Radix Entomolaris- Case Series

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Abstract

The success of root canal treatment depends on the accurate detection of all the canals, thorough an appropriately designed access cavity. Failure of the following steps in root canal treatment such as chemomechanical preparation and obturation may occur due to unusual tooth morphology. Therefore, understanding the various unusual anatomical representations is of prime importance. Frequently, mandibular molars have two roots with three canals (distal, mesiobuccal and mesiolingual) but in few teeth, the number of roots as well as root canals vary. This variation in the number of roots is known as radix. This article presents five case reports of mandibular first molars with extra roots and its management.

Keywords: *Radix Entomolaris, Anatomical Variations, Extra Roots, Mandibular Molar*

1. INTRODUCTION

One of the main reasons for failure of root canal treatment in molars is because the clinician has not removed all the pulp tissue and microorganisms from the root canal system (Cohen & Brown, 2002)[1]. A thorough understanding and awareness of the root canal morphology can contribute towards the success of endodontic treatment. The mandibular molars are known to present with anatomical variations that differ person to person. Carabelli (1844) was the first to highlight the presence of an additional root in mandibular molar which is usually seen distolingually and named it 'Radix entomolaris' (RE) and when placed buccally it is known as 'Radix paramolaris'.

The cause of formation of radix entomolaris is still unclear. In supernumerary roots with dysmorphic tooth, the reason to the occurrence could be related to various external factors while odontogenesis or also to penetrance of one or more atavistic gene of the polygenic system[2]. A more pronounced phenotypic manifestation of the expression from a particular gene can be seen in eumorphic roots[1]. Such cases of Radix Entomolaris has been found in a frequency of less than 5% population in Africa, white Caucasian , India and Eurasia whereas it is a common finding with a frequency of 5-30% in Mongoloid traits of China[3], Native America and Eskimos[4,5,6,7,8,9,10].

Moor, Deroose and Calberson in 2004 classified radix entomolaris based on the curvature of the root or root canal:

Type 1: A straight root canal or root.

Type 2: A curved coronal third which straightens in the apical and middle third.

Type 3: A second buccally oriented curve which begins in the apical or middle third with the initial curve in the coronal third.

Song JS et al. in 2010 further added two more newly defined variants of RE:

1. Small Type: Length shorter than half of the length of the distobuccal root.

2. Conical Type: Smaller than the small type and having no root canal within it.

The dimensions of the RE can vary. It could just be a short conical extension or a 'mature' root with normal length. Radiographs exposed at two different horizontal angles are needed to identify this additional root (Wang et al. 2011). In general, the RE is smaller than the distobuccal and mesial roots and can be separate from, or partially fused with, the other roots. The location of the orifice of the root canal of a RE has implications during access opening. Clinically a dark line on the pulp chamber floor can indicate the precise location of the RE canal orifice[11]. The distal and lingual pulp

chamber wall can be explored with an angled probe to reveal overlying dentin or pulp roof remnants masking the root canal entrance. The calcification, which is often situated above the orifice of the RE, has to be removed for a better view and access for instrumentation. In this article several such RE cases and their management has been reported.

2. CASE SERIES

Case 1

A 25-year-old male patient reported to the Department of Conservative Dentistry and Endodontics, FDS-RUAS, Bangalore with pain in his lower right back tooth region as his chief complaint. On intra-oral clinical examination, the mandibular right first molar was deeply carious and tender on percussion w.r.t mandibular right first molar. Electrical and Thermal pulp testing of the tooth elicited a negative response. Intra-oral periapical radiograph of the tooth revealed radiolucency in enamel, dentin and approximating pulp with periapical radiolucency w.r.t mesial and distal roots (Fig. 1).

Diagnosis of irreversible pulpitis with apical periodontitis was made. After anaesthetizing the tooth using 2% local anesthesia 1:200000 adrenaline and rubber dam isolation, access cavity preparation was done, and canal orifices were located with DG 16 endodontic explorer (Dentsply, Maillefer) (Fig. 2). After access cavity refinement, 5 canals were located, mesio-buccal, mid mesial, mesio-lingual, distal and extra disto-lingual root canal.

All the 5 root canals were initially negotiated with #10 K-file (Mani, Japan). The canal lengths were determined with apex locator (ApexID, Sybron Endo, USA) and later confirmed with the help of intra oral periapical radiograph (Fig. 3). 3% sodium hypochlorite along with 17% EDTA was used to clean the canals under standardized irrigation protocol. Cleaning and shaping were performed with NeoEndo Flex rotary system (NeoEndo, India) till a size of 25, 0.04. Following master cone selection (Fig. 4) the canals were dried with paper point and obturation was done by using single cone technique (Fig. 5) with 25, 0.04 gutta-percha cones and AH Plus sealer.

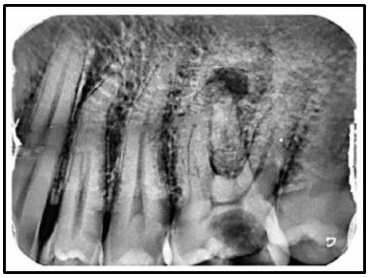

Figure 1: Pre-operativeIOPA

Figure 2: Accesscavity prepared

Figure 3: Working length determined

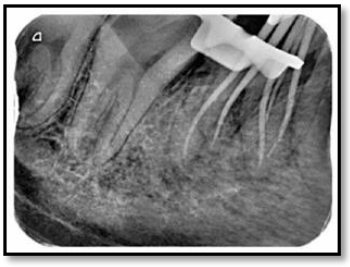

Figure 4: Master cone selected

Figure 5: Post-obturation IOPA

Case 2

A 24-year-old male patient reported with the chief complaint of severe pain in the right lower back tooth region for the past fifteen days. The patient gave a history of pain which was continuous and often disturbed his sleep. Pain aggravated on taking warm food and even during chewing. Decay was noticed in relation to mandibular right first molar and on percussion, was tender.

A negative response was elicited on thermal and electrical pulp testing. Intraoral Periapical radiograph of the tooth revealed radiolucency involving pulp, widening of the periodontal ligament and between the mesial and distal root, an additional root was observed. Caries excavation was performed, and the missing mesial wall was replaced with composite resin. Following inferior alveolar nerve block, an access cavity was prepared after the tooth was isolated with rubber dam.

Three canals could be located but the dentin map in a distolingual direction, seemed to be extending slightly. The orifice visible in distolingual direction was explored with DG 16 explorer (Dentsply, Maillefer) and enlarged with SX Protaper file (Dentsply, Maillefer). The canal was checked for its patency and working length was determined, initially with the help of apex locator, Root ZX (JMorita) and reconfirmed radiographically (Fig. 6).

Chemomechanical preparation with the help of rotary Protaper rotary system to size no. F1 was carried out. Master cone fit was confirmed radiographically (Fig. 7) and obturation was performed with single cone technique (Fig. 8) using gutta-percha cones and AH Plus sealer.

Figure 6: Working length determined

Figure 7: Master cone selected

Figure 8: Post-obturation IOPA

Case 3

A 42-year-old female patient reported with chief complaint of severe sensitivity in the left lower back region of the jaw for the past 3 days. On clinical examination left lower first molar revealed severe attrition with a deep occlusal facet and the tooth was tender on percussion.

After anaesthetizing the tooth, rubber dam isolation was done, and access preparation was performed, and the DG 16 endodontic explorer (Dentsply, Maillefer) was used to locate the canal orifices. Using #10 K-file (Mani Japan) the root canals were negotiated initially. Far from distal root canal, the fourth disto-lingual canal orifice was located. Working length was determined using the apex locator (Apex ID, Sybron Endo, USA) and confirmed radiographically using 15 number K -file (Mani Japan) (Fig. 9).

Cleaning and shaping was carried out using rotary MTwo system (VDW GmBh, Germany) till a size of 25. 0.06 with standard irrigation protocol by using 17% EDTA and 3% sodium hypochlorite. The patient was asymptomatic at the next appointment. A proper fit of cones was revealed in the Master cone radiograph (Fig. 10).

Paper points were used to dry the canals and using single-cone technique with gutta percha cones and AH plus sealer, obturation (Fig. 11) was performed.

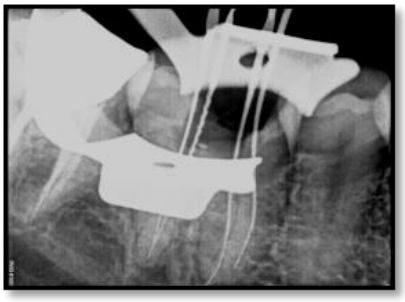

Figure 9: Working length determined

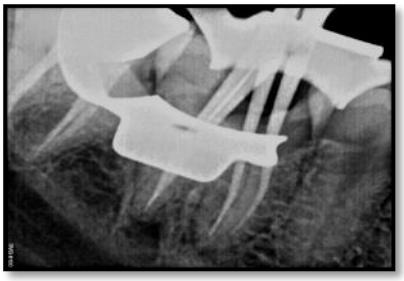

Figure 10: Master cone selected

Figure 11: Post-obturation IOPA

Case 4

A 31-year-old female patient reported with a chief complaint of severe pain in the right lower back tooth region for the past four days. Pain was of intermittent type, aggravated on taking cold food and persisted even after the removal of stimulus. Clinical examination revealed deep proximal caries involving the lower right first molar and was on percussion was tender. Pulp testing of the tooth using electrical and thermal tests elicited a negative response. Intraoral Periapical radiograph revealed radiolucency involving pulp with widening of the periodontal ligament space and between the mesial and the distal roots an additional root was noticed. Diagnosis made was irreversible pulpitis with apical periodontitis w.r.t 46. Caries excavation was done, and the missing wall was restored using composite resin. The tooth was anaesthetized and isolated with the help of rubber dam. Access opening was performed, and three canals could be located. The first distal canal was found slightly away from the center (buccally) indicating that the fourth canal was on the lingual side and the access cavity preparation was modified accordingly. Once the root canals were located, canal patency was obtained with ISO 15 no. K -file (Mani Japan). Determination of the working length was carried out using the apex locator (Apex ID, Sybron Endo, USA) and was radiographically confirmed (Fig. 12). Chemomechanical preparation was done with MTwo rotary system (VDW GmBh, Germany) till a size of 25. 0.06 using 17% EDTA and irrigants 3% sodium hypochlorite and normal saline. Master cone was selected and (Fig. 13) obturation (Fig. 14) was completed using single cone technique with gutta percha cones and the sealer AH Plus.

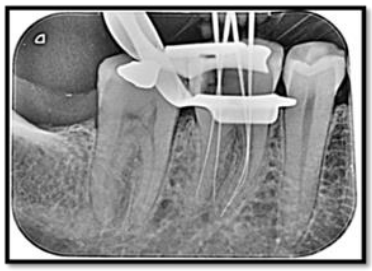

Figure 12: Working length determined

Figure 13: Master cone selected

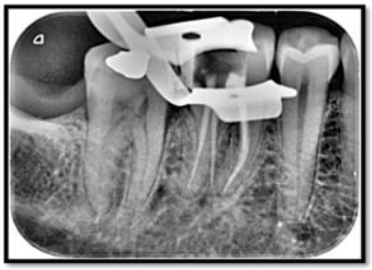

Figure 14: Post-obturation IOPA

Case 5

A 28-year-old female patient reported with a complaint of discomfort since a few days in the right posterior tooth region of the lower jaw. Clinically, the first lower right molar tooth had caries distally and on vertical percussion was tender. IOPA revealed periapical radiolucency involving both distal and mesial roots. Distally, a third additional root was detected.

A negative response was elicited on electric pulp testing. The lower right first molar was then diagnosed as irreversible pulpitis with apical periodontitis. The tooth was isolated with dental rubber dam following inferior alveolar nerve block. Access opening was carried out, and only one distobuccal canal orifice and two mesial canal orifices (mesiolingual and mesiobuccal) were located initially. On further exploration, another orifice was located distolingually.

Using Gates Glidden drills (Mani Inc., Japan), the root canals orifices were enlarged. The working length of the root canals were determined using the apex locator (Apex ID, Sybron Endo, USA), once the root canals were explored with a K-file ISO number 15 and this was confirmed radiographically (Fig. 15).

Chemomechanical preparation was carried out using NeoEndo Flex rotary system (NeoEndo, India) till a size of 20, 0.06 in all the canals with intermittent irrigation using 3% sodium hypochlorite and saline. Master cone selection done (Fig. 16) and obturation (Fig. 17) of the root canals was executed using single cone technique with gutta percha cones coated with AH Plus root canal sealer.

Figure 15: Working length determined

Figure 16: Master cone selected

Figure 17: Post-obturation IOPA

3. DISCUSSION

Variations in root and canal morphology especially in multirooted teeth remain a constant challenge for diagnosis as well as management. An in-depth knowledge of root canal morphology and the canal configuration is important for a successful endodontic therapy. Anomalies pose a challenge to the Endodontist and one such challenge is Radix Entomolaris and Paramolaris associated most commonly with first, second and third mandibular molars, with chance of occurrence least in second molar and maximum in first molar. Bilateral occurrence of RE is 60-70% [12,5,13]. The exact etiology determining the formation of RE remains unknown. In dysmorphic, formation of supernumerary root might be associated with external factors during tooth formation i.e. odontogenesis[14]. Atavistic gene or polygenetic system could be the added etiology to the same[15,13,16,17]. RE was first reported by Carabelli.

In about 90% of cases, a third root should normally be readily evident radiographically. Careful inspection of the radiograph most oftenly reveals the presence of a hidden RE, indicated as in unclear view or the outline of the distilled root. Conventional methods example champagne test, bubble test, transillumination, white line, red line test might be helpful in determining the canal orifices. Nevertheless, it is still missed owing to

its slender dimensions occasionally[18]. It has been reported earlier as aberrant canals, the mandibular 1st molars. CBCT and magnification aids like loupes and surgical microscope can aid in diagnosing as well as enhancing the treatment outcome.

Literature review reveals a majority of radices entomolaris with curved root canal morphologies making its management more difficult. A few cases have been reported with an additional curve beginning from the middle 3rd of the root[19]. Therefore, for proper management precurved files[20] with adequate coronal enlargement, thereby eradicating hindrances in the coronal part and establishing easy passage of the endodontic file to the apical portion. New generation electronic apex locator can be a valuable tool in determining and confirming the root length[21].

4. CONCLUSION

It is therefore imperative that the clinicians are well known about the unusual morphological variations about radix entomolaris in terms of location of the extra root, root canal anatomy and the root canal curvature. Knowledge of occurrence and the associated complication of such cases with preoperative radiographs and assist in better treatment outcome.

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