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Case Report

Rare case of a mandibular first molar with seven canals confirmed by cone beam computed tomography and its endodontic management

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ABSTRACT

The endodontic treatment of a mandibular molar with aberrant canal configuration can be diagnostically and clinically challenging. This case report presents the treatment of a mandibular first molar with seven root canals, of which four canals were located in the mesial root and three in distal root. This case presents a rare anatomic configuration and points to the importance of expecting and searching for additional canals.

Keywords: Cone beam computed tomography, mandibular first molar, seven root canals

Introduction

The main objective of root canal therapy is thorough cleaning and shaping of all pulp spaces and its complete obturation with an inert filling material. Failure to explore and instrument even one of the canals results in improper cleaning of root canal system and can lead to endodontic treatment failure.[1] The mandibular first molar, the earliest permanent posterior tooth to erupt, seems to be the tooth that most often requires root canal treatment. The usual canal distribution is two canals in the mesial root and one or two canals in the distal root. However, various case reports have also described the presence of a middle mesial (MM) and distal canals. In 1985, Reeh[2] has reported a case with seven canals consisting of four canals in the mesial root and three in the distal root. Advanced diagnostic tools such as cone beam computed tomography (CBCT) scan plays an important role in the diagnosis and management of such a complex canal system.

This case report presents the management of a mandibular first molar with seven root canals, four in mesial and three in distal root. In addition, this case report highlights the use of CBCT as a diagnostic tool in endodontics.

Case Report

A 37-year-old male patient with a non-contributory medical history reported to our department with discomfort and pain in the right mandibular region. History of present illness showed that there were few episodes of recurrent pain in that region for the past 1 year. There was a large carious lesion in relation to the right mandibular first molar. Pulp testing with cold and electric pulse tester was non-responsive. Intraoral periapical radiograph revealed a radiolucency around the periapex of the left mandibular first molar [Figure 1a]. It was diagnosed as pulpal necrosis with symptomatic apical periodontitis. Treatment plan was explained to the patient and endodontic treatment was initiated under rubber dam isolation. This case was ethically approved and written consent has been taken from patients.

Anesthesia of mandibular left first molar was achieved with inferior alveolar nerve block using 2% lignocaine and an endodontic access cavity preparation was done. Four canals were located, two in the mesial and two in the distal. However, on careful examination of the access cavity with endo explorer, an additional orifice was detected between the two main canals, both mesially and distally. On exploration with DG-16, there was a "catch" or a "stick" feeling where an MM canal was located close to mesiobuccal (MB) canal. The distance between the MM canal and mesiolingual (ML) canal with a prominent isthmus between the two, prompted us to look for a second MM canal. Further exploration on the isthmus revealed one more "stick" feeling which on penetration with profinder revealed to be a second MM located closer to the ML canal. Distally, additional orifice was present in middle of the main canals and no fourth canal was found distally.

Glide path and patency were achieved using no. 6, 8, and 10 k-files. Working length radiographs were taken at different angulations with a file placed in each of the four mesial and three distal orifices [Figure 1b] and confirmed with electronic

apex locator (Root ZX, J Morita, Tokyo, Japan). Cleaning and shaping was performed using a crown-down preparation with rotary Protaper instruments (Maillefer, Dentsply, Ballaigues, Switzerland) under profuse irrigation with 3% sodium hypochlorite solution. After drying the root canals with sterile paper points, obturation was carried out with Protaper gutta-percha cones (Maillefer, Dentsply, Ballaigues, Switzerland) using zinc oxide eugenol sealer. The access cavity was temporarily restored with cavit [Figure 1c and d]. At 6-month follow-up, the patient was completely asymptomatic [Figure 1e].

Since the anatomy was unusual, a CBCT image was taken to confirm the anatomy. CBCT imaging confirmed the presence of seven canals in the concerned tooth [Figure 1f].

Discussion

In this case, seven distinct orifices were identified in the floor of the pulp chamber, four were in mesial root and three were in distal root. Thus, an absence of report of seven canals, with only one report by Reeh[2] in 1985, makes this report unique and worth mentioning to understand the complexity of root canal system of mandibular first molar. The distal root of the mandibular first molar occasionally has 1, 2, or 3 canals. The prevalence of a single canal of the distal roots of mandibular first molar is very high where the presence of three and four canals is very low.[3] Baziar *et al*.[4] detected six canals in a mandibular first molar using CBCT, with two canals in mesial root and four canals in the distal root. Alenezi[5] reported a case of mandibular first molar with three canals existing in the mesial root and three canals in the distal root. Recently, two cases were reported by again by Alenezi *et al*.[6] of mandibular first molar with three root canals in mesial root in one case and three root canals in distal root of another one. Furthermore, there was a single case report published by Arora *et al*.[7] reporting the presence of eight canals in mandibular first molar with four canals in each root (mesial and distal).

Diagnostic aids such as CBCT, dentascan, multiple pre-operative radiographs, examination of the pulp chamber floor with a sharp explorer, troughing of the grooves with ultrasonic tips, staining the chamber floor with 1% methylene blue dye, performing the sodium hypochlorite "champagne bubble test," and visualizing canal bleeding points are all important aids in locating the root canal orifices.[8] The search for an extra orifice is also aided by the use of microscopes, magnifying loupes, and fiber-optic transillumination to locate the developmental line between the MB and ML orifices. A significant constraint in conventional radiography is that it produces a 2D image of a 3D object, resulting in the superimposition of the overlying structures. Therefore, such radiographs are of limited value in cases with complex root canal anatomy. Hence, CBCT has been specifically designed to produce undistorted three-dimensional non-invasive information of the root canal anatomy. Gopikrishna *et al*.[9] used spiral computerized tomography for the confirmatory diagnosis of a morphological aberration in the maxillary first molar. Matherne *et al*.[10] conducted an *ex vivo* investigation to compare a charge-coupled device photostimulable phosphor plates digital radiography system with CBCT to detect the number of root canals in 72 extracted teeth. They found that with digital radiography, endodontists fail to identify at least one root canal in 40% of teeth.

Treating extra canals may be challenging; however, the inability to find and properly treat the root canals may cause failures. With advance diagnostic aids such as CBCT and dentascan, these challenges can be overcome. Although the incidence of root and canal variations is rare, every effort should be made to find and treat all the root canals for successful clinical results.

Conclusion

Failure to locate and clean extra canals decreases the long-term prognosis of endodontic treatment. Adequate knowledge of

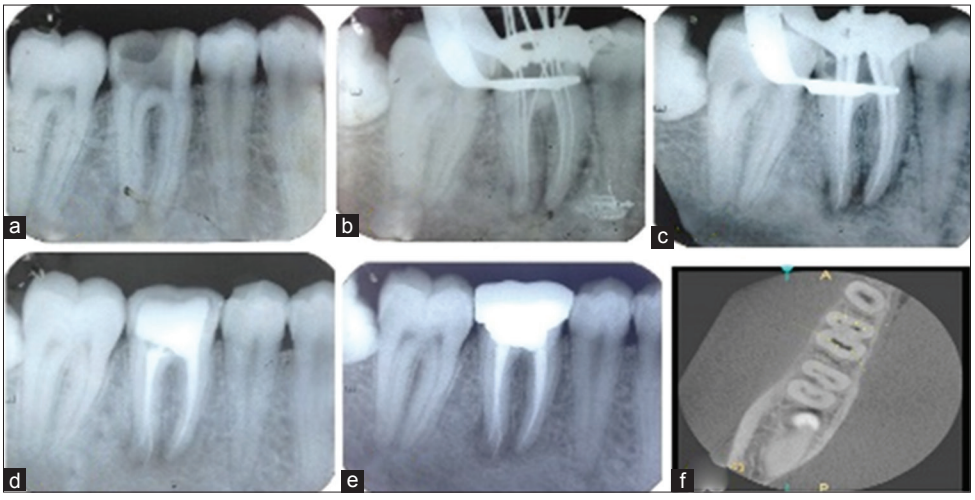

Figure 1: (a) - Pre-operative radiograph (b) - working length radiograph (c) - master cone radiograph (d) - obturation radiograph (e) - follow-up 6-month (f) - cone beam computed tomography

aberrancies, the will to search for them, combined with usage of magnification, and modern imaging techniques will beget us greater success. Advanced diagnostic tools like CBCT help to find the unusual variations in root canal anatomy. This case report describes a successful management of an aberrant morphology in a mandibular molar with four canals in the mesial root and three canals in the distal root confirmed with the advanced CBCT imaging technique.

Patient consent

We declare that we have taken written informed consent from the patient.

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