Identification of Independent Middle Mesial Canal in Mandibular First Molar Using Cone-Beam Computed Tomography Imaging

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Abstract

Introduction: The root canal treatment of a mandibular molar with aberrant canal configuration can be diagnostically and technically challenging. **Methods:** This case report presents the clinical management of a mandibular first molar with three separate mesial canals including middle mesial canal, which was confirmed by cone-beam computed tomography (CBCT) images. **Results:** Posttreatment images revealed three independent root canals in the mesial root obturated efficiently to the accepted lengths in all three canals. **Conclusion:** This case report highlights the usefulness of CBCT imaging for accurate diagnosis and management of the unusual canal morphology. *(J Endod 2010;36:542–545)*

Key Words

Cone beam computed tomography imaging, mandibular molar, middle mesial canal

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The main objective of root canal treatment is the thorough mechanical and chemical cleansing of the entire pulp space followed by complete obturation with inert filling material (1). Therefore, it is imperative that aberrant anatomy is identified before and during root canal treatment of such teeth.

Since Vertucci and Williams (2) first reported the presence of a middle mesial (MM) canal in a mandibular molar, there have been multiple case reports of aberrant canal morphology in the mesial root (3–9). In a clinical evaluation of 100 mandibular molars, Pomeranz et al (6) found that 12 molars had MM canals in their mesial roots and classified them into three morphologic categories as follows: fin, confluent, and independent. According to their classification, an independent canal implies the canal originated as a separate orifice and terminated as a separate foramen, and only two cases were identified as independent. Goel et al (9) reported mandibular first molars had MM canals in 15.0% of specimens. Among these MM canals, only 6.7% of MM canals were independent.

Radiographic examination using conventional intraoral periapical views is important for the evaluation of the canal configuration. However, it has its inherent limitation to assess the root canal system completely. Conventional multidetector computed tomography (CT) imaging has been widely used in medicine since the 1970s and was introduced in the endodontic field in 1990 (10). Recently, cone beam CT (CBCT) imaginig has been shown to provide comparable images at reduced dose and costs to be considered as an alternative to multidetector CT imaging in endodontics (11). Cotton et al (12) reported a number of useful applications of CBCT imaging in endodontics. Furthermore, Matherne et al (13) suggested that CBCT imaging is useful even in identifying the root canal system. To our knowledge, however, there has been no clinical report that identifies an independent MM canal using CBCT imaging effectively. In this report, we present clinical detection and management of an independent MM canal in mandibular first molar by using CBCT imaging.

Case Report

A 43-year-old woman whose medical history was noncontributory presented to the dental clinic with spontaneous pain in the right molar area. A clinical examination showed an extensive previous gold restoration in the right lower first molar (Fig. 1*A*). The patient presented severe lingering pain to cold water applied to the isolated tooth. A radiograph showed no specific pathosis on the tooth and its periapical tissue, but periapical pathosis was shown in an adjacent second premolar (Fig. 1*B*). Furthermore, a moderate periodontal problem existed on the first molar. Diagnoses of irreversible pulpitis without apical periodontitis of the right mandibular first molar and pulp necrosis with chronic apical periodontitis of the right second premolar were made.

After administering local anesthesia, rubber dam isolation, previous restoration, and all carious tissue were removed, and an adequate endodontic access was made. The pulp chamber floor showed four orifices corresponding to 4 root canals: mesiobuccal, mesiolingual (ML), distobuccal, and distolingual (Fig. 1*C*). Working lengths were estimated by using an electronic apex locator (Root ZX; Morita, Tokyo, Japan) and then confirmed with a radiograph. All canals were cleaned and shaped with Protaper rotary instruments (Dentsply-Maillefer, Ballaigues, Switzerland) under copious irrigation with

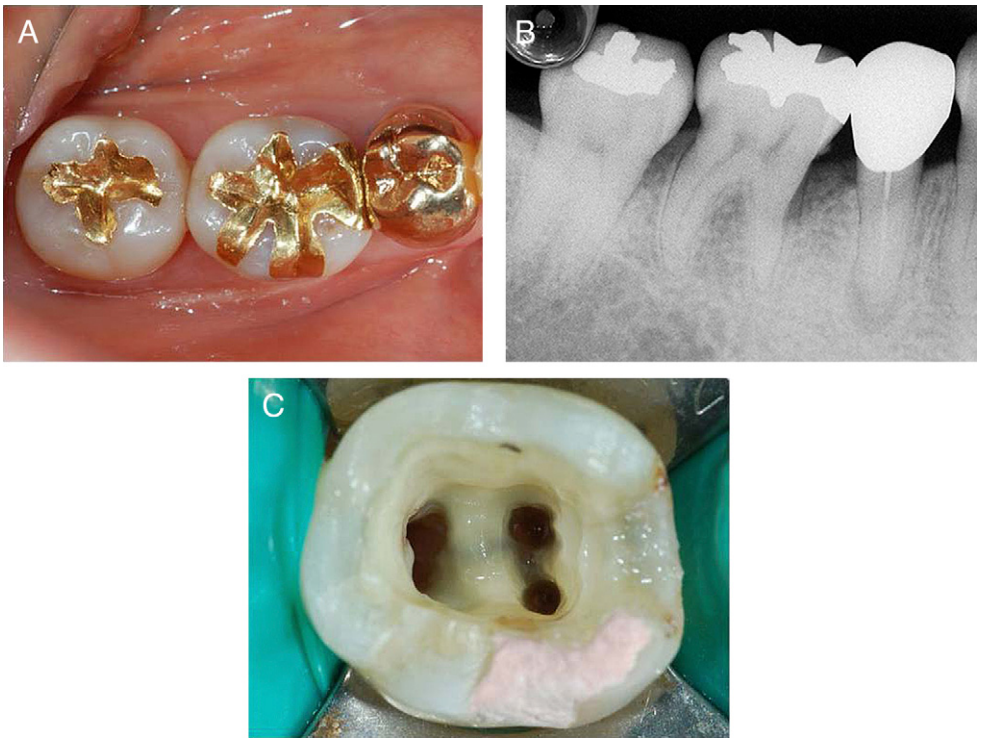

Figure 1. Pretreatment clinical (*A*) and radiographic view (*B*) of the right mandibular first molar with extensive gold restoration. (*C*) Floor of the pulp chamber showing conventional two orifices in the mesial root.

5.25% sodium hypochlorite. After preparation, the root canals were inserted with gutta-percha cones (Diadent, Seoul, Korea) to reconfirm working lengths. The angled radiograph implied the presence of an additional canal because the mesial root seemed to have another root apex (Fig. 2*A*).

By exploring the fissure located on the lingual aspect of the ML canal orifice with a sharp endodontic explorer, a "stick" was encountered. We decided to perform multisliced scans of the mandible with informed consent from the patient. The first molar was focused, and the morphology was obtained in transverse, axial, and sagittal sections

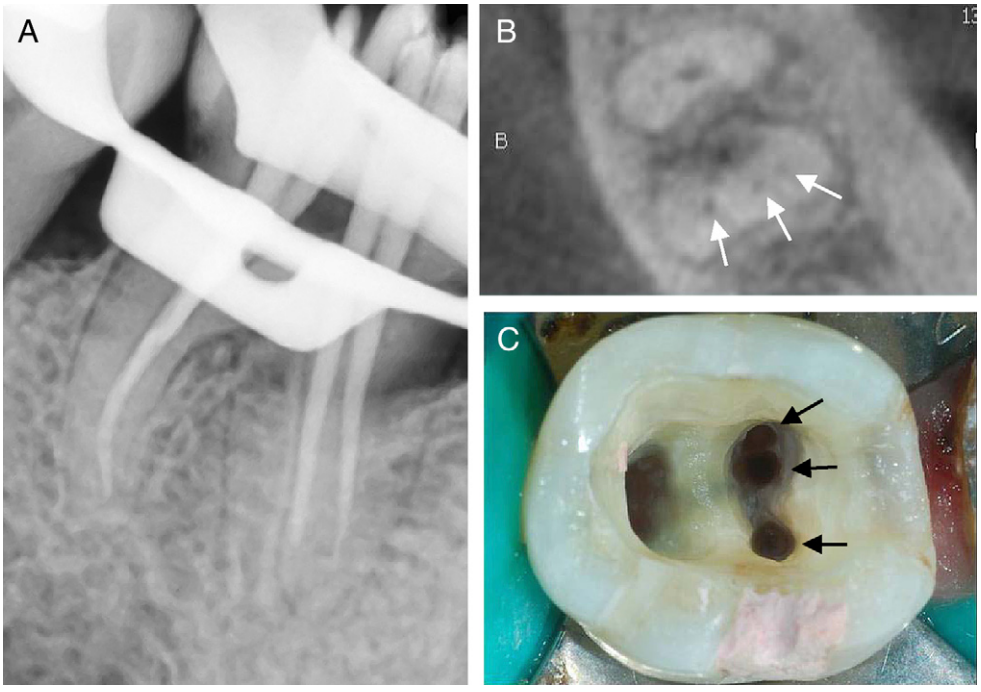

Figure 2. (*A*) A radiograph after master cone placement implies the possibility of additional canal in mesial root. (*B*) CBCT image showing three independent mesial canals (white arrows). (*C*) Pulpal floor showing three mesial canal orifices (black arrows).