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Endodontic Management Of A Rare Anatomic Aberration In A Two Rooted Maxillary First Molar With Two Canals - A CBCT Based Case Report

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Abstract
Objective - *To report the occurrence of variable anatomy in maxillary first molar to aid in evidence based endodontic practice in future.*
Clinical Considerations - *Anatomic variations are very common in maxillary first molars which can be found in the crown as well as root. Maxillary molars have the most complicated anatomy in maxillary dentition, henceforth it becomes vital to study and report their aberrations in detail. The occurrence of 2 roots with 2 canals in maxillary first molar is a rare event as cases with increased number of roots and root canals are more common than those with lesser number of roots and root canals. This case report presents a case showing the endodontic treatment of a maxillary first molar which presented with two roots only containing one root canal each along with varied anatomy of the palatal canal as compared to ideal one root one canal anatomy.*
Conclusion - *The endodontic management of mentioned tooth in the present case report was aided by use of CBCT for adequate diagnosis. Previous theoretical knowledge about occurrence of two roots and two root canals only, helped in identifying the case at an early stage. Reporting similar cases, thus creates awareness and spreads knowledge regarding the incidence and presence of such variable anatomies.*
Keywords - *maxillary molar, endodontic management, variable anatomy*

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I. Introduction

Variations in crown, root, root canal anatomy can be found in all types or groups of teeth. The variations can be external as well as internal including presence of extra cusps and roots, missing roots, extra canals or lesser canals. For a successful endodontic treatment, complete debridement of the root canal system is necessary which is achievable only if the clinician has sound knowledge about the internal and external anatomy of each tooth. Knowledge of the varied anatomy aids in looking for something extra as "one can treat what one can see".

It is generally accepted that maxillary first molar contains 3 roots, 2 buccal and 1 palatal with 4 root canals - 2 mesiobuccal, 1 distobuccal and 1 palatal. 2 mesiobuccal canals have been reported to exist in 18% to 96.1% cases[1]. Other variations including presence of one, four, five roots with five or six root canals have also been reported. Two roots with two root canals have been reported in 0.4% cases only in maxillary first molars[2]. Two rooted maxillary molars without fusion of buccal roots along with presence of two root canals has rarely been reported. This case report depicts one such case of two rooted maxillary first molar with two root canals.

II. Case Report

A 19-year-old male patient came to the department of Conservative Dentistry and Endodontics with the chief complaint of incomplete treatment in a tooth in left upper back region. The medical history was non contributory. Patient gave contributory dental history of treatment initiation a month ago in 26. He claimed that root canal treatment had been started in emergency at a private clinic a month ago. No extra oral or intra oral soft

tissue findings were seen. All the surrounding structures were within normal limits. Clinical examination revealed temporarily restored maxillary left first molar. The tooth was insensitive to temperature variation, electric pulp test and vertical percussion. Radiographic examination showed radiopaque material occupying the pulp chamber. On preoperative radiograph, radicular pattern gave suspicion of the presence of 2 roots only. No periapical findings and/or PDL widening could be appreciated. Alveolar bone was also found to be within normal limits. A diagnosis of previously initiated root canal treatment with normal periapical tissues was established in 26.

Under rubber dam isolation, access was gained into the pulp chamber after removal of the temporary restorative material. After removal of remnant caries, access cavity was modified to visualise the root canal orifices for a straight line access. Palatal orifice and one buccal orifice could be seen immediately but no distobuccal orifice could be found. The diameter of buccal orifice was larger than a typical mesiobuccal or distobuccal orifice in maxillary first molar (Fig 1).

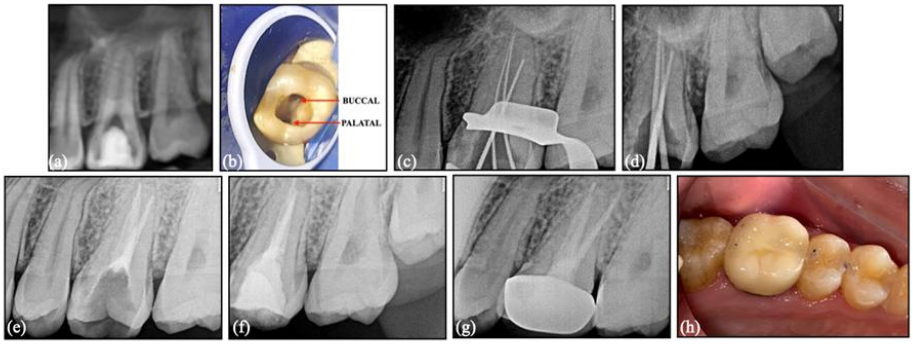

Fig 1 - (a) Preoperative radiograph of 26, (b) Clinical photograph of 26 showing two canal orifices, (c) Working length radiograph of 26, (d) Master cone radiograph of 26, (e) Obturation radiograph of 26, (f) Post obturation radiograph of 26, (g) PFM crown cemented in 26, (h) Post operative clinical photograph of 26

Further troughing and exploration with DG 16 did not lead to any success. Multiple digital radiographs were taken at different mesial distal angulations. It could be confirmed that only 2 roots were present but confirmation about presence of 2 root canals too was doubtful. Henceforth, the patient was advised to get a CBCT scan for the desired tooth. CBCT revealed the presence of 2 roots - one buccal and one palatal root with one canal in each root (Fig 2).

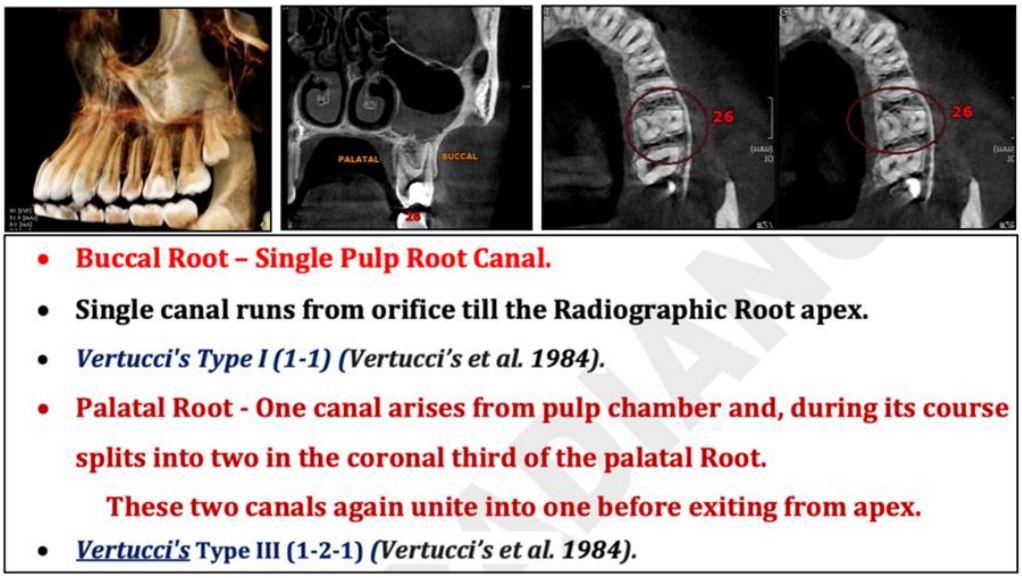

Fig 2 - CBCT images confirming two roots and two root canals in 26 along with Vertucci's Classification of root canal anatomy

The CBCT also revealed that buccal root had one canal, Vertucci's Type 1 root canal anatomy whereas the palatal root had one canal with one orifice which split into two midway and exited through one apical foramen,

i.e. Vertucci's Type III root canal anatomy. Occurrence of bilateral aberrations is commonly reported but in the presented case, presence of two roots and two root canals was unilateral in second quadrant only. Similar findings were not found in first quadrant with respect to 16.

In subsequent appointment, working length was determined using apex locator (Canal Pro Cl2i, Coltene) and confirmed radiographically. Buccal canal was prepared till 30-6% while the palatal canal was prepared till 35-4% using crown down technique (NeoEndo, Orikam). 5.25% sodium hypochlorite (Canal Pro, Coltene) and 17% EDTA were used for irrigation followed by normal saline as the final rinse. Canals were dried using sterile absorbent paper points, followed by obturation by cold lateral compaction technique using gutta percha cones and Apexit Plus Sealer (Ivoclar). The access cavity was restored permanently with composite resin and crown was placed in subsequent appointment. The patient was asymptomatic during the follow up period.

III. Discussion

The root canal morphology of each tooth varies greatly. Each tooth type has its own variations, prior knowledge of which facilitates precise detection of all the root canals during endodontic treatment. Maxillary first molar has been described as possibly the most treated and least understood posterior tooth by Burns[3]. Typically, a maxillary first molar is comprised of 3 roots containing 3-4 root canals. But this anatomy varies greatly according to reported literature. Cases with four to five roots containing four to six root canals have been reported overtime. Extra canals and accessory roots is a more common finding as compared to the occurrence of lesser number of roots and root canals. Very few cases have reported lesser roots according to the available literature.

Less roots can occur either due to fusion of two roots or due to formation of one root only. This is decided before root formation when the root sheath forms epithelial diaphragm which undergoes differential growth to cause division of root trunk into two, three or more roots. Failure of such differential growth leads to the formation of fused/ less number of roots.

It becomes vital to diagnose such anomalies and variations by appropriate use of pre operative and intra operative radiographs. Pre operative intra oral radiographs must be analysed critically to look for the number of roots and if possible, number of root canals to judge the severity and prognosis of each presented case. Multiple radiographs, at different mesio-distal angulations must be taken intra operatively. Confirmation of varied anatomy can be made clinically followed by radiographic aids like cone beam computed tomography (CBCT). Since, intraoral radiographs give 2 dimensional images, usage of three dimensional scans like CBCT aids diagnosis by giving clear picture of the contents of a tooth. In the presented case, presence of only two roots and two root canals was suspected from multiple angled intra oral radiographs followed by confirmation with a CBCT scan. Presence of two roots can be accompanied by two or three root canals. Case reports showing such unusual anatomy in maxillary first molar can be compiled to present the reported variations along with difference in root canal morphology using the Vertucci classification (Table 1).

The presented case had one root canal in buccal and palatal but the root canal morphology was Vertucci Type I in buccal and Type III in palatal, which has not been reported till date.

CLINICAL SIGNIFICANCE - Occurrence of variable anatomy in any tooth is a natural phenomenon but identification and appropriate treatment of the same is more important. This case was a significant finding for the database of anatomy of root canal system of maxillary first molars due to its rare incidence. Usage of CBCT, RVG, clinical expertise and sufficient anatomical knowledge led to satisfactory endodontic management followed by successful outcome.

IV. Conclusion

The presented case discusses the endodontic management of a maxillary first molar with variable root canal anatomy due to the presence of two roots containing two root canals. It highlights the usage of CBCT for confirmatory evaluation of the anatomy. Looking at the reported literature, it is safe to say that, such anatomy has rarely been reported due to which adequate reporting and knowledge of the anatomy is essential in order to increase the overall endodontic success rate.

Table 1 - Case series/ reports showing varied root canal anatomy in maxillary first molar with two roots

Case report/ series	Authors	Roots (Buccal/ palatal)	Number of canals	Canal morphology (Vertucci's classification)	
		Roots (Buccal/ palatal)		Buccal	Palatal
Case series	Malagnino et al.[4]	2	B^2P^1	Type II	Type I
Case report	Fava[5]	2	B^2P^1	Type IV	Type I

Case report	**Ma et al.[6]**	**2**	**B^1P^1**	**Type I**	**Type I**
Case report	**Yilmaz et al.[7]**	**2**	**B^3P^1**	**C shaped**	**Type I**
Case report	**Rahimi and Ghasemi[8]**	**2**	**B^1P^1**	**Type I**	**Type I**
Case series	**Shakouie et al.[9]**	**2**	**B^1P^1**	**Type I**	**Type I**
Case report	**Sharma et al.[10]**	**2**	**B^1P^2**	**Type V**	**Type I**

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