

# FOUR ROOTED PERMANENT MAXILLARY SECOND MOLAR WITH TWO PALATAL ROOTS: A CASE REPORT

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## ABSTRACT

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. Clinical and radiographic evaluations should be done thoroughly before initiating endodontic treatment so that the clinician can modify the access cavity for stress free entry to the complex root canal anatomy. The present article describes a case in which anatomical variation existed in the form of additional palatal root in maxillary second molar. The literature review, clinical implication, need to recognize and methods to identify these variations are described in this article.

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### KEY WORDS

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## INTRODUCTION

Sound knowledge of the root canal system and its frequently encountered variations help clinicians in achieving successful endodontics [1]. Anticipating the presence of variations should be a routine practice while performing endodontic therapy. Maxillary first molars have the most complicated root canal morphology amongst the permanent dentition; therefore, their anatomy has been evaluated extensively in various studies.

Maxillary first molars usually present with three roots and three canals, with a second mesiobuccal canal (MB2) canal seen in 18- 96.1% of the cases [2]. Nevertheless, it can present with more or less number of roots or root canals than the accepted norm. Other variations for maxillary first molars include one, [2] four, [3] and five [4] roots, which may include unusual morphologies of root canal system within individual roots. Cases with five, [5] six, [6] seven, [7] eight root canals [8] or a C-shaped canal configuration [9] have also been reported earlier. Two-rooted maxillary first molar with two canals have rarely been reported. Such anatomic variations have been reported in limited number of studies for maxillary second molar.

This case series presents maxillary first molars with unusual morphologies of patients who reported to the Department of Conservative Dentistry and Endodontics: 1. two roots and two root canals, 2. three roots with five canals (2 Distobuccal canals), 3. three roots with five canals (2 palatal canals) and 4. three roots with 6 canals (3 mesiobuccal and 2 distobuccal canals). The use of adjuncts such as the operating microscope and Cone Beam Computed Tomography (CBCT) are imperative in the identification and location of additional canals and therefore must be used during treatment.

## CASE DESCRIPTION

A 40 year old female patient reported to the clinic with the chief complaint of severe pain in the right upper back tooth region for the past two days. Patient gave a history of intermittent mild pain since one month. On clinical examination, tooth 27 had deep caries. The tooth was tender on percussion. Pre-treatment radiograph showed widening of the periodontal ligament space [Figure-1]. The crown was unusually large in appearance. A diagnosis of symptomatic pulpitis with symptomatic apical periodontitis was made and endodontic treatment was planned for 27. The tooth was anaesthetized and then isolated under rubber dam. The coronal access cavity was

prepared using an endo-access bur. One mesiobuccal, one distobuccal and two palatal canal orifices (mesiopalatal and distopalatal) were located on the floor of the pulp chamber using an endodontic explorer (DG 16 endodontic explorer, Ash Instruments, Dentsply Gloucester, United Kingdom). The dentinal map at the floor of the pulp chamber gave the appearance of letter 'X' [Figure-2]. The canal lengths were determined using radiograph and an apex locator (Root ZX; Morita, Tokyo, Japan). Cleaning and shaping was performed using ProTaper rotary instrument (Dentsply, maillefer, Switzerland) up to size F2 in crown down technique. Irrigation between each instrument was done using 3.5% Sodium hypochlorite and 17% EDTA. After the master cone selection [Figure-3] canals were obturated with the corresponding gutta percha and AH plus sealer (Dentsply, Mallifer, DeTrey Grabh Germany) [Figure-4]. The entire procedure was completed under operating microscope. Post endodontic restoration was completed and the patient was recalled for full coverage crown.



Fig: 1. Pre-operative radiograph



Fig: 2. Access cavity preparation (canal orifices and the dentinal map as seen under operating microscope)

## DISCUSSION

The root canal morphology of teeth is often extremely complex and highly variable. However it is more likely to occur in the second or third maxillary molar [5,6,7]. There is a higher tendency towards fusion of two or three roots. Whenever two palatal roots exists in maxillary molars, one of them is the normal palatal root, the other is supernumerary structure which can be located either mesiolingually (radix mesiolingualis) or distolingually (radix distolingualis) [8]. Christie et al proposed a classification system of four-rooted maxillary molars, based on root separation level and root divergence, describing three types (type I- III). Type I molars have two widely divergent

palatal roots that are often long and tortuous. The buccal roots are often cow-horn shaped and less divergent. Type II molars have four separate roots that are shorter, run parallel, have buccal and lingual root morphology, and have blunt root apices. Type III molars are constricted in root morphology with the mesiobuccal, mesiopalatal and distopalatal canals engaged in a web of dentin. The distobuccal root seems to stand alone and may even diverge to the distobuccal [3].



Fig: 3. Master cone selection radiograph



Fig: 4. Immediate post obturation radiograph

Stone and Stoner reported multiple root canal systems in maxillary molars such as a single palatal root containing two separate orifices, canals and foramina[9]. Maxillary second molar variants have already been reported in many clinical cases and in vitro studies and four roots with two separate palatal roots is found to be the least common among all the above[4]. In addition to Peikoff's results, a few less frequently occurred maxillary second molar variants have also been reported. Libfield & Rotstein's(1989) review and radiographic survey of 1200 teeth, reported (0.4%) incidence of maxillary second molars with four roots (two buccal and two palatal); rarer still in maxillary first molars[5]. Bralio et al reported a case of maxillary second molar with six canals[10]. Maxillary second molar with three buccal roots have been reported [11]. The prevalence of taurodontism is reported to range from 2.5% to 11.3% of the human population [12]. Kottoor et al. reported a case of maxillary second molar with five roots and five canals. Based on the anatomical relation of roots and their root canals a naming system was formulated by Kottoor et al and Albuquerque et al. This system is simple, yet extensive and appropriately names the internal and external morphology of maxillary and mandibular molars [13, 14]. Alavi et al.failed to find any four rooted maxillary molars among 268 maxillary molars in a Thai population.[15]. Al Shalabi et al. also did not find any teeth with extra palatal root in a sample of 83 teeth[16]. Even though the supernumerary root described here doesn't occur very often, an awareness of their presence is relevant in endodontics and surgical contexts. During clinical examination, if there is an extra cusp, cervical prominence or a deep groove, presence of an

additional root should be suspected. Careful observation of pre-operative radiographs is a must in diagnosing variations in the morphology. Superimposition of anatomic structures on these roots of maxillary molars may result in failure to diagnose [6]. A properly designed and prepared access cavity is helpful for diagnosis and negotiation of the root canal morphology [17]. However, some of the common iatrogenic access opening errors are caused during the search for extra or missing canals. These errors include perforations 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.

The present case report describes a new variant with four separate canals, mesiobuccal root, two individual palatal mesiopalatal and distopalatal with its own separate canal, and distobuccal root with a single canal. The 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. Up to now, the variant with four separate roots and four separate canals including two palatal was the least frequent abnormality, with its incidence ranging from 1.47 to 2.1%. Many diagnostic tools are also suggested to confirm these variations with each having their own limitations. These include: a) dye penetration contrast radiography b) CT scans with CBCT technique c) xeroradiography etc. [18,19]. Here the confirmatory diagnosis of the variation is so obvious by only visual examination, that the need for all other specialized techniques other than routine IOPA radiograph was not felt. The importance of unique coronal structure with regard to its large size and shape is stressed.

## CONCLUSION

Anatomic variations can occur in any teeth in any form. Although the prevalence of accessory root in maxillary molar is low, it is challenging for diagnosis and successful endodontic therapy. As non treatment of these additional roots or root canals can lead to endodontic failure, every effort should be made to identify it. Thus thorough knowledge of morphology, an awareness of anatomic variations of the teeth and careful observation of radiographs are essential for the location and identification of additional roots and root canals which can be facilitated by using operating microscope, CBCT, xeroradiography, SCT and above all clinical skill for successful treatment.

## FINANCIAL DISCLOSURE

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## CONFLICT OF INTERESTS

The author declares no conflict of interest.

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