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Radix Entomolaris: Case Series And Review

Dr. Ketaki Dinkar Jawale

PG Student, Dept of Conservative Dentistry and Endodontics, Bharati Vidyapeeth Deemed University, Dental College and Hospital, Sangli

Dr. Jayakumar Appasaheb Patil

Professor, Dept of Conservative Dentistry and Endodontics, Bharati Vidyapeeth Deemed University, Dental College and Hospital, Sangli

Dr. Sharad Basavraj Kamat

Professor and HOD, Dept of Conservative Dentistry and Endodontics, Bharati Vidyapeeth Deemed University, Dental College and Hospital, Sangli

Dr. Rutuja Vijay Chopade

Assisstant Professor, Dept of Conservative Dentistry and Endodontics, Bharati Vidyapeeth Deemed University, Dental College and Hospital, Sangli

Abstract: ***The success of endodontic therapy depends on thorough internal anatomy of the tooth, proper access opening, complete chemo-mechanical preparation and 3-dimensional obturation of root canal space. Root canal failure can be attributed to variety of reasons and one among these is failure to treat extra root or canal. This paper presents successful management of three cases of Radix entomolaris and also describes internal anatomy, prevelance and diagnosis of the same.***

Keywords: Anatomic Variations, Radiography, Root Canal Treatment

I. INTRODUCTION

The main objective of root canal treatment is thorough chemo-mechanical debridement of the entire root canal space and their three-dimensional obturation with an inert filling material and coronal sealing to obtain a hermetic seal. One of the main reasons for the failure of root canal therapy is the inadequate removal of pulp tissue and micro-organisms from the root canal system.

It is well documented that mandibular Ist molar exhibits two roots; one mesial and one distal. However literature search has revealed several anatomical variations in the form of roots and root canals in relation to mandibular Ist molar. The significant variant in mandibular Ist molar is the presence of supernumerary root that is found distolingually. This was first mentioned by 'Carabelli' and is called *Radix Entomolaris*. Root canal anatomy and the nature of human pulpal system often pose challenges in rendering quality endodontic treatment. Therefore it is essential for the clinician to have thorough knowledge of root canal anatomy and variations in obtaining optimal success.

II. CASE REPORTS

CASE I

A 24-year-old male patient reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of dull aching pain in left lower back tooth region since 1-month. The patient medical history was non-contributory. Intraoral examination revealed deep occlusal carious lesion with left mandibular Ist molar. The tooth had mild tenderness to percussion. On thermal testing the tooth was responsive and on electric pulp testing it showed delayed response. Pre-operative radiographic examination revealed coronal disto-occlusal radiolucency involving pulp space and widening of periodontal ligament. The radiograph also revealed an unusual anatomy of involved tooth with an additional disto-lingual root (Fig: 1a). From the clinical and radiographic findings, a diagnosis of chronic apical periodontits was made.

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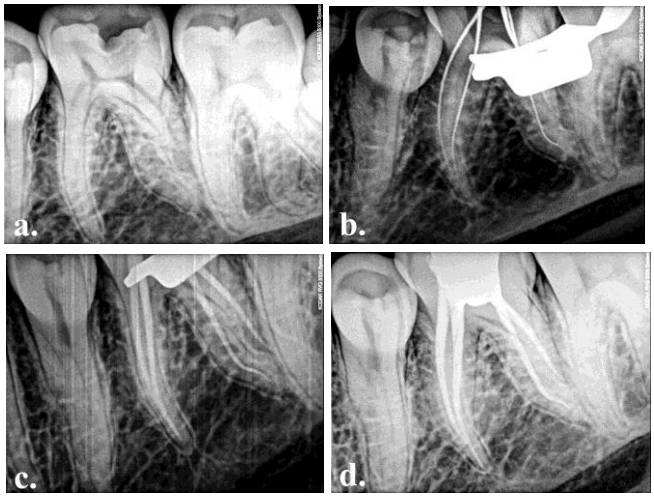

Figure 1: a: Pre Operative Image, b: Working length determination, c: Master cone selection, d: Post Obturation image

CASE II

A 28-year-old male patient reported to Department of Conservative Dentistry and Endodontics with a chief complaint of pain in right lower back tooth region since 3 days. Medical history of the patient was non-contributory. Past dental history revealed amalgam restoration with 46 and 47, 6 months back. Periodontal probing and mobility were within the physiologic limits. On thermal testing there was negative response to stimuli, where as with electric pulp testing there was delayed response with 46. Intraoral periapical radiograph revealed secondary caries in close proximity to pulp along with widening of periodontal ligament space. An additional root was also evident (Fig: 2a). Based on the above findings, a diagnosis of symptomatic apical periodontitis was made.

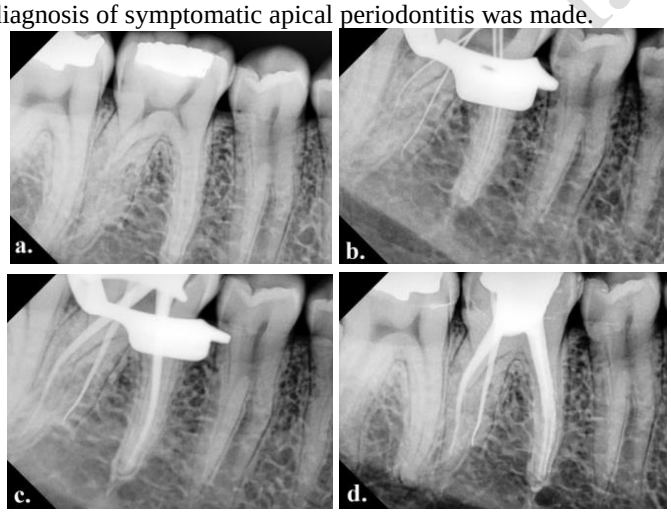

Figure 2: a: Pre Operative Image, b: Working length determination, c: Master cone selection, d: Post Obturation image

CASE III

A 17-year-old female patient reported to Department of Conservative Dentistry and Endodontics with a chief complaint of pain and swelling in left lower back tooth region for last 3 days. Intraoral examination revealed grossly decayed left mandibular Ist molar. Intraoral sinus was present in relation with 36. Tooth was tende on percussion and did not respond to thermal and electric pulp testing. Intraoral periapical radiograph revealed a deep carious lesion involving pulp, discontinuation of lamina dura and assosciated periapical lesion. It also showed an additional root at the distal side of tooth (Fig: 3a). Based on the clinical and radiographic findings, diagnosis of pulp necrosis with periapical abscess was rendered.

In all the three cases before the root canal treatment was planned and scheduled additional radiovisiograph (RVG) images at 20^0 mesial and distal horizontal angulations were taken to confirm the presence of additional roots and routine endodontic procedures was followed for all the three cases as mentioned below.

After taking consent from the patient, Local anesthesia was induced using 1.8 mL 2% lidocaine with 1: 200,000 epinephrine (Xylocaine; AstraZeneca Pharma India Ltd.). Rubber dam was placed, endodonti access opening was done with an Endo Access bur (Dentsply Tulsa, Tulsa, OK). Two mesial and one distal canal were located using DG- 16 endodontic explorer (Dentsply, United Kingdom). In addition, a dark line was observed between the distal orifice of the canal and distolingual corner of the floor of pulp chamber. The working length was determined with the help of an apex locator (Root ZX; Morita, Tokyo, Japan) and also radiographically (Fig: 1b, 2b, 3b). Cleaning and shaping was done by crown-down technique using ProTaper nickel-titanium rotary instruments (Dentsply Maillefer) till F1 finishing file. Irrigation between each instrument was performed using 2.5% sodium hypochlorite solution and 17% ethylenediaminetetraacetic acid. Final irrigation was done with 2% chlorhexidine gluconate. A master cone was selected and the fit was confirmed by the radiograph. The canals were dried with absorbent paper points (Dentsply Maillefer), and obturation was performed by lateral condensation technique using AH Plus sealer (Dentsply Maillefer, Ballaigues, Switzerland) and Gutta-percha cones (Fig: 1c, 2c, 3c). A post-operative intra-oral periapical radiograph was taken to ascertain obturation of root canal space (Fig: 1d, 2d, 3d). The access cavity was sealed and the patients were advised for full crown prosthesis.

Figure 3: a: Pre Operative Image, b: Working length determination, c: Master cone selection, d: Post Obturation image

III. DISCUSSION

Radix Entomolaris, the term was first coined by Carabelli. It is an anatomical variant found in the permanent mandibular first molar. Radix Entomolaris refers to mandibular molars having an additional root located distolingually.

CLASSIFICATION

Carlsen & Alexandersen (1990) classified radix entomolaris (RE) into four different types based on the location of its cervical part:

- ✓ Type A: the RE is located lingually to the distal root complex which has two cone-shaped macrostructures.
- ✓ Type B: the RE is located lingually to the distal root complex which has one cone-shaped macrostructures.
- ✓ Type C: the RE is located lingually to the mesial root complex.
- ✓ Type D: the RE is located lingually between the mesial and distal root complexes.

De Moor et al. (2004) classified radix entomolaris based on the curvature of the root or root canal:

- ✓ *TYPE 1:* a straight root or root canal.
- ✓ *TYPE 2:* a curved coronal third which becomes straighter in the middle and apical third.
- ✓ *TYPE 3:* an initial curve in the coronal third with a second buccally oriented curve which begins in the middle or apical third.

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.
- ✓ Conical type: smaller than the small type and having no root canal within it.

Recently Wang et al.(2011) gave another classification for RE depending on its radiographic appearance.

TYPE I: Presents the most identifiable radiographic image.

TYPE II: A large beam angulation is necessary mesially or distally for their identification.

TYPE III: Identification becomes extremely difficult because of the overlap at the adjacent distobuccal root.

The etiology behind formation of RE is still unclear. In dysmorphic roots, its formation could be related to external factor during odontogenesis or penetrance of an atavistic gene, while in eumorphic, racial genetic factors influence the profound expression of a particular gene resulting in more pronounced phenotypic manifestation. Curzon suggested that the 'three-rooted molar' trait has high degree of genetic penetrance as its dominance.

An extra distolingual root in the mandibular first molar is assosciated with certain ethnic groups. In white population, an extra distolingual root is present in mandibular I^{st} molars with frequency of 3.4- 4.2%. In black population, occurence is about 3%. Garg et al (2010) found 5.97% of additional DL root among the Indian population. In populations with Mangoloid traits such as Chinese, Japanese, Eskimo, Korean DL root occurs with a frequency of 5%- 40%. This indicates a high ethnic and racial variations among different groups. The RE is considered to be a normal morphologic variant or eumorphic root morphology due to its high frequency in Asian population.

Detection of RE during the diagnostic stage, helps the clinician to plan the treatment accordingly. On clinical examination, a more bulbous outline of the crown, an extra cusp along with cervical convexity can be suggestive of RE. On radiographic examination, a third root is visible in almost 90% of the cases. An unclear view or outline of the distal root contour or root canal reveal the presence of the "hidden" RE. Taking multiple radiographs with 20^0 mesial and distal angulation helps in identifying the extra root. Spiral computed tomography images also seem to be more conservative, accurate and look to be promising tool for investigating the prevalence and morphological features of DL roots in molars. Recently Cone-beam Computed Tomography has emerged as a useful tool to aid in the diagnosis of the teeth with complex root anamolies. It enables 3-D visualization, eliminates super-impositions and also aids in understanding of the true morphology of root canals.

IV. CONCLUSION

Clinicians should be aware of these unusual root morphologies in the mandibular first molars. Proper mesial and distal angulation and interpretation of radiographs help to identify the root canal anatomy and variations that are present in it. The morphological variations of the RE in terms of root inclination and root canal curvature demand a careful and adapted clinical approach to avoid or overcome procedural errors during endodontic therapy.

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