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Atypical maxillary first molars with two palatal canals in a single palatal root- A case report

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Abstract

Variations in root canal morphology is a challenge and the dentist should have thorough knowledge regarding such anatomic variations for successful endodontic outcomes. Even though an exclusively single canal anatomy in palatal canals of maxillary molars is most prevalent, this traditional assumption needs to be changed. Though rare, two palatal canals have an incidence of 2–5.1% in maxillary first molars. This case report describes the endodontic management of two such cases, one with Vertucci type V and one with Vertucci type II variation.

Keywords: Bio-C sealer; Maxillary first molar; Two palatal canals; Vertucci variation

Introduction

Variations in the root and root canal morphology, especially in multirooted teeth, is a constant challenge for diagnosis and management and the dentist ought to be familiar with such variations in order to achieve successful results at the end of root canal therapy. [1] A thorough chemo-mechanical preparation and an adequate three-dimensional obturation is of utmost importance for successful endodontic therapy. Complex internal anatomy and extra canals being missed are some of the reasons leading to endodontic failure. [2]

Cleghorn et al did a comprehensive review of the root and root canal morphology of the maxillary first molar. Generally described as a group of teeth having three roots including two buccal roots and one palatal root, the permanent maxillary molars can have a wide range of variations that includes two, four, five, six, seven, and eight root canals as well as O-shaped canals within individual roots. [3]

Shahi et al reported 0.73% of the first molars with two palatal canals whereas, Zheng et al reported a prevalence rate of 1.12 and 1.17% for presence of an extra canal in the distobuccal and palatal roots, respectively. [4,5] The patient's age plays an important role in the detection of fewer canals in maxillary molars, probably due to the calcification and morphological changes that occur with age.[6] Baratto-Filho et al assessed internal morphology of maxillary first molars by three different methods and found that second palatal canal prevalence in ex vivo assessment was 2.05%, in clinical assessment, 0.65%, and was 4.55% by cone-beam computed tomography. [7]

This case report presents the endodontic management of two maxillary first molars with two palatal canals in a single palatal root.

Case report

Case 1

A 40-year-old female reported to the department of conservative dentistry and endodontics with a history of pain in the upper left back tooth region for 2 weeks. The patient gave a history of a fixed partial denture being present for 2 years that was removed due to the pain which was spontaneous and increased on lying down. A medical history of hypothyroidism, under medication was noted. Clinical examination revealed a composite restoration in the maxillary left 1st molar with tenderness to percussion. Cold test was done with no response indicating absence of vitality. Clinical and radiographic findings led to a diagnosis of chronic apical periodontitis requiring root canal therapy. Radiographic evaluation of the involved tooth indicated an unusual root canal anatomy with the single palatal canal bifurcating into two canals beginning at the middle third of the root (Vertucci type V pattern).

The patient was administered local anaesthesia with 2% lidocaine containing 1:80000 epinephrine and access opening was done under rubber dam isolation. Clinically, three canal orifices were located with the palatal canal orifice being large and oval. [Fig 1a] Probing the palatal canal with a 10 K-file revealed the presence of two canals bifurcating from a single large orifice. Working length (WL) was determined using the Root ZX apex locator [Fig 1b] and biomechanical preparation (BMP) was done using ProTaper Universal files (Dentsply Maillefer, Switzerland) upto file size F2. The canals were irrigated with 3% sodium hypochlorite and 17% EDTA during instrumentation and calcium hydroxide–based intracanal dressing was placed in all canals with a lentulospiral as there was a periapical lesion with tenderness on percussion present. Obturation was done after 2 weeks using cold lateral compaction of gutta percha along with Bio-C sealer [Fig 1c, d]. The tooth was then restored with composite restoration and referred to department of prosthodontics for fixed partial denture.

Case 2

A 42-year-old male reported to the department with a history of throbbing pain that increased on lying down in the upper left back tooth region since 1 month. No relevant medical history was noted. Clinical examination revealed a deep carious lesion in the maxillary left 1st molar tooth with positive tenderness on percussion.

Clinical and radiographic findings led to a diagnosis of chronic apical periodontitis necessitating root canal therapy. Radiographic evaluation of the involved tooth indicated an unusual root canal anatomy with the presence of two palatal canals joining at the apex to exit as one apical foramen, i.e., Vertucci type II pattern.

The patient was administered local anaesthesia with 2% lidocaine containing 1:80000 epinephrine and access opening was done under rubber dam isolation. Clinically, four canal orifices were located with two palatal canal orifices [Fig 2a]. WL was established using the Root ZX apex locator [Fig 2b] and BMP was done using Neo Endo NiTi rotary files up to 25.6% with the palatal and distal canals whereas mesial canal was prepared up to 20.6%. Irrigation was done using 3% NaOCl and 17% EDTA during instrumentation. After BMP, due to the presence of weeping canals, Ca $(OH)_2$ medicament was placed for a 14-day period after which obturation was done using single cone technique along with Apexit Plus sealer [Fig 2c, d]. The tooth was then restored with composite restoration followed by a metal crown.

Discussion

Successful endodontic treatment relies on thorough knowledge of variations in root canal morphology and also the clinicians experience. [8] Multiple radiographs need to be taken with different angulations to overcome superimpositions and better identify such rare abnormalities. Failure in identifying anatomical variations leads to persistence of micro-organisms because of incomplete instrumentation, inadequate cleaning and insufficient obturation which in turn would result in endodontic failure. [9]

Maxillary first molars largely have a single root with a single palatal canal opening as one apical foramen which will also be visible in an initial periapical radiograph. However, a fastbreak appearance or a transition from a well-defined canal anatomy to an ill-defined anatomy usually indicates a complex internal anatomy. Anatomic variations in the maxillary first molar have an overall prevalence of less than 2%. Certain populations have shown an unexpectedly higher figure according to review of the literature with the Indian population having a 9.7% prevalence in the maxillary first molar and 14% in maxillary second molars whereas 33.3% was seen in the maxillary first molars of Pakistani population. These ethnicities thereby endure a higher risk of missing extra palatal canals and endodontic failures. [1,10]

The various patterns of two canals in a single palatal root are displayed in table 1. [11]A classification based on the degree of divergence and fusion level of the roots of maxillary molars was put forward by Christie et al. [12] [Table2]

In case1 (Vertucci type V), Bio-C sealer was used as it was available in a premixed syringe allowing easier placement. Studies showed that it has a higher flow as well as increased dentinal tubule penetration when compared to other resin based and $Ca(OH)_2$ based sealers and thereby better filling of the lateral canals. [13]

Every clinician should master the knowledge of root canal morphology and its variations and have an eye of a hawk in identifying such anatomy. The present cases demonstrated endodontic management of maxillary first molar with two palatal canals in a single root and it supplements past reports of the presence of such configuration in these teeth. Clinicians' expertise, approach and the use of novel technologies such as CBCT and dental operating microscope are key factors

in identification and management of such aberrant canal anatomy.

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Legend Tables and Figures

Table 1: Patterns of two canals in a single palatal root of maxillary molars (Rajalbandi S et al,2013)

(1)	Single root with two separate orifices, two separate canals and two separate foramina.
(2)	One palatal root, one orifice, a bifurcated canal and two foramina
(3)	Two separate palatal roots, each with one orifice, one canal and one foramen.

Table 2: Christie et al classification based on the degree of divergence and fusion level of the roots of maxillary molars (Christie WH et al, 1991)

Type I	Maxillary molars having two widely divergent palatal roots that are often long and tortuous, the buccal roots often being 'cow-horn' shaped and less divergent. Radiographically, this type shows four separate root apices
Type II	Maxillary molars having four separate roots, although the roots are often shorter, run parallel, have buccal and lingual root morphology, with blunt root apices. Radio graphically, buccolingual superimposition may give an impression that only one mesial and distal root is present.
Type III	Maxillary molars with constricted root morphology, the Mesiobuccal, mesiopalatal and distopalatal canal being encaged in a web of root dentine. The distobuccal root in such cases appears to stand alone, and may even diverge distobuccally.

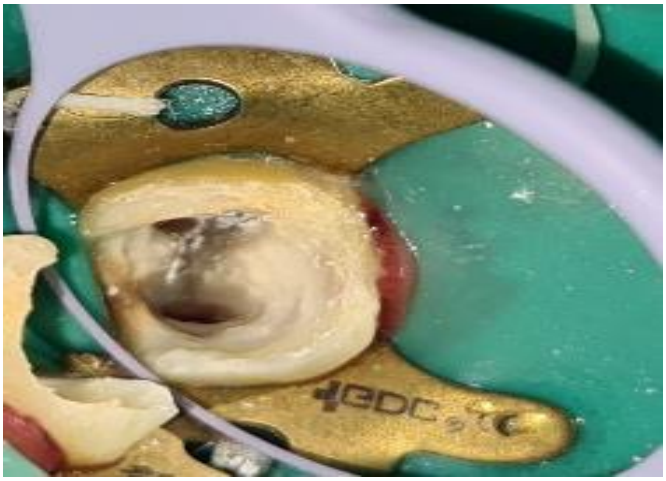

Fig 1 a: Access opening of maxillary left first molar [Case 1]

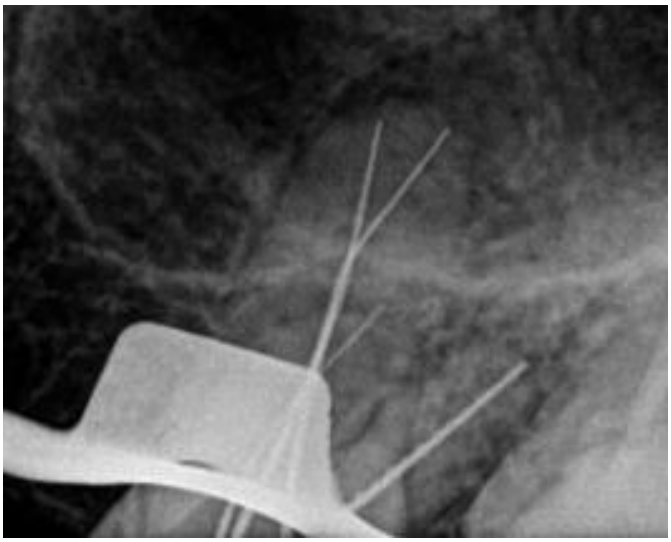

Fig 1 b: Working length determination [Case 1]

Fig 1 c: Master-cone IOPA [Case 1]

Fig 1 d: Post-obturation IOPA [Case 1]

Fig 2 a: Access opening of maxillary left first molar [Case 2]

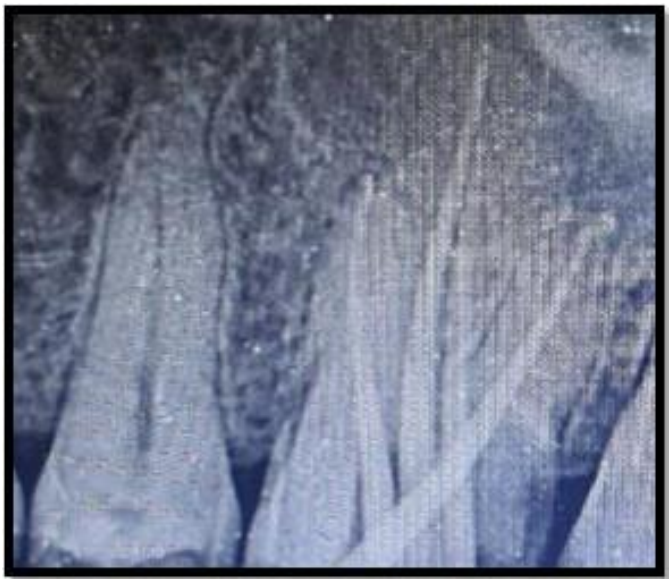

Fig 2 b: Master-cone IOPA [Case 2]

Fig 2 c: Post-obturation IOPA [Case 2]