

CASE REPORT**Two Canals in Palatal Root of Maxillary Molar: Case Series****Muhammad Ali¹, Ahsan Inayat²**¹Department of Operative Dentistry, Fatima Jinnah Dental College, Karachi, ²Department of Prosthodontics, Dr. Ishrat ul Ebad Institute of Oral and Health Sciences, DUHS, Karachi, Pakistan.**ABSTRACT**

Evaluating morphology of a root canal is important in determination of a successful endodontic therapy. This article highlights the need to be aware of different morphologies, which can exist in the root canal system of upper molars. This is usually associated with buccal root and has been documented in several studies in literature. On the other hand, it is not often that we come across variations in the palatal roots. These cases discuss such a case where two canals were discovered in palatal root during root canal treatment of maxillary first molar. It is essential to evaluate pre-operative radiographs and have proper knowledge of anatomy of the root canal system before initiating the treatment. All roots must be explored carefully to ensure that all canals are negotiated, debrided and obturated to ensure successful endodontic outcome. This case report shows a case series in endodontic management of a maxillary first molar with two palatal canals.

Keywords: Palatal, Molar, Knowledge, Outcome, Endodontic.**Corresponding Author:****Dr. Muhammad Ali**Department of Operative Dentistry,
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INTRODUCTION

Every root canal treatment procedure aims at complete cleaning, shaping and obturation of the whole root canal. Endodontic failure occurs because of existence of microorganisms. Wein's classification of root canal anatomy classifies canals into four types: Type 1 represents a single canal leading from the pulp chamber to the apical foramen. Type 2 represents two canal leaving pulp chamber and converging on their course to emerge as a single common apical foramen. Type 3 represents two separate canals keeping their separate, distinct course terminating at two separate apical foramina. Type 4 represents one canal diverging into two separate canals before reaching the apex and terminating at two distinct apical foramina^{1,2}. Patients undergoing root canal therapy displayed 96.7% mesiobuccal roots having a single canal with a Type 1 canal configuration, and 3.3% mesiobuccal roots with a Type 2 canal configuration³. This case series shows a permanent upper molar with two palatal canals.

CASE REPORT: 1

A female of 20-year-old presented at Department of Endodontics, Fatima Jinnah Dental Hospital, giving complaint of constant pain and food impaction in her left maxillary first molar. Upon evaluation and clinical examination, the tooth revealed a carious lesion corresponding to 2.3 of the Graham J. Mount classification. The tooth was tender on percussion and gave a lingering response on thermal and electric pulp testing. After thorough intra oral and radiographic examination, a diagnosis of irreversible pulpitis/acute apical periodontitis was made and patient was advised nonsurgical endodontics. Patient was given local anesthesia, 2% lidocaine and rubber dam placed. Caries removal was done and a conventional endodontic access achieved. Upon examination after chamber access, the chamber anatomy showed three principal root canal systems: Mesiobuccal (MB), Palatal (P) and Distobuccal (DB). After using endodontic explorer (DG 16) along with loupes of 3.5X magnification, another hemorrhagic point was observed near the palatal

canal. Dentine ledge overlying the orifice of second palatal canal removed. Chamber access was expanded to a trapezoidal shape to include additional canal. Endodontic explorer gave a "catch" on both the canals.

Patency was established and presence of MB2 and P2 canals were confirmed with intraoral periapical radiographs processed digitally using DIGORA Optime®. (Soredex, Finland) After coronal flaring using universal shapers SX (Dentsply Protaper), working length of each canal was assessed through an apex locator and was confirmed with radiograph (Figure 1). Pulpectomy was done under irrigation with 2.5% NaOCl. Cleaning and shaping was done using Protaper Rotary NiTi file system. Figure 2 shows a clinical picture of pulpal floor after initial filing. GP radiograph taken as indicated in Figure 3. Canals were dried with paper points and obturated with Protaper Gutta percha (Dentsply, Maillefer) using Sealapex® (Sybron Endo.USA) (Figure 4). The access was temporary build with Cavit (3M ESPE.USA) and patient was recalled after seven days for final restoration.

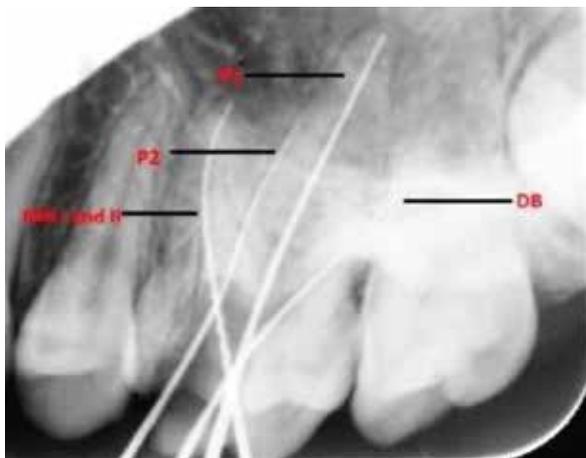


Figure 1: Radiograph showing working length determination.



Figure 2: Clinical picture showing access cavity preparation.

CASE REPORT: 2

A 57 years old male patient presented at Department of Periodontics, Fatima Jinnah Dental, College and Hospital, giving complaint of dull pain, food impaction in his maxillary right 1st molar. On clinical examination, the tooth showed bone loss in the mesial side along with gingival recession and root exposure. The pain was intermittent and increasing on intake of hot and cold foods and continues for some time. On examination, intraorally tooth showed positive tender to percussion. After radiographic evaluation as seen in (Figure 1A) it was diagnosed it as a perio-endo problem. Patient was scheduled with deep curettage twice and had treatment for one week. Patient was recalled but no improvement was noticed on his follow-up and that time his pain worsened. He was referred to department of endodontics for emergency chamber opening. Patient received two cartridges of local anesthesia, 2% lidocaine (Post superior alveolar region) chamber access done. In addition, rubber dam was placed. After de-roofing the chamber conventional procedure was done and isolation maintained. Canal negotiation was done

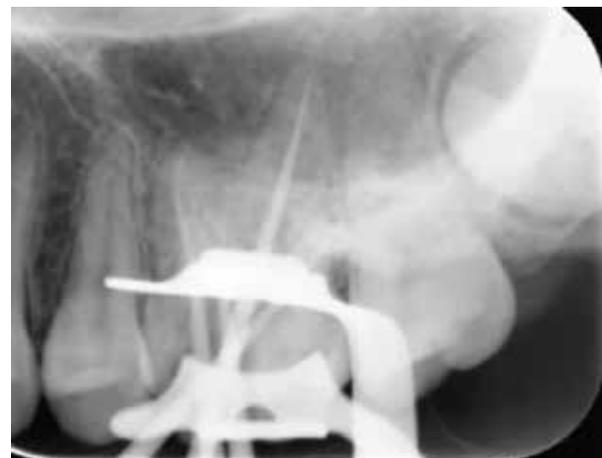


Figure 3: Radiographic image showing master cone selection.



Figure 4: Postoperative Radiograph after obturation.

with SybronEndo K files using #10 file and working length x-ray taken distobuccal).

Pulpectomy was done until 25mm K-file, while doing pulpectomy in palatal canal, during irrigation another hemorrhagic spot was seen 2mm beside to the palatal orifice, Patency #10 was inserted in this canal and 25mm K-file was inserted in the first palatal canal. Canals were confirmed with intraoral periapical radiographs processed digitally using DIGORA Optime (Figure 1C). Irrigation with sodium hypochlorite was also carried out (Figure 1B). Same measures were taken to prepare distopalatal canal. Patient was recalled after 3 days for Cleaning and shaping. On this appoint-

ment, coronal flaring was by DENSTPLY ProTaper SX and S1; working length of each canal was assessed through an apex locator. Cleaning and Shaping was finished with crown-down technique utilizing manual hand protaper files. After preparation, canals were cleaned (Figure 2) with paper point and then cone fit radiograph taken. After length confirmation, application of sealer was applied using Sealapex (Sybron Endo.USA) on GP and warm lateral condensation was done (Figure 1D). The access was temporary build with light cure GIC and was kept on follow-up for 5 days. After 5 days follow up there were no symptoms of pain and TTP upon examination. Then was scheduled for permanent restoration.

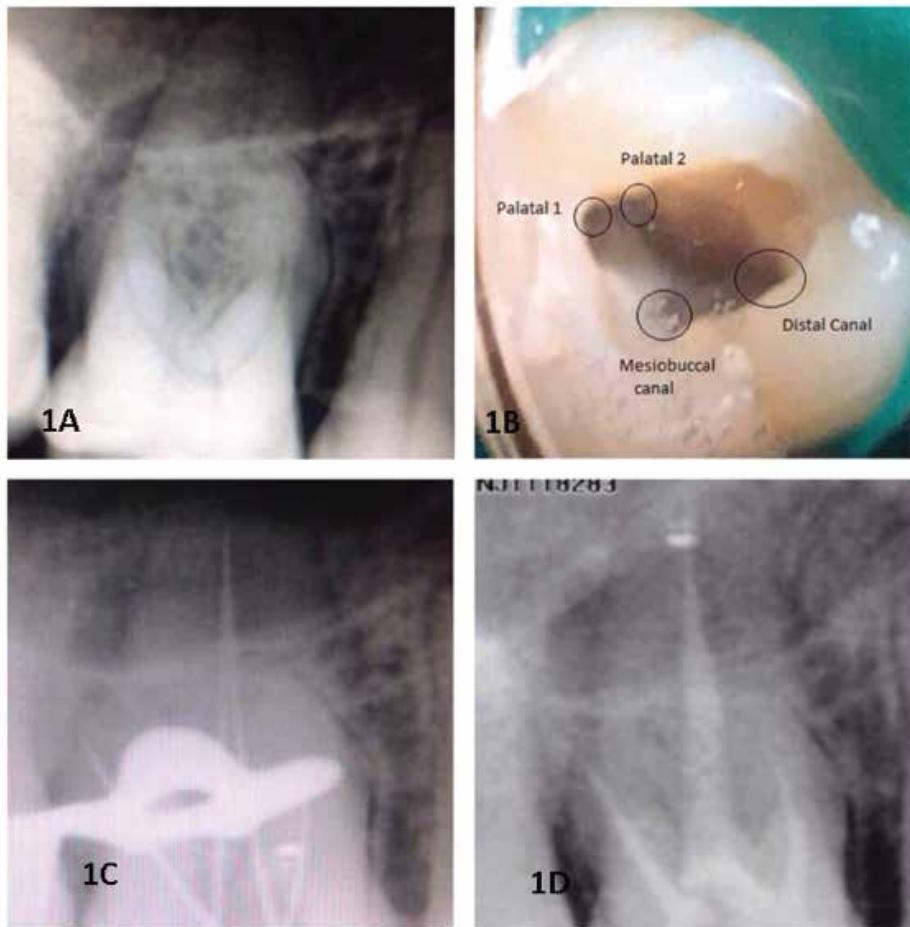


Figure 1A: Preoperative radiograph, Figure 1B: Access cavity preparation and canal negotiation, Figure 1C: Working length determination, Figure 1D: Radiograph showing obturated canals.



Figure 2: Showing canal orifices and highlighted palatal canals.

DISCUSSION

In our practice, it is commonly seen that, the first maxillary permanent molar has three roots and mesiobuccal root having two canals (Mesiobuccal and Mesiobuccal Buccal 2) while palatal and distobuccal roots usually having a single each canals. One variation at palatal root is having two canals. The occurrence of MB-2 canal is quite common, but occurrence of second palatal canal is usually rare⁴. Canal negotiation is a challenge for endodontist since orifices may have been shifted

or having calcification or having additional canals in an unusual location⁵. This case series describes non-surgical endodontic therapy of an unusual maxillary 1st molar with two palatal canals. The maxillary first molar is discussed in endodontics with three roots and three-four root canal. It is rare to have a second palatal canal in maxillary first molars. These cases highlight endodontic anatomy of a maxillary first molar with two canals in palatal root. Practitioners can only detect and negotiate these unusual occurrences with proper access cavities. In this case report, conventional triangular access for maxillary molar was modified to a trapezoidal shape in order to improve visualization to see the additional canals. Evaluation of radiograph with proper inspection of floor of pulp chamber with proper visualization and probe allows the clinician to identify orifice and locate the canal. The use of endodontic explorer, loupes and digital radiography was crucial for the detection and management of two canal in the palatal and the Meso-Buccal root. Clinician should scrutinize floor of chamber and radiograph in search for an additional canal possibility. These additional canals must be distinguished and debrided to avoid endodontic failure. Indeed, when recurrence of radicular anatomy abnormality is extremely low, dental specialist must consider the possibility that a tooth has additional canal or indeed additional root⁶. The ratio of report in two canals in palatal root is low. Table 1 shows variations in anatomy of Palatal canal of upper 1st molar⁷.

The variations in palatal root of upper 1st molar teeth were introduced by Stone and Stroner⁴⁶. It was seen that they performed a vitro study in which five hundred extracted molars in a preclinical labo-

Table 1: Summary of case reports of maxillary molars with more than one palatal canal.

Study	Molar Type	N	Age	Ethnicity	Country	Anatomy
Almeida et al ⁸	1st	1	37	ND	Brazil	2-2
Asghari et al ⁹	1st	1	21	ND	Iran	2 roots
Badole et al ¹⁰	1st	1	28	ND	India	2-2
Munavalli et al ¹¹	1st	1	28	ND	India	2-1
Kumar ¹²	1st	1	20	ND	India	2-1
Kotthoor et al ¹³	1st	1	30	Indian	India	2-2
Du et al ¹⁴	1st	1	21	China	Chinese	2-2
Kotthoor et al ¹⁵	1st	1	37	ND	India	2-1
Albuquerque et al ¹⁶	1st	3	55; 45; 32	ND	India	2-1; 2-1; 2-1
Karthikeyan and Mahalaxmi ¹⁷	1st	3	38; 21; 49	ND	India	2-1; 2-1; 2-1
He et al ¹⁸	1st	2	35 (one patient)	ND	China	2 roots; 2 - 1

Holderrieth and Gernhardt ¹⁹	1st	2	32; 21	ND	Germany	1-2; 2-1-2
Aggarwal et al ²⁰	1st	1	23	ND	India	2-2
de Almeida-Gomes et al ²¹	1st	1	26	ND	Brazil	2-2
Poorni et al ²²	1st	3	45; ND; 25	ND	India	2-1; 2-1; 2-1
Gopikrishna et al ²³	1st	1	25	ND	India	2 roots
Baratto-Filho et al ²⁴	1st	1	38	Japanese	Brazil	2 roots
Maggiore et al ²⁵	1st	1	19	Black	USA	1-3
Holtzman ²⁶	1st	1	22	White	Israel	2-2
Wong ²⁷	1st	1	22	White	USA	1-3
Bond et al ²⁸	1st	1	27	Black	USA	2-2
Stabholtz and Friedman ²⁹	1st	1	13	ND	Israel	2-2
Cecic et al ³⁰	1st	1	23	White	USA	1-2
Thews et al ³¹	1st	2	21; 43	ND	USA	2-1; 2 roots
Chawla et al ³²	2nd	1	42	ND	India	3-1
Nabavizadeh et al ³³	2nd	1	52	ND	Iran	2-1
Shojaeian et al ³⁴	2nd	1	45	ND	Iran	2 roots
Badole et al ³⁵	2nd	1	33	ND	India	2 roots
Kotloor et al ³⁶	2nd	1	35	ND	India	2 roots
Holderrieth and Gernhardt ³⁷	2nd	2	39; 40	ND	Germany	1-2; 1-2
Qun et al ³⁸	2nd	1	ND	ND	China	2 roots
Ghoddusi et al ³⁹	2nd	1	45	ND	Iran	2 roots
Shin et al ⁴⁰	2nd	2	21; 48	ND	South Korea	2 roots in both
Ulusoy and Gorgul ⁴¹	2nd	1	25	ND	Turkey	2 roots
Kim et al ⁴²	2nd	1	31	ND	South Korea	2 roots
Deveaux ⁴³	2nd	1	24	ND	France	2 roots
Libfeld and Rotstein ⁴⁴	2nd	1	27	Caucasian	Israel	2 roots
Benenati ⁴⁵	2nd	1	15	Caucasian	USA	2-2

Under "Anatomy", "2 roots" indicates 2 separate palatal roots, ND not defined.

ratory and evaluated that the root of palatal molar could exhibit more than one canal therefore (two) canals which can be bifurcated or can be separated. It also can be single root with two canals in or with separation. Christie et al. classified the abnormal anatomy of the maxillary second molars into three types: Type 1: Buccal roots shows a cow horn shaped and a less divergence with 2 widely divergent roots in palatal orifice, which sometimes is often tortuous and long. The root apices are separated. Type 2: Four short and separated roots of blunted root apices that run parallel. Type 3: Root morphology is constricted with mesio buccal, mesio palatal and distopalatal canal engaged at the web of a root dentine. The disto-buccal root seems to stand-alone and may diverge to distobuccal canal⁴⁷. In this present case, a conventional access (triangular pattern) was modified into a trapezoidal form to improve access to the additional canals. Usually, proper visual inspection of the pulp chamber floor by probing and proper visualization of periapical x-ray enable the dentist to locate and identify the orifice of the canal. In calcification cases of pulp chamber, sometimes-single orifice may be blocked at the orifice and may look like two orifices. Ultrasonic tips may help to remove this calcification and help in confirmation of single canal. Use of dental operating microscope, endodontic explorer, electronic apex locator and dental loupes are important for the detection and management of the two canals in the MB or a palatal root. It is the duty of an examiner or dentist who should do thorough examination of pulpal floor and periapical radiographs for possibility of additional canals⁴.

CONCLUSION

The knowledge of tooth anatomy is pre-requisite. Proper evaluation should be done during clinical and radiographic examination of the patient. Palatal root of maxillary 1st molars has a 2% to 5.1 % incidence of two root canal. Second palatal canal in the maxillary molar has a very low incidence. It is an important aspect to take such variation to consideration during endodontics, despite the low incidence in order to ensure success. Ability to locate an extra canal in a root canal system is a major factor of the success in an endodontic treatment.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

ETHICS APPROVAL

Ethical approval was taken from ethical review committee.

PATIENT CONSENT

Patient consent was taken before starting the procedure and for publishing.

AUTHORS' CONTRIBUTIONS

MA given the idea and performed the research study. AI conducted literature search and wrote the manuscript.

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