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## Case Report

### Endodontic Management of a Rare Four-Rooted Maxillary Second Molar

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#### ABSTRACT:

The presence of additional roots and root canals in maxillary second molars is a rare anatomical variation that can complicate endodontic management. This case report describes the diagnosis and successful nonsurgical root canal treatment of a four-rooted maxillary second molar, highlighting the importance of careful radiographic evaluation and magnification in achieving a favorable clinical outcome.

**Keywords:** Maxillary second molar, Four roots, Root canal morphology, Endodontic management, Anatomical variation

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#### INTRODUCTION

Maxillary molars are known for their wide range of canal arrangements. Typically, MSMs have three roots: one located on the palate side, one on the mesiobuccal side, and another on the distobuccal side, with usually one canal in each root<sup>1</sup>. Failing to locate and properly treat all root canals is one of the main reasons for unsuccessful root canal procedures<sup>2</sup>. Nevertheless, the internal anatomy of these teeth can be unpredictable. Often, incomplete cleaning or filling of undetected canals is a key factor behind treatment failure<sup>2</sup>. Missed canals tend to occur because of their complex shapes, limited exploration, or the constraints of traditional two-dimensional (2D) X-rays<sup>3</sup>. When untreated, these hidden canals can harbor bacteria, leading to ongoing inflammation around the tip of the root, reinfection, and ultimately, failure of the treatment. In endodontics, understanding the detailed root canal morphology is crucial because success hinges on thoroughly cleaning, shaping, and sealing all the existing pathways.

Research has documented various rare configurations of root and canal structures in MSMs. Peikoff et al. described six main types, with the most common being three separate roots and canals, accounting for around 56% of the cases. Following that are cases with three roots and four canals - specifically, two

mesiobuccal canals - making up about 22.7%. Other variations include two roots with merging canals (9%), two separate roots (6.9%), a single root (3.1%), and less commonly, four roots with two palatal canals (1.4%)<sup>4</sup>.

This case report aims to highlight the significance of advanced diagnostic imaging and careful clinical evaluation in identifying and managing less common anatomical variations in maxillary second molars. Specifically, it presents the endodontic management of an MSM with two buccal and two separate palatal roots - detected using CBCT - underscoring the importance of comprehensive canal mapping and precise diagnosis in achieving treatment success.

#### CASE PRESENTATION

A 28-year-old female patient with non-contributory medical history reported to the department of Conservative Dentistry and Endodontics, RUHS CODS, Jaipur with the chief complaint of pain in upper left back tooth regionsince 1 month. The patient mentioned undergoing a root canal treatment attempted by a general dentist one week prior.

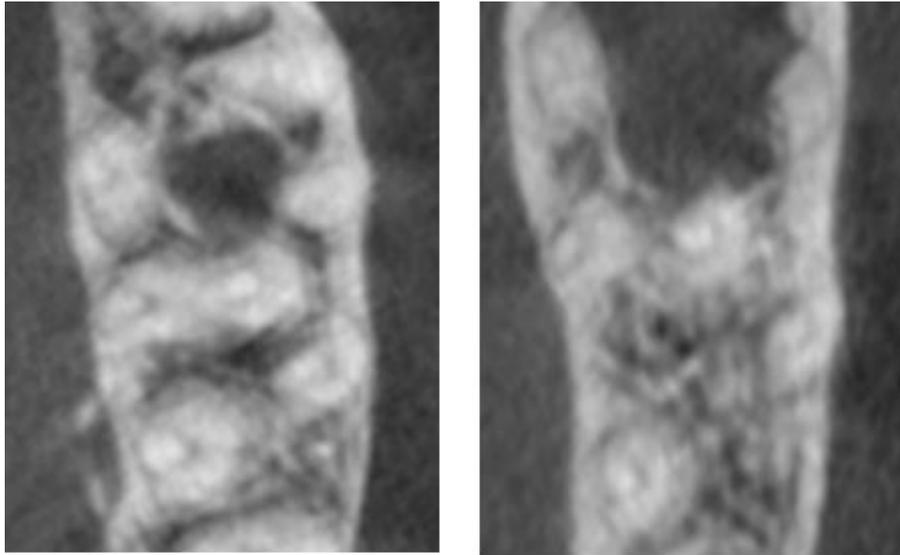
Clinical examination revealed aocclusally carious left maxillary second molar(#27)which was tender on percussionand A diagnostic radiograph of maxillary left second molar showed previously initiated root

canal treatment. Also, slight widening of PDL space was seen. And when radiograph taken from mesial distal angulation extra root outline was seen (figure 1). Hence, to ascertain this complex root canal anatomy of the tooth in a three-dimensional manner, Cone Beam Computed Tomography – Limited FOV- 5\*5cm (Carestream CS9300 Imaging system, Carestream Health, Inc New York, USA) was planned (Figure 2). Based on clinical and radiographic examinations, the tooth was diagnosed as previously initiated root canal therapy with symptomatic apical periodontitis. After discussing various treatment options with the patient, local anesthesia was delivered using buccal infiltration of lidocaine with epinephrine (Dentsply Pharmaceutical, York, PA, USA) to start non-surgical root canal retreatment (NSRCRTx). The tooth was isolated with a rubber-dam ((ColteneWhalent, USA)) and an triangular access cavity was prepared and Careful exploration of the pulp chamber floor with an endodontic explorer DG-16 was done and Locate three canals mesiobuccal, distobuccal and palatal. On the basis of the palatal canal being placed more mesially than at the center, The access cavity outline was extended distally and changed from triangular to a more trapezoidal form and the fourth canal orifice was located( figure 3). The canal patency was checked for all the four canals by #10 Kfiles (MANI) and the working length was determined using an electronic

apex locator(Root ZX mini, J Morita, Tokyo, Japan)) and confirmed with a radiograph( figure 4). Following the working length determination, the mesio buccal and distobuccal root canal was enlarged with Ni-Ti rotary files (Coltene Hyflex CM) up to 25 (0.04 taper) under copious irrigation till working length and mesiopalatal and distopalatal canal enlarged up to 25 (0.06 taper) till the working length . Irrigation was done using 5% sodium hypochlorite(Hyposol, PrevestDenPro, Ltd., India) solution (2ml/canal) during each instrumentation and activated by sonic(SuperEndo Sonic Activator, Waldent Innovations Pvt. Ltd., India) irrigation for 30 seconds. Final irrigation was done using Sodium Hypochlorite for 1 minute followed by 17% EDTA(Prime Dental Products Pvt. Ltd.,India) for 1 minute followed by flushing with saline. Canal was dried using absorbent paper point Calcium hydroxide(Prime Dental Products Pvt. Ltd.,India) dressing was given for 1 week and the access cavity was sealed with Cavit(Prime Dental Products Pvt. Ltd.,India)). At the second visit, the canals were irrigated with NaOCl and dried & Master cone radiograph was taken(figure 5). Obturation was done using single cone technique using AH Plus Root Canal Sealer (Dentsply DeTrey, Germany). Permanent restoration was done using composite( 3M ESPEfiltek350XTUSA )figure6)



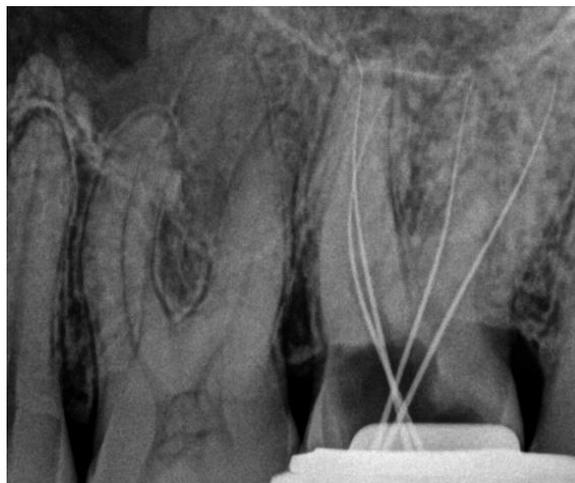
**Figure 1: Preoperative Radiograph**



**Figure 2: Cone Beam Computed Tomography (Axial Section)**



**Figure 3: Clinical Picture**



**Figure 4: Working Length Radiograph**



**Figure 5: Master Cone Radiograph**



**Figure 6: Post Endodontic Radiograph**

## DISCUSSION

The maxillary second molar usually has two buccal roots and a palatal root. Four rooted maxillary second molar is a rare condition. Table 1 shows incidence of four rooted maxillary second molar by various authors. Christie et al.<sup>8</sup> in 1991 have proposed a classification system describing three types (I-III) of four rooted maxillary second molar abnormalities, based on root separation level and their divergences.

Type I -with long tortuous divergent separate palatal roots

Type II -with short blunt and parallel roots

Type III -those with three convergent roots and distinctly divergent fourth distobuccal root..

The clinician should therefore give special attention to the evidence of the occurrence of anatomical variations throughout the procedure. The belief that a tooth has only a fixed number of roots and root canals is now obscure and it is very important that careful attention is paid to locate and treat the extra canals. Canals are often missed as the clinician fails to locate them successfully. Difficulties during

endodontic treatment of maxillary second molar are due to its posterior position, superposition of anatomical structures in radiograph (such as zygomatic arch) leads to failure of diagnosing unusual anatomy<sup>9</sup>.

Radiographic examination is an essential component of the management of endodontic problems. The amount of information gained from conventional radiographs and digitally captured periapical radiographs is limited by the fact that the three dimensional anatomy of the area being radiographed is compressed into a two-dimensional image.<sup>10</sup> Thorough knowledge of anatomical variations and frequent anomalies in the region besides multiple radiographs with different angles or cone-beam computed tomography (CBCT) could be helpful, the advantage over the conventional radiograph it being the three-dimensional image and also allows the operator to look at multiple slices of tooth roots and their root canal systems. CBCT images always result in the identification of the greater number of root canal systems than digital images.<sup>11</sup>

## CONCLUSION

Hence a good knowledge of internal anatomy, possible normal variations, use of multiple angulated radiographs are necessary as missed extra canals or roots could lead to root canal treatment failure. The

additional uses of newer diagnostic aids like CBCT may also help in diagnosing and locating extra canals. Hence not knowing the internal anatomy of the tooth we are treating is like setting out on an unknown journey without a road map.

Author	Study Type	Country	1 Root	2 Root	3 Roots	4 Roots
Nikoloudaki GE <sup>5</sup> (2017)	CBCT	Greece	5.4%	8.2%	85.07%	1.24%
Neelkanthan et al. <sup>6</sup> (2018)	CBCT	India	0.9%	5.8%	93.1%	-
H.M.Alamri et al. <sup>7</sup> (2020)	CBCT	Saudi Arabia	0.3%	6.6%	92%	1.1%

## REFERENCES

- Libfeld H, Rotstein I. Incidence of four-rooted maxillary second molars: literature review and radiographic survey of 1,200 teeth. *J Endod.* 1989;15:129–131. doi: 10.1016/S0099-2399(89)80134-7.
- García-Guerrero C, Delgado-Rodríguez CE, Molano-González N, Pineda-Velandia GA, Marín-Zuluaga DJ, Leal-Fernandez MC, Gutmann JL. Predicting the outcome of initial non-surgical endodontic procedures by periapical status and quality of root canal filling: a cohort study. *Odontology.* 2020;108:697–703.
- Patel S, Brown J, Pimentel T, Kelly RD, Abella F, Durack C. Cone beam computed tomography in endodontics - a review of the literature. *Int Endod J.* 2019;52:1138–11
- Peikoff MD, Christie WH, Fogel HM. The maxillary second molar: variations in the number of roots and canals. *Int Endod J.* 1996;29:365–369.
- Nikoloudaki G, Kontogiannis T, Kerezoudis N. Evaluation of the Root and Canal Morphology of Maxillary Permanent Molars and the Incidence of the Second Mesiobuccal Root Canal in Greek Population Using Cone-beam Computed Tomography. *Open Dentistry J.* 2015; 9.
- Neelakantan P, Subbarao C, Ahuja R, Subbarao CV, Gutmann JL. Cone-beam computed tomography study of root and canal morphology of maxillary first and second molars in an Indian population. *J Endod.* 2010 Oct;36(10):1622-7.
- Madfa AA, Almansour MI, Al-Zubaidi SM, Alghurayes AH, AlDakhayel SD, Alzoori FI, Alshammari TF, Aldakhil AM. Cone beam computed tomography analysis of the root and canal morphology of the maxillary second molars in a Hail province of the Saudi population. *Heliyon.* 2023 Aug 26;9(9):e19477.
- Christie WH, Peikoff MD, Fogel HM. Maxillary molars with two palatal roots: A retrospective clinical study. *J Endod.* 1991;17:80-4.
- Ajinkya M, Pawar, Contemporary endodontic management of four rooted maxillary second molar using waveOneContemp. *Clin Dent.* 2014 Jan-Mar;5(1):130–133
- Patel S, Dawood A, Whaites E, Pitt Ford T. New dimensions in endodontic imaging: Part 1. Conventional and alternative radiographic systems. *Int Endod J.* 2009;42:447–62.
- Matherne RP, Angelopoulos C, Kulild JC, Tira D. Use of cone-beam computed tomography to identify root canal systems in vitro. *J Endod.* 2008;34:87–9