3-D diagnosis-assisted management of anomalous mandibular molar

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Abstract

This case report describes the successful non-surgical endodontic management of carious exposed three-rooted mandibular molar with four root canals detected on the pre-operative radiograph taken with 20 degrees mesial angulation and confirmed with a 64-slice helical computed tomography scan-assisted 3-D-reconstructed images. Access cavity shape was modified to locate the extra canal with respect to the distolingual root in the left mandibular first molar. Copious irrigation was accomplished with 5.25% sodium hypochlorite and 17% EDTA. Biomechanical preparation was done using protapers. Calcium hydroxide dressing was done for 1 week. The tooth was obturated using gutta percha and AH 26 root canal sealer, and it was permanently restored with composite. Clinical examination on follow-up visits revealed no sensitivity to percussion and palpation in the left mandibular first molar. Thorough knowledge of root canal variations and use of advanced diagnostic modalities lead to successful non-surgical management of the complex cases.

Keywords: Radix entomolaris, three-rooted mandibular molar, 3-D scan

Introduction

The main aim of endodontic treatment is to treat or prevent apical periodontitis.[1] The success of contemporary and modern endodontics relies upon adequate knowledge of root canal anatomical variations and use of advanced diagnostic and treatment modalities. The orthograde management of the straightforward and complex cases have shown predictable results. Recent studies and reviews have shown success rates up to 95% in teeth with irreversible pulpitis[2,3] and 85% in teeth with necrotic root canals.[4] Mandibular molars are the first permanent teeth to erupt in the oral cavity at 6–7 years followed by completion of calcification at 8–9 years of age. The completion of canal differentiation commences at 3–6 years after closure of the apical foramen.[5,6] Many variations exist with regards to its root and root canal anatomy thus necessitating critical evaluation of each individual case for variations.[7] This case report describes the successful non-surgical endodontic management of a three-rooted mandibular first molar with two canals in the mesial root, one canal each in both distobuccal and distolingual roots using helical computed tomography (CT) imaging.

Case Report

A 21-year-old male reported to the outpatient department of Conservative Dentistry and Endodontics with a chief complaint of pain in the lower left back region since 2 months. The patient’s medical history was non-contributory. Extraoral examination did not reveal any significant changes. Clinical examination revealed the decayed distal surface in the left mandibular first molar (tooth #36) [Figure 1] with no fistulae or edema. There was tenderness to palpation and vertical percussion, but the tooth mobility was within normal physiological limits. Thermal testing elicited a delayed and prolonged response in tooth #36. The pre-operative radiograph of tooth #36 taken from 20 degrees mesial angulation showed the presence of three roots with slight widening of the periapical periodontal ligament space in relation to the mesial root apex and periapical radiolucency measuring about 1 mm with respect to the periapex of the
distobuccal root [Figure 2]. From the clinical and radiographic findings, a diagnosis of irreversible pulpitis with acute apical periodontitis with tooth #36 was made. To confirm the presence of extra root and to get detailed information of the anatomical variation in tooth #36, three-dimensional reconstructed [Figures 3 and 4] and axial images [Figure 5] were obtained using a 64-slice helical CT scan. Dentascan was the case of radix entomolaris with vertucci type I root canal in both distobuccal and distolingual root and type II in mesial root. The distal surface of the tooth was restored with composite resin (Z100; 3M Dental Products, St Paul, MN, USA) after caries excavation to enable better isolation. Tooth #36 was anesthetized by using 1.8 mL (30 mg) of 2% lidocaine containing 1:200,000 epinephrine (Xylocaine; AstraZeneca Pharma Ind Ltd., Bangalore, India). A rubber dam was placed and a modified endodontic access opening was established in tooth #36. The pulp chamber floor was shown to have four canals connected by the developmental root fusion line (DRFL). Coronal enlargement was done with a nickel–titanium (NiTi) ProTaper SX rotary file (Dentsply Maillefer, Ballaigues, Switzerland) to improve the straight-line access. Working length was determined with the help of an apex locator (Root ZX; Morita, Tokyo, Japan) and later confirmed by using a radiograph [Figure 6]. Cleaning and shaping was performed under rubber dam isolation by using ProTaper NiTi rotary instruments (Dentsply Maillefer) with a standardized technique. Irrigation was performed using normal saline, 5.25% sodium hypochlorite solution and 17% ethylenediaminetetraacetic acid. Final rinse was carried out with 2% chlorhexidine solution after saline irrigation. After completion of cleaning and shaping, the root canals were dried with absorbent points (Dentsply Maillefer). Calcium hydroxide (Calcicur; VOCO, Cuxhaven, Germany) was placed as an intracanal medicament with a lentulo spiral (Dentsply Maillefer) for 1 week and the access cavity was sealed with Cavit (3M ESPE Dental Products, St Paul, MN, USA). The patient was asymptomatic on the next visit; therefore, tooth #36 was obturated using protaper gutta percha and AH 26 root canal sealer [Figure 7]. The tooth was permanently restored using composite resin (Z100; 3M Dental Products). The patient was clinically asymptomatic on follow-up visits. Radiographically, there was healing of the periapical lesion after 7 months.
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Discussion

Mandibular molars being the cornerstones of dental occlusion are reported to have the incidence of a third root in 13% of the cases, and this was strongly correlated with the ethnicity of the studied population. Three canals are present in 61.3%, four canals in 35.7% and five canals in approximately 1%. Root canal configuration of the mesial root revealed two canals in 94.4% and three canals in 2.3%. The most common canal system configuration was Vertucci type IV (52.3%), followed by type II (35%). Root canal configuration of the distal root revealed type I configuration in 62.7%, followed by types II (14.5%) and IV (12.4%). The presence of isthmus communications averaged 54.8% on the mesial and 20.2% on the distal root. Presence of extra roots in the mandibular molars was first reported in the literature by Carabelli. The presence of extra root on the buccal surface is termed as radix paramolaris and on the distal surface is termed as radix entomolaris. Carleson and Alexandersen described that root canal morphology in extra root was found to be Vertucci’s type I mostly.

Ethnicity is a predisposing factor for anatomical variations such as number of roots, but there is no direct relationship between ethnicity and configuration of the root canal system. The incidence of three-rooted mandibular first molars in the Indian population is 5.97%,[9] in Europeans is 3.4–4.2%,[10] in Africans 3%[11] and in Eurasians less than 5%.[12] The prevalence in the Taiwanese population is 33.33%, with a bilateral incidence of a symmetrical distribution of 53.65%. There was a significantly greater incidence of three-rooted teeth on the left side of the mandible than on the right, but gender did not show a significant relationship with this variant prevalence.[13] The Mongoloid population exhibited significantly more mandibular first molars with three roots, with a 3:1 ratio when compared with Caucasians and African Americans, with the frequency ranging from 5% to 30%.[14] Thus, this trait is considered as eumorphic variation in people with the Mongoloid traits.

Conclusion

Thorough knowledge of root canal anatomical variations predispose to the success of endodontic treatment performed in a non-invasive manner. Use of advanced diagnostic and treatment aids help in managing various challenges faced by endodontists in day-to-day practices.

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