International Journal of Research in Health and Allied Sciences

Journal home page: www.ijrhas.com

Official Publication of "Society for Scientific Research and Studies" [Regd.]

ISSN: 2455-7803

CASE REPORT

Management of Anatomic Variations of Mandibular First Molar Namely Radix Entomolaris and Paramolaris – A Case Series

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ABSTRACT

Anatomic variations can occur in any tooth, therefore careful clinical and radiographic examination is compulsory for successful outcome. An awareness and thorough knowledge of internal and external root canal morphology contribute to the successful root canal treatment. In mandibular first molar Radix Entomolaris (Additional lingual root) and Radix Paramolaris (Additional Buccal root) with two distal roots is an interesting example of anatomic variation. Radix entomolaris (RE) is considered to be an Asiatic trait. However, its prevalence in Indian population is found to be lower than in other Asian races. Nevertheless, its awareness and identification is vital to achieve endodontic success. This case report discusses endodontic treatment of three mandibular molars with a radix entomolaris or paramolaris. The prevalence, the external morphological variations and internal anatomy of the radix entomolaris and paramolaris are described. Avoiding procedural errors during endodontic therapy demands an adapted clinical approach to diagnosis and root canal treatment

Key words: Endodontic treatment, mandibular molar, anatomical variations, radix entomolaris, radix paramolaris.

Received: 12 February, 2019 Revised: 24 February, 2019 Accepted: 25February, 2019

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This article may be cited as: Pratap R, Shekhar R, Paul R, Saraswat A. Management of Anatomic Variations of Mandibular First Molar Namely Radix Entomolaris and Paramolaris – A Case Series. Int J Res Health Allied Sci 2019; 5(2):91-95.

INTRODUCTION

The prevention or healing of endodontic pathology depends on a thorough chemomechanical cleansing and shaping of the root canals before a dense root canal filling with a hermetic seal. An awareness and understanding of the presence of unusual root canal morphology can thus contribute to the successful outcome of root canal treatment. It is known that the mandibular first molar can display several anatomical variations. Apart from variations in the number of root canals, the number of roots may also show discrepancy. An additional third root, first mentioned in the literature by Carabelli[1], is called the radix entomolaris (RE).[2] This supernumerary root is located distolingually in mandibular molars, mainly first molars. An additional root at the mesiobuccal side is called the radix paramolaris (RP). The identification and external morphology of these root complexes, containing a lingual or buccal supernumerary root, are described by Carlsen and Alexandersen.[3,4]

The presence of a separate RE in the first mandibular molar is associated with certain ethnic groups. In African populations a maximum frequency of 3% is found[5], while in Eurasian and Indian populations the frequency is less than 5%. In populations with Mongoloid traits (such as the Chinese, Eskimo and American Indians) reports have noted that the RE occurs with a frequency that ranges from 5% to more than 30%. Because of its high frequency in these populations, the RE is considered to be a normal morphological variant (eumorphic root morphology).[6]Some studies report a bilateral occurrence of the RE from 50 to 67%. Bolk reported the occurrence of a buccally located additional root: the RP. This macrostructure is very rare

and occurs less frequently than the RE. The prevalence of RP, as observed by Visser, was found to be 0% for the first mandibular molar, 0.5% for the second and 2% for the third molar. Other studies have, however, reported RP in first mandibular molars.[6,7,9]

The presence of an extra root may lead to missed canal, instrument separation due to severe curvature, aberrations in cleaning and shaping while doing endodontic therapy, and so on. Thus, a very accurate clinical and radiographic diagnostic procedures and meticulous canal preparation are necessary.[7]

The purpose of this article is to annotate cases on endodontic management of two Radix Entomolaris and one Radix Paramolaris in the mandibular first molar with the aid of CBCT imaging.

CASE REPORT

CASE 1

A 46-year-old male reported to the Department of Conservative Dentistry and Endodontics at K.D Dental College and Hospital, with the chief complaint of pain in right posterior tooth region of lower jaw for 3 days. Pain was continuous in nature and aggravated on chewing food and consumption of cold beverages. Clinical examination revealed that #46 was carious and tender on percussion. Radiographs showed caries involving pulp and widening of periodontal ligament with respect to both the teeth. Medical history was noncontributing. Treatment plan was explained to the patient and the root canal treatment of #46 was started. To confirm RE, CBCT imaging of the tooth (Kodak 9500, tube voltage: 90 kV, current: 10 mA, Carestream health Inc., Rochester, NY, USA) was performed after obtaining informed consent from the patient. The transverse, axial, and sagittal CBCT sections of the involved tooth were taken. The CBCT scan slices confirmed the presence of RE.[Figure 1(a,b)]

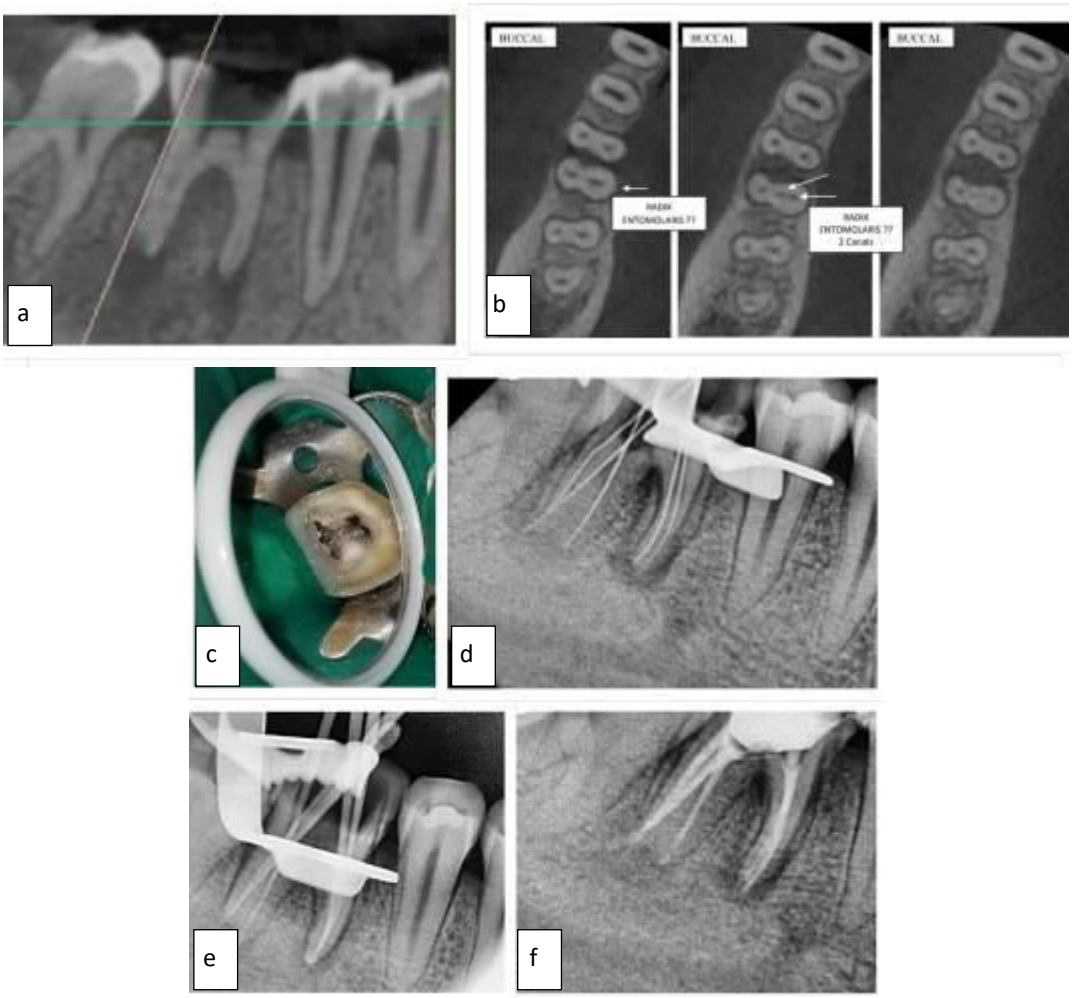

Figure 1: (a) CBCT cross section irt #46 (b) axial section irt # 46 (c) Clinical photograph (d)Working length radiograph irt # 46(e) Mastercone radiograph irt # 46 (f)Postoperative radiograph irt # 46

CASE 2

A 30-year-old male patient was referred to the Department of Conservative Dentistry and Endodontics at K.D Dental College and Hospital, with severe, throbbing, constant pain in the mandibular right first molar, i.e., tooth # 46, for the past seven days. The medical history was non-contributory. On clinical examination, tooth # 46 had a deep carious lesion. The tooth was severely tender on percussion. Preoperative radiograph revealed the presence of an extra distal root with accompanying apical radiolucency. Acute apical periodontitis was established as a diagnosis based on the patient history and clinical examination. The buccal object rule (same-lingual opposite-buccal rule) confirmed the additional root as a distolingual root (radix entomolaris). CBCT was advised to confirm that the additional root was located distolingual to the mesial root The transverse, axial, and sagittal CBCT sections of the involved tooth were taken [Fig. 2(a,b,c)]. The CBCT scan slices confirmed the presence of radix entomolaris.

After administration of local anesthesia using 2% lidocaine with 1:100,000 epinephrine (Daroupakhsh, Tehran, Iran) and rubber dam isolation, tooth # 46 was accessed. Four distinct canal orifices were located[Figure 2(d)] and negotiated using a K-Flex file ISO 15 (Dentsply Malliefer). The working length was determined by a Root ZX apex locator [Figure 2(e)] and later confirmed by parallel periapical radiograph. After debriding pulp tissues, Gates Glidden drills (Dentsply, Maillefer) were used in a crown down fashion to enlarge the orifices, and the canals were shaped with NeoEndo Flex files(Orikam Healthcare India Pvt. Ltd) upto size 25/0.04 % in all four canals under copious irrigation with 2.5% sodium hypochlorite and lubrication with RC-Prep. The canals were then dried and filled with calcium hydroxide and the patient was recalled after 1 week.

The patient reported back after 7 days with relief of symptoms, temporary restoration was removed, and canals were irrigated with sodium hypochlorite (2.5%). Mastercone radiograph was taken.[Figure 2(f)] All four canals were obturated using zinc oxide eugenol (Dentsply DeTrey, Germany) sealer. Postendodontic restoration was done by composite..[Figure 2(g)]

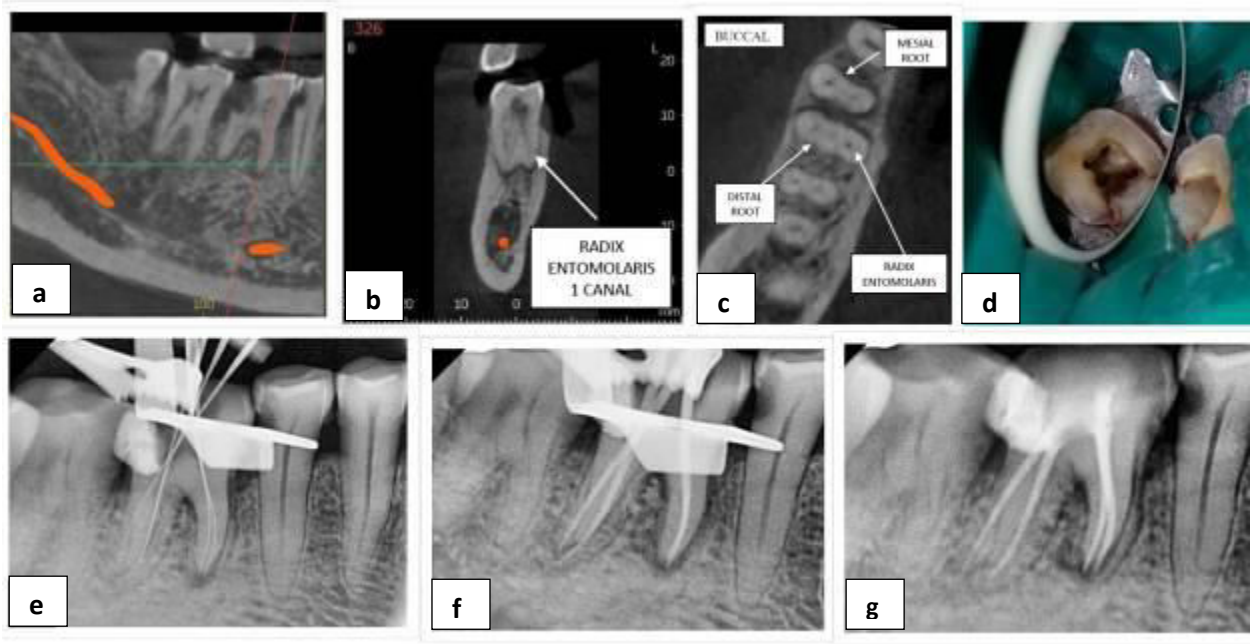

Figure 2: (a) CBCT cross section irt #46 (b) CBCT Cross Section - Distal Root + Radix Entomolaris irt 46 (c) CBCT axial section irt #46 (d) clinical photograph irt #46 (e) working length radiograph irt #46 (f) mastercone radiograph irt #46 (g) postendodontic restoration irt #46

CASE 3

A 38-year-old male patient reported to Department of Conservative Dentistry and Endodontics at K.D Dental College and Hospital, with a chief complaint of pain in the lower left back tooth region since 2 days. On clinical examination, there was deep Class II distoocclusal restoration with secondary caries in relation to #36. Tooth elicited positive response on vitality testing and was tender on percussion. IOPAR revealed the presence of periodontal ligament widening at apical third of the roots[Figure 3 (a)]. Diagnosis of symptomatic irreversible pulpitis with apical periodontitis was made, and RCT was recommended. During RCT procedure, the location of additional orifice on mesiobuccal aspect and Type 2 radiographic image confirmed the presence of RP. Radix root showed Type A configuration of the canal.The RCT was completed as per the standard protocol

After administration of local anesthesia using 2% lidocaine with 1:100,000 epinephrine (Daroupakhsh, Tehran, Iran) and rubber dam isolation, tooth # 36 was accessed. Four distinct canal orifices were located [Figure 3 (b)], and negotiated using a K-Flex file ISO 15 (Dentsply Malliefer). The working length was determined by a Root ZX apex locator and later confirmed by parallel periapical radiograph [Figure 3 (c)]. After debriding pulp tissues, Gates Glidden drills (Dentsply, Maillefer) were used in a crown down fashion to enlarge the orifices, and the canals were shaped with NeoEndo Flex files (Orikam Healthcare India Pvt. Ltd) upto size 25/0.04% in all four canals under copious irrigation with 2.5% sodium hypochlorite and lubrication with RC-Prep. The canals were then dried and filled with calcium hydroxide and the patient was recalled after 1 week.

The patient reported back after 7 days with relief of symptoms, temporary restoration was removed, and canals were irrigated with sodium hypochlorite (2.5%). Mastercone radiograph was taken [Figure 3 (d)].All four canals were obturated using zinc oxide eugenol (Dentsply DeTrey, Germany) sealer.Postendodontic restoration was done with composite [Figure 3 (e)].

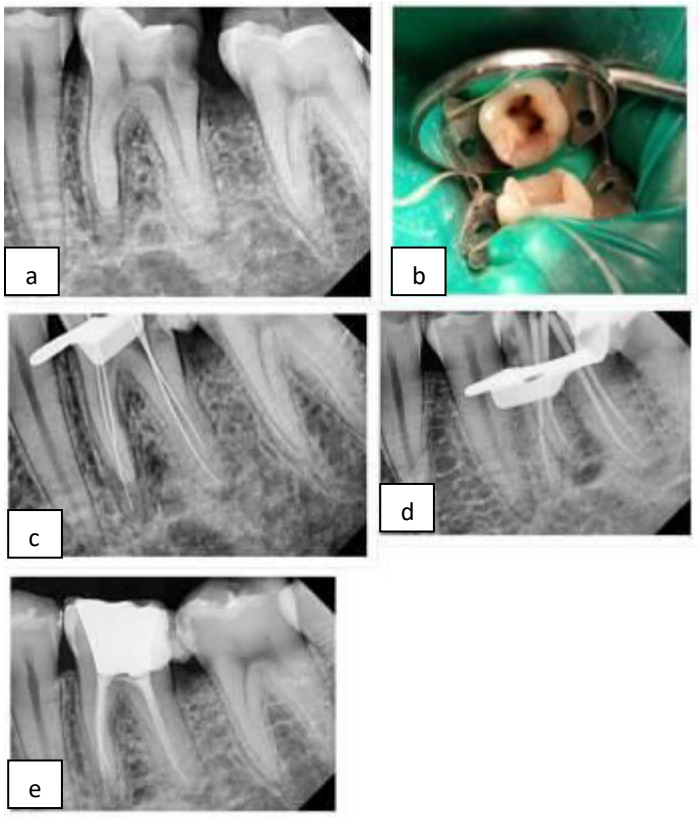

Figure 3: a) Preoperative Radiograph irt #36; b) Clinical Photograph irt #36; c)Working length radiograph irt #36; d) Mastercone radiograph irt #36; e) Postoperative radiograph irt #36.

DISCUSSION

The presence of a radix entomolaris(RE) or radix paramolaris(RM) has clinical implications in endodontic treatment. An accurate diagnosis of these can avoid complications or a 'missed canal' during root canal treatment. Because the RE is mostly situated in the same buccolingual plane at the distobuccal root, a superimposition of both roots can appear on the preoperative radiograph and 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 'hidden' RE. To reveal the RE, a second radiograph should be taken from a more mesial or distal angle (30°). Clinically, with a good knowledge of law of symmetry and law of orifices, various methods like, visualizing the dentinal map and canal bleeding points, using DG-16 explorer, micro-opener, toughing of the grooves with ultrasonic tips, staining the chamber floor with 1% methylene blue dye, champagne bubble test, magnetic resonance microscopy and micro computed tomography will be useful to locate the canals. Three-dimensional imaging techniques based on computed tomography (CT) and cone beam computed tomography (CBCT) are useful for visualizing or studying the true

morphology of an RE in a noninvasive manner using less radiation. However, cost and access to them are said to be the limiting factors. Further, good illumination and the use of accessories like magnifying loupes, microscopes etc are also valuable in locating and managing RE.[10]Clinical inspection of the tooth crown and analysis of the cervical morphology of the roots by means of periodontal probing can facilitate identification of an additional root. An extra cusp (tuberculum paramolare) or more prominent occlusal distal or distolingual lobe, in combination with a cervical prominence or convexity, can indicate the presence of an additional root.[11]

The etiology behind the formation of the RE is still unclear. In dysmorphic, supernumerary roots, its formation could be related to external factors during odontogenesis, or to penetrance of an atavistic gene or polygenetic system (atavism is the reappearance of a trait after several generations of absence). In eumorphic roots, racial genetic factors influence the more profound expression of a particular gene that results in the more pronounced phenotypic manifestation. A RE can be found on the first, second and third mandibular molar, occurring least frequently on the second molar.[8,12]

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

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.

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

Type B– Refers to an RP in which the cervical part is located centrally, between the mesial and distal root complexes.

Initial diagnosis and implementing the treatment plan with appropriate techniques and instruments facilitates successful endodontic outcome and avoids possible errors.[13,14]

CONCLUSION

Clinicians should be aware of the unusual root morphologies in the mandibular molars. The knowledge about prevalence, diagnosis, morphology, canal configuration of a radix entomolaris or paramolaris and clinical approach to treat it would be a very important prerequisite to achieve endodontic success. With advent of modern techniques and instruments teeth with morphological variations can be successfully treated.

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