

Treating Rare with Care: Radix Ento-Paramolaris-Endodontic Management of Mandibular Second Molar with Four Roots and Five Canals

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Abstract: *The morphological variation in the number of roots and root canals, especially in multi-rooted teeth is a constant challenge for diagnosis and successful endodontic therapy. Knowledge of the most common anatomic characteristics and their possible variations is fundamental. Although, endodontic management of four-rooted mandibular first molars have been observed on a few occasions in the literature, to the best of our knowledge four-rooted mandibular second molars having two mesial and two distal roots have not been reported. This paper highlights endodontic management of mandibular second molar with four roots (two mesial and two distal) with one canal in each root and its cone beam computed tomography (CBCT) evaluation which was primarily done for post treatment assessment for diagnosing post-endodontic complications, also confirming our radiographic diagnosis of this variation. Thus, helping us to portray the anatomy of this rare variation.*

Keywords: Cone beam computed tomography; endodontic management, four-rooted; mandibular second molar

1. Introduction

The most common configuration of the mandibular second molar is the presence of two roots, although the presence of one and three roots has also been reported.¹ An anatomic variation, first mentioned in the literature by Carabelli (1844), is an additional third root. The nomenclature of radix entomolaris and radix paramolaris refers to supplemental roots located distolingually and mesiobuccally, respectively.² Therefore, it is mandatory for the clinician to have a thorough knowledge of the root canal anatomy and its variations. With the availability of such promising and exciting diagnostic tools such as computed tomography, new vistas have been opened in the non-invasive evaluation of dental morphology.³

The presence of four roots in a mandibular first molar is a rare variation, and very few cases have been reported in the literature.⁴ Few cases on been reported on mandibular first molar with four roots and four or five canals. Very few cases have been reported on mandibular second molar with four roots and four canals. But, there is no case reported on mandibular second molar with four roots and five canals.

So, the clinical relevance and main purpose of this case report is to present an uncommon case of mandibular second molar with four independent roots and five canals using CBCT as a diagnostic aid and under magnification.

2. Case Report

A 37 year old female patient reported to Department of Conservative dentistry and Endodontics with the chief complaint of pain in the lower right back teeth region of mouth since two weeks. Pain was spontaneous that intensified during mastication. Patient medical history was non-contributory. Clinical examination revealed decayed mandibular right second molar. Tooth was tender on vertical percussion. Pulp sensibility test using cold and electric pulp

testing elicited a negative response. Radiographic examination revealed radiolucency involving pulp with periapical radiolucency. Based on history, clinical & radiographic examination, Diagnosis of irreversible pulpitis with periapical abscess was made. Treatment plan suggested was non- surgical endodontic therapy.

A thorough examination of pre operative radiograph revealed radio opacities adjacent to mesial and distal root, presence of twin periodontal ligament (PDL) outline of roots which revealed presence of extra roots (Figure 1). As, a result CBCT was advised in relation to right mandibular second molar (47) which revealed presence of four roots and five canals. Axial views of the tooth were obtained at three different levels of root [Slice thickness: 75 um). (Figure 2)

- At Cervical third - On evaluation, all four roots seemed to be fused at this level, two canals in mesiolingual root
- At Middle third - Axial slice at this level revealed two distinct distal roots and two distinct mesial roots, two canals separate in mesiolingual root.
- At apical third - Axial slice at this level revealed four distinct roots, fusion of two Canals in mesiolingual root. Thus, CBCT data and their three- dimensional reconstruction image confirmed presence of four roots with single canal in mesiobuccal, distobuccal, distolingual root & two canals in mesiolingual root with 2-1 Configuration.

Informed consent was obtained from patient. Tooth was anesthetized with an inferior alveolar nerve block using 2% lignocaine with 1: 80,000 epinephrine, rubber dam isolation was established.

Access Cavity preparation was done and pulp chamber floor was explored under magnification which revealed five distinct orifices MB, ML1, ML2, DB, DL. Followed by which working length was determined by electronic apex locator and was verified with radiograph. Chemomechanical preparation was done using endodontic rotary instruments

and canals were prepared till 25.4%. Canals were disinfected with 2.5% NaOCl followed by normal saline. Canals were dried using paper points, intracanal medicament was placed followed by temporary restoration.

During the second appointment temporary restoration was removed, irrigation was done using 2.5% NaOCl and normal saline. Canals were properly dried and master cone radiograph was taken. Obturation was done using 25.4% gutta percha followed by post obturation restoration was done using composite.

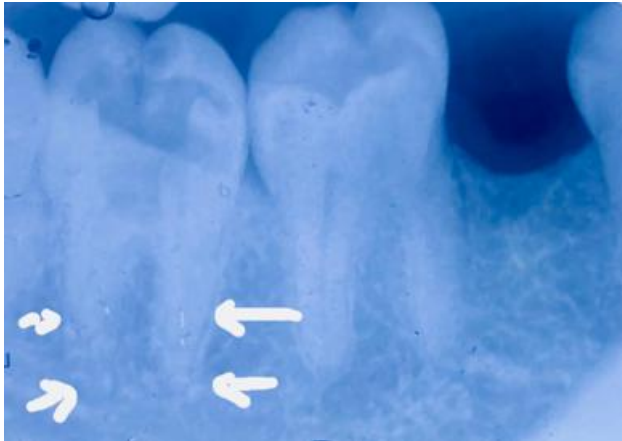


Figure A: Pre operative radiograph



Figure C: 3-D reconstruction images

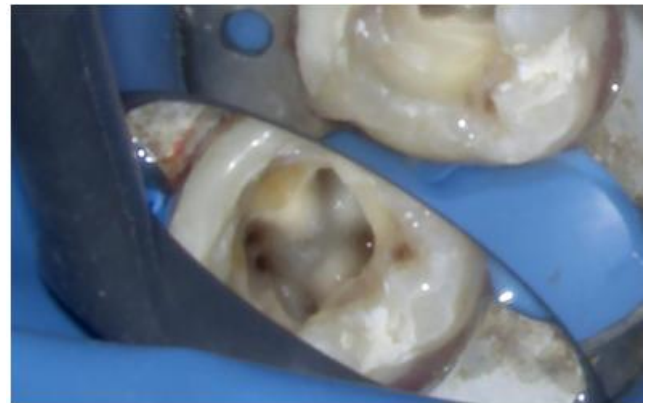


Figure D

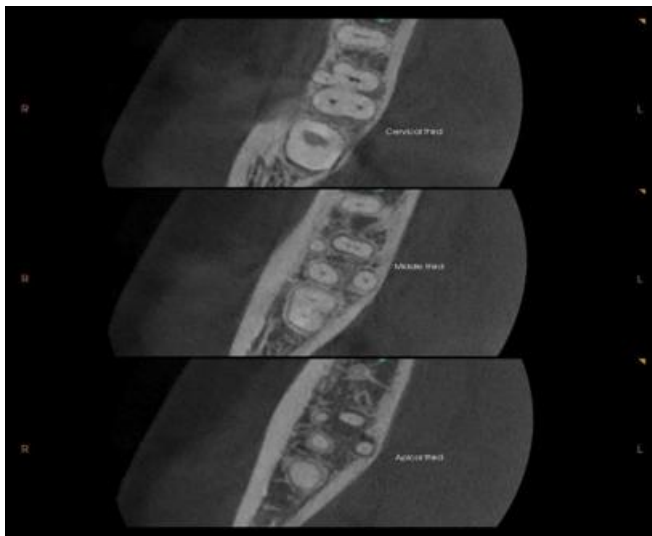


Figure B: CBCT images axial view

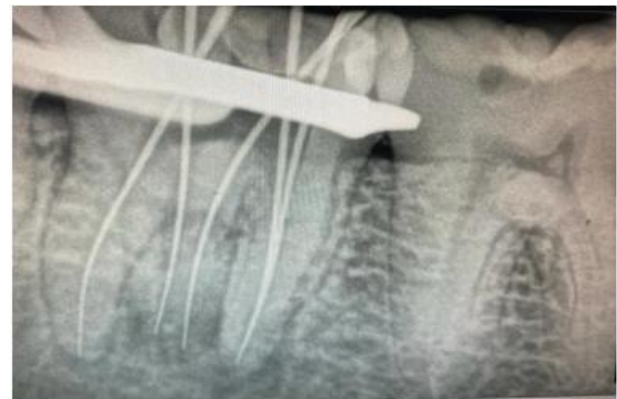


Figure E



Figure F



Figure G



Figure H



Figure I

Figure D: Access opening clinical photograph, **Figure E:** Working length radiograph, **Figure F:** Master cone radiograph, **Figure G:** Post obturation radiograph, **Figure H:** Post obturation restoration, **Figure I:** Full coverage restoration

3. Discussion

The major cause of failure of root canal therapy is the complexity of the root canal system. Mandibular molars can manifest with several anatomical variations, based on the internal and external morphology of the tooth.⁵ According to study by Prasanna Neelakantan et al., most of the mandibular second molars had two separate roots (87.8%) with three canals.⁶ Manning reported that out of 149 extracted mandibular second molar 22% had single roots, 76% had two roots and 2% had three roots.⁷

Radiographs produce only a two-dimensional image of a three-dimensional object resulting in superimposition of images. Hence, they are of rather limited value in cases with complex root canal anatomy. Interpretation and appraisal based on a two-dimensional radiograph may alert the clinician to the presence of aberrant anatomy but would not be able to present the variable morphological structure of root canals and their interrelations.⁸

Recently, Aamir Rashid Purra et al., presented a case of four roots (three mesial roots and one distal root) in mandibular second molar though it was four rooted three out of four were mesial roots and one distal.³ Unlike present case which is the rare case of four rooted mandibular second molar with presence of two mesial and two distal roots and five canals.

Kottoor et al. described the developmental root fusion line (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.⁹

This case report found a similar configuration and confirms the findings of Kottoor et al. A diagrammatic representation

of the pulp chamber floor shows the location of canal orifices in the present case. All the orifices were at the terminus of DRFL and formed a trapezoidal configuration. The mesial orifices formed the shorter side while the distal orifice formed the longer side of the trapezoid due to the distolingual root orifice's asymmetrical displacement towards the distolingual corner.

In this case report, use of magnification aided in the proper detection of extra canals. A decision to clarify the anatomy by CBCT was taken considering the unusual radiographic presentation. The CBCT images disclosed a four-rooted mandibular second molar that showed independent roots without any fusion. The limitations of periapical radiographs include anatomical noise, the two-dimensional nature of the resulting image and superimposition of structures.¹⁰ CBCT overcomes these limitations by enabling us to visualize the third dimension and also eliminating super-impositions. It also aids in depth understanding of the true morphology of root canals.⁵

4. Conclusion

It can be concluded that a thorough examination of pre operative radiograph are most important with knowledge of variations in root and root canal morphology, aid of advanced radiographic technology like CBCT and magnification for successful treatment outcome.

This case reports mainly (Radix ento-paramolaris) a very rare and uncommon case of mandibular second molar with four independent roots and five canals with single canal in mesiobuccal, distobuccal, distolingual root and two canals with 2-1 configuration in mesiolingual root.

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