

## Endodontic Management Of Aberrant Root Canal Anatomy In Mandibular Premolars

Research Article

Pradeep Solete<sup>1\*</sup>, Sneha Pai<sup>2</sup>

<sup>1</sup> Associate Professor, Department of Conservative Dentistry and Endodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University 162, Poonamallee High Road, Chennai 600077, Tamilnadu, India.

<sup>2</sup> Department of Conservative Dentistry & Endodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India.

### Abstract

For the success of endodontic treatment, an understanding of root canal anatomy and morphology is very important. Proper endodontic management would require a thorough debridement, disinfection and obturation of the root canal. Mandibular premolars are termed as “enigma to endodontists” as they are believed to possess aberrant root canal anatomies such as multiple root canals, apical deltas and lateral canals. Such aberrant anatomies depend on various factors like ethnic background, age and gender of the population. These variations in anatomies can be identified using various radiographic techniques and under magnification. Failure to identify and disinfect additional canals would result in flare ups and failures. This article reports the aberrant mandibular premolar anatomies and discusses the treatment recommendations for a successful endodontic outcome.

**Keywords:** Mandibular Premolar; Vertucci's Classification; CBCT; Aberrant Canal Anatomy; Periapical Radiography.

### Introduction

Knowledge of root canal anatomy along with radiographic details and magnification are very important for the successful endodontic management of teeth with aberrant root canal anatomies which in turn would determine the prognosis of the treated tooth [1, 2]. Inability to locate, disinfect and obturate any of the roots or root canals would result in treatment failure [3, 4]. Mandibular premolars have been reported to be the most challenging teeth for endodontic management, especially when they are present with multiple roots or canals [5, 6]. The likelihood to possess variations, narrow mesio distal dimensions, practice of conservative accesses, apical bifurcations and trifurcations of the canal and compromised visibility add on to the difficulty of endodontically managing these teeth [2].

Endodontic treatment aims to debride and disinfect the root canal so as to prepare it to receive an inert filling material that will block

all portals of exit [7-9]. Failure to disinfect or obturate root canals would result in treatment failure [10, 11]. Mandibular premolars are believed to possess complex root canal anatomies with most of the teeth showing Vertucci's Type I canal configuration and about 20% of the teeth showing prevalence of multiple canals.

Previously our team has a rich experience in working on various research projects across multiple disciplines [12-26]. Now the growing trend in this area motivated us to pursue this project. This case report discusses endodontic management of a mandibular 1st and 2nd premolar with varied root canal anatomy.

### Case Report 1

#### Mandibular First Premolar (44) With Two Roots and Two Canals

A 45 year old female patient reported with pain in 44 which ag-

#### \*Corresponding Author:

Pradeep Solete,

Associate Professor, Department of Conservative Dentistry and Endodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University 162, Poonamallee High Road, Chennai 600077, Tamilnadu, India.

Tel: +919710404482

Email Id: [pradeeps@saveetha.com](mailto:pradeeps@saveetha.com)**Received:** May 03, 2021**Accepted:** May 26, 2021**Published:** May 30, 2021**Citation:** Pradeep Solete, Sneha Pai. Endodontic Management Of Aberrant Root Canal Anatomy In Mandibular Premolars. *Int J Dentistry Oral Sci.* 2021;08(05):2601-2604.**doi:** <http://dx.doi.org/10.19070/2377-8075-21000509>**Copyright:** Pradeep Solete ©2021. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

gravated on chewing and having cold beverages. Patient gave a history of initiated root canal therapy 3 months ago. Clinical examination showed a prepared access cavity in 44 with tenderness to percussion. Radiographic examination revealed radiolucency in the coronal portion that was confluent with the root canals, indicative of initiated root canal treatment in 44 along with periapical radiolucency. Angled radiograph (SLOB technique) showed the presence of 2 roots in 44. The case was diagnosed as previously initiated root canal treatment in 44 with symptomatic apical periodontitis.

**Treatment Protocol**

Patient was informed about the treatment protocol and an informed consent was taken. The tooth was anesthetized using an inferior alveolar nerve block with 2% Lignocaine HCL containing 1:2 lacs units of adrenaline (Lignox, Indoco Remedies Ltd, India). Access cavity was modified with Endo-Z bur (Dentsply-Sirona, USA). Magnification was achieved using an OPMI pico dental operating microscope (CarlZeiss, Germany). Since the radiograph showed bifurcation of the root in the middle third, the access cavity was flared for easy access and visibility. The canals were negotiated using a size 10K file (Dentsply-Sirona, USA). Cleaning and shaping was done using ProTaper Gold rotary files (Dentsply-Sirona, USA) with the crown down technique using 3% sodium hypochlorite and 17% EDTA which was activated using Endoactivator (Dentsply-Sirona, USA). The root canals were obturated using cold lateral condensation technique using resin sealer (AH plus, Dentsply-Sirona, USA). Post obturation radiograph was taken to assess the quality of obturation following which a permanent restoration was placed. (Figure 1).

**Case Report 2**

**Mandibular Second Premolar (45) With Two Roots and Four Canals**

A 59 year old male patient reported with pain in 45 which aggravated on having cold beverages and on chewing. Patient gave a history of initiated root canal treatment 1 week ago. Clinical examination showed deep cervical abrasion and recession on the buccal aspect of 45 with a temporary restoration. Radiograph revealed radiolucency in the coronal aspect of 45 that was confluent with the root canal indicative of initiated root canal treatment along with widened periodontal ligament space. It was diagnosed as previously initiated root canal treatment in 45 with symptomatic apical periodontitis.

CBCT scan was taken to evaluate the canal morphology.

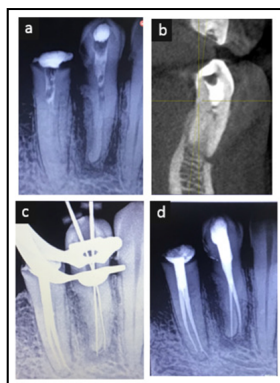
**Treatment Protocol**

The same treatment protocol was followed as mentioned above. In this case, the mandibular premolar was seen to have two roots that had two root canals which split apically to exit as four canals. All the canals were negotiated, disinfected, shaped and obturated. (Figure 2).

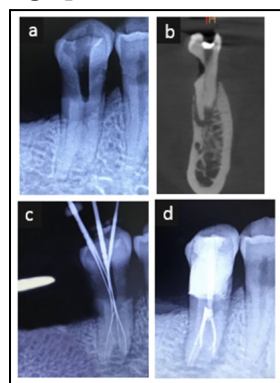
**Discussion**

Mandibular premolars show complex and highly variable root ca-

**Figure 1. Mandibular first premolar (44) a. Pre operative radiograph. b. Pre operative CBCT. c. Working length determination radiograph. d. Obturation radiograph.**



**Figure 2. Mandibular second premolar (45) a. Pre operative radiograph. b. Pre operative CBCT. c. Working length determination radiograph. d. Obturation radiograph.**



nal anatomy which makes endodontic treatment very challenging. Multiple root canals have been identified in mandibular premolars with the incidence of more canals in black populations [27, 28].

The first step in root canal treatment would be to predict the root canal anatomy. This could be made possible by tracing the anatomical landmarks on the pulp floor which would disclose supplementary canals if present [29]. Tactile exploration of the pulpal floor carefully with hand files is recommended rather than searching for the canals at random places.

Further identification of aberrant anatomy is made possible with the help of angled radiographs, which on careful observation would show the presence of multiple roots or canals [27, 29]. Careful observation of the root shape and its position relative to the tooth would also help in identifying multiple canals [30]. Also, canal continuity should be looked for. Sudden disappearance of a canal would indicate towards a splitting canal.

If multiple canals are suspected and not clearly identified with conventional radiographs, CBCT imaging can also be used as the presence of additional canals or splitting of canals would be clearly evident in different sections of the scan [31, 32].

Endodontic management of premolars with multiple root canals can be successfully done by complete removal of pulp tissue from the root canal system which is achieved by careful exploration of the canal system with tactile sensation or magnification, thorough disinfection of the root canal with activation followed by three dimensional obturation to seal the canal space. Application of knowledge regarding root canal anatomies supplemented with appropriate diagnostic aids would help in achieving successful outcome in the management of cases with aberrant anatomies.

Our institution is passionate about high quality evidence based research and has excelled in various fields [16, 33-43].

## Clinical Significance

The cases of aberrant anatomies described above have been successfully managed endodontically mainly with the aid diagnostic aids that helped in predicting the canal anatomy and magnification which helped in the visualization of the canals. Also a rare variation of aberrant anatomy (mandibular premolar with four canals) has been observed and managed in the case report. This article highlights the importance of acquiring knowledge on root canal anatomy along with disinfection and sealing of the root canal space in achieving predictable outcomes after root canal treatment.

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