DOI: 10.7860/JCDR/2026/87353.23873

Case Report

Dentistry Section

CBCT Diagnosis of Radix Entomolaris in a Mandibular First Molar Mimicking Multitooth Pathology: A Case Report

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ABSTRACT

Anatomical variations in mandibular molars, particularly the presence of a Radix Entomolaris (RE), may complicate endodontic diagnosis and treatment. When associated with sinus tract misdirection, such variations can mimic pathology involving adjacent teeth and lead to diagnostic uncertainty. A 33-year-old female presented with intermittent pain in the lower left posterior region with a persistent sinus tract. Sinus tract tracing and periapical radiographs initially suggested involvement of adjacent teeth. However, clinical examination and vitality testing excluded pathology in neighbouring teeth. Radiographic evaluation revealed an additional distolingual root in the mandibular first molar, suggestive of RE. Root canal treatment was performed using modified access, flexible nickel-titanium instrumentation and calcium hydroxide intracanal medication. Post-obturation Cone-Beam Computed Tomography (CBCT) confirmed that the periapical lesion was confined to the distal root, explaining the misleading sinus tract pathway. The patient became asymptomatic, with complete resolution of the sinus tract.

Keywords: Cone-beam computed tomography, Periapical periodontitis, Root canal treatment, Sinus tract misdirection, Supernumerary roots

CASE REPORT

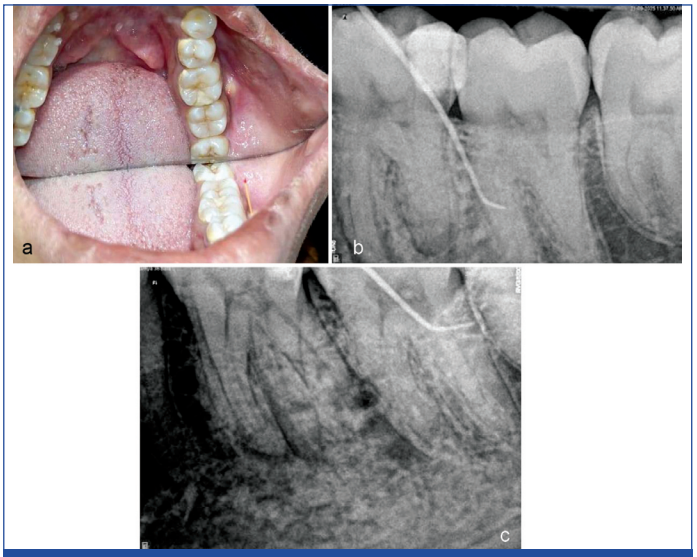
A 33-year-old female patient presented with the chief complaint of pain in the lower left posterior region of the jaw, accompanied by a bitter taste sensation for the past three months. The pain was intermittent in nature and aggravated during mastication. She had no relevant medical history and was not on any long-term medication. The patient also gave a history of dental restoration in the involved tooth, following which pain began after a period of approximately 18 months.

On clinical examination, tooth 36 presented with a composite restoration on the disto-occlusal surface, tenderness to percussion, no response to cold test and Electric Pulp Test (EPT). A sinus tract was present between teeth 36 and 37 in the mucogingival junction with purulent discharge. Sinus tracing was performed with a size-25 gutta-percha cone with 2% taper, the periapical radiographs were taken in both paralleling and bisecting technique. The gutta-percha cone pointed towards tooth 37 in the paralleling technique and towards tooth 38 in the bisecting angle technique [Table/Fig-1a-c]. This led to diagnostic misinterpretation. Teeth 37 and 38 did not show any tenderness to percussion and showed a normal response to both cold test and EPT. Periapical radiographs of tooth 36 revealed the presence of additional distal root suggestive of RE and widening of periodontal ligament space, with disruption of lamina dura and ill-defined radiolucency in the periapex of distal roots of 36.

With the clinical and radiographic examination, the tooth 36 was diagnosed as previously restored tooth with pulpal necrosis and chronic periapical abscess. The treatment plan was root canal treatment in 36 followed by crown.

Prior to initiating treatment, written informed consent was obtained from the patient. Local anaesthesia was administered using 2% lidocaine hydrochloride with 1:80,000 adrenaline (Lignospan Special, Septodont). The tooth was isolated using a rubber dam with a 13A clamp. Following isolation, an endodontic access cavity was prepared in tooth 36. Careful inspection of the pulp chamber floor revealed four canal orifices: mesiobuccal, mesiolingual, distobuccal and distolingual.

Initial canal negotiation was performed with stainless steel K-files. The working length was determined using a #15 K-file with an electronic apex locator (Root ZX, J. Morita) and confirmed radiographically. The working length measured 20 mm for the mesiobuccal and mesiolingual canals and 21 mm for the distobuccal and distolingual canals [Table/Fig-2a]. Apical patency was confirmed using a #10 K-file, which passed through the working length without binding.



[Table/Fig-1]: Sinus tract tracing with gutta-percha point:a) Sinus tracing; b) Preoperative image using paralleling technique; c) Preoperative image using bisecting angle technique.

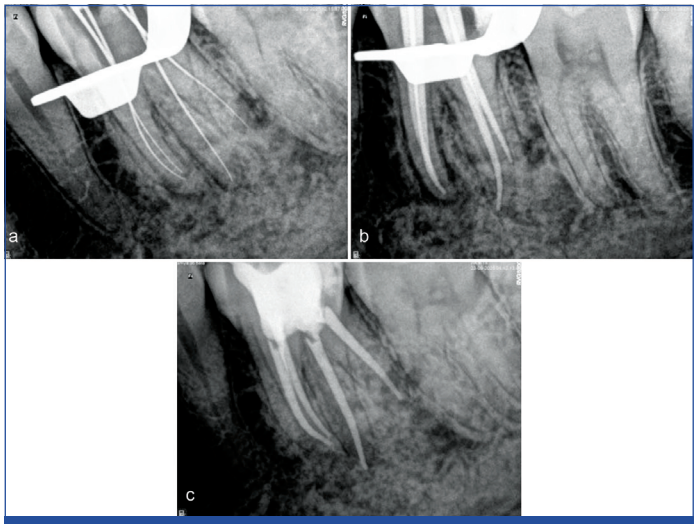
Cleaning and shaping were performed using rotary nickel-titanium constant taper files (EndoArch Blue Constant Taper Files, EndoArch) up to an apical preparation size of 35/.04. Due to the presence of a distolingual root suggestive of RE, instrumentation was performed carefully using flexible Nickel Titanium (NiTi) instruments to preserve the original canal curvature.

Throughout instrumentation, copious irrigation was performed using 5.25% sodium hypochlorite (Chlorax 5.25%, Cerkamed), with approximately 2 mL of irrigant used per instrumentation cycle. Irrigant activation was achieved using ultrasonic activation with T2 ultrasonic tips (Thalal) positioned 2 mm short of the working length to enhance irrigant penetration and canal disinfection.

At the end of the first visit, the canals were dried and calcium hydroxide intracanal medicament (RC Cal, Prime Dental Products) was placed. The access cavity was temporarily sealed with cavit temp zinc oxide non eugenol cement and the patient was recalled after 14 days.

At the second visit, the patient was asymptomatic and complete resolution of the sinus tract was observed. The intracanal medicament was removed by copious irrigation with 5.25% sodium hypochlorite (Chlorax, Cerkamed) activated ultrasonically, followed by a final rinse with 17% Ethylenediaminetetraacetic Acid (EDTA) (Oricam Neo EDTA Liquid, Orikam Healthcare) to facilitate smear layer removal. The canals were dried with sterile paper points.

Obturation was performed using gutta-percha master cones of size 35 with 4% taper, corresponding to the final apical preparation. A resin-based sealer (RC Seal, Prime Dental Products) was used and obturation was completed using the continuous wave of compaction technique. The access cavity was finally restored using a bulk-fill flowable composite resin (SDR, Dentsply Sirona) [Table/Fig-2b,c].

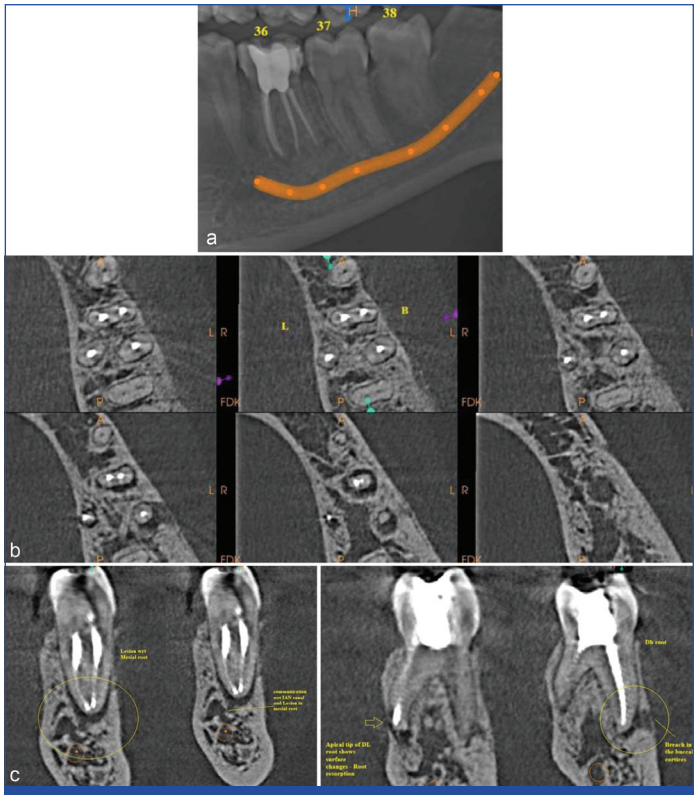


[Table/Fig-2]: Root canal procedure: a) Working length determination; b) Master cone selection; c) Post-obturation radiograph.

The CBCT was advised post-obturation to resolve the diagnostic discrepancy while adhering to the As Low As Diagnostically Acceptable (ALADA) principle. Written informed consent was obtained from the patient prior to CBCT imaging. CBCT examination confirmed that the periapical lesion was associated exclusively with the distal root of tooth 36, thereby excluding pathology in teeth 37 and 38. Axial section images clearly demonstrated the presence of two distinct distal roots, confirming the presence of RE. Furthermore, coronal sections revealed the periapical lesion associated with the distal root of tooth 36, which was seen extending inferiorly and communicating with the inferior alveolar canal, along with a breach of the buccal cortical plate. The diagnostic discrepancy observed during sinus tract tracing was therefore attributed to the extensive periapical lesion originating from the distal root of tooth 36 [Table/Fig-3a-c].

The CBCT also helps to classify RE based on cervical attachment (Carlsen and Alexanderson), root curvature (De Moor), morphology (Song) and radiographic visibility (Wang) [1-4]. Classification systems are clinically relevant as they help anticipate root curvature severity, canal negotiability and the need for modified access design and instrument selection.

In the present case, the RE was classified as Type A based on cervical attachment, as the cervical portion was located distally with two normal distal root components. According to De Moor's classification, it was Type III, exhibiting an initial curvature in the coronal third followed by a second buccally oriented curve extending from the middle to the apical third. Radiographically, it corresponded to Type I, as the supernumerary root was clearly identifiable on preoperative radiographs.



[Table/Fig-3]: CBCT images: a) Panoramic reconstruction demonstrating the close proximity of the inferior alveolar nerve to the mandibular molar roots; b) Axial section demonstrating two distinct distal roots, confirming Radix Entomolaris (RE); c) Coronal sections showing periapical lesion communicating through inferior alveolar canal and breaching the buccal cortex.

DISCUSSION

The incidence of anatomical variations in molars is influenced by ethnic and genetic factors, with deviations from the typical two-rooted mandibular and three-rooted maxillary morphology, including supernumerary roots and additional canals, posing significant challenges in endodontic diagnosis and treatment outcomes. Among mandibular molars, RE and Radix Paramolaris (RP) are the most recognised variants. This report presents a case of anatomical variation in root canal morphology of a mandibular first molar, highlighting the associated diagnostic challenges and clinical management.

In some populations, anatomical variations are normal inherited traits, while in others they are rare and influenced by developmental disturbances or ancestral gene expression [2]. Supernumerary roots in mandibular molars, RE located distolingually and the rarer RP located mesiobuccally, are clinically significant variations that can compromise endodontic success if unrecognised [3]. Failure to recognise such variations remains a leading cause of missed canals, persistent periapical pathology and post-treatment disease, particularly in mandibular first molars where access limitations and overlapping roots complicate diagnosis.

The reported prevalence of RE varies widely across populations, with higher incidence in Mongoloid groups (5-30%) and lower frequencies in Caucasian (3-4%) and African populations (0-3%). Indian studies demonstrate considerable regional variation, with prevalence ranging from less than 5% to nearly 24%. Such variability reinforces the need for population-specific awareness during routine endodontic assessment, particularly in mandibular first molars [5].

Sinus tract misdirection occurs because inflammatory exudate follows the path of least resistance through periodontal ligament spaces or alveolar bone rather than a direct route, allowing the tract to emerge far from the actual source of infection [6]. Such misdirection may result in erroneous attribution of the lesion to adjacent teeth, leading to unnecessary treatment or delayed management of the true source. This phenomenon is particularly problematic in molars with supernumerary roots, where atypical root positions further

distort radiographic interpretation. This is further compounded by the complex three-dimensional root anatomy and the inherent limitations of two-dimensional radiographs, where superimposition, distortion and lack of buccolingual information may cause the traced gutta-percha point to appear to originate from an incorrect tooth or root [7].

Therefore, angulated radiographs are essential, as they reduce superimposition, improve spatial interpretation and aid in accurately identifying the true endodontic source of the sinus tract. Clinicians should consider a structured differential diagnosis when evaluating draining sinus tracts in the posterior mandible, including adjacent tooth necrosis, periodontal abscess, vertical root fracture and non odontogenic lesions. Correlation of vitality testing, percussion response, sinus tract tracing and multi-angled radiographs is essential before attributing pathology to a specific tooth.

In cases of sinus tract misdirection associated with RE, CBCT is justified as it overcomes the limitations of two-dimensional radiographs by eliminating anatomical superimposition and accurately identifying the true source of infection [8]. CBCT clearly delineates the hidden distolingual root, traces the three-dimensional path of infection and reveals the characteristic severe root curvature of RE (≈62°) compared with RP (≈50°) [9]. Severe curvature associated with RE necessitates modification of the conventional triangular access cavity to a trapezoidal or quadrangular form to facilitate straight-line access.

The use of pre-curved scouting files, flexible NiTi rotary instruments and cautious irrigation protocols is essential to minimise the risk of ledging, transportation, or instrument separation. This information is critical for correct diagnosis, selection of smaller and more flexible instruments and prevention of missed canals or procedural errors, thereby improving treatment outcomes. Current endodontic imaging guidelines recommend CBCT when conventional radiographs are inconclusive and when findings are expected to influence diagnosis or treatment planning. In cases involving suspected supernumerary roots or misleading sinus tract pathways, limited field-of-view CBCT provides decisive diagnostic information while maintaining radiation safety in accordance with the ALADA principle. In the present case, CBCT was employed to resolve diagnostic ambiguity arising from sinus tract misdirection and to confirm the true source of infection, thereby justifying its use under the ALADA principle [10].

Accurate identification and management of RE is essential for successful endodontic treatment, as untreated additional roots may harbour persistent infection and contribute to post-treatment disease. In the present case, sinus tract misdirection initially mimicked pathology involving adjacent teeth, creating a diagnostic dilemma. Careful correlation of clinical findings with angulated radiographs helped raise suspicion of anatomical variation, while CBCT provided definitive confirmation of the additional distal root and the true origin of the periapical lesion. The present case highlights the importance of maintaining a high index of suspicion for root anatomical variations in mandibular molars and integrating clinical examination with appropriate imaging to ensure accurate diagnosis and effective endodontic management.

CONCLUSION(S)

The RE may lead to misleading sinus tract tracing and apparent involvement of adjacent teeth, creating a diagnostic dilemma. In the present case, clinical tests and angulated radiographs raised suspicion of anatomical variation, while CBCT confirmed the additional distal root and localised the periapical lesion to tooth 36. Recognition of this variation enabled appropriate endodontic treatment of the affected tooth and avoided unnecessary intervention in adjacent teeth. Careful evaluation of root morphology should therefore be considered when sinus tract tracing and conventional radiographs produce inconsistent findings.

Authors' contribution: Conceptualisation, Investigation, Data Curation, Writing – Original Draft, Writing – Review and Editing, Visualisation done by DBSK.

Acknowledgement

The author gratefully acknowledge the support of the Department of Conservative Dentistry and Endodontics, Government Dental College and Hospital, Cuddalore, where this case was carried out under the supervision of the Department faculty. The author would like to thank Prof. Dr. Shafie Ahamed for his supervision.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Jan 12, 2026
- Manual Googling: Mar 26, 2026
- iThenticate Software: Mar 28, 2026 (7%)

ETYMOLOGY: Author Origin

EMENDATIONS: 6

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Jan 10, 2026**
Date of Peer Review: **Mar 10, 2026**
Date of Acceptance: **Mar 31, 2026**
Date of Publishing: **Jul 01, 2026**