Case Report

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Endodontic management of mandibular first molar with six root canals with an aid of Cone Beam Computed Tomography: A case report

Abstract:
The mandibular first molars show many anatomical variations. Normally ,they have three or four root canals and rarely have five or more root canals. The present case report highlights a rare anatomical configuration with six root canals (3mesial and 3distal) in the mandibular right first molar diagnosed during endodontic treatment using a dental operating microscope and confirmed with the help of cone-beam computed tomography (CBCT) images. This case report revealed an increasing possibility of detecting additional canals through the magnification of the microscope and the improvement of CBCT diagnostic technology. Clinicians should have a thorough knowledge of the root canal system and internal anatomy and be alert about the possible existence of any variation in the canal morphology because it determines the successful outcome of endodontic treatment.

Key-words: CBCT, Magnification, Rootcanal.

Introduction:

The objective of endodontic treatment is thorough disinfection and obturation of the root canal system in all its dimensions.[1] A comprehensive understanding of tooth anatomy, its variations, and root canal morphology is necessary for an effective root canal procedure in order to access and remove pulp tissue and germs and to manage root ends properly, as it determines the successful outcome of endodontic treatment.[2,3]

The inability to appropriately understand the anatomical configuration of teeth and identify all the root canals for subsequent disinfection and obturation may lead to endodontic treatment failure.[4] Therefore, the details of unusual root canal morphology should be known to ensure successful root canal treatment.[5,8] The canals should beaccurately located, cleaned, shaped, and obturated.[9-11] T he mesial and distal roots of the mandibular first molars have two mesialcanals and oneor two distalcanals, respectively. Rarely, there is a third canal known as the middle mesial canal that separates the mesiolingual and mesiobuccal canals, located in the developing groove. The occurrence of a middle mesial (MM) canal varied from1to15%.[12] The middle distal (MD) canal, positioned between the distolingual and distobuccal canals, is a rare occurrence. The occurrence of three canals in the distal root is rare, observed inonly0.2-3% of cases.[13,14] The present study reported the successful endodontic treatment with a mandibular first molar with six root canals (three in the mesial root and three in the distal root).

Case Report:

A42-year-old female patient reported to the Department of Conservative dentistry and Endodontics with the chief

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complaint of pain in the lower right back tooth region for 10 days back. Patient gave the history of dental treatment from private practitioner one month back. Extraoral examination revealed no swelling, sinus tracts, or lymphadenopathy. Intraoral examination revealed a temporary restoration on the disto-occlusalsurface of the tooth (Fig.1a). There was pain on tenderness, tooth mobility within physiological limits, and gingival attachment was normal. Preoperative radiograph showed restoration in mandibular first molar (Fig.1b). Thermal pulp testing (Endo-Frost,

Coltene-Whaledent, Langenau, Germany) elicited no response. Based on the clinical and radiographic findings, a diagnosis of previously initiated RCT with symptomatic apical periodontitis in mandibular right first molar was made. The informed consent was obtained before commencing the treatment. Isolation was maintained through out the procedure with the rubber dam; Following the removal of the previous old filling and dental caries, conventional endodontic access was established. The pulp chamber was assessed using a DG-16 endodontic explorer, and four canal orifices were observed initially, but further exploration revealed 6 canal orifices: middle mesial located between mesiobuccal and mesiolingual root canals and middle distal canals located between the root canals of distobuccal and distolingual root canals (Fig.1c). The canals were negotiated using a number10K-file (Dentsply-Maillefer, Ballaigues, Switzerland); anindependent apical foramen was found. Irrigation was performed using 5% sodium hypochlorite solution (NaOCl)and17% EDTA. A closed dressing was given. To better elucidate the morphology of the root canals and the scope of lesions, CBCT was advised; and it confirmed the sixcanals (Fig.1d): mesiobuccal, mesiolingual, middlemesial, distobuccal, distolingual, and middledistal.

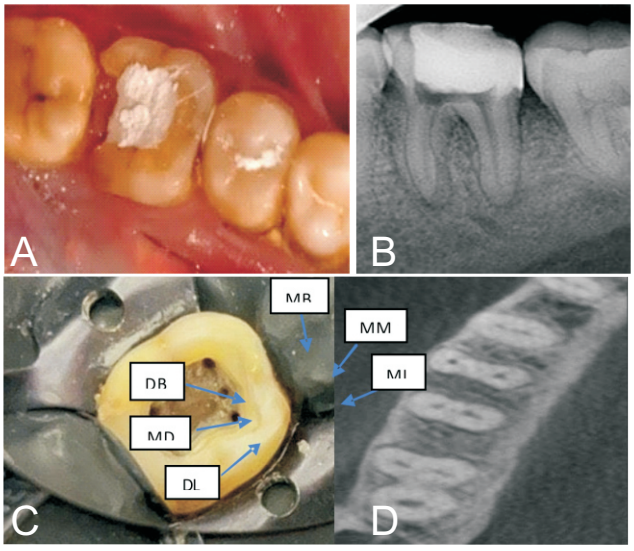

Figure1:

a: Clinical image showing restored mandibular right first molar **b:** Intra oral periapical radiograph showing deep restoration in mandibular right first molar **c:** Access Cavity showing six canal orifices **d:** Axial section of CBCT image of mandibular right first molar showing six canals.

At the second appointment, the working length was measured with an electronic apex locator (Coltene Canal Pro, Coltene/Whaledent, Germany) and confirmed by a radiograph with size 10 K-files (Fig.2a,2b). The root canals were then cleaned and shaped with nickel-titanium rotary instruments (Orikam Healthcare India Pvt.Ltd) to 25,6% using the crown-down technique. During the procedure, EDTA gel usedas a lubricant and 5% sodium hypochlorite solution used as an irrig antalong with saline. Calcium hydroxide with chlorhexidine used as intracanal medicament. The tooth was temporarily restored with cavit and patient was recalled after 1 week. In the following appointment, after the removal of intracanal medicament, final irrigation was done with 2% Chlorhexidine (Prevest ChlorX, Prevest Denpron Ltd., India) using sonic activation (Endoactivator, Dentsply Sirona, Ballaigues, Switzerland). Master cone radiographs were taken. (Fig.2c,2d). The canals were dried with sterilepaper points (Diadent, Diadent Group International, Korea) & obturated with a corresponding single cone with bioceramic sealer (Fig.2e,2f). The post-endodontic restoration was done using light cure restorative resin (Ivoclar Tetric N-Ceram, Ivoclar vivadent marketing India Pvt. Ltd., Haryana, India. Radiograph displaying gutta-percha cones placed in six canals wrt#46 (Fig.2g,2h). Post obturation CBCT was advised which also revealed obturated six root canals (Fig. 2i).

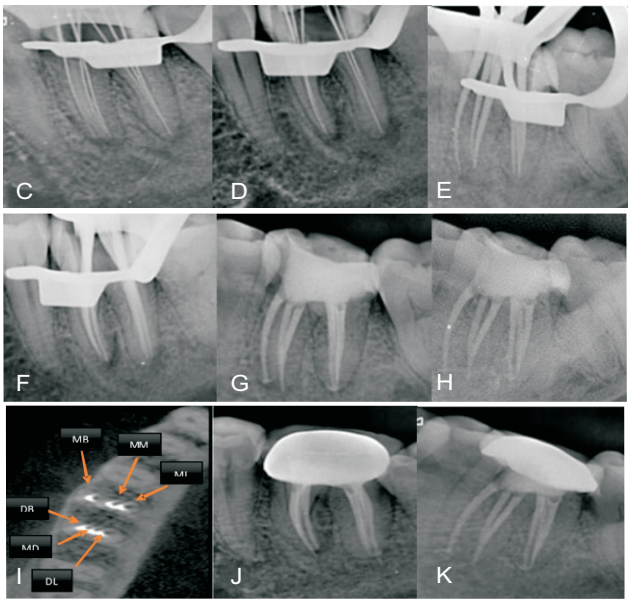

Figure2:

a, b: Working length radiographs from two different angulations **c, d:** Master Cone radiographs from two different angulations **e, f:** Post Endodontic restoration radiographs **g:** Axial section of CBCT image of mandibular right first molar after Obturation **h, i:** Follow-up radiographs after Six months.

Discussion:

The detection of additional canals requires thorough knowledge of root canal morphology and its frequent variations. Careful examination of the pulpal floor, selective troughing, and better visualization through a dental operating microscope is essential for the detection of additional canals in a mandibular first molar.[15,16] In a study by Azimetal, the MM canal was found in 46.2% of cases, out of which 6.6% were located after conventional access preparation and 39.6% after standardized troughing.[15] They also reported a significantly higher incidence of an MM canal in the younger patients. Selectivet roughing along with better visualization throug a dental operating microscope helped to locate additional MM and DM canals. Wallace and Baugh reported a case of the MM canal in the mandibular first molar, where the MM canal originated as a separate orifice but joined in the apical third of the canal.[17] Izaz et al reported a case of MD canal that joined the main canal in the apical third.[16] In this case, the DM canals started as distinct openings and stayed separate along the full length of the canal, whereas MM canal originated as a separate orifice, but joined in the apical third of the canal.

The use of CBCT scans may help to produce an accurate diagnosis and morphological evaluation in endodontics when root canals overlap and complex anatomies present.[17] In the present case, the periapical radiograph showed that the rootc anal images were hazy and overlapped. The law of symmetry as advocated by Krasnerand Rankow, along with modifications in the access cavity design (from triangular to rectangular or rhomboidal), should be taken into account for identifying extra canals in both the mesial and distal roots of MFMs. The MM and MD orifices may initially not be visible due to the overlying dentin, which is lighter in color than the pulp chamber floor. It is important to expect multiple canals whenever an isthmus is visibly present, especially when there is a significant gap between the openings of the two primary canals.[18] Low-speed burs or ultrasonic scalers should be used to troughed the isthmus and check for any possible sticking points. Every possible effort should be made to identify and manage the various root canal configurations of MFMs in order to attain a greater success rate.

In this case, during access opening, we encountered four root canals, but as stated earlier, there was a distance between the orifices, so further exploration revealed six orifices. To verify this, CBCT scan was recommended for the right mandibular molar. The application of CBCT influenced the reviewers' decisions regarding pulpal and periapical diagnoses and, importantly, when identifying etiological factors and suggesting a treatment plan. A study conducted by Chogleetal. confirmed that CBCT imaging had a considerable impact on identifying the etiologic factors associated with endodontic pathosis (55% overall change) and on formulating treatment suggestions (49% overall change).[19]

Conclusion:

Patients having teeth with morphological or anatomic variations might not beusual, but it is imperative for a clinician to have an understanding of it to manage such cases successfully. A thorough understanding of the root canal anatomy and identification of variations in location and number of canals combined with complete biomechanical preparation and indispensable use of irrigants

ensure the success of a root canal procedure. A proper hermetic seal of canals obtained by obturation and a restoration ensuring the coronal seal is verypivotal and contributes to the success of the treatment.

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