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Unmasking the hidden root: Endodontic management of radix paramolaris

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Abstract

Anatomical variations in mandibular molars present a significant challenge in endodontic therapy. One such rare variation is the *radix paramolaris*, an additional supernumerary root located buccally. Failure to identify and treat this anomaly may lead to persistent pathology and compromised prognosis. This case report describes the diagnosis and successful endodontic management of a mandibular molar with radix paramolaris. Careful radiographic examination and clinical exploration were crucial for identifying the additional root. Access cavity design was caries driven which facilitated canal location, followed by cleaning and shaping using a rotary NiTi system and irrigation protocol to ensure disinfection. Obturation was completed with a warm vertical compaction technique, achieving a three-dimensional seal. The patient remained asymptomatic with satisfactory periapical healing at follow-up. This report underscores the importance of awareness, accurate diagnosis, and the use of advanced techniques in managing rare root canal anatomical variations.

Keywords: Radix paramolaris, mandibular molar, anatomical variation, endodontic management, case report

1. Introduction

Successful endodontic therapy hinges upon a comprehensive understanding of root canal anatomy and its myriad variations. Mandibular molars, in particular, present significant morphological diversity that can challenge diagnosis and clinical outcomes. Among these anatomical anomalies, the presence of an additional supernumerary root—termed radix molaris is especially noteworthy. Two primary variants have been documented: the radix entomolaris (RE), located distolingually, and the much rarer radix paramolaris (RP), situated mesiobuccally or buccally^[1].

Carabelli (1844) was the first to describe the presence of supernumerary roots in mandibular molars. Two distinct variations have since been identified: the *radix entomolaris*, located distolingually, and the *radix paramolaris*, located mesiobuccally or buccally. Among these, radix paramolaris is considered extremely rare, with a reported prevalence of less than 5%^[2]. Failure to recognize such variations can result in missed canals, persistent periapical pathology, and eventual treatment failure. Careful interpretation of preoperative radiographs, aided by advanced imaging modalities such as cone-beam computed tomography (CBCT), along with modified access cavity designs, plays a pivotal role in identifying and managing these anomalies^[3].

Recent CBCT-based epidemiological studies provide insight into their prevalence across different populations. For example, a Saudi Arabian CBCT study reported that 4.5% of mandibular first molars presented with a radix molaris; specifically, 4.3% were RE and only 0.3% were RP^[4]. A broader Brazilian CBCT assessment found an overall radix molaris prevalence of 5.4%, with approximately 7.0% of these cases being RP. These findings reaffirm that while RE occurs at a non-negligible rate, RP remains exceedingly uncommon^[5].

Detection of such rare configurations is vital for ensuring comprehensive treatment. RP's mesiobuccal location often places it outside the expected access and may be overlooked with standard two-dimensional imaging. CBCT has proven invaluable for identifying these anatomical variations, enabling more accurate diagnosis and facilitating modified access cavity designs for successful endodontic intervention.

This case report presents the clinical diagnosis and successful endodontic management of a mandibular molar exhibiting radix paramolaris, highlighting the indispensable role of anatomical awareness, advanced imaging, and treatment adaptation when confronting such rare anomalies.

Case Report

A 35-year-old female patient, Kavitha, reported with a chief complaint of pain in the lower left back tooth region for the past one month. The pain was described as sharp, continuous, and increasing in intensity at night, with tenderness noted on percussion. Pulp sensibility testing revealed an exaggerated lingering response to cold and a negative response to the electric pulp test, findings consistent with symptomatic irreversible pulpitis.

Clinical Examination

Intraoral examination revealed deep caries in the mandibular left first molar (tooth 36). The tooth was tender on vertical percussion but showed no mobility. Adjacent soft tissues appeared normal, with no sinus tract or swelling noted.

Radiographic Examination

Periapical radiograph revealed radiolucency approaching the pulp with widening of the periodontal ligament space. An additional root outline suggestive of a radix paramolaris was observed on the buccal aspect. Fig-1

Surgical Management

The patient was anesthetized with 2% lignocaine (1:80,000) and rubber dam isolation was achieved using a #12A hygienic clamp. Access opening was performed through the carious lesion with an Endo Access bur no. 2 (Dentsply Sirona, USA) under an operating microscope. Upon exposure of the pulp chamber, deroofting was completed using a safe-ended Endo Z bur. Careful exploration revealed two orifices on the mesial aspect and two orifices on the distal aspect, consistent with the presence of a radix paramolaris. Fig-2

The canals were initially negotiated using a #10 K-file with pre-curved tips to facilitate exploration. Working length was then established with a #15 K-file using a Root ZX mini apex locator and confirmed radiographically. Radiographic evaluation with mesial and distal angulations revealed the presence of an additional root, consistent with radix paramolaris. Fig 3, 4, 5 Biomechanical preparation was subsequently carried out using Super Endo Blue rotary files, ensuring thorough shaping and cleaning of all canals.

Cleaning and shaping were carried out in all four canals distobuccal, mesiobuccal, mesiolingual, and distolingual up to size 25.04%. Irrigation was performed throughout the procedure using 5.25% sodium hypochlorite and saline. Following instrumentation, the canals were flushed with

saline and a final rinse of 2% chlorhexidine was given. An aqueous calcium hydroxide paste was then placed as an intracanal medicament, and the tooth was temporized for two weeks.

At the subsequent visit, the intracanal medicament was removed using a hand file along with copious saline irrigation. The canals were then dried with sterile paper points, and a final rinse with 17% EDTA was performed to eliminate the smear layer. The master cone fit was checked and confirmed radiographically Fig-6, 7, 8. Finally, obturation was carried out using gutta-percha with the single cone technique in combination with Seal Max-R sealer, ensuring a three-dimensional hermetic seal. Fig-9.



Fig 1: (Pre-operative radiograph)



Fig 2: (Access opening, 4 canals located)

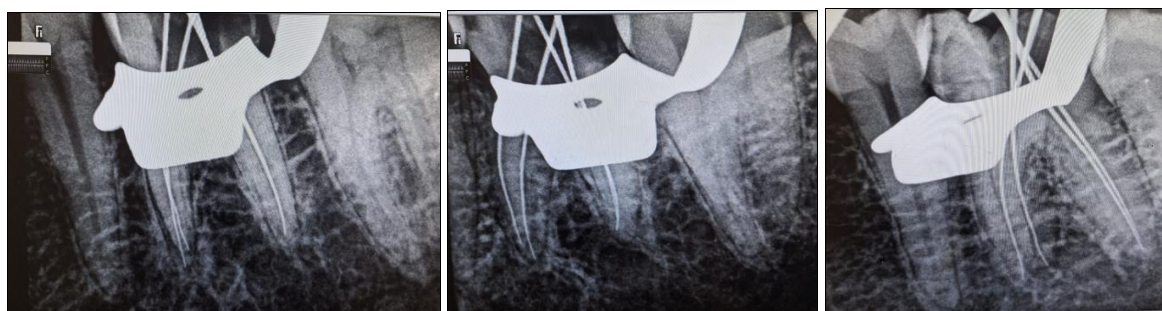


Fig 3, 4, 5: (Working length determination; different angulations)



Fig 6, 7, 8: (Master cone fit; different angulations)



Fig 9: (Obturation)

Discussion

The primary objective of endodontic therapy is thorough debridement and disinfection of the root canal system, followed by a three-dimensional hermetic seal to prevent reinfection. Anatomical variations, such as radix paramolaris, pose significant diagnostic and clinical challenges, as missed canals are among the most common causes of endodontic failure [6]. Careful clinical and radiographic examination, supplemented with advanced imaging when required, is essential for identifying such variations. In the present case, the presence of radix paramolaris was confirmed during clinical access and subsequent radiographic evaluation.

Effective biomechanical preparation and irrigation are critical to eliminating microbial load from such complex root canal systems. Sodium hypochlorite remains the gold standard irrigant because of its dual ability to dissolve organic tissue and exert broad-spectrum antimicrobial action [7]. Chlorhexidine was used as a final rinse due to its substantivity, providing prolonged antimicrobial effects against residual flora [8].

Calcium hydroxide was employed as an intracanal medicament for two weeks. Its high alkalinity not only provides broad antimicrobial activity but also neutralizes bacterial endotoxins, which play a key role in sustaining periapical inflammation [9]. This step is particularly valuable in anatomically challenging teeth like radix paramolaris, where complete microbial eradication in one visit may be difficult.

In the subsequent appointment, smear layer removal was achieved with 17% EDTA, which facilitates better sealer adaptation by opening dentinal tubules and removing inorganic debris [10]. Radiographic verification of master cone fit ensured accurate working length and apical sealing. Obturation was performed using a single cone technique with gutta-percha in combination with a resin-based sealer (Seal max-R). Resin-based sealers exhibit good handling properties, low solubility, and strong adhesion to dentin, thereby providing an effective seal and enhancing the longevity of

root canal treatment [11, 12].

The favorable outcome in this case emphasizes the importance of recognizing anatomical variations and adopting a systematic disinfection protocol. Literature highlights that teeth with extra roots, such as radix paramolaris, are particularly prone to missed anatomy, which can compromise treatment outcomes if not identified. By integrating advanced irrigation strategies, intracanal medicament, smear layer removal, and bioactive obturation, a predictable prognosis can be achieved.

Conclusion

Successful endodontic management of teeth with anatomical variations such as radix paramolaris requires meticulous diagnosis, careful access refinement, and a systematic disinfection and obturation protocol. The present case highlights the importance of clinician awareness and the integration of advanced irrigation, intracanal medicaments, and bioactive sealers in achieving predictable outcomes. Early recognition of such aberrant root morphology is critical to prevent missed canals and ensure long-term treatment success.

Conflict of Interest

Not available.

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Not available.

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