Maxillary second molar tooth with two palatal roots evaluated using cone beam computerized tomography: A case report.

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ABSTRACT

This case report presents theendodontic management of a deeply carious maxillary second molar tooth with two palatal roots and four root canals. The varied morphology associated with maxillary second molars is elaborately discussed. The root canal morphology in the present case is demonstrated using Cone beam computed tomography(CBCT).

KEYWORDS:

Anatomic variation, Maxillary, Palatal roots, Second Molar.

INTRODUCTION:

A proper cleaning and shaping of root canal system is essential for a successful endodontic treatment outcome. So a clinician must have thorough knowledge of the complexities of the rootcanal anatomy and its variations for executing endodontic treatment effectively.

Maxillary second molar usually has three roots, mesiobuccal, distobuccal and palatal, each with one canal.[1,2]A review of the literature demonstrates a wide variation in number of rootcanals and its form in maxillary second molars.According to the in-vitro study of Pecora et al, the maxillary second molar displayed three canals in 58% of cases and four canals in 42% of cases. The fourth canal was found in the mesiobuccal root of the teeth in 100% of these cases.[3]According to

Pineda and Kuttler, mesiobuccal root of maxillary molar has shown many variations like one canal and one foramen in 64.6%, one canal and two foramina in 14.4% of cases, two canals and one foramen in 8.2% of cases, two canals and two foramina in 12.8% of cases.[4]Variations reported in the invitro studies include four rooted teeth with two palatal roots having a single canal in each root with its occurrence ranging from 0.4% to 1.4%.[5,6]Various clinical case reports have been reported having extra palatal roots and/or canals.[7-9]Cases of maxillary second molar with three buccal roots and five roots have been previously reported in literature.[10,11]Alanishowed a case of bilateral fourrooted maxillary second molar with an extra palatal root, and Pasternak Junior et al reported a maxillary second molar with three roots having six canals (3 palatal,2 mesiobuccal and 1 distobuccal).[12,13] Other variations include taurodontismand asingle rooted maxillary molar with a single canal.[14,15] The present case reports a variation of root canal anatomy of maxillary second molar tooth with two palatal roots,each with a separate root canal evaluated with the help of Cone Beam Computerized Tomography (CBCT).

CASE REPORT

A 45-year-old apparently healthy female patient reported to the Department of Conservative Dentistry and Endodontics, SDM College of Dental Sciences, Dharwad with a chief complaint of dull pain in the upperleft back teeth. The medical history was non-contributory. Clinical examination revealed deep proximal caries in relation to the maxillary left second molar (#27).The tooth was not tender to vertical percussion and there were no signs of periodontal inflammation. Vitality tests showed abnormal response to cold and electric pulp testing.Preoperative radiographic investigation of the involved tooth showed evidence of proximal (mesial) caries approximating pulp. The tooth also showed a variation of root canal morphology with an extra palatal root on the radiograph. A diagnosis of chronic irreversible pulpitis was made for #27and endodontic treatment was planned.

After administration oflocal anaesthesia with 2% lignocaine containing 1:200,000 adrenaline (LOX*2%, Neon laboratories Ltd, Mumbai, India), an endodontic access was made under rubber dam isolation. Examination of the pulp chamber floor with an Hu-Friedy (Chicago IL)

DG-16 endodontic explorer and surgical operating microscope revealed four orifices mesiobuccal(MB),distobuccal(DB) mesio palatal (MP) and distopalatal (DP) orifices. After initial exploration of four canals with #10 K- Files (Mani,IncTochigi,Japan), coronal enlargement was done using Protaper orifice shaper Sx (DentsplyMaillefer, Ballaigues,Switzerland)(Fig 1).

The working length (WL) (Fig 2) was determined by Propexpixi (Densply) apex locator which was confirmed radigraphically. The root canals were cleaned and shaped using Protaper Ni-Ti rotary instrumentation (DentsplyMaillefer) with a crown down technique and copious irrigation with saline, 3% sodium hypochlorite solution, and 17% EDTA. Final Irrigation was done with 2% chlorhexidine. Calcium hydroxide intracanal medicament was placed and temporary access was sealed with Cavit (3M ESPE AG, Seefeld, Germany). After one week, since the tooth was asymptomatic, the root canal system was obturated using cold lateral condensation of gutta-percha and AH- Plus Sealer (DentsplyDetrey GmbH, Konstanz, Germany) after taking the master cone radiograph (Fig 3). The tooth was restored with posterior composite resin and post obturation radiograph was taken(Fig 4).Inorder to identify the angulation and divergence of palatal roots, a CBCT image was then taken with informed patient consent. A multi slice CBCT of the maxilla was performed with a tube voltage of 100KV and tube current of 8 mAs. The involved tooth was focused and the morphology was obtained in transverse, axial and sagittal sections of 0.5mm thickness. 3D image reveals two divergent, totally separated palatal roots with no much curvature whereas MB and DB roots are curved distally at apical one-third(Fig 5)and in axial section it revealed the presence of four distinct root canals(Fig 6). The patient was asymptomatic during the follow-up period.

DISCUSSION:

It is evident from the literature review and the case report above, that the clinician should have a good knowledge about root canal anatomy and its variations for the successful outcome of endodontic treatment. Also it is important that clinicians should use all the advanced diagnostic aids to locate and treat the entire root canal system.[16]Surgical operating microscope and CBCT are useful diagnostic aids in locating hidden canals in addition to conventional radiography. The

main drawback of conventional radiography is that it is a 2 -dimensional representation of a 3-dimensional object,which will result in loss of clarity of the image. Though in our present case we have used CBCT postoperatively, it will facilitate access to the internal canal anatomy if used pre-operatively. All these preoperative investigations will guide the clinician to modify the access during preparation which will aid in locating extra orifices.

There are many variations of internal anatomy of maxillary second molar have been reported in various clinical cases and invitro studies. A retrospective study in 520 completed endodontic treatments of maxillary second molar teeth by Peikoff et al. classified the anatomical root and canal variations into six categories: (1) three separate roots and three separate canals; (2) three separate roots and four canals; (3) three roots and canals whose mesiobuccal and distobuccal canals combine to form a common buccal with a separate palatal canal; (4) two separate roots with a single canal in each; (5) one main root and canal; (6) four separate roots and four separate canals including two palatal.[17] This study also revealed that occurrence of "standard" configuration, ie, three roots with three or four canals, was the most frequent (88.6%). Also Christie et al classified the maxillary molars with two palatal roots into three types according to their root separation level and their divergences.In type 1 maxillary molars have twowide long separated roots, while type 2 roots are parallel and separated but shorter than type 1 and has blunt root apices. In type 3 web of dentine engages the root except the distobuccal root.[6]Our current case report falls into category 6 of Peikoff's classification and type 1 of Christie's classification. Appropriate pre-operative investigations, careful clinical examination with multiple angled radiographs and surgical operating microscope is desirable to avoid omission of extra canal orifices.

CONCLUSION

The root canal anatomy of each tooth in the human dentition has certain common characteristics as well as numerous atypical ones that can be a road map to the success of endodontic therapy. Knowledge of the existence of these root canal anatomic variations is important for both diagnosis and treatment. Thus it is essential to highlight the need to look for

unusual morphology and additional rootcanals with the utilization of modern diagnostic aids like CBCT and Dental operating microscope so as to avoid failures in endodontic treatment.

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FIGURES AND LEGENDS

Figure 1:Access Opening with enlarged orifices

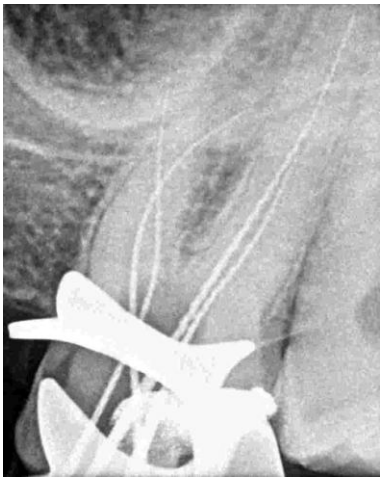

Figure 2: Working Length Radiograph

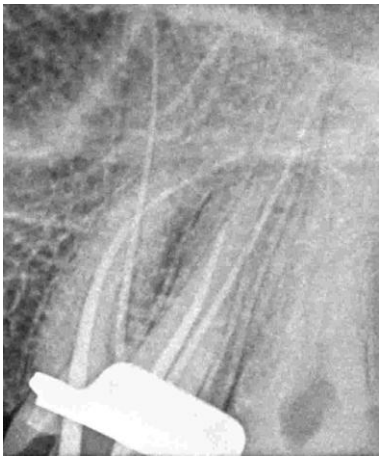

Figure 3: Master cone Radiograph

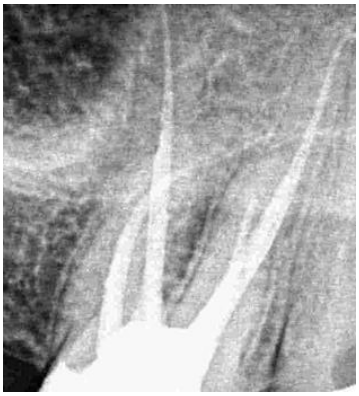

Figure4:Obturation Radiograph

Figure 5:CBCT 3D Image

Figure 6: CBCT axial image