



Endodontics

AN UNUSUAL CASE OF FOUR ROOTED MANDIBULAR FIRST MOLAR – A RARE CASE REPORT

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ABSTRACT

Aim: This clinical case report describes the non-surgical endodontic management of a rare, atypical four rooted mandibular first molar. **Background:** The Mandibular molar is usually two rooted with one mesial and one distal root. Additional roots are rare which requires accurate diagnosis and a methodical and scrupulous endodontic treatment. Cone Beam Computed Tomography and magnification using a dental microscope play a crucial role in managing these unusual anatomical variations. **Case Description:** A 33-yr old female patient presented with chief complain of pain in lower left back tooth region since 3 weeks. Clinical examination revealed a carious left mandibular first molar which was tender on percussion led to a provisional diagnosis of symptomatic apical periodontitis of the left mandibular first molar, necessitating endodontic therapy followed by prosthesis. This clinical case report describes the endodontic management of an unusual case of a permanent mandibular first molar with four roots (two mesial & two distal). A Cone Beam Computed Tomography confirmed a four-rooted mandibular molar. The dental microscope proved invaluable in this case, assisting at every stage from canal identification to post-endodontic restoration, thereby ensuring successful management. A 12-month follow-up confirmed treatment success, with the patient reporting no discomfort. **Conclusion:** Successful endodontic treatment begins with proper clinical and radiographic examinations mainly in aberrant morphological teeth with extra hidden canals and roots. The present case report highlights the successful endodontic treatment of an atypical four individual rooted mandibular first molar by following a systematic approach from diagnosis to its clinical management. **Clinical Significance:** With careful planning and precise execution, in conjunction with CBCT and dental microscope, can simplify the treatment workflow, leading to accuracy and predictability in managing these complex anatomic variations.

KEYWORDS : Cone Beam Computed Tomography; Mandibular First Molar; Root Canal Anatomy; Magnification; Developmental Root Fusion Line

INTRODUCTION

Teeth with untreated canals harbours the bacterial aetiology and are often the cause of failure of endodontic treatment. An understanding and anticipation of the uncommon morphology allows clinicians to negotiate and chemo-mechanically debride the entire root canal complex and significantly influence the success of the endodontic treatment. Mandibular molars are usually two rooted with one mesial and one distal root.¹ An additional third root, located distolingually in mandibular molars denominated as radix entomolaris was first mentioned in the literature by Carabelli.² Whereas radix paramolaris is an additional root at the mesio-buccal side. Carlsen and Alexandersen have described the identification and external morphology of these root complexes, containing a lingual or buccal supernumerary root but mention of a four-rooted mandibular molar sometimes encountered in the clinical practice in the literature is rare.^{3,4} The presence of four roots in a mandibular first molar is a rare variation, and very few cases have been reported in the literature. The conventional radiography images produce anatomical noise due to the superimposition of three-dimensional structure in a two-dimensional image. The integration of Computed tomography in endodontics allows an accurate discernment and diagnosis of even complex anatomic morphology.⁵ Owing to the limited documentation on mandibular first molar with distinct four roots with four canals, this report presents a successful nonsurgical endodontic management of a four-rooted permanent mandibular first molar diagnosed with the aid of Cone Beam Computed Tomography.

Case Description

A 33-yr old female patient reported to Department of Conservative Dentistry & Endodontics with chief complain of pain in lower left back tooth region since 3 weeks. His medical history was non-contributory. Clinical examination revealed a carious left mandibular first molar which was tender on percussion led to a provisional diagnosis of symptomatic apical periodontitis of the left mandibular first molar, necessitating endodontic therapy followed by prosthesis.

Conventional radiographic evaluation of the involved teeth revealed an

unusual vague outlines double lining of the periodontal ligament, suggesting accessory root. A 20 degree mesial angulation radiograph reinforced the possibility of two extra roots as the apical contour of the mesial and distal root diverged into two separate termini (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 (CarestreamCS9300 Imaging system, Carestream Health, Inc New York, USA) was planned (Figure 2A to C).

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 Whalant, USA). Careful exploration of the pulp chamber floor with an endodontic explorer DG 16 was done. Visual examination of the pulp chamber floor indicated unique pattern of developmental root fusion lines forming X configuration. Start X ultrasonic tips (Dentsply Maillefer, Ballaigues, Switzerland) were utilised for controlled extension of the access cavity to expose the root canal orifices. After careful inspection, four canal orifices namely mesiobuccal, mesiolingual, distobuccal and distolingual were located under magnification (Figure 3) 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 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, Prevest DenPro, 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 Single cone Technique Guttapercha 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 1 year (Figure 7).

DISCUSSION

Atypical anatomical variations are frequently seen in mandibular molars which require accurate diagnosis and clinical approach for its successful endodontic management. High-quality preoperative radiographs with different horizontal angulations (20° and 40°) should be used to identify the anatomical variations of the root canal system. Multiple angled radiographs combined with Cone Beam Computed Tomography helps in treatment planning to manage these cases.

Four rooted mandibular first molar is a rare occurrence with a reported incidence of 0.04%.⁶ Kottoor et al.⁷ reported the presence of three distal canals, while Ghoddusi et al.⁸ noted the presence of four distal canals. Like the number of root canals, the number of roots may also vary. Morita in a laboratory study examined 2,164 extracted mandibular first molars and reported only a single four-rooted first molar, in a male patient, which formed 0.04% of the total sampled Japanese population (Mongoloid race).⁸ Hemant Ramesh Chourasia et al. found no evidence of four-rooted first molars when examined the root canal morphology of permanent mandibular first molars in an Indian population.

In the present case, an intraoral periapical radiograph taken in multiple angulated views revealed a double periodontal ligament and an apical root contour suggestive of extra roots. The roots and the pulp canal anatomy overlying in a buccolingual plane can be obfuscated in two-dimensional radiography and the three-dimensional computed tomography images can overcome this limitation. A decision to clarify the anatomy by cone beam computed tomography was taken considering the unusual radiographic presentation. The Computed tomography images disclosed a four-rooted mandibular first molar, with two mesial and two distal roots and Type 1 root canal configuration.

Visual inspection of the Developmental Root Fusion Line (DRFL) in the floor of the pulp chamber guides the extension of pulp chamber and also provides diagnostic clues of the root anatomy. Kottoor et al. described the DRFL in the pulp chamber of a four rooted mandibular molar with four roots (two mesial and two distal) as an X configuration and suggested it as a diagnostic predictor of four rooted mandibular molar.¹⁰ This case report found a similar configuration and the angle formed between the DRFLs joining both the mesial and distal orifices was acute angle rather than obtuse angle. All the orifices were at the terminus of developmental root fusion line (DRFL) and formed a trapezoidal configuration.

Start X ultrasonic tips were utilised for a controlled extension of the access cavity and to trough the calcification overlying the root canal orifices. Magnification and illumination are absolute prerequisites for evaluating colour changes and for working deep inside the tooth. Dental microscope played a vital role in managing this type complex endodontic case by improving visualization and accuracy which enables to clean and shape root canal more efficiently.

After location of all the canal orifices, the initial root canal scouting and negotiation should be done with small sized K files (size 10 or less) with gentle tactile advancement to its apical end.¹¹ The initial file should be visually inspected as it may provide an insight of the canal curvature. The supplementary roots may have severe root curvatures especially in its apical third. A reproducible glide path should be established and files progressed sequentially to avoid any procedural errors. The preparation of a glide path followed by biomechanical preparation with a controlled memory rotary Ni-Ti files will lead to a centred root canal preparation and decrease the possibility of ledge formation, zipping and transportation of canals in supplemental roots with sharp curvatures.

CONCLUSION

Successful endodontic treatment begins with proper clinical and radiographic examinations mainly in aberrant morphological teeth with extra hidden canals and roots. Also, clinician should be aware of the root and canal morphology variations and should be able to use

modern diagnostic aids if needed. The present case report highlights the successful endodontic treatment of an atypical four individual rooted mandibular first molar by following a systematic approach from diagnosis to its clinical management.



Figure 1: Preoperative Radiograph - A 20° mesial angulation intra-oral periapical radiograph (IOPA) revealed the apical contour of mesial and distal roots diverging into two separate termini suggesting the presence of two supplemental roots. (Indicated by the red arrows)



Figure 2A to C: Cone Beam Computed Tomography-Axial Section showing four distinct roots separating from middle third to apical third. (A) Coronal Third; (B) Middle Third; (C) Apical Third

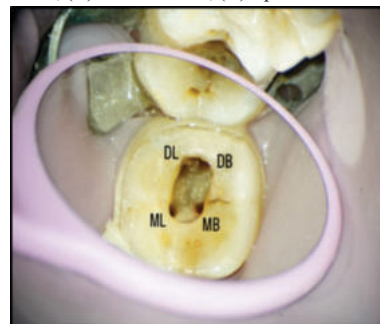


Figure 3: Clinical Photograph (Magnification - 25x) – showing four distinct mesiobuccal (MB), mesiolingual (ML), distobuccal (DB) and distolingual (DL) orifices presenting in the form of 'X'.

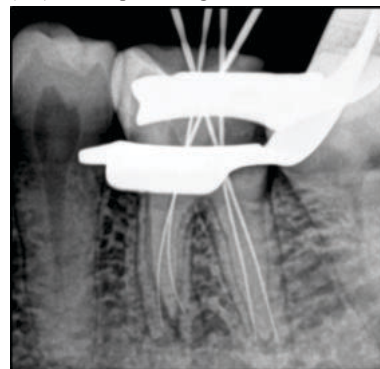


Figure 4: Working Length Radiograph illustrating the files placed in four distinct canals of four roots.



Figure 5: Master Cone Radiograph

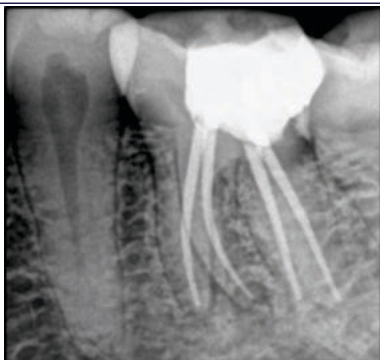


Figure 6: Post endodontic Radiograph

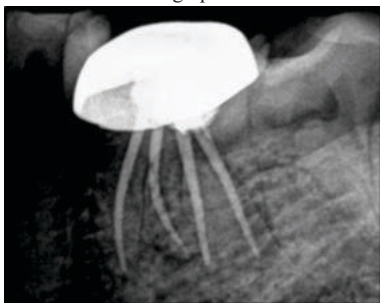


Figure 7: 1-year follow-up radiograph

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