

Case Report

Endodontic Management of Mandibular First Premolar with two roots and three canals – A Case Report

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ABSTRACT:

This case report presents an extremely rare clinical case of a mandibular premolar with two roots and three canals. Mandibular premolars usually have a single root and a single canal. The occurrence of two roots with three separate root canals is unusual. The use of CBCT and dental operating microscope in this rare case greatly contributed toward making a confirmatory diagnosis and successful endodontic management.

Keywords: Mandibular premolars, Cone Beam Computed Tomography, Root canal morphologic variations.

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INTRODUCTION

The main objective of endodontic therapy is mechanical and chemical debridement of the entire root canal followed by a three-dimensional obturation with an inert filling material and coronal restoration. However, the presence of an untreated or missed root canal may lead to endodontic treatment failure. Sometimes, root canals are left untreated because the clinicians fail to identify their presence particularly in teeth that have anatomical variations.

It has been reported that mandibular premolars are probably the most difficult teeth to treat endodontically due to the most atypical and exotic root canal morphology. Mandibular first premolars, the 'Endodontist's enigma' are anatomically unpredictable and often present with a wide variety of morphological oddities¹.

Zillich and Dowson reported that a second or a third canal exists in 23% of first mandibular premolars². A study by Vertucci revealed that the mandibular first premolar had one canal at the apex in 74% of the teeth, two canals in 25.5% and three canals in the remaining 0.5%³. Owing to the limited documentation on first premolars with two roots and three canals, this

report presents a rare anatomical variation involving a two-rooted first premolar with three distinct canals.

CASE REPORT

A 45-yr old male patient reported to Department of Conservative Dentistry & Endodontics at RUHS College of Dental Science with chief complain of pain in lower left back tooth region since 3 weeks. His medical history was non-contributory. Patient also consulted a dentist who had initiated root canal treatment and referred the case to our institution.

Clinical examination revealed a carious left mandibular first premolar (#34) which was tender on percussion led to a provisional diagnosis of symptomatic apical periodontitis of the left mandibular first premolar (#34), necessitating endodontic therapy followed by prosthesis.

Conventional radiographic evaluation of the involved teeth revealed an unusual, complex root canal anatomy and vague outlines of two roots identified with three canals (Figure 1). Hence, to ascertain this complex root canal anatomy of the tooth in a three-dimensional manner, Cone Beam Computed Tomography – Limited FOV- 5*5cm (Carestream

CS9300 Imaging system, Carestream Health, Inc New York, USA) was planned (Figure 2).

The tooth was anesthetised using 2% Lignocaine with 1:100000 Epinephrine (Martin & Brown Bio-Sciences Pvt. Ltd., India). Access opening was modified using an Endo-Access bur FG 2(Dentsply Sirona) in a high-speed arotor handpiece under rubber dam isolation (Coltene Whalent, USA). Careful exploration of the pulp chamber floor with an endodontic explorer DG-16 was done. After careful inspection, three canal orifices Mesiobuccal, Distobuccal) and Lingual were located under magnification using microscope (Labomed Magna) and patency was obtained using a size 10 K-file (Mani, Inc., Japan). Working length was determined using electronic apex locator (Root ZX mini, J Morita, Tokyo, Japan) and confirmed radiographically (Figure 3 & 4).

Canals were cleaned & shaped using a crown-down technique with Ni-Ti rotary files (Coltene Hyflex CM) up to 25 (0.04 taper) under copious irrigation. Irrigation was done with 5% sodium hypochlorite

(Hyposol, PrevestDenPro, Ltd., India) solution (2ml/canal) using 30G Needle -Single Vent (Master Clean 1- Ident, Gujarat, India) during each instrumentation and activated by sonic irrigation (SuperEndo Sonic Activator, Waldent Innovations Pvt. Ltd., India) for 30 seconds. Final irrigation was done 17% EDTA (Prime Dental Products Pvt. Ltd., India) for 1 minute followed by flushing with saline. Canals were dried using absorbent paper point. Calcium hydroxide dressing was given for 1 week.

On subsequent visit, canals were flushed with saline & master cone radiograph was taken (Figure 5). Obturation done using thermoplasticized technique (Eighteeth, Changzhou Sifary Medical Technology Co. Ltd.) using AH Plus Root Canal Sealer (Dentsply DeTrey, Germany). Post endodontic restoration done with composite resin (Te-Econom Plus, Ivoclar Vivadent, AG Liechtenstein) (Figure 6). The patient experienced no posttreatment discomfort on a follow-up of 6 months (Figure 7).



Figure 1: Preoperative Radiograph



Figure 2: Cone Beam Computed Tomography Sections – Axial and Saggital Section

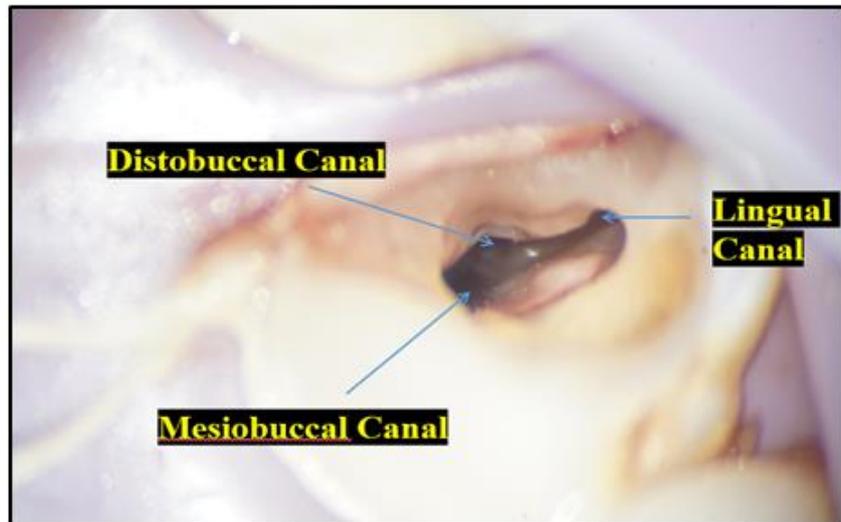


Figure 3: Clinical Photograph (Magnification - 25x)



Figure 4: Working Length Radiograph



Figure 5: Master Cone Radiograph



Figure 6: Post endodontic Radiograph



Figure 7: 6 Month Follow-up

DISCUSSION

Successful endodontic treatment of mandibular premolars is often a challenging task. This can be related to the internal morphology of the pulp cavity, the number of root canals and the presence of apical deltas and lateral root canals. Table 1 and 2 shows the anatomical variations in the mandibular first premolar as reported by various authors.

High-quality preoperative radiographs with different horizontal angulations (20° and 40°) should be used to identify the anatomical variations of the root canal system¹¹. The sudden radiographic disappearance (fast break) of a root canal on parallel radiographs may be evidence of a dividing root canal or an additional root canal¹². Multiple angled radiographs combined with Cone Beam Computed Tomography¹³ helps in treatment planning to manage these cases.

A small access cavity in such teeth restricts the visualization of the area hence, a wider endodontic access is necessary to locate the additional root canals. In order to better visualize the pulp chamber, the access cavity should have divergent walls towards the occlusal aspect, allowing identification of the anatomic map of the pulp chamber floor with its canal orifices. Magnification and illumination are absolute prerequisites for evaluating colour changes and for working deep inside the tooth. Magnification loupes and dental microscopes play a vital role in managing complex endodontic cases by improving visualization and accuracy which enables the clinician to clean and shape root canal more efficiently.

From locating canals to post endodontic restoration under the microscope aided in successful management of this case.

Table 1: Anatomical variations of single rooted Mandibular First Premolar

| Author | Year | Population | One canal | Two canals | Three canals |
|---------------------------------|------|----------------|-----------|------------|--------------|
| Pineda and Kuttler ⁴ | 1972 | Mexico | 74.2% | 24.9% | 0.9% |
| Zillich and Dowson ² | 1981 | Michigan | 80.7% | 18.9% | 0.4% |
| Vertucci ³ | 1984 | Florida | 74.0% | 25.5% | 0.5% |
| Yoshioka et al. ⁵ | 1985 | Tokyo, Japan | 80.6% | 15.1% | 4.3% |
| R.Saeed ⁶ | 2007 | Chennai, India | 70.6% | 22% | 1.2% |
| Jain and Bahuguna ⁷ | 2011 | Gujarat, India | 67.39% | 2.8% | 0% |
| P.Thanaruengrong ⁸ | 2021 | Thailand | 63.1% | 0.6% | 0% |

Table 2: Incidence of occurrence of two roots in Mandibular First Premolar

| Author | Year | Population | Incidence | Study Type |
|--------------------------------|------|---------------------------|-----------|---------------|
| Iyer et al. ⁹ | 2006 | Chennai Population, India | 3.9% | In vivo |
| R.Saeed ⁶ | 2007 | Iranian Population | 2% | In vitro |
| Jain and Bahuguna ⁷ | 2011 | Gujarat Population, India | 2.8% | In vitro |
| P.Thanaruengrong ⁸ | 2021 | Thai Population | 1.6% | CBCT analysis |

CONCLUSION

A rare case of a mandibular first premolar with two separate roots and three canals was successfully managed non-surgically. This report highlights the significance of thorough anatomical understanding and the application of tailored endodontic techniques to ensure successful clinical results.

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