

Endodontic Treatment of Mandibular Premolars with Complex Anatomy: Case Series

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Abstract:- Mandibular premolars are usually thought to be easy to treat endodontically but variations in their anatomic configuration make them a difficult task to accomplish. The possibility of additional root canals should always be kept in mind when performing endodontic treatment with such cases. Adequate knowledge of pulp canal anatomy, proper radiographic interpretation, incorporation of CBCT, and dental operating microscope are prerequisites for the best possible outcome in complex root canal treatment. This case series presents a relatively uncommon clinical case of mandibular premolars with two and three canal configurations managed with the help of DOM.

Keywords:- Complex Anatomy, Endodontic Enigma, Mandibular Premolar.

I. INTRODUCTION

Thorough knowledge and understanding of normal anatomy along with its common variation, good radiographs with correct interpretation, optimal access preparation, treatment of almost all micro entries of the internal aspect of the tooth are crucial for the success of root canal treatment. Failure to appreciate these anatomic variations may increase the chance of root canal failure. Root canals may be left untreated because the clinician is unaware of their presence [1]. Newer aids like CBCT and DOM play a major role in finding canals [2]. A dental operating microscope opens a new horizon for clinicians, especially when treating endodontic enigma [2].

If one proceeds with a notion of finding a single canal in this tooth, then the clinician is highly likely to miss a significant canal which can cause the failure of the entire treatment plan. So, it is necessary to have an understanding and contemplate the morphological pattern usually observed

in these teeth as they pose a considerable clinical challenge for their management.

Mandibular premolars may have vast diversity in canal morphology [3]. Mandibular second premolars usually have one canal but two or more canals may exist [4], [5]. The incidence of these teeth with two and three canals is between 0-0.4% and 2.5% respectively [3], [6].

II. CASE REPORT 1

A 50-year-old female reported to the Department of Conservative Dentistry and Endodontics with the complaint of pain in the posterior right mandibular region for 3 weeks. The episode of pain was spontaneously induced, sharpshooting, and necessitated intake of analgesics for relief. She had no relevant medical history. On clinical examination right mandibular first premolar (#44) was grossly carious. Clinical examination, radiographic interpretation, and vitality test led to the diagnosis of symptomatic irreversible pulpitis with right mandibular first premolar thus requiring endodontic treatment.

Radiographic examination of the affected tooth denoted the unusual anatomy of tooth #44 (Fig- 1). Shadow of pulp chamber was discontinuing as the radicular pulp at 3mm below the crestal bone. Such appearance is usually suggestive of the division of the main canal into two or more canal systems. Appearance, in this case, is suggestive of bifurcation. The tooth was anesthetized using 2% Lignocaine with 1:100000 adrenaline. Rubber dam isolation was done and endodontic access opening using No. 2 round bur and safe end bur (Mani, Inc., Tochigi, Japan) in a high-speed airoter handpiece. The procedures were done under a dental operating microscope (DOM; Carl Zeiss, Germany). Access opening and deroofting was done at 0.6x magnification. The pulp chamber was flushed with 2.5% sodium hypochlorite. A

sharp endodontic explorer was used to locate canal orifices under 1.6x magnification.

GG drills (Mani, Inc., Tochigi, Japan) were used for coronal flaring up to the canal furcation, this allowed fiberoptic of the microscope to illuminate the furcation area. Careful exploration of the pulp chamber floor revealed three canals orifices, two in buccal and one in lingual (Fig- 2). Canal patency was achieved using #10 K-file (Mani, Inc., Tochigi, Japan). Working length was determined using a standard protocol (Fig- 3). Cleaning and shaping were performed using a crown-down technique at 1.4x magnification using Protaper gold nickel-titanium rotary instruments (Maillefer, Dentsply, Ballaigues, Switzerland) under intermittent irrigation with 2.5% sodium hypochlorite and EDTA (AveuPrep, Vasai, India). The temporary restoration was placed upon completion and the patient was recalled after 2 days.

Rubber dam isolation was performed and temporary restoration was removed. A master cone radiograph was taken which confirmed three separate root canals (Fig-4). Sonic activator (Endoactivator, Maillefer, Dentsply, Ballaigues, Switzerland) was used for activation of the sodium hypochlorite, root canals were dried using paper points (Maillefer, Dentsply, Ballaigues, Switzerland). Canal obturation was carried out in two segments along with a resin sealer. (AH Plus, Maillefer, Dentsply, Ballaigues, Switzerland). Individual tributaries of the main canal beyond furcation were obturated using single cone technique and the cones were seared off at the level of furcal orifices using touch n heat system (Sybron Endo, California, USA), and pluggers were used to vertically compact the gutta-percha. Radicular pulp space was obturated using thermoplasticized injectable gutta-percha (Kerr, California, USA). A hand plugger was used for the compaction of thermoplasticized gutta-percha. (Fig- 5) shows post obturation radiograph.

III. CASE REPORT 2

A 30 years old male reported to the Department of Conservative Dentistry and Endodontics with the complaint of pain in the posterior right mandibular region for the last 1 week. He gave a history of intermittent pain and food lodgment for the past 1 month in the same region. There was no relevant medical history. On clinical examination right mandibular second premolar (#45) had amalgam restoration having secondary caries. Clinical examination, radiographic interpretation, and vitality test led to the diagnosis of symptomatic irreversible pulpitis with right mandibular second premolar thus requiring endodontic treatment.

Radiographic interpretation of the affected tooth denoted the unusual anatomy of tooth #45 (Fig- 6). To study anatomic variation in detail CBCT was taken which showed root bifurcation mesiodistally (Fig- 7 and 8) Prior to CBCT previous amalgam restoration with #45 was removed to decrease the artifacts. As guided by the CBCT main canal was clinically found at the middle one-third of the root (Fig-9). After careful exploration of both the canals standard protocol for working length determination (Fig- 10) cleaning

and shaping and obturation (Fig- 11 and 12) were followed as used in the previously described case.

IV. DISCUSSION

Root canal anatomic variations are particularly common with mandibular premolars thereby it is imperative for correct diagnosis, treatment planning, and careful handling of the endodontic procedure [7]. Table 1 shows anatomic variation in mandibular first premolars while Table 2 shows anatomic variations in mandibular second premolars by various authors. According to trope et al [8] found that Afro-Americans have the highest incidence of mandibular premolars with extra canals than Caucasians. A study of 2000 mandibular premolars in Chennai (India) showed that one canal was seen in 75.4% and two distinct canals in 20.8% while three separate canals in 0.4% of mandibular premolars [7].

The clinician should visualize radiographically and have adequate knowledge of internal anatomy before undergoing endodontic treatment. When performing endodontic treatment examination of pulp chamber floor may offer clues for the location of orifices. Krasner and Rankow [9] demonstrated a definite pattern of pulp chamber floor and canal wall anatomy exists. They proposed six laws for identifying canal orifices which were found in 95% of the examined tooth.

The introduction of the microscope in Endodontics has revolutionized the everyday practice of specialty, enabling the practitioner to deliver an exceptionally high level of care in cases that previously may have been untreatable or resulted in a compromised prognosis. Microscopes are very helpful in treating complex anatomy such as endodontic enigma. D G 16 probe is particularly useful as a pathfinder on dental maps for finding canals. Evaluation of two or more radiographs is of utmost importance before an endodontic procedure. According to Martinez-Lozano et al [10] by changing the horizontal angulation by 20° and 40° showed the actual number of canals in premolars. CBCT is also a valuable tool for determining the number and position of root canals before an endodontic treatment, which was used in one of the cases.

Also, abrupt disappearance of main canal indicate that there is a trifurcation or bifurcation which are the guidelines suggested by Nattress and Martin. [11]

V. CONCLUSION

Owing to anatomic variations which are relatively common with mandibular premolars which significantly increases the difficulty for endodontic treatment. Thus dental operating microscopes should be incorporated are in our practice as it is a valuable tool to increase the visualization and illumination at the same time.

TABLE I. ANATOMIC VARIATION IN MANDIBULAR FIRST PREMOLARS ACCORDING TO VARIOUS AUTHORS:

Author	Year	One canal	Two canals	Three canals
Vertucci [6]	1984	74%	25.5%	0.5%
Pineda and Kuttler [4]	1972	74.2%	24.9%	0.9%
Calışkan [12]	1995	75.5%	18.8%	5.7%
Zillich and Dowson [13]	1973	80.7%	18.9%	0.4%

Fig. 3. Case 1. (Working length radiograph).



TABLE II. ANATOMIC VARIATION IN MANDIBULAR SECOND PREMOLARS ACCORDING TO VARIOUS AUTHORS:

Author	Year	One canal	Two canals	Three canals
Vertucci [6]	1984	97.5%	2.5%	-
Pineda and Kuttler [4]	1972	98.8%	1.2%	-
Calışkan [12]	1995	93.6%	6.4%	-
Zillich and Dowson [13]	1973	88.4%	11.2%	0.4%

Fig. 4. Case 1. (Master cone radiograph)



Fig. 1. Case 1. (Pre operative radiograph)



Fig. 5. Case 1. (Post obturation radiograph)



Fig. 2. Case 1. (Pulp chamber floor showing three canals under DOM 1.6x magnification).



Fig. 6. Case 2. (Pre operative radiograph)

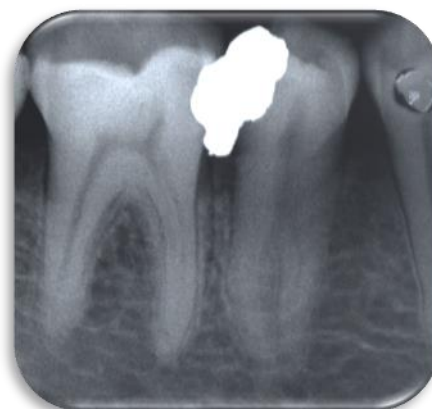


Fig. 7. Case 2. (CBCT showing sagittal section)



Fig. 8. Case 2. (CBCT showing axial section)

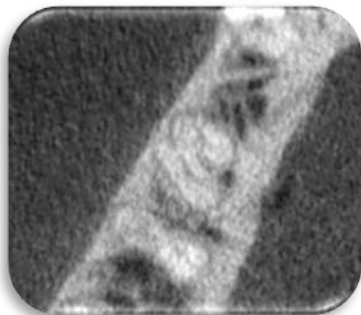


Fig. 9. Case 2. (Pulp chamber floor showing two canals under DOM 1.6x magnification)

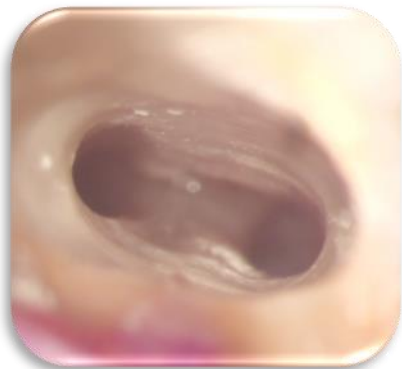


Fig 10. Case 2. (Working length radiograph).



Fig 11. Case 2. (Master cone radiograph)



Fig 12. Case 2. (Post obturation radiograph)



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