

## Endodontic Management of Mandibular Molars with Additional Distal Root: A Series of 3 Cases

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### Abstract:

Mandibular molars can possess a supplementary root located lingually known as radix entomolaris (RE) or buccally known as the radix paramolaris. If a dentist has an awareness and understands root canal morphology of this unusual supplementary root, subsequently can result in the successful outcome of root canal treatment. This present report discusses two mandibular molars with an RE or paramolaris treated endodontically along with the prevalence, the external morphological variations, and internal anatomy. Both of these macrostructures are rare in the permanent human dentition.

**Key Words:** Endodontic treatment, morphological variations, radix entomolaris, radix paramolaris

### Introduction

The outcome of endodontic pathology depends on a meticulous chemo-mechanical cleaning and shaping of the root canals before filling with dense root canal filling material to create a hermetic seal.<sup>1,2</sup>

Mandibular first molar is known to display several anatomic and morphological disparities. In some cases, the mesial root consists of two separate root canals that end in two discrete apical foramina. Or, in some cases, these foramina

amalgamate together at the root tip to end in one foramen. The distal root characteristically presents a kidney-shaped root canal which even though possesses a narrow and round orifice, the distal root may present a second distal root canal.<sup>3</sup> Literature presents a number of rare anatomical and morphological variations in the mandibular first molar. Fabra-Campos<sup>4,5</sup> and Bond<sup>6</sup> reported cases with the presence of three mesial canals, and Strone<sup>7</sup> noted the presence of three distal canals. Similar to a number of root canals, roots may also vary in number. A supplementary third root called as radix entomolaris (RE)<sup>8</sup> was first mentioned in the literature by Carabelli.<sup>9</sup> This additional root is positioned distolingually in mandibular molars, mostly first molars. Another additional root located mesiobuccally is known as the radix paramolaris (RP). Carlsen and Alexandersen<sup>10,11</sup> described identification characteristics and external morphology of these root complexes. The prevalence, external morphological variations, clinical approach to diagnosis and endodontic treatment of the RE and paramolaris are described in the present report. An awareness and knowledge regarding root canal morphology of this unusual supplementary root subsequently can result in the successful outcome of root canal treatment.

### Case Reports

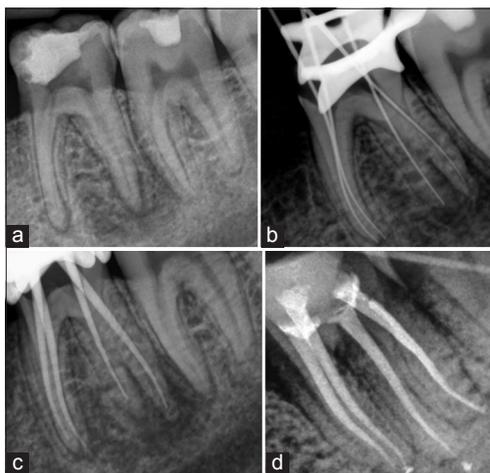
#### Case 1

A 44-year-old male patient reported to the Department of Conservative Dentistry and Endodontics of Bharati Vidyapeeth Deemed University Dental College and Hospital, Pune, Maharashtra, India, with a history of severe pain in the lower-left posterior tooth for few days. The clinical examination revealed bad amalgam restoration on the tooth 36 with recurrent caries on the mesial side of the tooth (Figure 1a). The tooth was tender on percussion. The medical history of the patient was non-contributory. The case was diagnosed as necrotic pulp with acute apical periodontitis. The diagnostic radiographs were taken from various horizontal angles (Figure 1a), which revealed an additional root present distally. Access cavity preparation was done with an Endo Access Bur No. E0123 and Endo Z (Dentsply Maillefer, Ballaigues, Switzerland) after administration of local anesthesia and isolation of tooth with a rubber dam. As the first distal canal was located buccally, thus access was modified to find the other distal canal, on the lingual side. A pre-curved K-file ISO number 15 (Dentsply Maillefer) was used to explore the canal. An apex locator (Root ZXII, JMorita, Suita City, Osaka, Japan) was used to determine the working length electronically which

was verified by periapical radiography (Figure 1b). The root canals were shaped with ProTaper rotary instruments until F1 File (Dentsply Maillefer) and Glyde (Dentsply Maillefer) was used as the lubricant. 5%NaOCl was used for irrigation. Following this, a closed dressing of CaOH<sub>2</sub> was given for 14 days. The CaOH<sub>2</sub> paste was removed by irrigation, and the canals were shaped with F2 instruments. The canals were dried, and a gutta-percha master cone was confirmed radiographically (Figure 1c). Then, the canals were obturated (Figure 1d) by vertical compaction with 6% gutta-percha points (Dentsply Maillefer) and AH Plus Sealer (Dentsply Maillefer), and the access was closed with glass ionomer cement (Ketac Fil, 3M ESPE, Seefeld, Germany). The post-obturation restoration was done with composite.

### Case 2

A 38-year-old male patient reported to the Department of Conservative Dentistry and Endodontics of Bharati Vidyapeeth Deemed University Dental College and Hospital, Pune, Maharashtra, India, with a history of pain on chewing and sensitivity to hot and cold in the lower-left posterior tooth for few days. The clinical examination revealed fractured amalgam restoration on the tooth 36 with recurrent caries on the distal side of the tooth (Figure 2a). The tooth was tender on percussion. The medical history of the patient was non-contributory. A diagnosis of necrotic pulp with acute apical periodontitis was confirmed. The diagnostic radiographs



**Figure 1:** (a) Pre-operative radiograph, (b) Working length radiograph, (c) Master cone radiograph, (d) Post-operative radiograph.



**Figure 2:** (a) Pre-operative radiograph, (b) Master cone radiograph, (c) Post-operative radiograph.

were taken from various horizontal angles (Figures 2a), which showed an additional distal root. After administration of local anesthesia, isolation of tooth by the rubber dam, access cavity was prepared by an Endo Access Bur No. E0123 and Endo Z (Dentsply Maillefer, Ballaigues, Switzerland). After locating first distal canal lingually, access was modified to search the other distal canal on the buccal side. A pre-curved K-file ISO number 10 (Dentsply Maillefer) was used to explore the root canals. The distobuccal canal showed curvature on 10 number K file in the apical third. An apex locator (Root ZXII. JMorita, Suita City, Osaka, Japan) was used to determine the working length electronically. The root canals were shaped with ProTaper rotary instruments until F1 File (Dentsply Maillefer) and Glyde (Dentsply Maillefer) was used as the lubricant maintain the canal anatomy. 5%NaOCl was used for irrigation. The canals were dried, and a gutta-percha master cone was confirmed radiographically (Figure 2b). Then, the canals were obturated (Figure 2c) by vertical compaction with 6% gutta-percha points (Dentsply Maillefer) and AH Plus Sealer (Dentsply Maillefer), and temporary restoration (non-eugenol MDTemp) was used to close the access followed by permanent composite restoration after 2 days.

### Case 3

A 54-year-old male patient reported to the Department of Conservative Dentistry and Endodontics of Bharati Vidyapeeth Deemed University Dental College and Hospital, Pune, Maharashtra, India, with a history of severe pain and swelling in the lower-left posterior tooth for few days. The clinical examination revealed deep distal, proximal caries extending into pulp. The tooth was tender on percussion. Intraoral examination revealed swelling of the buccal mucosa. The medical history of the patient was non-contributory. A diagnosis of necrotic pulp with chronic apical periodontitis was performed. Emergency access cavity preparation was done with an Endo Access Bur No. E0123 and Endo Z (Dentsply Maillefer, Ballaigues, Switzerland) under local anesthesia and the tooth was isolated by the rubber dam. After the first distal canal was located buccally, access was modified to search the other distal canal present on the lingual side. The root canals were cleaned and shaped with a pre-curved K-file ISO number 10 (Dentsply Maillefer). An apex locator (Root ZXII. JMorita, Suita City, Osaka, Japan) was used to determine working length electronically, and periapical radiography was used to confirm it (Figure 3a). The root canals were shaped with ProTaper



**Figure 3:** (a) Working length, (b) Master cone radiograph, (c) Post-operative radiograph.

rotary instruments until F1 File (Dentsply Maillefer) and Glyde (Dentsply Maillefer) was used as the lubricant. 5% NaOCl was used for irrigation. Following this, a closed dressing of CaOH<sub>2</sub> was given for 2 weeks. The CaOH<sub>2</sub> paste was removed by irrigation, and the canals were shaped with F2 instruments. The canals were dried, and a gutta-percha master cone was confirmed radiographically (Figure 3b). Then, the canals were obturated (Figure 3c) by vertical compaction with 6% gutta-percha points (Dentsply Maillefer) and AH Plus Sealer (Dentsply Maillefer), and temporary restoration (non-eugenol MDTemp) was used to close the access opening followed by permanent composite restoration after 2 days.

### Discussion

The success of endodontic treatment of mandibular molars depends on thorough knowledge of root canal morphology and configuration of teeth. The occurrence of RE and RP is found frequently in first and third mandibular molars. The occurrence of RE and RP is least frequent in a second mandibular molar. The bilateral occurrence of RE ranges from 50% to 67%.<sup>12</sup> The frequency of RE in Indian population is 3.2%,<sup>13</sup> and RP is 2%.<sup>14</sup> In general, RE is smaller than distobuccal and mesial roots. RE is separate from or partially fused with distal root. A clinician should diagnose additional root by pre-operative radiograph, clinical inspection, and access opening. Intraoral periapical radiographs may serve as an important aid in identifying RE. It is suggested that the radiographs were successful in over 90% of the cases while identifying additional roots. Radiographic features such as double periodontal ligament images or unclear view of distal root/canal indicate the possibility of RE. Then, one should take a second radiograph with different angulations to verify the hidden root.<sup>15</sup> The clinical examination using a periodontal probe of the crown part along with cervical part of the roots aids in the identification of morphology and thus facilitates identification of supplementary root. The presence of an extra cusp called as tuberculum paramolare or a more prominent disto-occlusal or distolingual lobe; in addition to a cervical prominence or convexity provides an indication of the presence of an additional root. The orifice of the RE is located mesiolingually from the main distal canal, thus requiring a more rectangular or trapezoidal outline form of the access cavity. The other methods are visualizing dental map and bleeding points, extending the access cavity using ultrasonic tips, verifying by champagne bubble test, magnifying loops, microscope, and also by CBCT.<sup>16</sup> After the canal location followed by orifice enlargement and working length

determination, the flexible nickel-titanium rotary files should be used to maintain the anatomy and follow the curvatures with the centered preparation restricting enlargement from coronal to apical preparation for successful endodontic treatment.

In all the present cases, all the radiographs taken during the root canal treatment were clearly showed RE and prevented the need for further investigations such as cone-beam computed tomography and three-dimensional reconstruction, which are useful to study the morphology of RE in a non-invasive manner.<sup>17</sup>

### Conclusion

Clinicians must be familiar with these unusual root morphologies present in the mandibular first molars for the successful outcome of the endodontic treatment. It is important to diagnose RE or paramolaris before initiation of root canal procedure to facilitate the process and to avoid missing of the canals which can further cause patient as well as dentist discomfort. Pre-operative periapical radiographs taken at two different horizontal angles are essential to identify these unusual root morphologies. The awareness of presence of the additional root results in less challenging situation for the clinician as access opening cavity will be modified accordingly with distolingual extension. The morphological variations of supplementary roots due to differences in root inclination and curvature of root canal insists a careful and modified clinical approach to avoid or overwhelm procedural errors in the course of root canal treatment.

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