

Endodontic Management of Four Rooted Maxillary Second Molar Using CBCT as A Diagnostic Aid -A Case Report

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Abstract: Successful Endodontic treatment depends upon Adequate knowledge about the morphology of root canal system and diagnosing the anatomic variants to avoid missed canals. Maxillary second molars usually present with two buccal and one palatal root. Occurrence of an extra palatal root is a rare scenario with prevalence of around 1.4%. The following case report describes endodontic management of maxillary second molar with an unusual morphology of two independent palatal roots identified using CBCT. The access cavity design was modified and the chemo-mechanical preparation of root canals was done using rotary NiTi files and a separated instrument was bypassed and obturation was done using Endocem MTA sealer.

Keywords: Anatomic Variations, CBCT, Radix Mesiolingualis, Endocem MTA.

I. Introduction

Knowledge of the morphology and an awareness of unusual anatomy are essential for the successful endodontic treatment. Undetected anatomical variations of roots or root canals which remain untreated are the main reasons for endodontic failure. DOW & INGLE have attributed a failure rate of 2.88% to unfilled canals during root canal therapy². Therefore thorough knowledge of roots and root canal morphology are essential. Maxillary molars are one of the most complex teeth by virtue of their multifaceted internal and external anatomy and second molar is no exception. A literature search revealed that various authors reporting these variations in the maxillary molars have used numerous terminologies to define their roots and canals. The second mesiobuccal canals which has been variously cited as MB₂, mesiopalatal, second mesiobuccal and the mesiolingual canals^{3,4,5,6}. It has been widely accepted as MB₂ subsequently the third mesiobuccal canal was termed as MB₃⁷. Also various authors have interchangeably used the term mesiopalatal to describe both the MB₂ as well as mesial of the two palatal canals.

Normally, maxillary second molar has mesiobuccal, a distobuccal and a palatal root. The presence of two palatal roots in the second maxillary molars is a rare phenomenon⁸. Peikoff et al observed 1.4% of maxillary second molar as having two palatal roots⁹. While Libfeld and Rotstein reported a 0.4% incidence of 4 rooted maxillary second molars.¹⁰ The four rooted anatomy in its various forms are very rare in the maxillary first molar. However it is more likely to occur in the second or third maxillary molar.^{10,11,12} There is higher tendency towards fusion of two or three roots. Whenever two palatal roots exist in maxillary molars, one of them is the normal palatal root, other is supernumerary structure which can be located either mesiolingually (radix mesiolingualis) or distolingually (radix distolingualis).¹³ Conventional radiographic interpretation of such anatomy is challenging due to the usual close relationship of these roots and the possible superimposition of zygomatic arch on radiographic images. Cone beam computed tomography (CBCT) views are beneficial in interpreting the morphology of these roots and their degree of separation from the adjacent root. This case also deals with the management of a separated instrument in a conservative approach.

II. Case Report

A 62-year-old male patient reported with the chief complaint of on and off swelling in upper left back tooth region for last few days. The pain was aggravated on mastication. The clinical examination revealed an old amalgam restoration with secondary caries and marginal fracture, and a draining sinus in relation to 27 in the buccal vestibule. The tooth was mildly tender on percussion. His medical history was non-contributory. Pulp sensitivity test were performed electric and thermal, which suggested tooth to be nonvital and intraoral periapical radiograph of 27 revealed a radiopaque restoration and an unclear outline of the palatal root (fig.1) a periapical lesion was present in relation to mesiopalatal root of 27. Based on clinical and radiographic examination, a diagnosis of Chronic Periapical Abscess with 27 was established. There was unclear outline of palatal root and a hazy bifurcation was observed in palatal root in the periapical radiograph giving an impression

of a second root. A CBCT was advised to confirm the finding. CBCT revealed the details 3 dimensionally and slices were obtained in coronal/axial and transverse sections. The presence of extra root was confirmed and viewed in buccal aspect (fig.2) and lingual aspect (fig.3). The axial section confirmed the root canal configuration and two distinct separate palatal roots were confirmed. Transverse sections revealed the root canal pattern which corresponded to Wein's type I anatomy.

After the confirmation of findings from CBCT the endodontic treatment was initiated in 27. The tooth was anesthetized and isolated under a rubber dam to prepare the access cavity. Since the extra root was present more mesiopalatally the shape of access cavity was modified to a trapezoidal shape extending in a mesio palatal direction to approach the extra orifice. Biomechanical preparation was done using K-file and Protaper Universal files (Densply Mallefer, Switzerland) in a crown down fashion and working length was established through electronic apex locator (Root ZX, JMorita, Japan). In spite of modification in the access cavity an instrument separation occurred in the mesiopalatal canal. The S2 instrument separated in the apical third which was first attempted to retrieve failing which it was bypassed using small k-files no. 6, 8, 10 and working length was achieved. The canals were irrigated with 2.5% sodium hypochlorite and 17% EDTA (Canallarge, Amdent, Italy) during cleaning and shaping. Calcium hydroxide was placed to disinfect the root canals as an intra-canal medicament and the mesiopalatal canal was observed for 2 weeks. The tooth being asymptomatic after 2 week cleaning and shaping was completed and master cone IOPA was taken (fig.5), obturation was done using gutta-percha points (Densply Mallefer, Switzerland) and MTA based endodontic sealer (Endocem MTA sealer, Marushi, Korea) by single cone hydrostatic condensation technique and access cavity was sealed with composite.

III. Discussion

Usual maxillary second molar has one palatal root and two buccal roots. Four rooted maxillary second molar is a rare condition some authors described few cases of maxillary second molars with two palatal roots or canals.^{8,12} Presence of extra canals or roots in the mesiobuccal portion of these teeth is more common^{14,15}. Difficulties during endodontic treatment of maxillary second molar are due to its posterior position, superposition of anatomical structures in radiograms such as zygomatic arch which leads to failure of diagnosis unusual anatomy. Also buccal roots of the same tooth could overlap the extra palatal root. Stone and Stoner reported variation of the palatal root of maxillary molars, such as a single root with two separate orifices, two separate canals and two separate foramina, two separate roots each with one orifice, one canal and one foramen, a single root with one orifice, a bifurcated canal and two separated foramina.¹⁶ Christie et al were the first to report the presence of an additional palatal root in maxillary molars and have reported 16 cases of maxillary molars with two palatal roots found during 40 yrs of clinical practice.

Peikoff et al (1996) demonstrated six variants of maxillary second molars in their study and their frequency of occurrence are as follows: 3 separate roots and 3 separate canals (56.9%), 3 separate roots and 4 canals (22.7%), 3 roots and canals whose mesiobuccal and distobuccal canals combine to form a common buccal with a separate palatal canal (9%), two separate roots with a single canal in each (6.9%), one main root and canal (3.1%), 4 separate roots and four separate roots and four separate canals including two palatal (1.4%) Carlsen and Alexandersen, has given the classification of four rooted maxillary molars teeth with accessory palatal roots

Radix Mesiolingualis- an accessory root that has direct affinity to the mesio palatal part of the maxillary molars crowns which is very pronounced. It can be separate and non separate

Radix Distolingualis- an accessory root that has direct affinity to the distopalatal part of maxillary molar crown which is very pronounced. It can be separate non separate or separate, non separate.

Radix Mesiolingualis/Distolingualis- both mesio palatal and distopalatal roots have direct affinity to the very pronounced mesio palatal and distopalatal part of the maxillary molar crown respectively. They can be separate, non separate or separate non separate.¹³

A properly designed and prepared access cavity is helpful for diagnosis and negotiation of root canal morphology. However, some of the common iatrogenic access opening errors are caused during the search for extra or missing canals. These errors include perforation and excessive tooth removal if the clinician carefully examines the pulp chamber floor and wall anatomy with the help of loupes or an endodontic microscope such iatrogenic errors can be minimized. In the present case access cavity was modified to a trapezoidal form to accommodate the orifice of the additional palatal canal and to achieve straight line access to all the canals, hence any tooth requiring endodontic treatment should be evaluated thoroughly for variations before initiating treatment.

In this case S1 instrument was separated in mesio-palatal canal. The reported incidence of fractured Niti rotary instruments varies from 0.4% to 4.4%. Pettietle et al 2002 and Spill et al 2005 discussed the two main causes for instrument fracture are flexural fatigue and torsional fatigue. The torsional fatigue occurs when the tip

or any other part of file is locked or bond with the canal while the shaft continues to rotate , as was in this case. Torsional stress can occur in 55.7% of fractured instruments.

Sattapan et al in 2000 stated that for preventing instrument fracture due to torsional stress a proper endodontic access cavity should be made, shaping should be done without applying apical pressure, use of lubricating agent /irrigants and instruments of proper taper. The separated instrument was first attempted to retrieve using manual technique, which was difficult to retrieve due to posterior position of the tooth and inaccessible location, the separated instrument was bypassed upto working length using K file. The prognosis in case of instrument fracture depends on the location and duration of fractured instrument. As before progressing to S1 initial cleaning and shaping was completed with manual K file and WL was achieved by bypassing the separated fragment. Decision to obturate the tooth with a MTA sealer was made after observing the tooth for 2 weeks with calcium hydroxide were it remained asymptomatic. A eight month follow up radiograph showed healing of the periapical region in the mesio palatal root apex.

Figures



Fig 1 A: Preoperative IOPA radiograph with 26 and 27, **B:** Preoperative picture with fractured amalgam restoration, **C:** draining sinus in the buccal vestibule .



Fig 2: Access opening and root configurations of 27.



Fig 3 A: palatal aspect of 27, **B:** buccal aspect of 27.

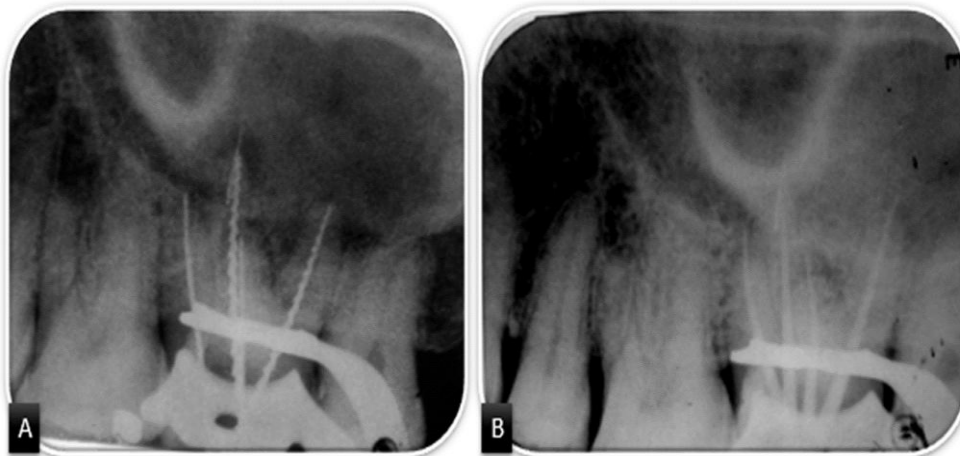


Fig 4 A: working length determination radiograph of 27, **B:** Master cone radiograph of 27

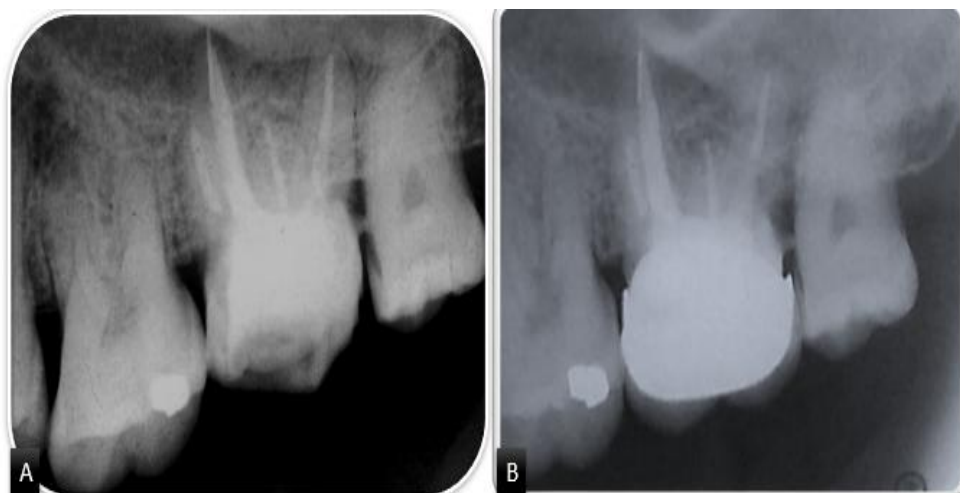


Fig 5 A: Obturation radiograph of 27, **B:** A eight month follow up radiograph.

IV. Conclusion

The present case report discusses the endodontic management of an unusual case of a maxillary second molar with four roots and four canals and also highlights the role CBCT as an objective analytic tool to ascertain root canal morphology.

References

- [1]. Siqueira JF Jr, Rocas IN. clinical implications and microbiology of bacterial persistence after treatment procedures. *J Endod* 2008;34:1291-301.
- [2]. Dow PR, Ingle JJ. Isotope determination of root canal failure. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1955;8:1100-1104.
- [3]. N.Adanir,"An unusual maxillary first molar with four roots and six canals:a case report," *Australian Dental Journal*, vol.52,no.4, pp.333-335,2007
- [4]. J.Kottoor, N.Velmurugan,R. Sudha, and S.Hemamalathi,"Maxillary first molar with seven root canals diagnosed with cone – beam computed tomography scanning :a case report" *Journal of Endodontics*, vol.36,pp.915-921,2010.
- [5]. K.Karthikeyan and S . Mahalaxmi," New nomenclature for extra canals based on four reported case of maxillary first molars with six canals," *Journal of Endodontics*,vol.36,no.6,pp.1073-1078,2010.
- [6]. A. Favieri,F.G.B.De Barros, and L.C.Campos,"Root canal therapy of a maxillary first molar with five root canal :case report,"*Brazilian Dental Journal*,vol.17,no.1,pp.75-78,2006.
- [7]. E.Ozcan,A.M.Aktan,and H. Ari," A case report: unusual anatomy of maxillary second molar with 3 mesiobuccal canals,"*Oral Surgery,Oral Medicine,Oral pathology,Oral Radiology and Endodontology*,vol.107,no.1,pp.e43-e46,2009.
- [8]. Christie WH, Peikoff MD, Fogel HM. Maxillary molars with two palatal roots:a retrospective clinical study.*J Endod*1991,17:80-4.
- [9]. Peikoff MD, Christie WH, Fogel HM. The maxillary second molar: variations in the number of roots and canals.*Int Endod J*1996,29;365-369.
- [10]. Libfeld H, Rotstein I. Incidence of four-rooted maxillary second molar : literature review and radiographic survey of 1200 teeth. *J Endod* 1989,15:129-131.
- [11]. Caliskan MK, Pehlivan Y, Sepetcioglu F, Turkun M, Tuncer SS. Root canal morphology of human permanent teeth in a Turkish population. *J Endod* 1995;21:200-204.
- [12]. Benenati FW. Maxillary second molars with two palatal canals and a palatogingival groove. *J Endod* 1985;11:308-310.
- [13]. Carlsen O, Alexander V. Radix mesiolingualis and radix distolingualis in a collection of permanent ,maxillary molars. *Acta Odontol Scand* 2000 oct;58(5):229-36.
- [14]. Lee JS. Root canal anatomy of Korean maxillary second molars using a cleaning method. *J Korean Assoc Conserv Dent* 1980;6:83-7.
- [15]. Kulild JC, Peters DD. Incidence and configuration of canal system in the mesiobuccal root of maxillary first and second molars. *J Endod* 1990;16:311-7.
- [16]. Stone LH, Stoner WF. Maxillary molars demonstrating more than one palatal root canal. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*.1981;51:649-52.