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RESEARCH ARTICLE

RADIX ENTOMOLARIS AND PARAMOLARIS: A CASE SERIES WITH CLINICAL IMPLICATION

[1]Dr. Debaprasad Das, [2]Dr. Anirban Bhattacharyya, [3]Dr. Asim Bikash Maity, [4*]Dr. Somsubhra Pramanik, [5]Dr. Gayatri Majumder and [6]Dr. Abhisek Guria

[1,2,3]Professor. Dept. of Conservative Dentistry & Endodontics, Haldia Institute of Dental Sciences & Research, Banbishnupur, Balughata, Haldia, West Bengal 721645.
[4]2nd Year post-graduate student, Dept. of Conservative Dentistry & Endodontics, Haldia Institute of Dental Sciences & Research, Banbishnupur, Balughata, Haldia, West Bengal 721645
[5]Assistant Professor, Dept. of Conservative Dentistry & Endodontics, Haldia Institute of Dental Sciences & Research, Banbishnupur, Balughata, Haldia, West Bengal 721645
[6]Assistant Professor, Dept. of Conservative Dentistry & Endodontics, Haldia Institute of Dental Sciences & Research, Banbishnupur, Balughata, Haldia, West Bengal 721645

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**Corresponding author:*
Dr. Somsubhra Pramanik

ABSTRACT

A clinician should have complete knowledge about anatomic variations of macrostructure and the external as well as internal anatomy of the tooth which is essential for a successful outcome. An awareness and thorough knowledge of root canal morphology contribute to the success of root canal treatment. Successful endodontic treatment includes the acts of locating the root canal orifice, chemo-mechanical cleaning, and shaping the root canal system before placement of a dense root canal filling with a fluid-tight seal. Anomalies in the tooth are often encountered which poses difficulties in dental treatments. As in any other teeth, mandibular molars are also prone to anatomic variation. Morphologic variations in mandibular first molars are seen in the number of root canals or the number of roots. An additional third root, first mentioned in the literature by Carabelli, is termed as Radix Entomolaris (RE). This supernumerary root is located distolingually in mandibular molars, mainly first molars. An additional root at the mesiobuccally side is termed as Radix Paramolaris (RP). This case series focuses mainly on the diagnosis and management of variable root canal anatomies like radix entomolaris and paramolaris in mandibular molars.

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INTRODUCTION

As stated by Barrett, "of all the phases of anatomic study in the human system, one of the most complex is that of pulp cavity morphology."[1, 2] Root canal anatomy is highly complex and unpredictable. An awareness and understanding of the presence of additional root and unusual root canal morphology are essential, as it determines the successful outcome of endodontic therapy. To achieve these goals, it helps the clinician to have integral knowledge of the root canal anatomy, and its anatomic varieties, including additional roots, extra canals, webs, fins, and isthmuses that may complicate the endodontic procedure. [3]

Inadequate knowledge about these variations might be one of the reasons for the failure of root canal therapy. Hence, successful endodontic treatment depends on locating all canals; thorough chemo-mechanical debridement followed by three-dimensional obturation with a perfect fluid-tight seal. [4]The first mandibular permanent molar is the earliest tooth to erupt and it is the one most frequently in need of endodontic treatment. The majority of mandibular first molars have two roots, mesial and distal with two mesial and one distal canal. An additional third root, first mentioned in the literature by Carabelli (1844), is called radix entomolaris (RE), when located distolingual and is called the radix paramolaris (RP) when located on the mesiobuccal side.

The identification and external morphology of these root complexes, containing a lingual or buccal supernumerary root, are described by Carlsen and Alexandersen. When present, a complete diagnosis and treatment plan is necessary and the clinician should take it as an additional canal to fill.[5, 6]

Case 1: A 28 years old male patient reported with a chief complaint of pain in the lower left posterior region of the jaw for the past 15 days. RVG showed the presence of occlusal restoration with secondary caries approaching the pulp space with respect to #36. The tooth was tested with an electric pulp tester which elicited a negative response. The diagnosis was finalized as symptomatic apical periodontitis and root canal treatment was recommended. RCT procedure was initiated under local anesthesia by giving inferior alveolar nerve block followed by rubber dam isolation. The access cavity was prepared. Canal orifices were located by using DG-16 explorer (Dentsply, United Kingdom). Initially, two mesial canal orifices (MB & ML) and one distal (DB) were located and on further exploration, another canal on the distolingual part of the pulpal floor was located. The presence of Radix Entomolaris was confirmed by radiographic image.

Working length determination was done with an apex locator and confirmed with a radiograph. Cleaning and shaping were performed with Hyflex CM files (Coltene Whaledent) up to 25/0.04 in the mesiobuccal canal due to control memory, the file always follows the anatomy of the canal, thus significantly reducing the risk of ledging, transportation and perforation of the canal and other canal prepared with Hero Gold (Micro-Mega France) up to 20/.06 in crown down technique. Canals were irrigated with 5.25% Sodium Hypochlorite intermittently and finally with 17% EDTA. Calcium Hydroxide intracanal medicament was placed as dressing in the first visit. In the next visit, after 10 days, irrigation was done, canals were dried with paper points, and master cone selection was done with radiograph and obturation with laterally condensed gutta-percha and Sealapex sealer (Karr). Post Endodontic restoration was done with composite resin.

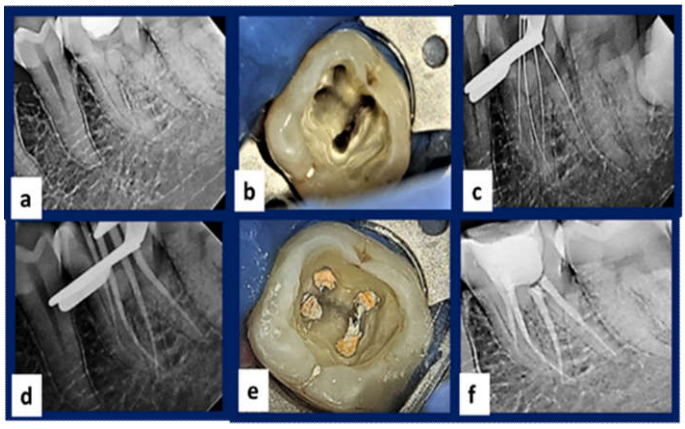

Fig.1a) Pre op radiograph. b) Access opening. c) Working length determination radiograph d) Master cone selection radiograph. e) Obturation clinical view. f) Post obturation radiograph

Case No 2: A 29 years old male patient reported with the chief complaint of pain in the lower left back teeth region for the last 7 days. On clinical examination, the tooth had occlusal deep caries and was tender on percussion with respect to 36. The tooth was tested with an electric pulp tester which elicited a negative response.

The diagnosis was finalized as symptomatic apical periodontitis and RCT was recommended. RCT was started and the location of the extra orifice and radiograph indicated the presence of RP which was confirmed with a radiograph. RCT was completed with standard protocol.

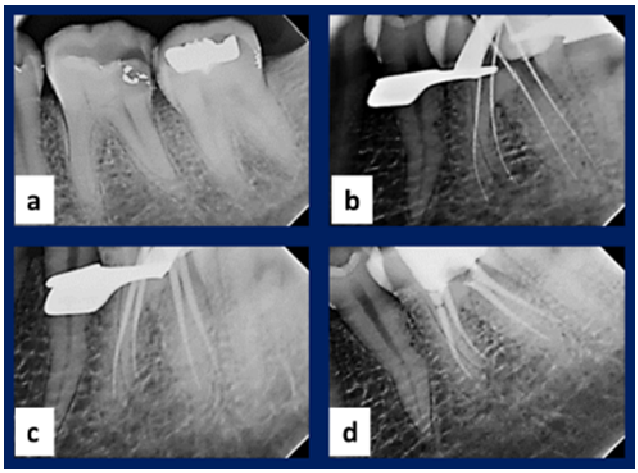

Fig. 2a. Pre op radiograph. b) Working length determination radiograph c) Master cone selection radiograph. d) Post obturation radiograph

Case 3: A 15 years old female patient reported with the chief complaint of pain in the lower left back teeth region for the last 10 days. On clinical examination, the tooth had occlusal deep caries and was tender on percussion with respect to 36. The pulp tester elicited a negative response. IOPAR showed coronal radiolucency approximating pulp space with periodontal ligament space widening at the apical third of the roots. The tooth was diagnosed with chronic apical periodontitis. RCT was started and location of extra orifice its position suggested the presence of RP which was confirmed with a radiograph. RCT was completed with standard protocol.

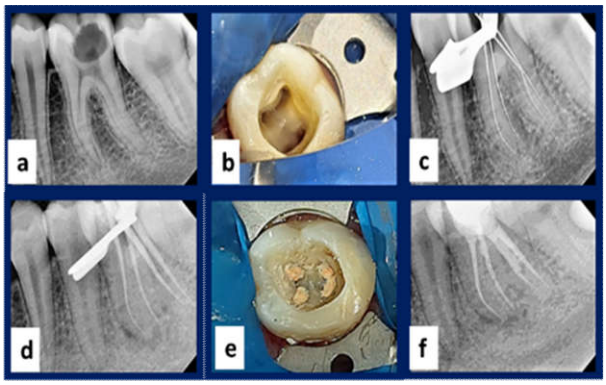

Fig. 3a) Pre op radiograph. b) Access opening. c) Working length determination radiograph d) Master cone selection radiograph. e) Obturation clinical view. f) Post obturation radiograph.

Case 4: An 18 years old male reported with the chief complaint of pain in the lower right back tooth region for the last 1 month. On clinical examination, a deep class 1 cavity was discovered in relation to #46. Diagnosis of Symptomatic apical periodontitis was made and RCT was recommended. During RCT, the location of the additional orifice on the mesiobuccal aspect and its location suggested presence of RP which was confirmed by RVG. The RCT was completed as per the standard protocol.

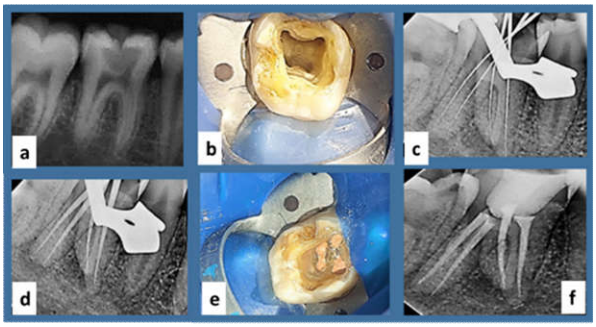

Fig. 4. a) Pre op radiograph. b) Access opening. c) Working length determination radiograph d) Master cone selection radiograph. e) Obturation clinical view. f) Pst obturation radiograph

DISCUSSION

Prevalence of Radix Paramolaris and Entomolaris: In African populations its presence is 3%. [7] In Eurasian and Indian populations, it is less than 5%. Based on studies in populations with Mongoloid traits (such as the Chinese, Eskimo, Native American, Indian), radixentomolaris occurs with a frequency that ranges from 5% to more than 30%.[8, 9, 10, 11, 12, 13, 14.] In Caucasians the RE is not very common and, with a maximum frequency of 3.4 to 4.2% and is considered to be an unusual or dysmorphic root morphology.[15,16] RP is comparatively rare than the RE. African population has a prevalence rate of 1.5 – 3%. Indian population has around 2%. According to Visser[17,] the etiology of this root formation is still unclear, but its formation could be related to external factors such as those involved in tooth development (odontogenesis) and penetrance of an atavistic gene or polygenetic system (appearance of a trait belonging to a distant ancestor that has been dormant in recent generations). Racial genetic factors can also influence the profound expression of a particular gene that can result in a more profound phenotypic manifestation.[18, 19] Curzon suggested that the 'three-rooted molar' trait has a high degree of genetic penetrance as its dominance was reflected in the fact that the prevalence of the trait was similar in both pure Eskimo and Eskimo/ Caucasian mixes. [20]

Tooth morphology: Carlsen and Alexanderson classified RE based on the location of its cervical part into four types. Type A–Distally located cervical part with two normal distal root components, Type B Same as Type A; however, only one normal distal root component, Type C–Mesially located cervical part and Type AC–Central location between mesial and distal root components. [21, 22, 23] De Moor et al. classified RE-based on the curvature in buccolingual orientation into three types. Type I–Refers to a straight root/root canal, Type II–Refers to an initially curved entrance which continues as a straight root/root canal and Type III Refers to an initial curve in the coronal third of the root canal, and a second buccally oriented curve starting from the middle to apical third.[24] Wang et al. gave another classification for RE depending on its radiographic appearance. Type 1: Presents the most identifiable radiographic image, Type 2: A large beam angulation is necessary mesially or distally for their identification and Type 3: Identification becomes extremely difficult because of the overlap of the adjacent distobuccal root.[25] Carlsen and Alexanderson classified RP based on the location of its cervical part into two types. Type A–Refers to an RP in which the cervical part is located on the mesial root complex and Type B–Refers to an RP in which the cervical part is located centrally, between the mesial and distal root complexes.[26] Song JS et al. (2010) further added two more newly defined variants of RE.

Small type: length shorter than half of the length of the distobuccal root and **Conical type:** smaller than the small type and having no root canal within it.[27]

Clinical Management: The clinical success of root canal therapy depends on the clinical triad of diagnosis, adequate chemo-mechanical preparation, and 3D obturation. So, the first step of the endodontic triad, i.e., a correct diagnosis is one of the most important steps for successful endodontic therapy. The presence of an RE or an RP has clinical implications in endodontic treatment. An accurate diagnosis of these supernumerary roots can avoid complications or a 'missed canal' during root canal treatment. Because the (separate) RE is mostly situated in the same buccolingual plane as the distobuccal root, a superimposition of both roots can appear on the preoperative radiograph, resulting in an inaccurate diagnosis. A thorough inspection of the preoperative radiograph and interpretation of particular marks or characteristics, such as an unclear view or outline of the distal root contour or the root canal, can indicate the presence of a 'hidden' RE. In the present case series, the variation in distal and mesial root anatomy was identified through careful reading of angled IOPA radiographs. The pre-op radiograph was taken with conventional angulation and the second working length with a mesial shift of approximately 20 degrees. This buccal object rule has been also called the Same Lingual, Opposite Buccal rule (SLOB)/Clark's rule/Walton's projection.

An additional root appears as a shadow or thin radiolucent line in the radiograph. So, a minimum of two angulated diagnostic radiographs is a must to avoid any iatrogenic mistake. Apart from radiographical diagnosis, there are various methods to locate additional canals, such as - clinical inspection of tooth crown and analysis of cervical morphology of the roots utilizing periodontal probing. Good illumination, use of magnifying loupes, microscopes, knowledge of the law of symmetry, the law of orifice location, visualizing the dentinal map, and canal bleeding points, using instruments like an endodontic explorer, pathfinder, DG 16 probe, and micro-opener and the Champagne effect (bubbles produced by remaining pulp tissue in the canal while using sodium hypochlorite in the pulp chamber) all helps in their detection. An extra cusp (tubercular paramolar) or more prominent occlusal distal or distolingual lobe, in combination with a cervical prominence or convexity may also hint at their presence. Advanced imaging techniques can aid to locate and confirm additional canals in the case of multirooted teeth. These techniques include digital radiography, fiber -optic illumination, dental endoscopy and orascopy, micro-computed radiography (CT), visualization endograph using Ruddle's solution, and magnetic resonance microscopy.[28, 29, 30] With the help of advanced modalities it is easier to detect RE but these are expensive and inconvenient tools. Hence conventional and digitalized radiography would suffice for the diagnosis of RE/RP.[31] As the orifice of radix entomolaris is distolingually located, the shape of the access cavity should be modified from classical triangular form to trapezoidal or rectangular form to better locate the orifice of the distolingual root. Sometimes the canal orifice of RE or RP could be occluded by secondary or calcified dentin. When searching for hidden canals, we should keep in mind that secondary dentin is generally whitish or opaque, whereas the chamber floor is darker and grey in

appearance. Clinicians should also be cautious about extra gauging and perforation while searching for extra canals.

CONCLUSION

Ability to correctly interpret the radiograph, careful inspection of the pulp chamber floor, and use of recent concepts in access cavity preparation along with the sound knowledge of the variable anatomy of the root canal are very important for the clinician to locate and treat the root canals in case of RE or paramolaris. Clinicians should be aware of this uncommon anatomy in the mandibular first molars in terms of root inclination and root canal curvature. A Skilful diagnostic and radiographic interpretation are a must for proper treatment of such abnormal anatomic variations. Preoperative Periapical radiographs exposed at two different horizontal angles are helpful in such cases for diagnosis of the additional root.

REFERENCES

1. SeguraEgea JJ, JiménezPinzón A, RíosSantos JV. 2002. Endodontic therapy in a 3rooted mandibular first molar: Importance of a thorough radiographic examination. *J Can Dent Assoc.,* 68:5414.
2. Tu MG, Huang HL, Hsue SS, Hsu JT, Chen SY, Jou MJ, et al., 2009. Detection of permanent threerooted mandibular first molars by conebeam computed tomography imaging in Taiwanese individuals. *J Endod.,* 35:5037.
3. Pawar AM, Kokate SR, Hegde VR. 2013. Contemporary approach in successful endodontic intervention in radix entomolaris. *World J Dent.,* 4(3):208–13.
4. Arun J, Mayuri BS, Nandini TN, Mallikarjun Goud K. 2015. Radix entomolaris and paramolaris: A case series *International Journal of Oral Health Sciences* | Jan-Jun | Vol 5 | Issue 1
5. Bolk L. 1994. The importance of endodontics in maxillary and mandibular molar root canals. *J Can Dent Assoc.,* 60:52732.
6. Zeinab Movassagh,1 ParastooGhahari,1 andNargesHeidari1 RadixEntomolaris: A Case Report Avicenna J Dent Res. 2016September;8(3): e26265
7. Sperber GH, Moreau JL. 1998. Study of the number of roots and canals in Senegalese first permanent mandibular molars. *Int Endod J.,* 31:112– 6.
8. Tratman EK. 1938. Three-rooted lower molars in man and their racial distribution. *Br Dent J.,* 64:264 –74.
9. Pedersen PO. 1949. The East Greenland Eskimo dentition. Numerical variations and anatomy. A contribution to comparative ethnic odontography. Copenhagen: Meddeleser om Gronland. 104:140 – 4.
10. Turner CG 2nd. Three-rooted mandibular first permanent molars and the question of Am Indian origins. Am J Phys Anthropol 1971; 34:229 – 41.
11. Curzon MEJ, Curzon AJ. 1971. Three-rooted mandibular molars in the Keewatin Eskimo. *J Can Dent Assoc.,* 37:71– 2.
12. Yew SC, Chan K. 1993. A retrospective study of endodontically treated mandibular first molars in a Chinese population. *J Endod.,* 19:471–3
13. Reichart PA, Metah D. 1981. Three-rooted permanent mandibular first molars in the Thai. *Community Dent Oral Epidemiol.,* 9:191–2.
14. Walker T, Quakenbush LE. 1985. Three rooted lower first permanent molars in Hong Kong Chinese. *Br Dent J.,* 159:298 –9.
15. Curzon ME. 1973. Three-rooted mandibular permanent molars in English Caucasians. *J Dent Res.,* 52:181.
16. Ferraz JA, Pecora JD. 1993. Three-rooted mandibular molars in patients of Mongolian, Caucasian and Negro origin. *Braz Dent J.,* 3:113–7.
17. Visser JB. Beitragzur Kenntnis der menschlichen Zahnwurzelformen. Hilversum: Rotting 1948;49 –72.
18. Reichart PA, Metah D. 1981. Three-rooted permanent mandibular first molars in the Thai. *Community Dent Oral Epidemiol.,* 9:191–2
19. Ribeiro FC, Consolaro A. 1997. Importanciaclinica y antropologica de la raiz distolingual en los molars inferiorespermanentes. *Endodoncia*, 15:72– 8
20. Curzon ME. 1974. Miscegenation and the prevalence of three-rooted mandibular first molars in the Baffin Eskimo. *Community Dent Oral Epidemiol*., 2:130 –1.
21. Carlsen O, Alexandersen V. 1990. Radix entomolaris: identification and morphology. *Scand J Dent Res.,* 98:363-73.
22. Grossman LI. In: Endodontic Practice. 11th ed. California: Lea and Febiger; 1987. p. 145-78.
23. Ingle JI, Bakland LK, 2002. Endodontic cavity preparation. In: Endodontics. 5th ed. B.C. Decker: Elsevier Inc; P.405-510.
24. De Moor RJ, Deroose CA, Calberson FL. 2004. The radix entomolaris in mandibular first molars: an endodontic challenge. *Int Endod J.,* 37:789-99.
25. Wang Q, Yu G, Zhou XD, Peters OA, Zheng QH, Huang DM. Evaluation of x-ray projection angulation for successful radix entomolaris diagnosis in mandibular first molars in vitro. J Endod 2011; 37:1063-8.
26. Carlsen O, Alexanderson V. Radix paramolaris in permanent mandibular molarsIdentification and morphology. Eur J Oral Sci 1991; 99:189-95.
27. Song JS, Choi HJ, Jung IY, Jung HS, Kim SO. 2010. The prevalence and morphologic classification of distolingual roots in the mandibular molars in a Korean population. J Endod 36: 653-657.
28. Wang Q, Yu G, Zhou XD, Peters OA, Zheng QH, Huang DM. 2011. Evaluation of x-ray projection angulation for successful radix entomolaris diagnosis in mandibular first molars in vitro. *J Endod*., 37:1063-8.
29. Weine FS, editor. Access cavity preparation and initiating treatment. In: Endodontic Therapy. 3rd ed. St. Louis, USA: The C.V. Mosby Company; 1982. p. 207-55.
30. Reuben J, Velmurugan N, Kandaswamy D. 2008. The evaluation of root canal morphology of the mandibular first molar in an Indian population using spiral computed tomography scan: an in vitro study. *J Endod*., 34:212-5.
31. Ingle JI, Heithersay GS, Hartwell GR. 1994. Endodontic diagnostic procedures. In: Ingle JI, editor. Endodontics. 4th ed. Philadelphia: Lea and Febiger; p.123-7.

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