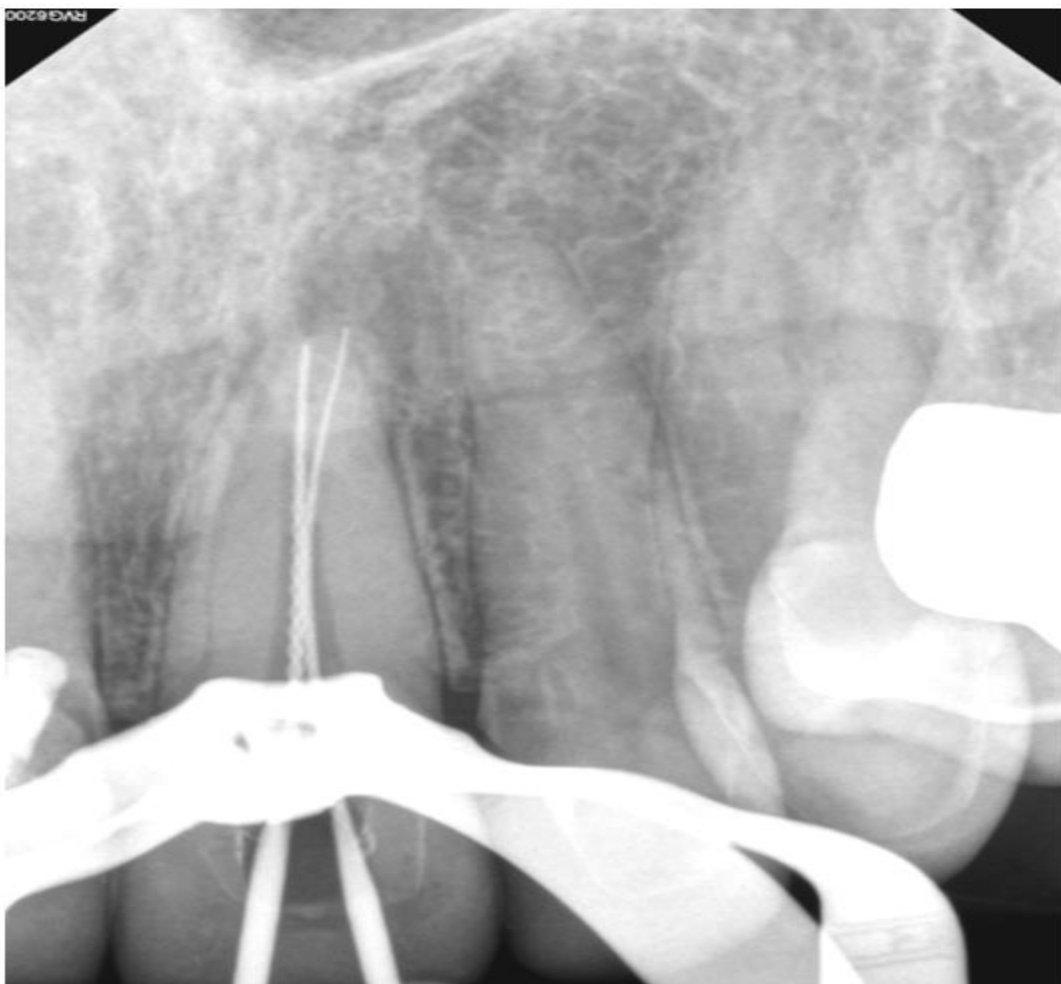
**Figure 1:** Preoperative radiographs #9.



**Figure 2A:** Pre-operative CBCT sagittal view #9.



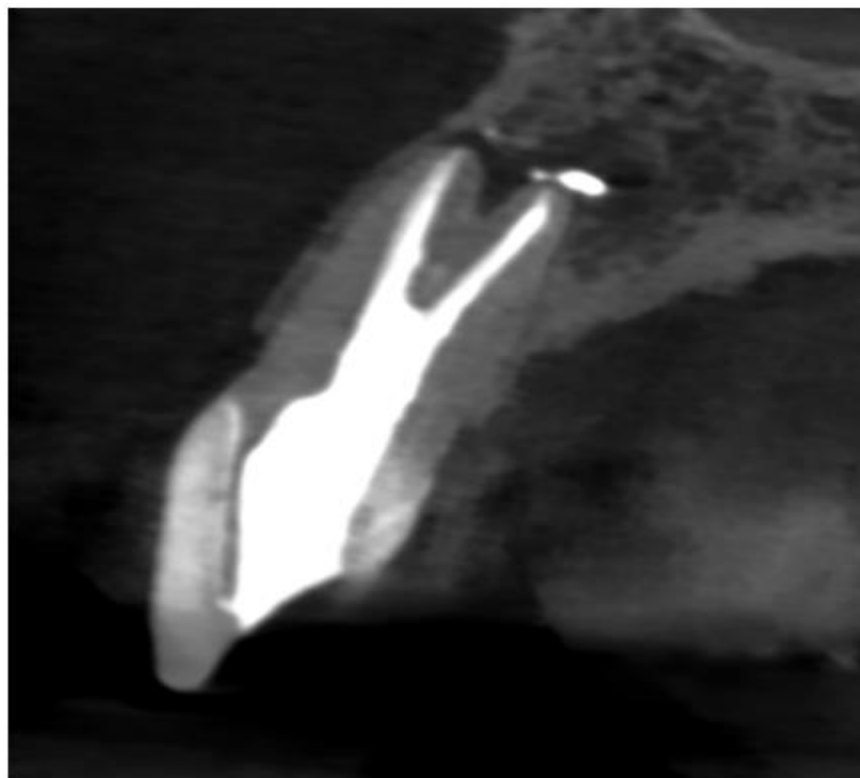
**Figure 2B:** Preoperative CBCT axial view #9.



**Figure 3:** GP removed and WL established #9.



**Figure 4:** Obturation complete #9.



**Figure 5:** One-year follow-up CBCT sagittal view #9.

## DISCUSSION

Detection, cleaning, and shaping of the root canals are important factors for a successful endodontic treatment. Endodontic diagnostic decisions are made through radiographic interpretation [2]. Proper radiographic techniques and interpretations are essential when initiating root canal therapy. Our awareness of unusual anatomy has become much improved as our 3D imaging has advanced. This case demonstrates that it is of utmost importance to keep a keen eye for the possibility of unusual tooth root anatomy.

Missed canals have been previously reported in the range of 12-23% [3-7]. Rouhani *et al.* [7] showed a high prevalence of missed canals and periapical lesions in endodontically treated teeth. This report describes an unusual case of a maxillary incisor with two root canals that was mainly diagnosed with CBCT. From a clinical standpoint, the tooth had no different features than the contralateral tooth.

Similar two-rooted maxillary incisors have been described [8-23].

Although conventional radiographs can reveal the additional canal, it may produce radiographic artifacts. Additionally, radiographs are two-dimensional and do not provide a fully accurate image of the root. In this case report, the use of CBCT was important to visualize the second root canal. CBCT is important as it allows a 3D image of the tooth providing a complete assessment of the root canal, including volumetric measurements [24-27].

For the use of CBCT in endodontics the most indicated protocol should have a smaller field of view and higher spatial resolution; [28] however, a higher radiation dose may be necessary. De Lima *et al.* [28] evaluated the accuracy of an optimized CBCT protocol for the detection of intraoperative endodontic complications. They concluded that in most conditions, irrespective of the presence of metallic materials, the values of accuracy, sensitivity, specificity, and area under the receiver operating characteristic curve did not differ significantly between the dose protocols used [28].

A report by Taintor & Ross [29] showed that general practitioners are not very aware of the different morphological variations of the root canal system. Therefore, careful diagnosis should be stressed when performing any root canal treatment.

## REFERENCES

1. Vertucci FJ. Root canal anatomy of the human permanent teeth. Oral Surg, Oral Med, Oral Pathol. 1984;58(5):589-599.
2. Reit C, Gröndahl HG. Endodontic retreatment decision making among a group of general practitioners. Scand J Dent Res 1988;96(2):112-117.
3. Karabucak B, Bunes A, Chehoud C, Kohli MR, Setzer F. Prevalence of apical periodontitis in endodontically treated premolars and molars with untreated canal: a cone-beam computed tomography study. J Endod. 2016;42(4):538-41.
4. Mashyakhy M, Hadi FA, Alhazmi HA, Alfaifi RA, Alabsi FS, Bajawi H, et al. Prevalence of missed canals and their association with apical periodontitis in posterior endodontically treated teeth: A CBCT Study. Int J Dent. 2021;2021:9962429.
5. Costa F, Pacheco-Yanes J, Siqueira Jr J, Oliveira A, Gazzaneo I, Amorim C, et al. Association between missed canals and apical periodontitis. Int Endod J. 2019;52(4):400-6.

6. Baruwa AO, Martins JNR, Meirinhos J, Pereira B, Gouveia J, Quaresma SA, et al. The influence of missed canals on the prevalence of periapical lesions in endodontically treated teeth: A cross-sectional study. J Endod. 2020;46(1):34-9.e1.
7. Rouhani A, Aboutorabzadeh SM, Reyhani M, Kheirabadi N, Mortazavi S, Navabi S. Prevalence of missed canals in endodontically treated teeth: A cone-beam computed tomography study. J Clin Exp Dent. 2023;15(8):e605-e611.
8. Sinai IH, Lustbader S. A dual-rooted maxillary central incisor. J Endod. 1984;10(3):105-06.
9. Patterson JM. Bifurcated root of upper central incisor. Oral Surg Oral Med Oral Pathol. 1970;29(2):222.
10. Heling B. A two-rooted maxillary central incisor. Oral Surg Oral Med Oral Pathol. 1977;43(4):649.
11. Michanowicz AE, Michanowicz JP, Ardila J, Posada A. Apical surgery on a two-rooted maxillary central incisor. J Endod. 1990;16(9):454-5.
12. Rao Genovese F, Marsico EM. Maxillary central incisor with two roots: a case report. J Endod. 2003;29(3):220-1.
13. Gonzalez-Plata RR, Gonzalez-Plata EW. Conventional and surgical treatment of a two-rooted maxillary central incisor. J Endod. 2003;29(6):422-4.
14. Drent T, de Baat C. A two-rooted maxillary incisor. Ned Tijdschr Tandheelkd. 2006;113:33-5.
15. Hatton JF, Ferrillo PJ, Jr. Successful treatment of a two-canaled maxillary lateral incisor. J Endod. 1989;15(5):216-8.
16. Matta MS. Two-rooted maxillary central incisor: A case report. Iranian Endod J 2012;7(4):215-218.
17. Lin WC, Yang SF, Pai SF. Nonsurgical endodontic treatment of a two-rooted maxillary central incisor. J Endod. 2006;32(5):478-81.
18. Aydemir S, Helvacioglu-Yigit, Sinanoglu A, Ozel E. Retreatment of a maxillary lateral incisor with two separate root canals confirmed with cone beam computed tomography. J Clin Med Res. 2015;7(7):560-563.
19. Christie WH, Peikoff MD, Acheson DW. Endodontic treatment of two maxillary lateral incisors with anomalous root formation. J Endod. 1981;7(11):528-534.
20. Friedman S, Mor H, Stabholz A. Endodontic therapy of a fused permanent maxillary lateral incisor. J Endod. 1984;10(9):449-451.
21. Maghsoudlou A, Jafarzadeh H, Forghani M. Endodontic treatment of a maxillary central incisor with two roots. J Contemp Dent Pract. 2013;14(2):345-7.
22. Ravindranath M, Neelakantan P, Subba Rao CV. Maxillary lateral incisor with two roots: a case report. Gen Dent. 2011;59(1):68-9.
23. Thompson BH, Portell FR, Hartwell GR. Two root canals in a maxillary lateral incisor. J Endod. 1985;11(8):353-355.
24. Thomas AR, Soe HHK, Silva CS, Kaur H, Ganendrah LD, Gomez LM. Comparison of accuracy and reliability of CBCT and 3D laser scanner in the volumetric assessment of the root canal space. Am J Dent. 2023;36(5):246-250.

25. Rodríguez G, Patel S, Durán-Sindreu F, Roig M, Abella F. Influence of cone-beam computed tomography on endodontic retreatment strategies among general dental practitioners and endodontists. J Endod. 2017;43(9):1433-1437.
26. Arkhipova A, Bovanova N, Lastovichek D, Ramonova A, Generalov E, Byakova S. Radiographic criteria for differential diagnosis between vertical root fracture and apical periodontitis in single-rooted endodontically treated premolars using cone-beam computed tomography. J Endod. 2024;50(3):329-335.
27. Chugal N, Assad H, Markovic D, Mallya SM. Applying the American Association of Endodontists and American Academy of Oral and Maxillofacial Radiology guidelines for cone-beam computed tomography prescription: Impact on endodontic clinical decisions. J Am Dent Assoc. 2024;155(1):48-58.
28. de Lima JP, Mazzi-Chaves JF, de Sousa-Neto MD, Candemil AP. Could low-dose cone-beam CT be used for endodontic intraoperative diagnosis? J Endod. 2023;49(9):1161-1168.
29. Taintor JF, Ross PN. Opinions and practices of American Endodontic Diplomates. Dent J. 1978;44(7):321-5.