

Endodontic management of mandibular third molar with three mesial roots using spiral computed tomography scan as a diagnostic aid: a case report

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Aberrant root canal anatomy is diagnostically and clinically challenging for clinicians. The most common root canal configuration of human molars is 2 roots and 3 canals, but various combinations may still exist. Third molars are known to have the most unusual anatomy among human teeth. Restorative, prosthetic, and orthodontic considerations often require endodontic treatment of third molars in order for them to be retained as functional components of the dental arch. The present case report demonstrates unusual root canal morphology of the mandibular third molar. Roentgenographic examination, which included spiral CT scan, revealed 3 separate mesial roots in tooth #48 with 3 independent canals and 3 canal orifices, indicating an endodontic rarity. The present case report puts impetus on exploration of additional canals using advanced diagnostic aids, such as spiral computed tomography, which can have a huge impact on the successful outcome of endodontic therapy. (*Oral Surg Oral Med Oral Pathol Oral Radiol* 2013;115:e6-e10)

Root canal treatment is aimed at thorough mechanical and chemical debridement of the pulp canal space and its complete obturation using an inert filling material preventing ingress of microorganisms.¹ Continued presence of microbial infection in the root canal system is among the main factors responsible for failure of endodontic therapy.² Complexity of the root canal system is a major hindrance during endodontic therapy both from a microbiological and technical view.¹ Therefore, it is imperative that the dentist must not only be familiar with such variations but also use advanced diagnostic aids, such as dental operating microscope and computed tomography (CT) for the location, negotiation, and subsequent management of such cases. Mandibular third molars being the last teeth in the molar series have the most unpredictable anatomy and are associated with greater variation in the root pattern and canal systems.³ The morphology of the mesial root canal system in mandibular molars is even more complex, with high frequency of communication between

the canals. Mandibular molars usually have mesiobuccal (MB) and mesiolingual (ML) canals in the mesial root canal system but a middle mesial (MM) canal may also be found in the developmental groove between MB and ML canals in 1% to 15% cases.^{4,5} In virtually all cases, this canal joins either the ML or MB canal in the apical third; thus, it has been argued that it is not an extra canal, but rather it is a result of instrumenting the isthmus area present between the ML and MB canals.⁵ In such cases, spiral CT (SCT) can be very useful and conclusive to determine the abnormal root canal anatomy. The occurrence of 3 independent canals in the mesial root system has been frequently reported in the literature, both in vitro and in vivo,⁶ but through an extended literature search, 3 mesial canals in 3 separate mesial roots has rarely been described, indicating a rare anatomic configuration. The purpose of this article was to report a case of a mandibular third molar with 3 separate mesial roots with SCT and its successful endodontic treatment.

CASE REPORT

A 22-year-old male patient with noncontributory medical history presented with the chief complaint of food lodgement in the lower right mandibular third molar. In the dental history, there were no episodes of spontaneous pain. On clinical examination, the tooth showed a deep carious lesion on the buccal surface of the tooth. The tooth was not painful to percussion and was not responsive to sensitivity tests (cold, hot, electric). The preoperative diagnostic radiograph of the right third molar revealed a radiolucency involving enamel, dentin, and approximating the pulp with no periapical radiolucency (Figure 1, A). The clinical diagnosis of necrotic pulp without apical periodontitis was made, and endodontic treatment was scheduled.

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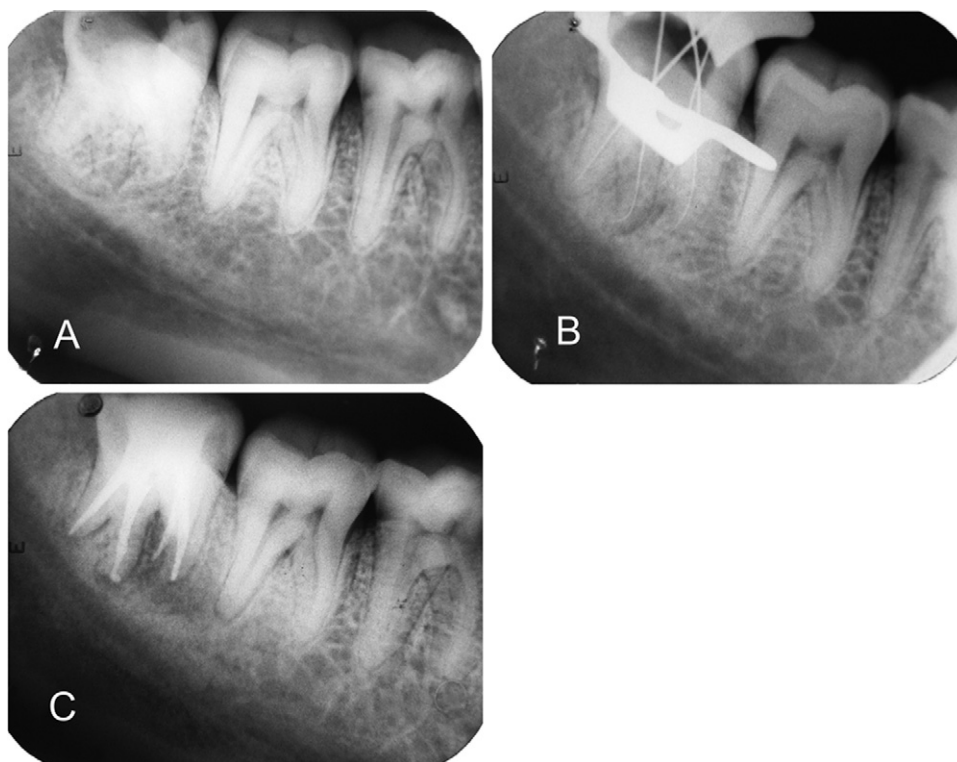


Fig. 1. **A**, Preoperative radiograph of right mandibular third molar. **B**, Working length determination radiograph showing 4 separate root and root canals. **C**, Radiographic image of the tooth showing successfully obturated root canals.

On examination of the preoperative radiograph, there seemed to be 2 additional roots in the third molar. An SCT scan was planned to determine whether 2 additional roots were truly present. Hence, to confirm the root canal systems of the third molar in a 3-dimensional (3D) manner, dental imaging with the help of an SCT was planned. A multislice or SCT of the mandible was performed with the dental software Dentascan (GE Healthcare, Milwaukee, WI). A 3D image of the mandible was obtained. The teeth were focused, and the morphology was obtained in transverse, axial, and sagittal sections of 1-mm thickness. The transverse images obtained from SCT revealed that the third molar had 4 separate roots and root canals (Figure 2). After administration of local anesthesia (2% lidocaine with 1:100,000 epinephrine), rubber dam (Hygenic, Coltene Whaledent, USA) was placed, all carious tissue was removed with an endodontic excavator (Hu Friedy, Chicago, IL), and an adequate endodontic access was made. On probing (DG-16 endodontic explorer, Hu Friedy, USA) under magnification from the dental operating microscope (Zeiss Eyemag Pro S; Carl Zeiss SpA, Aresse, Italy), the pulp chamber floor showed 4 orifices corresponding to 4 root canals: MB, MM, ML, and distal. The working lengths were established with an electronic apex locator (Propex II, Dentsply, Asia), and 4 K files 15# were used to confirm them radiographically (Figure 1, B) The working length measurement radiograph showed 3 independent mesial root canals in 3 separate mesial roots. The canals were instrumented with Mtwo (VDW GmbH, Munich, Germany) NiTi rotary instruments. Irrigation was done with copious amounts of

5.2% sodium hypochlorite and 17% EDTA. The canals were finally flushed with sterile saline, dried with sterile paper points (Dentsply Maillefer), and obturated with gutta percha (Dentsply DeTrey GmbH, Konstanz, Germany) and AH-Plus (Dentsply DeTrey GmbH, Konstanz, Germany) sealer using cold lateral condensation technique (Figure 1, C). Spiral CT images of the mandibular right third molar showed 4 separate successfully obturated root canals (Figure 3). To ensure adequate seal during interappointment time, an adhesive plug of resin composite flow (Surefil SDR flow, Dentsply, Asia) 2 mm in thickness, was put on each root canal orifice, and intermediate restorative material was used. The patient experienced no postoperative squeal, and an appropriate coronal restoration was performed in a subsequent appointment to ensure an adequate coronal seal with universal composite resin restorative material (3M ESPE Dental Products, St. Paul, MN). The patient will be followed clinically every 6 months during the first 2 years and then yearly to monitor peri-radicular responses.

DISCUSSION

The present case report highlights the unusual anatomy of a mandibular third molar with 3 mesial roots and 4 separate root canals. Most of the endodontic literature describes the mandibular third molar as having 2 roots and 3 root canals, but through an extended literature search, 3 mesial canals in 3 separate mesial roots have

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