

Maxillary First and Second Bicuspid with Three Distinct Roots - An Unusual Occurrence

Abstract

An anomaly is a variation of the normal. Dental anthropology is the study of the origin and variations in the human dentitions. Maxillary first bicuspid (premolars) are described morphologically as showing two cusps and two roots, whereas the maxillary second premolars shows presence of two cusps and one root. The maxillary premolars have highly variable root canal morphology and the various possible anatomic configurations of maxillary premolars are well documented in literature. Maxillary first and second premolars with three separate and distinct roots are uncommon. The anatomy of maxillary premolars with three root canals, mesiobuccal, distobuccal and palatal, is similar to that of adjacent maxillary molars, and they are therefore sometimes called small molars or 'radiculous'. The aim of this article is to report two such cases of three rooted maxillary premolars with three distinct and separate roots. As a dentist we should be aware of such morphological variations observed during routine dental examination and one should not be very dogmatic about the standard morphological features of the teeth. Proper documentation of these variations may help anthropologists in their study of a population.

Key Words

Maxilla; bicuspid; dental root

Dr Pankaj Kukreja¹, Dr Nitin B Rohatgi², Dr Bhavna Jha Kukreja³, Dr Sanjeev Kumar⁴

¹Reader, Department of Oral and Maxillofacial Surgery, ITS Centre for Dental studies and Research, Ghaziabad, Uttar Pradesh, India

²Consultant Endodontist, Central Health Care Dental Centre, Model Town-2, Delhi, India

³Senior Lecturer, Department of Periodontology, ITS Centre for Dental Studies and Research, Ghaziabad, Uttar Pradesh, India

⁴Professor & Head, Department of Oral and Maxillofacial Surgery, ITS Centre for Dental studies and Research, Ghaziabad, Uttar Pradesh, India

INTRODUCTION

The Maxillary premolars have highly variable root canal morphology and the various possible anatomic configurations of maxillary premolars are well documented in literature. One of the possible variations of the maxillary premolars is the presence of extra roots. Generally, the maxillary first premolar typically has two well-formed roots (56%). These divide in the middle third of the root and lie buccal and lingual to one another. About 40% have only one root containing two canals that then unite in a common foramen. Three-rooted maxillary first pre-molars are uncommon (0.5-6%) and frequently have one canal in each of three roots.^[1] Lower incidence of three root canals (0.3%-2%) has been reported for second premolars.^[1] The anatomy of maxillary premolars with three root canals, mesiobuccal, distobuccal and palatal, is

similar to that of adjacent maxillary molars, and they are therefore sometimes called small molars or 'radiculous'.^[2] The aim of this article was to report two such cases of three rooted maxillary premolars with three distinct and separate roots.

CASE REPORT 1

A 56 year old female with a non-contributory medical history reported in the post-graduate clinics of our college and hospital, complaining of difficulty in chewing due to a mobile tooth in the right maxillary posterior region. The clinical examination showed that she was suffering from advanced generalised periodontitis, with generalised gingival recession and a grade II mobile right maxillary second premolar, which was non-carious and non-tender. The patient was partially edentulous, with a total of 10 teeth remaining in her jaws. The opposite maxillary arch was edentulous



Fig. 1: Right maxillary second premolar (occlusal aspect)



Fig. 2: Right maxillary second premolar (mesial aspect)



Fig. 3: Right axillary second premolar (distal aspect)



Fig. 4: Right maxillary second premolar (palatal aspect)



Fig. 5: Right axillary second premolar (buccal aspect)



Fig. 6: Right maxillary second premolar showing all three distinct roots



Fig. 7: Radiograph of left maxillary first premolar showing three distinct roots

and she gave no history of difficult extractions, and/or retained roots. Patient was offered periodontal treatment for the same, but she refused and desired extraction of the tooth. The extraction was carried out under local anesthesia, i.e. 2% Lignocaine hydrochloride containing 1:200000 adrenalin. During extraction, the tooth was delivered with a fractured root. Upon examination, it was found to be a three rooted premolar, and the roots were mesio-buccal, distobuccal and palatal (Fig. 1 to Fig. 6). It was the mesio-buccal root

which was fractured, and the same was delivered by using a fine apexo elevator. Post-operative healing was uneventful.

CASE REPORT 2

A 40-year-old female patient was referred by a general dentist to an endodontist for the root canal treatment of her left maxillary first premolar. The patient's chief complaint was moderate lingering pain after drinking cold water. There was no specific finding during the extra-oral examination. At the initial examination, a radiolucent area was noted underneath the distal and mesial aspects of an existing Class II mesio-occluso-distal composite restoration in a periapical radiograph of that tooth, which was suspected to be a recurrent carious lesion. No periradicular lesions or widening of the periodontal ligament spaces were found to be associated with the tooth. Besides reproducing the lingering pain using a vitality thermal test, no other abnormalities of palpation, percussion, probing depth, or mobility were seen. Clinically, carious

pulp exposure was detected following removal of the amalgam restoration and underlying soft dentine. A diagnosis of symptomatic irreversible pulpitis was made with normal periapical tissue. This tooth was to be restored by a crown after complete root canal treatment. The tooth was isolated with a rubber dam after receiving infiltration with local anesthesia (2% lidocaine with 1:200000 adrenalin). The access cavity was prepared with a number 4 round carbide bur, and an ovoid outline of the pulp chamber was established. Three canal orifices were detected with an endodontic explorer i.e. mesiobuccal, distobuccal and palatal. All the three root canal orifices were located using a number 10 K-file. Working length was established with radiograph by number 15 K-files and confirmed using an Apex locator. The canals were cleaned and shaped with hand K files and nickel titanium files, frequently irrigating with 5% sodium hypochlorite and 17% EDTA. Calcium hydroxide was used as an intracanal medicament and the access cavity was sealed with temporary filling material. In the next appointment, one week later, the patient was asymptomatic. Intracanal calcium hydroxide dressing was removed from the maxillary left first premolar and the canals were irrigated with 5% sodium hypochlorite. Canals were dried with sterile paper points and obturated with gutta-percha and a suitable sealer using cold lateral condensation technique. Access cavity was restored with composite resin. Intraoral Periapical radiograph (Fig. 7) was taken post treatment which revealed the presence three separate roots in the maxillary left first premolar.

DISCUSSION

The literature reveals wide variations in root canal morphology of maxillary premolars. The maxillary second premolar usually has one root and one canal in 75% of cases, and one root and two canals in 25% of cases. Studies have demonstrated a lower incidence of three root canals between 0.3 and 2%. Bellizzi and Hartwell^[3] found only 1.1% of teeth with three canals in 630 maxillary premolars, and did not report any with three roots. According to Bellizzi and Hartwell,^[3] the root morphology of maxillary second premolars can be divided into three groups; 1) three fused roots or fused buccal roots and a partially fused or separated palatal root; 2) buccal roots fused at the middle or apical third, and with a separated or partially fused palatal root; and 3) all three roots separated at the cervical third.

Velmurugan *et al.*,^[4] have reported that out of 220 maxillary second premolar teeth that were endodontically treated, only three of these had three roots and three canals. In additionally, there are several case reports of maxillary second premolar with three canals and three independent roots. Pineda and Kuttler^[5] could not find three rooted maxillary second premolar in their study. Three rooted maxillary premolars are reported to be rare variation in Asian population as compared to the non-Asian population. There are few case reports in the literature which reported the bilateral occurrence of three rooted maxillary second premolars. Three rooted maxillary premolars are more often found in people with Turner's syndrome.^[6] Our patient, however, did not show any signs or features of the existence of Turner's syndrome. Pécora *et al.*,^[7] have studied the external anatomy of 435 maxillary second premolars and the internal anatomy of 300 of these premolars in vitro. For the study of the internal anatomy, the teeth were decalcified and cleared. One canal was found in 67.3% of the second premolars, two canals in 32.4% and three canals in 0.3% of these premolars. A total of 90.3% had one root and 9.7% two roots. A predominance of root curvature toward the distal was found in maxillary second premolars with both one and two roots. They were not able to find any maxillary second premolars with three separate roots. Studies show that maxillary second premolars are very less likely to have three canals. To date, only a few cases of maxillary second premolars with three roots (and three canals) have been reported in the literature. Yeh *et al.*,^[8] have reported a 20-year-old female who had three root canals in a maxillary second premolar, which underwent endodontic treatment. They have noted in their literature review that the incidence of maxillary second premolars with three root canals seems to be distributed among particular regions of the world: with most being in South America (five cases reported in Brazil), followed by the Middle East (three in Saudi Arabia and two in Turkey), and southern China (one in Hong Kong and one, the first case, in Taiwan). It would be interesting to consider whether there were any possible contributing factors to this, such as inheritance patterns or ethnic origins. A literature analysis by Cardinali *et al.*,^[9] stressed that the presence or absence of a third root canal is influenced by genetic factors, since three-rooted

premolars are more frequent in Caucasian populations and practically non-existent in Asian populations. Barkhordar *et al.*,^[10] have discussed the surgical treatment of a maxillary second premolar with three roots. In their case, Conventional endodontic therapy was not possible because of complete calcification of the root canal systems. Apicoectomies and retrograde amalgam filling were performed on all roots, resulting in successful treatment. Clinically, one must be very careful when performing endodontic treatment of maxillary premolars because of the extreme variability in its anatomy. There are various theories explaining the existence of abnormal number of roots (greater than normal), including hyperactivity of the Hertwig's epithelial root sheath and a pathological degeneration in the same area, and producing an invagination from the dental papilla forming an accessory root. Usually, the first premolars have a high variability in the morphology of the root canal system, but the presence of three roots is very rare. Ethnicity has a significant influence on aberrant anatomy. Radix Entomolaris, an extra distal root in a mandibular molar, is often seen in Oriental and Eskimo populations. Similarly 2 and 3 canal premolars are seen frequently in black populations. 'C' shaped anatomy is seen more commonly in Chinese, Korean and Indian populations. Bilateral symmetry is a feature of aberrant anatomy. Rarer the aberration, the more common is the bilateral symmetry. Knowledge of the basic tooth anatomy and its variations from the normal is required for the success of non-surgical root canal treatment and surgical extractions. A correct diagnosis and careful clinical and radiographic interpretation are the first requirements for success in endodontic therapy. In addition to having a sound knowledge of the normal tooth anatomy, the clinician should bear in mind that possible variations can exist in each tooth and should use additional caution.

REFERENCES

1. Vertucci FJ. Root canal morphology and its relationship to endodontic procedures. *Endodontic Topics*. 2005;10(1):3-29.
2. Soares JA, Leonardo RT. Root canal treatment of three-rooted maxillary first and second premolars - a case report. *Int Endod J*. 2003;36(10):705-10.
3. Bellizzi R, Hartwell G. Radiographic evaluation of root canal anatomy of in vivo endodontically treated maxillary premolars. *J Endod*. 1985;11:37-9.

4. Velmurugan N, Parameswaran A, Kandaswamy D, Smitha A, Vijayalakshmi D, Sowmya N. Maxillary second premolar with three roots and three separate root canals-case reports. *Aust Endod J*. 2005;31:73-5.
5. Pineda F, Kutler Y. Mesiodistal and buccolingual roentgenographic investigation of 7,275 root canals. *Oral Surg Oral Med Oral Pathol*. 1972;33:101-10.
6. Midtbo M, Halse A. Root length, crown height and root morphology in Turner's syndrome. *Acta Odontol Scand*. 1994;52:303-14.
7. Pecóra JD, Sousa Neto MD, Saquy PC, Woelfel JB. In vitro study of root canal anatomy of maxillary second premolars. *Braz Endod J*. 1992;3:81-5.
8. Yeh CS, Wong WB, Kan WYW, Tu MG. Root canal treatment of a three-rooted maxillary second premolar. (Short communication). *Journal of Dental Sciences* 2013; <http://dx.doi.org/10.1016/j.jds.2013.02.016>.
9. Cardinali F, Cerutti F, Tosco E, Cerutti A. Preoperative diagnosis of a third root canal in first and second maxillary premolars: a challenge for the clinician. *ENDO (Lond Engl)* 2009;3(1):51-7.
10. Barkhordar RA, Sapone J. Surgical treatment of a three-rooted maxillary second premolar. Report of a case. *Oral Surg Oral Med Oral Pathol*. 1987;63(5):614-6.