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Endodontic Treatment of Uncommon Morphology of Two-Rooted Mandibular Canine: A Case Report

Case Report

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Abstract

Effective root canal treatment is highly dependent on the clinician's knowledge and ability to manage abnormal anatomic differences. One root with one canal is the usual appearance of the mandibular canine. This report presents the endodontic management of an uncommon occurrence where the mandibular canine has two roots and two canals.Thirty-year-old Saudi female referred from the prosthodontic clinic for root canal treatment of the lower left canine. All steps were performed within the current state-of-the-art practices in endodontics, starting with appropriate clinical and radiographical interpretation and diagnosis, proper anaesthesia, rubber dam isolation, and dental microscopic and ultrasonic endodontic tips usage to ease access cavity preparation, and canal localization. Distinct debridement and accurate instrumentation of the two root canal systems followed by 3D obturation was performed to promote the effective treatment of such structural abnormalities. A 6-month follow up using CBCT confirmed root anatomy uniqueness in addition lack of pathology.

Keywords: Anatomical Aberrations; Mandibular Canine; Root Canal Morphology; Two Roots.

Introduction

Canines are the "cornerstone" of the mouth, and the reason behind this is their efficiency inmastication, stability of dental arch, and natural facial expression support [1].

The organization and number of root canals in the permanent mandibular canine has high variation among different studies. While the prevalence of a single-rootedmandibular canine withtwo canalsis approximately 15% [2-5], that of tworootedcanines with twocanals was reported to be only 5% [6, 7].

Successful root canal treatment aims to eradicate microorganisms from the entire root canal system, complete sealing of the canal space, and preserve periapical tissue integrity. This demands a full understanding of root canal morphology [8, 9].

The case report below outlines how a mandibular canine with unusual morphology including two canals in two separated roots can be managed.

Case Report

Thirty-year-old Saudi female was referred to the Endodontics clinics at Princess Nourah bint Abdulrahman University, Dental College, Riyadh, Saudi Arabia, for endodontic management of the left mandibular canine.The patient was medically fit, unaware of any allergies nor taking any medications. Clinical examination revealed a defective restoration with recurring caries. Thermal pulp vitality tests yielded a negative response, whileresponse topalpation and percussion were normal. Periodontal pocket depth was within normal. Radiographic evaluation revealed normal periapical tissue, however, a loss of the continuity within the middle third of the canal spacewas noticed (Figure 1), arousing the suspicion of atypical canal anatomy [10]. Based on the findings, the diagnosis was necrotic pulp with normal apical tissue, therefore, a primary root canal treatment was indicated. The tooth would be restored with post and core followed by crown by the referring prosthodontist.

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After patient consent was obtained, local anaesthesia was given with epinephrine using infiltration technique. Rubber dam isolation with clamp no.(9) was placed, and caries and defective restoration were removed. Access cavity was performed using long neck round carbide bur: Mueller bur, size Blue (Brasseler; Savannah, USA). The pulp chamber floor was inspected under the Dental operating microscope (DOM) (Global Dental Microscopes A6, Global Surgical Corporation, USA)using a magnification factor of 1.25 which renders x8 magnification. Two orifices were found buccally and lingually. Preparation of a straight-line access was achieved using diamond-coated ultrasonic tips with a taper of 5%: Endo Success ET18D(Satelec;Merignac, France) under the DOMwhich helped prevent extreme removal of tooth structure. The orifices were enlarged using orifice openers: Pre-Race 30/0.06 (FKG dentaire S.A., La Chaux-de-Fonds, Switzerland), then size 15 k-files(Medin, A.S. Czechia)wasused with an electronic apex locator Root ZX II (J. Morita, Tokyo, Japan) to determine working length which wasverified radiographically (Figure 2a-d).

Instrumentation was accomplished to size 35/0.04 Profile rotary system (Dentsply Maillefer, Ballaigues, Switzerland). Sodium hypochlorite 5.25% and Ethylenediaminetetraacetic acid (EDTA) 17% were used for irrigation combined with the use of the EndoActivator system kit (Dentsply Maillefer, Switzerland). Paper points were used to dry the canals, then Gutta-percha cones (size 35/0.04) along with AH Plus sealer (Dentsply Maillefer, Ballaigues, Switzerland) were used in continuous wave compaction technique to seal the two root canal systems threedimensionally. Periapical radiographs were captured to verify final quality of obturation.

The access cavity was sealed using Glass ionomer cement (GC Fuji II LC, United states). Then the patient was referred to the prosthodontic clinic to continue with the prosthetic treatments.

The 6-month follow-up radiograph revealed cast post and core with a temporary crown. Upon clinical and radiographic examinations (Periapical radiographs andCone Beam Computed Tomography(CBCT)), the tooth demonstrated absence of tenderness or pain and normal periapical tissues (Figure 3a-d).

Discussion

The key to successful root canal treatment depends on appropriate diagnosis, thorough cleaning, shaping, and tight seal obturation. Inadequate performance of any step will lead to postoperative complications, discomfort, and disease. Thus, the clinician must be familiar with any peculiar anatomy and interpret the preoperative radiographs exhaustively by taking multiple angles [11, 12].

Several authors studied the structure of the root canal of mandibular canine. Vaziri et al [13] noted the existence of mandibular canines with one root and two canals to be 12% using stereomicroscope. Han et al [14] reported the prevalence of the existence a two-rooted mandibular canine to be 6.5% using CBCT.Moreover, Monsarra et al [11] documented the incidence of the same to be 2.5%.Bizarre anatomy like three canals in two or three roots also have been recorded [15, 16].

In Saudi Arabia, Aldahman et al [17] in 2019 reported the incidence of having one root with single canal 95.4% and single root with two canals to be 4.6%, while having two roots and two canals was only 0.2% using CBCT.

This case presented one such rare occurrence. Pre-operative x-rays alluded to the existence of unusual pulp canal anatomy which helped prepare the clinician mentally. The fast break of the root canal that appears in the radiograph indicates a cleave in the root canal. Inserting a gutta-percha cone or file in the canal that ap-

Figure 1. Multiple angulations of preoperative periapical radiographs of the left mandibular canine.

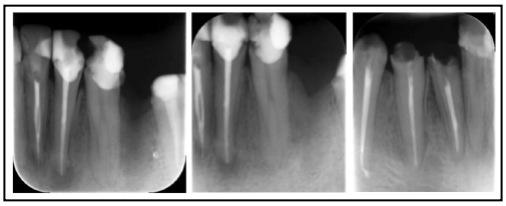


Figure 2. a) Working length b) Master apical cone c&d) Postoperative radiographs.

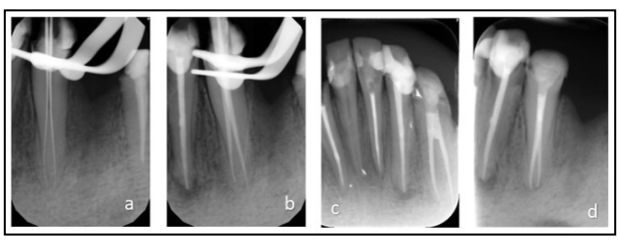
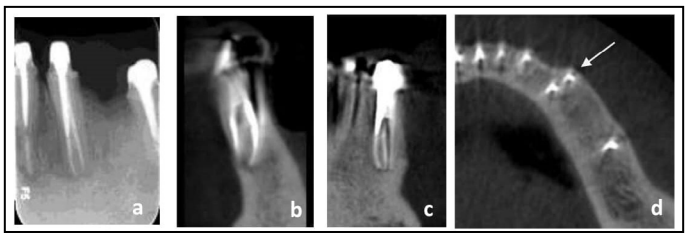


Figure 3. Postoperative follow-up at six months a) Periapical radiograph b) CBCT sagittal view c) CBCT coronal view d) CBCT axial view.



pears eccentric will confirm the presence of this condition [10]. The use of CBCT is a well-designed method to study the root canal morphology because of its ability to produce a 3D image with no superimposition and complete morphologic details [17]. CBCT is considered an effective tool in endodontic diagnosis and follow-up [18].

Inadequate access preparation causes difficulty in locating all canals which can lead to incomplete removal of bacteria and non-success of the endodontic treatment [19]. Hoen& Pink [20] recorded that 42% of endodontically failing teeth had missed canals.A dental operating microscope is a vital instrument in endodontics for the diagnosis of different anomalies in the root canal anatomy [21, 22].

The use of an electronic apex locator gives correct working length during root canal treatment [23]. Root ZX considered precise electronic apex locators used for measurement of the root canal working length [24].

None of the available irrigation techniques completely eliminate the smear layer existing on the root canal system walls, especially apically. However, combining the conventional needle irrigation with EndoActivator was more productive at smear layer removal than conventional needle irrigation alone [25]. The use of nickel-titanium (NiTi) endodontic rotary files enables the shaping of the canals in a shorter time compared to the conventional manual files, despite the complexities of the case [26].

Conclusion

Despite the limitation of literature reports about the incidence of mandibular canines with twodistinct roots, clinicians must have accurate knowledge and full consideration of theunusual alterations in root canal morphology that can lead to successful endodontic treatment.

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Conflicting Interest

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

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