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Case Series

Endodontic challenges in the management of radix entomolaris: Case series

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ABSTRACT

Endodontic treatment of Radix Entomolaris is challenging and requires a complete understanding of root canal system, and skills to manage the commonly occurring mishaps during the treatment. Therefore, comprehensive clinical & radiographic interpretation is critical in identifying unusual root canal morphologies. The additional root variation in the mandibular molars may be present either mesio-bucally (Radix Paramolaris) or distolingually (Radix Entomolaris). This case series intends to discuss the diagnosis, endodontic challenges during file separation, and non-surgical endodontic management of two cases of Radix Entomolaris in the mandibular first molar.

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1. Introduction

In endodontics, one of the most common reasons for failure and flare-ups is the missed canal. The mandibular first molar is most likely to present with structural variations. The majority of permanent mandibular first molars typically have 2 roots- mesial and distal with 3 root canal systems,^{1,2} but the presence of variations with respect to the number of roots and canal morphology is also not occasional.³ The supplementary root in these variants which have 3 distinct roots is typically positioned distolingually, and it is called Radix Entomolaris (RE). In the literature, Radix Entomolaris was first mentioned by Carabelli in the year 1844.⁴ The radix root has been reported to be generally smaller in comparison with the distobuccal root, and frequently curved, which requires particular consideration during the cleaning and shaping of the canal to avoid endodontic mishaps.⁵ This paper describes the diagnosis, challenges, and non-surgical endodontic management of

two cases of Radix Entomolaris in the mandibular first molar.

2. Case I

A 15-year-old male reported to the department of Conservative Dentistry and Endodontics, Indira Gandhi Government Dental College and Hospital, Jammu with the chief complaint of continuous pain in the lower left back tooth region since 4-5 days, which was exaggerated on chewing and consuming hot beverages whereas relieved on taking cold beverages. On oral examination, 36 presented with deep occlusal caries. Tooth was tender to percussion with lingering response to various pulp sensitivity tests for more than 30 seconds. On the intraoral periapical radiograph, radiolucency involving the pulp and periapical area was noted in 36. The hint of an additional root was given by a radiopaque line around the root. Consequently, another radiograph with a slight mesial angulation was taken to confirm the presence of the additional root [Figure 1a]. Diagnosis of symptomatic irreversible pulpitis with acute

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apical periodontitis was made and the endodontic treatment of 36 was recommended.

The tooth was first anesthetized with 2% lignocaine (xicaine, ICPA health products Ltd, Gujarat, India) and then isolated under rubber dam. Access opening was performed in 36 with # 2 endoaccess bur (Dentsply Maillefer, Switzerland) and safe end bur (Endo-Z, Dentsply, Switzerland) was used to extend the access cavity laterally. Four canal orifices i.e., two mesial and two distal were seen [Figure 1b] and reconfirmed using an endodontic explorer- DG16. The working length was determined using an electronic apex locator (Root ZX, Tokyo, Japan) and reconfirmed later by radiograph [Figure 1c]. Canals were negotiated using #08 and #10 size K hand files (Dentsply Maillefer, Switzerland). Canals were prepared using rotary files (ProTaper Gold, Dentsply-Maillefer, Switzerland) along with irrigation, using 3% sodium hypochlorite solution and Normal saline. Final preparation of canals was done till Protaper Gold file no. F2 in mesial and distolingual canals whereas F3 size in the distobuccal canal with Prepcanal (Ammdent; India) as lubricant. For canal disinfection, calcium hydroxide as a premixed paste (UltraCal XS, Ultradent products, INC) was used and temporary restoration was given. In the following appointment, canals were thoroughly irrigated. Final flush was performed with 17% EDTA (Prevest DenPro; Jammu) followed by 3% sodium hypochlorite. Canals were dried using absorbent paper points and master cone confirmation radiograph was obtained [Figure 1d]. Later, canals were obturated with laterally condensed Protaper gutta-percha points (Dentsply Maillefer; Switzerland) and the resin-based sealer -Adseal (Meta Biomed Co.Ltd.; Korea) [Figure 1e]. Patient was then scheduled for a permanent restoration.

3. Case II

A 19-year-old girl reported to the department of Conservative Dentistry and Endodontics, Indira Gandhi Government Dental college and hospital, Jammu with the chief complaint of a decayed tooth along with food lodgement in lower right back tooth. On the radiograph, radiolucency involving the pulp with the periapical area was noted in 36. Radiograph with a different angulation was taken to confirm the presence of an additional root. The tooth responded negative to EPT and cold test. The tooth was diagnosed with pulp necrosis and root canal treatment of the involved tooth was advised.

The tooth was first anesthetized with 2% lignocaine (xicaine, ICPA health products Ltd, Gujarat, India) and then isolated under rubber dam. Access opening was performed in 36 with # 2 endoaccess bur (Dentsply Maillefer, Switzerland) and safe end bur (Endo-Z, Dentsply, Switzerland) was used to extend the access cavity laterally. Four canal orifices i.e., two mesial and two distal were

seen [Figure 1b] and reconfirmed using an endodontic explorer- DG16. The working length was determined using an electronic apex locator (Root ZX, Tokyo, Japan) which was reconfirmed later by radiograph [Figure 2a]. A smooth glidepath was made using #08 and #10 size K-files. Sx rotary file was used initially to flare canal orifices followed by glidepath file (ProTaper Gold, Dentsply-Maillefer) along with copious irrigation, using 3% sodium hypochlorite solution and normal saline. While shaping the canal, the S1 file separated in the distal canal at the apical end as confirmed by the radiograph [Figure 2b]. To retrieve the broken file, canals were first enlarged coronally by the Gates Glidden file (Mani; Japan) size #2 followed by #3. A small 10k hand file was used to bypass the broken file, followed by no. 15 K file to make it loose in the canal. After the successful bypass, Ultrasonic tip was activated into the canal for 10 seconds along with copious irrigation with 17% EDTA which resulted in the successful retrieval of the separated fragment of the file, later confirmed by radiograph [Figure 2c]. The final preparation of canals was done till Protaper file no F2 in mesial and distolingual canals whereas till F3 size in the distobuccal canal with Prepcanal (Ammdent; India) as lubricant. Calcium hydroxide (UltraCal XS, Ultradent products, INC) was placed for canal disinfection and temporary restoration was placed. In the following appointment, after the removal of the temporary restoration, canals were thoroughly irrigated. Final flush was performed with 17% EDTA (Prevest DenPro; Jammu) followed by 3% sodium hypochlorite. Canals were dried using absorbent points and master cone confirmation radiograph was obtained [Figure 2d]. Later, canals were obturated with laterally condensed gutta-percha along with the Adseal, (Meta Biomed Co.Ltd.; Korea) which is a resin based sealer [Figure 2e]. The patient was then recalled for a permanent restoration.

4. Discussion

The etiology behind Radix Entomolaris (RE) formation is still unclear. However, some authors consider Radix to be linked with genetic origins rather than a developmental disturbance.^{5,6} It was proposed that these “three-rooted molar” had a high degree of genetic penetration as reflected in the fact that pure Eskimo and Eskimo/Caucasian mixed-race individuals had a similar prevalence of the trait. In the literature, the occurrence of RE has been reported by many authors. The frequency of radix in Africans is around 3%,⁷ whereas, in Indian and Eurasian inhabitants, the frequency is around <5%.⁸ sThe frequency of RE in populations with Mongoloid traits (such as the Chinese, Eskimo, and American Indians) has been reported within the ranges of 5% to more than 30%.⁸⁻¹⁴ Therefore, RE is considered to be a normal morphological variant (eumorphic root morphology) in these populations. The RE is not usually seen in the caucasian population and, its frequency is

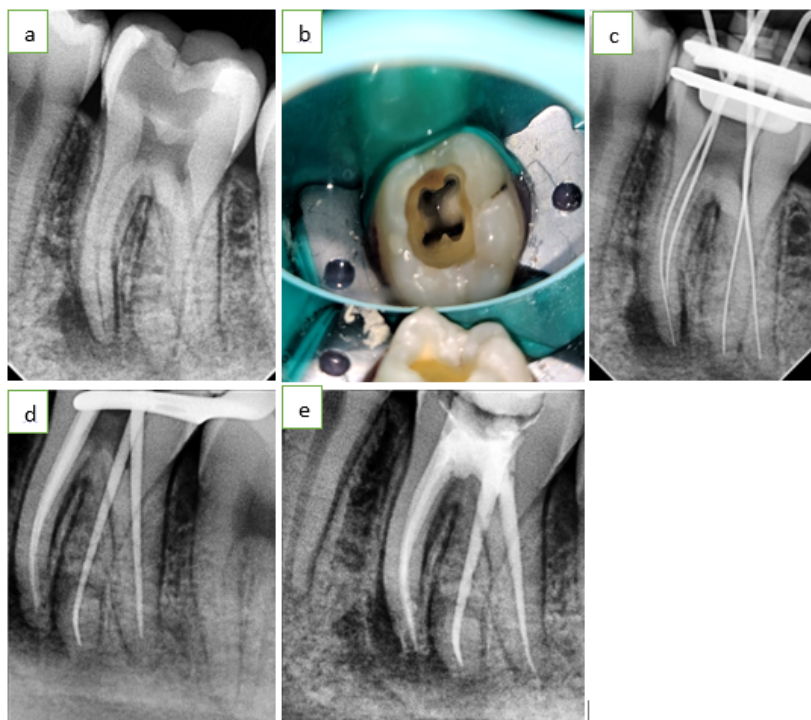


Fig. 1: **a:** Pre-operative radiograph showing additional root wrt 36; **b:** 4 canal orifices; **c:** Working length radiograph; **d:** Mastercone confirmation radiograph; **e:** Immediate post-obturation radio graph

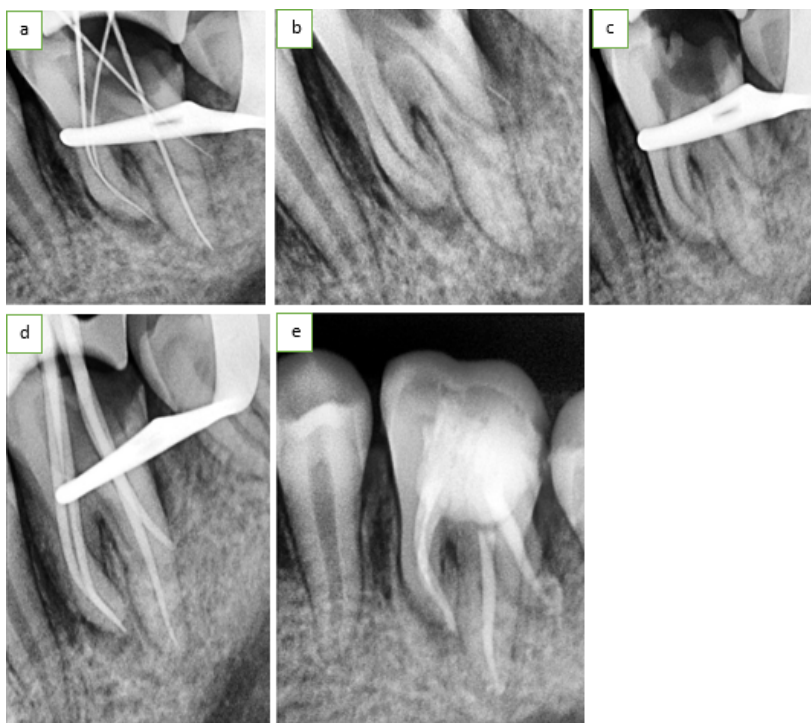


Fig. 2: **a:** Working length radiograph; **b:** File separation in the canal; **c:** File removal confirmation; **d:** Mastercone confirmation radiograph; **e:** Post obturation radiograph

reported with a range of 3.4 to 4.2%.^{15,16}

There are a lot of variations concerning the dimensions of the RE, as it may vary from a short root to a 'mature' root with normal length. Based on the location of the cervical part of the RE, Carlsen, and Alexandersen¹⁷ have classified radix entomolaris into 4 different types: types A, B, C, and AC.

Type A- distally located RE with two normal root components, Type B- distally located RE with one root component, Type C- mesially located cervical part, and Type AC- centrally located RE, between the distal and mesial root components. This categorization makes it easy to distinguish the separate RE from the non-separate RE. In the apical two-thirds of the RE, mesially or distally angled inclination may be present. Another classification which was based on the curvature of the separate RE variants in bucco-lingual positioning was given by De Moor et al.¹⁸ They categorized RE into 3 different types. Type I denotes a straight root/root canal, Type II denotes an initially curved entrance that 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 curve beginning in the middle and continuing to the apical third.

The infrequent occurrence of such variants in teeth necessitates clinicians to stay observant in the diagnosis and management part. A good quality preoperative radiograph is crucial for the cases of RE as missing any particular characteristic due to an unclear view can hamper the success of the treatment. On a radiograph, particular characteristics such as the presence of an additional outline of the root canal can indicate the presence of a 'hidden' radix. In order to confirm the existence of the RE, another radiograph from an angle more mesial or distal should be advised. On clinical examination, the RE may have a more protuberant occlusodistal or distolingual lobe, or an extra cusp (Tuberculum paramolare). All these things along with a combination of cervical bulge or convexity on the tooth may help in identifying the presence of supplementary root.

In endodontics, one of the most commonly occurring mishaps is the fracture of the instrument. This poses a great challenge to the operator in the appropriate cleaning and shaping of the canal. When an instrument is fractured inside the canal, a clinician is left with three choices- whether to bypass it, retrieve it or leave the fragment inside the canal and obturate it till the upper part of the separated instrument.¹⁹ Radix entomolaris with a separated file may put the clinician in a worrying state, however, it is up to the clinician's knowledge and skills to manage this complicated situation. Treatment modality majorly depends upon the site and size of the file separated. It may vary from the use of small hand instruments to sophisticated retrieval kits or ultrasonic tips.²⁰ In the present case, coronal flaring along with the use of an ultrasonic tip helped in retrieving the broken fragment.

A severe canal curvature, predominantly in the apical third region of the root, if not judiciously negotiated may

lead to uneven biomechanical preparation because of the formation of a ledge, with canal transportation, and loss of working length. To avoid file separation, it is important to enlarge the orifices, have a smooth glidepath with small hand K files up to size 15 or 20, and then switch to the rotary file system for the further shaping of the canals.

5. Conclusion

A clinician needs to have a thorough knowledge of the radiographic interpretation with different angles, root canal system, and its variations for the success of treatment. An endodontic mishap like file separation especially in Radix Entomolaris may further complicate the case. Therefore, an operator needs to integrate the best strategies of prevention as well as recognition, and management, to reduce them.

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7. Conflicts of interest

There are no conflicts of interest.

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