

RADIX ENTOMOLARIS: A CLINICAL CHALLENGE OF AN ADDITIONAL DISTOLINGUAL ROOT IN MANDIBULAR MOLARS”

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ABSTRACT

Background: Radix entomolaris (RE) is an anatomical variation characterized by the presence of an additional distolingual root in mandibular molars. Failure to identify and treat this extra root canal system may result in persistent infection and endodontic failure. Awareness of such variations and their proper management is essential for successful root canal therapy.

Case Series: This article presents three clinical cases of mandibular first molars exhibiting radix entomolaris. The patients presented with different pulpal and periapical conditions, including irreversible pulpitis and apical periodontitis. Diagnosis was established through careful clinical examination and intraoral periapical radiographs taken at different horizontal angulations. Access cavities were modified to a trapezoidal configuration to facilitate identification of the additional distolingual canal. Working length determination was performed using apex locators and radiographs. Biomechanical preparation was carried out using nickel-titanium rotary instrumentation systems with copious irrigation using sodium hypochlorite and EDTA. All canals were subsequently obturated with gutta-percha and zinc oxide eugenol sealer.

Results: In all three cases, the additional root and canal were successfully identified, negotiated, cleaned, shaped, and obturated. The modified access cavity design and careful radiographic assessment played a crucial role in achieving successful treatment outcomes.

Conclusion: Radix entomolaris presents a significant endodontic challenge that requires thorough knowledge of root canal anatomy, careful diagnosis, and appropriate clinical modifications. Early recognition and meticulous management of this anatomical variation can significantly improve treatment outcomes and reduce the risk of missed canals and endodontic failure.

Keywords: Radix entomolaris, mandibular first molar, anatomical variation, root canal treatment, endodontics, additional root.

INTRODUCTION

A thorough understanding of root canal anatomy and its variations is essential for the success of endodontic treatment. One of the most significant anatomical variations in mandibular molars is the presence of an additional root known as radix entomolaris (RE). This anatomical entity was first described by Carabelli, who identified an extra distolingual root in mandibular molars. The occurrence of RE presents a clinical challenge, as failure to detect and treat this additional root canal system can lead to persistent infection and endodontic failure.

Radix entomolaris is most commonly found in mandibular first molars and is characterized by its location lingual to the distal root. The prevalence of this variation shows considerable ethnic diversity, being relatively uncommon in Caucasian populations (<5%) but more frequently observed

in Asian populations, where its incidence may range from 5% to 30%^{1,2}. Such variations highlight the importance of careful radiographic and clinical examination prior to endodontic procedures.

From a clinical perspective, the presence of RE requires modifications in conventional access cavity design and canal exploration techniques. Standard triangular access cavities may need to be altered to a trapezoidal form to locate the distolingual canal orifice effectively. Advanced diagnostic tools such as Cone Beam Computed Tomography have significantly improved the detection of such anatomical variations, allowing for more predictable treatment outcomes.³

Therefore, knowledge of radix entomolaris and its morphological variations is crucial for clinicians to avoid missed canals and ensure successful root canal therapy. The

following case series illustrates the successful diagnosis and management of radix entomolaris in mandibular first molars, highlighting the importance of awareness and adherence to sound endodontic principles in achieving favorable clinical outcomes.

CASE REPORT 1

56-year-old male patient reported with pain in right mandibular first molar i.e. 46, since a week. The pain aggravated on taking cold and hot food items and upon mastication. His medical history was noncontributory. Clinical examination of 46 revealed deep occlusal carious lesion and it was tender to percussion. The periodontal examination of 46 showed Periodontal Ligament Space enlargement and loss of lamina dura and additional root between mesial and distal root. Two radiographs with different horizontal angulations were taken which confirmed that the additional root was present distolingual to the mesial root. Diagnosis of nonvital tooth with apical periodontitis was

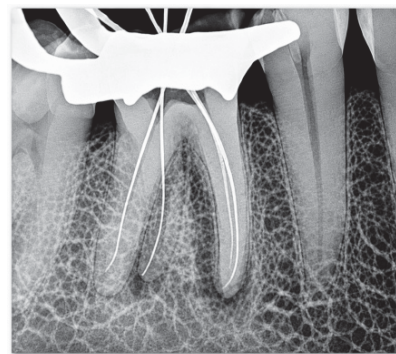
found. Endodontic treatment modality is found best suited for this clinical condition

Lignocaine Nerve block to anaesthetise the tooth was given and then Access opening done to locate canals. Trapezoidal access cavity done to locate all canals. Mesio Buccal, mesiolingual and distal canal located easily. Pulp chamber floor revealed four canal orifices (2 mesial & 2 distal), confirming the presence of additional distal canal. Between distal canal orifice and the distolingual corner of the pulp chamber floor. At this corner overlying dentin was removed and a second distal canal orifice was detected.

Working length established with radiograph and apex locator help with no.10 K files inside the canals. Biomechanical preparation done with NT gold rotary file system upto 25/0.04. Irrigant between each instrument used was sodium hypochlorite 5.25% and 17% EDTA. After the master cone selection, canals were obturated with single cone technique with gutta-percha of 25/0.04 and ZOE sealer.



(A)



(B)



(C)



(D)

FigureNo. 1: (a) Access opening (b) Working length IOPARc)
Master cone IOPARd) Obturation IOPAR

CASE REPORT 2

32 yrs old female reported with pain in left mandibular back teeth region. Patient gave a history of pain since 2 weeks. Intraoral examination revealed class 2 Distocclusal dental caries in tooth 36 with slightly increased mobility. Diagnostic radiograph revealed carious lesion close to the pulp with a faint outline of an additional root overlapping the mesial root of left mandibular first molar. Diagnosis of irreversible pulpitis was made so, endodontic therapy was

planned.

Lignocaine Nerve block to anaesthise the tooth was given and Access opening done for canals location. Negotiation with K file no.10 done Working length measured with radiograph and apex locator. Biomechanical preparation was done with Gen Endo (coltene) rotary file system. Irrigant NaOCl and EDTA was used between instruments to clear debris and avoid blocking of canals. Obturation was performed with gutta-percha with ZOE sealer

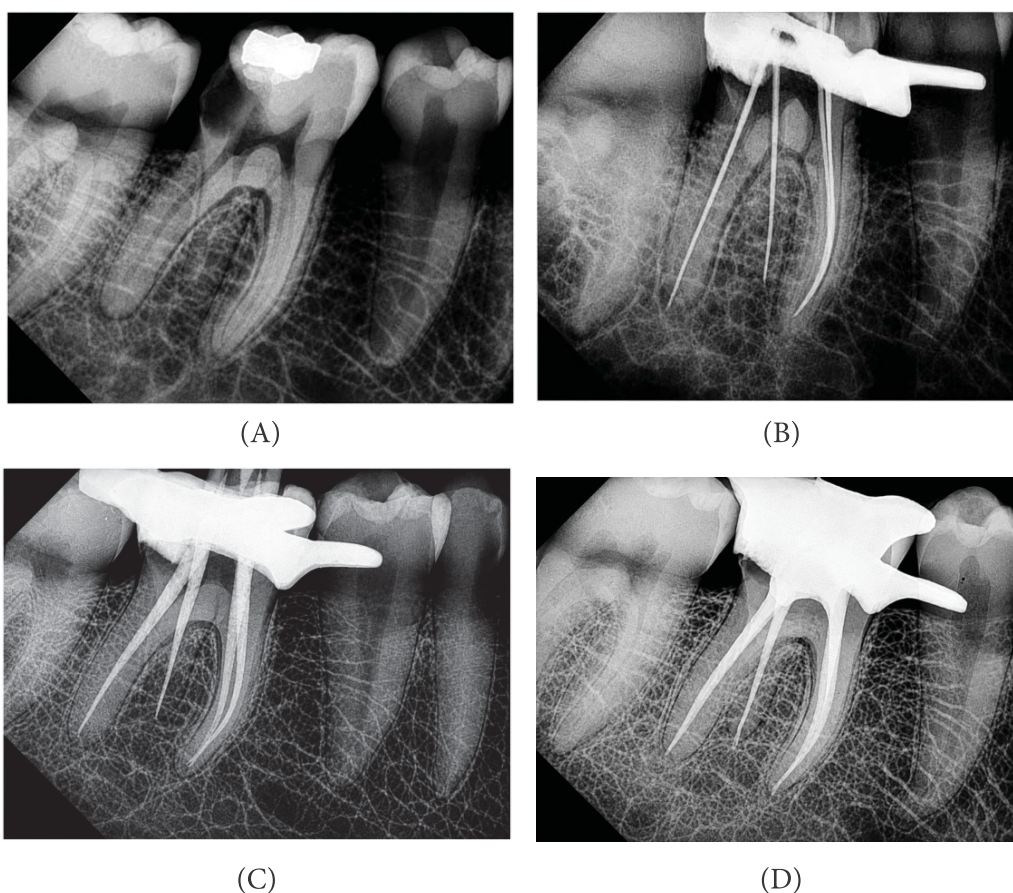


Figure No. 2: (a) Pre Operative IOPAR (b) Working length IOPAR
(c) Master cone IOPAR (d) Obturation IOPAR

CASE REPORT 3

Male Patient of 42 years reported to Department of Conservative and Endodontics with history of pain which was spontaneous and continuous in the right posterior region. The first mandibular molar 46 showed large cavity decay MESIO occlusally and was negative for the pulp sensibility test (cold); the palpation and percussion tests were positive. Diagnostic IOPAR revealed carious pulpal exposure. Clinically and radiological examination lead to diagnosis of acute irreversible pulpitis and root canal therapy was performed for this first molar. Radiological examination also

lead to the suspicion of extra root presence.

Access opening performed after tooth with lignocaine nerve block. Carious dentine removed to locate canal orifices. Two mesial canals and two distal canals located with the help of DG 16 explorer. Distal canal orifices were located on buccal and lingual side. All four canals were negotiated with no.10 k file. BMP performed with Neoendo file system. Copious irrigation was done to remove debris and clean the canals with NaOCl 5.25% and EDTA 17%. After thorough irrigation, master cone was taken and obturation was performed Guttpercha and ZOE sealer.

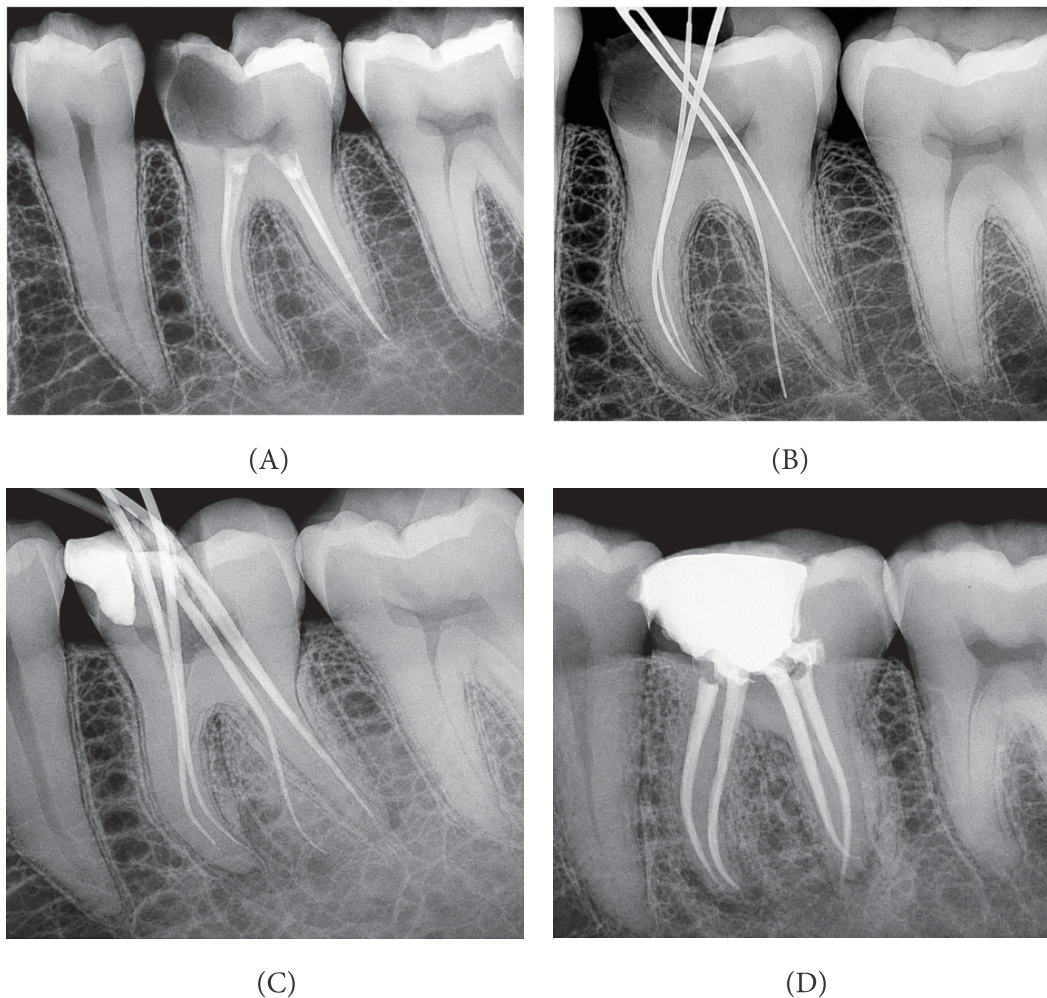


Figure No. 3: (a)Pre operative IOPAR (b)Working Length IOPAR (c)Mater cone IOPAR (d) Obturation IOPAR

DISCUSSION

The present case series demonstrates the successful management of RE in mandibular first molars with different pulpal conditions, including irreversible pulpitis and apical periodontitis. These findings support the concept that anatomical variations are independent of pulpal status and must always be anticipated during endodontic procedures.¹ In all cases, the additional root was identified through careful interpretation of intraoral periapical radiographs taken at multiple horizontal angulations. This technique remains a cornerstone in endodontic diagnosis, as supernumerary roots are often masked by overlapping structures in standard radiographs.^{1,2}

However, conventional radiography provides only a two-dimensional image of a three-dimensional structure, which

may limit accurate detection. In such situations, advanced imaging modalities such as Cone Beam Computed Tomography have proven invaluable. CBCT allows precise visualization of root morphology, canal configuration, and curvature, thereby significantly enhancing diagnostic accuracy and treatment planning.³ Nevertheless, due to considerations of radiation exposure and cost, its use should be reserved for complex or doubtful cases.

The prevalence of RE exhibits significant ethnic variation, with a higher incidence reported in Asian populations compared to Caucasians.^{2,6} This epidemiological pattern is consistent with the demographic profile of the patients in the present case series. Therefore, clinicians practicing in regions with higher prevalence should maintain a high index of suspicion for the presence of an additional root in mandibular

molars.

From a clinical standpoint, modification of the access cavity design is essential for locating and managing RE canals effectively. The conventional triangular access cavity is often inadequate; hence, it should be modified into a trapezoidal or rectangular form to improve visibility and allow straight-line access to the distolingual canal.^{4,7} In the present cases, such modifications facilitated the identification of four canal orifices, including the additional distolingual canal. Careful exploration of the pulpal floor, particularly along developmental grooves, is crucial for detecting hidden canal orifices.⁸

Instrumentation of RE canals can be particularly challenging due to their curvature, reduced diameter, and complex anatomy. According to De Moor et al., RE canals may exhibit varying degrees of curvature, which increases the risk of procedural errors such as ledging, canal transportation, and instrument separation.¹ In the present cases, the use of nickel-titanium rotary instruments, along with prior glide path establishment, allowed safe and efficient canal preparation. Adequate irrigation using NaOCl and EDTA was employed to ensure effective debridement and removal of smear layer, which is essential for achieving optimal disinfection.^{5,9}

Another important consideration is the role of magnification and illumination in detecting additional canals. The use of dental operating microscopes or loupes has been shown to significantly improve the detection rate of accessory canals, thereby enhancing treatment outcomes.¹⁰ Although not always available, their use is highly recommended, especially in complex anatomical cases.

Failure to identify and treat RE canals is a well-documented cause of endodontic failure. Missed canals harbor residual bacteria, leading to persistent infection and post-treatment disease.¹¹ Therefore, clinicians must adopt a systematic approach that includes careful radiographic assessment, access cavity modification, thorough canal exploration, and meticulous cleaning and shaping.

The successful management of all three cases in this report highlights the importance of awareness, early diagnosis, and appropriate clinical strategies in dealing with radix entomolaris. Incorporating modern diagnostic tools and adhering to sound endodontic principles can significantly improve treatment outcomes in such anatomically complex cases.

CONCLUSION

Radix entomolaris represents a clinically significant anatomical variation that can directly influence the success of endodontic therapy. The present case series highlights the importance of thorough knowledge of root canal morphology, careful radiographic interpretation, and a high index of suspicion when treating mandibular molars, particularly in populations with higher prevalence of this variation.

Early and accurate diagnosis—achieved through multiple

angulated radiographs and, when required, advanced imaging such as Cone Beam Computed Tomography—is essential for identifying additional roots. Modification of the conventional access cavity design, meticulous exploration of the pulpal floor, and the use of appropriate instrumentation techniques are key factors in successfully managing such cases.

Failure to recognize and treat the additional canal may result in persistent infection and endodontic failure. Therefore, clinicians must adopt a systematic and cautious approach to ensure all canals are located, cleaned, shaped, and obturated effectively.

Within the limitations of this case series, it can be concluded that awareness of radix entomolaris, combined with sound clinical skills and adherence to endodontic principles, significantly enhances treatment outcomes and reduces the risk of missed canals.

REFERENCES

1. De Moor RJG, Deroose CA, Calberson FLG. The radix entomolaris in mandibular first molars: an endodontic challenge. *Int Endod J*. 2004;37(11):789–99.
2. Tu MG, Tsai CC, Jou MJ, Chen WL, Chang YF, Chen SY. Prevalence of three-rooted mandibular first molars among Taiwanese individuals. *J Endod*. 2007;33(10):1163–6.
3. Patel S, Durack C, Abella F, Shemesh H, Roig M, Lemberg K. Cone beam computed tomography in endodontics. *Int Endod J*. 2015;48(1):3–15.
4. Abella F, Patel S, Durán-Sindreu F, Mercadé M, Bueno R, Roig M. Mandibular first molars with distolingual roots: review and clinical management. *Int Endod J*. 2012;45(11):963–78.
5. Vertucci FJ. Root canal anatomy of the human permanent teeth. *Oral Surg Oral Med Oral Pathol*. 1984;58(5):589–99.
6. Curzon MEJ. Three-rooted mandibular permanent molars in English Caucasians. *J Dent Res*. 1973;52(1):181.
7. Ribeiro FC, Consolaro A. Importância clínica e antropológica do radix entomolaris em molares inferiores permanentes. *Rev Odontol UNESP*. 1997; 26(1): 137–42.
8. Krasner P, Rankow HJ. Anatomy of the pulp chamber floor. *J Endod*. 2004;30(1):5–16.
9. Zehnder M. Root canal irrigants. *J Endod*. 2006;32(5):389–98.
10. Baldassari-Cruz LA, Wilcox LR, Rivers BJ. The influence of dental operating microscope on detection of root canal orifices. *J Endod*. 2002;28(4):324–7.
11. Hoen MM, Pink FE. Contemporary endodontic retreatments: an analysis based on clinical treatment findings. *J Endod*. 2002;28(12):834–6.
12. Schäfer E, Breuer D, Janzen S. The prevalence of three-rooted mandibular permanent first molars in a German population. *J Endod*. 2009;35(2):202–5.