

Mandibular Canine with Two Roots

Muthhin Almuthhin^{1*}, Al Turki Azizah Abdulaziz², Haneen Alsally³, Aljohara Alhargan⁴, Yasmeeen Alshammari⁵ and Nasser Alkatheeri⁶

¹Endodontic Resident in Saudi Board of Endodontic 3rd year, Ministry of Health, Saudi Arabia

²Dental services, Endodontic Consultant, King Abdulaziz Medical City, Ministry of National Guard, Saudi Arabia

³Endodontic Resident in Saudi Board of Endodontic 4th year, Qassim University, Saudi Arabia

⁴Endodontic Resident in Saudi Board of Endodontic 3rd year, Ministry of National Guard, Saudi Arabia

⁵Ministry of health, General Dentist, Saudi Arabia

⁶Consultant, Endodontic Division, Director, Endodontic Residency Program, Dental services, King Abdulaziz Medical City, Ministry of National Guard, Saudi Arabia

***Corresponding author:** Almuthhin M, Endodontic Resident in Saudi Board of Endodontic 3rd year, Ministry of Health, Alkarj, Riyadh, Saudi Arabia, Tel: +966 11 801 1111; E-mail: almodhen.m@gmail.com

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Abstract

Background: Supporting the lower lip and creating the esthetic appearance is mainly dependent on the mandibular canine; the mandibular canine also used to keep the prosthesis like overdenture due to its stability under occluding forces. So, in cases that required endodontic treatment for the mandibular canine, the treatment should be accurate to save the tooth. Usually, the mandibular canine has only one root with one root canal, but lately, several canals were observed in the mandibular canine.

The case series: This case series shows 3 cases with two root canals of the mandibular canine.

Conclusion: Mandibular canine with two roots is a rare variation. However, its treatment can be successful depending on the correct diagnosis and description of the two root canals.

Keywords: *Mandibular canine; Two root canals; Restoration*

1. Introduction

In the dental arch, the mandibular canine is a very significant tooth, particularly if used in financing prosthesis due to its stability arising from its long wide root [1]. The pulp is the source of sensation to the teeth, which, if undergone irreversible pulpitis due to various reasons alike traumatic accidents or carious lesions, endodontic treatment should be done [2]. The

mandibular canine, which will undergo endodontic treatment due to affected pulp, needs proper examination and treatment planning to provide a favorable prognosis [2]. Mandibular canine normally has one root with one canal. However, by modern technology, some instances were found to have different morphological changes, including the presence of two roots [1,2]. In the current case series, the review presents three cases that required endodontic treatment for one of their mandibular canines, and during diagnosis and treatment, the canine was found to have two roots with two root canals [3].

2. Review of Literature

The configuration of the root canal of permanent human teeth was categorized into different types varying from single to triple separate and distinct canals [4]. The most prevalent for mandible canine is that it has one root and one root canal [5,6], while the presence of two roots and two root canals happens by 1%-5% [6]. The internal anatomy of the root canals sometimes doesn't connect with the outer shape of the teeth [2]. Many case reports showed changes in mandibular anatomy; one case was described having mandibular canine with three canals and two roots [7], another paper reported a case with two roots and two canal roots [8]. The over denture needs a prior step, which is root canal treatment [9]. Good quality endodontic treatment requires getting attention to the morphology of the current canals and the variations in the entire system ere treatment. Consequently, long term durability of the teeth can be obtained [2]. The insufficient understanding of the anatomy of the pulp space leads to many problems in the treatment of the root canal [10]. The presence of undetected different root canal is a primary cause for endodontic treatment failure [11]. The failure in the inadequate root canal treatment causes pain, complications, and post-operative disease [12,13].

3. The Case Series

3.1 Case 1

The first case is a 70-year old female patient who visited the Endodontic Department in the national guard hospital of tooth #33 (left mandibular canine). She was referred by a prosthodontic resident, for intentional root canal treatment for making over denture, on clinical examination, a dental radiographic examination revealed a sudden loss in the continuity of the canal (FIG. 1a) and presence of a groove in the outer part of the root, the presence of a mandibular canine with two independent, narrow, canals was suggested. Radiographic images of the counterpart canine showed normal characteristics, based on the clinical and radiographic findings, a diagnosis of the normal tooth pulp with normal periapical tissues was established, and root canal treatment was planned. After the patient provided signed informed consent, local consent, local anesthesia was administered, and a dental dam was placed. Access was created from the buccal side with the assist of microscope (FIG. 2); the pulp chamber roof and the lingual cervical ridge were eliminated to obtain access to the second canal. As the initial clinical and radiographic findings indicated the presence of a second root canal, the radicular pulp space was carefully screened with the DG-16 endodontic explorer (American Eagle, CA, USA), and the entrances of two root canals were found, one buccal and one lingual. Based on this information, the treatment protocol was focused on avoiding the removal of excessive tooth structure or perforation of the roots. Under abundant irrigation with 5.25% sodium hypochlorite (NaOCl), the canals were explored with a size#15 K-file, and cervical flaring was carefully performed with#2 Gates Glidden bur. The working length was determined with a radiograph and corroborated with an electronic apex locator. Cleaning and shaping of the apical thirds were per-formed with rotatory K3 files (K3 0.4/25,0.4/30, 0.4/35) followed by manual instrumentation with a size #25K-file in both root canals, irrigating with 5.25% NaOCl between the use of each instrument was performed. Due to

time constraints, 17% ethylene di-amine tetra-acetic acid (EDTA) irrigation and ultrasonic activation were performed. Once both canals were dried, they were filled with a mix of gutta-percha and resin-based sealer (AH-Plus) (FIG. 3 and 1b), using warm vertical compaction (FIG. 1c and 1d). The access opening was sealed with temporary cement, and a final radiograph was taken, then the case referred back to prosthodontics resident.

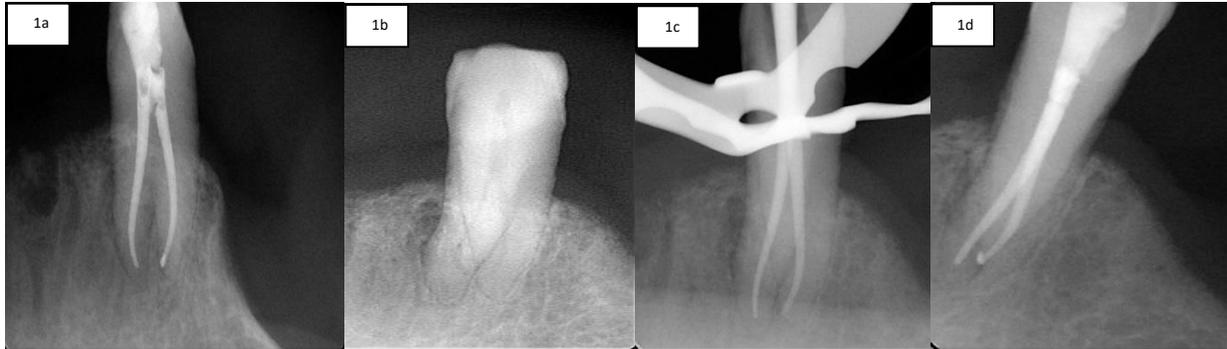


FIG. 1. Showed a dental radiographic examination revealed a sudden loss in the continuity of the canal.



FIG. 2. The mandibular canine after complete cleaning and shaping of the two canals.



FIG. 3. The mandibular canine after obturation of the two canals.

3.2 Case 2

The second case is a 36 years old Saudi female who was presented to the endodontic postgraduate clinics of King Saud bin Abdulaziz University for Health Sciences (KSAU-HS), Riyadh, Saudi Arabia, for intentional nonsurgical root canal treatment of mandibular right canine (number 43). The patient was referred from the Department of Prosthodontics. Dental

history revealed that the patient had restoration in this tooth for more than five years ago. Intra - oral examination of 43 revealed large restoration associated with recurrent caries. The tooth was not tender to percussion nor palpation and was normally responsive to the sensibility test. Periapical radiographs revealed normal periodontal ligament space associated with intact lamina dura.

A diagnosis of normal pulp and normal periapical tissue was established. After careful examination of the root outline on different angulated periapical radiographs, a bifurcated root was suspected, the conformation of the root\ root canal bifurcation was performed by a limited field-of-view cone-beam computed tomography obtained (FIG. 4). The treatment involved the application of local anesthesia of 2% lidocaine with 1:80,000 epinephrine was administered through infiltration (Dentsply, Maillefer, Ballaigues, Switzerland) and a dental dam was placed for isolation. After the restoration and decayed tissue were removed using long shank medium high - speed round bur, one canal orifice was identified under dental operating microscope (Zeiss OPMI Pico, Carl Zeiss Surgical, Oberkochen, Germany). With the aid of magnification throughout the treatment, the lingual cervical ridge was eliminated, and the cervical part of the canal was flared carefully with #2 and #3 Gates Glidden burs to gain access to the second canal, then the radicular pulp space was carefully explored with the DG-16 endodontic explorer (American Eagle, CA, USA), and the entrances of two root canals were found, one buccal and one lingual. Canals patency was checked with #10 K - file and then negotiated to the full working length with #15 K-file (Dentsply, Maillefer, Ballaigues, Switzerland). Working length determined by electronic apex locator Root ZX II (J. Morita, Tokyo, Japan) and confirmed radiographically (FIG. 5). The canals were prepared with Profile 0.04 rotary system (Dentsply, Maillefer, Ballaigues, Switzerland) using a crown - down technique with master apical filing up to #35 in the lingual canal and #40 in the buccal canal. Irrigation with 5.25% sodium hypochlorite solution (NaOCl) was done at each change of file, and 17% ethylene diamine tetra acetic acid (EDTA) used as a final rinse after instrumentation. Before obturation, the root canals were dried by paper points, and the obturation was done by meeting Gutta - percha cones and AH-Plus Sealer (Dentsply Maillefer, Ballaigues, Switzerland). The cervical part of the cones was cut using SuperEndo B&L-alpha II device (B&L Biotech. Inc., Gyeonggi-do, Korea) and the cervical part backfilled with thermoplastisized gutta-Pecha using SuperEndo B&L-beta device (B&L Biotech. Inc., Gyeonggido, Korea). The final radiographs show well-obtured canals (FIG. 6). The access cavity then filled with temporary filling material (Coltosol, Germany) followed by glass-ionomer cement (GC Corporation, Tokyo, Japan).

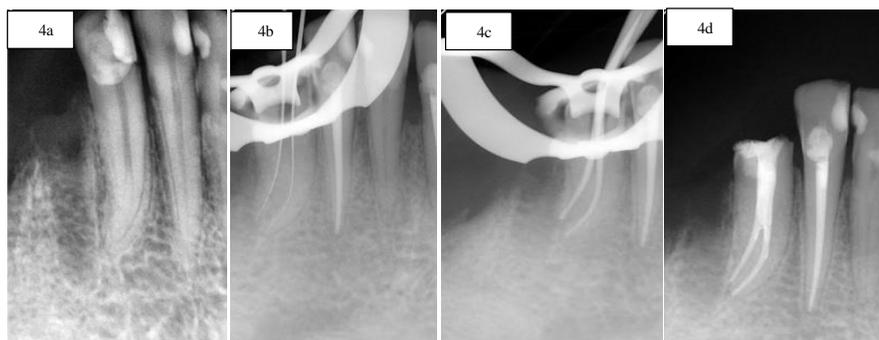


FIG. 4. A bifurcated root was suspected; conformation of the root\ root canal bifurcation was performed by a limited field-of-view cone beam computed tomography.

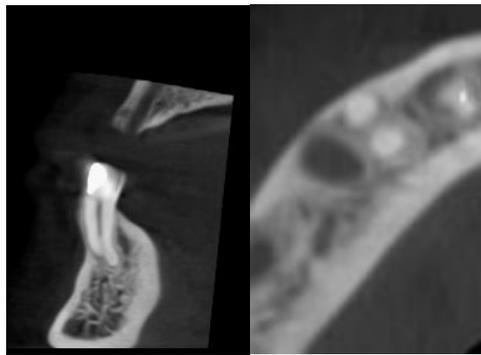


FIG. 5. Working length determined by electronic apex locator Root ZX II (J. Morita, Tokyo, Japan), and confirmed radiographically.



FIG. 6. The final radiographs show well obturated canals.

3.3 Case 3

The third case is a 40-year-old Saudi female; this case was referred by the dental intern in COD to the endodontic board to carryout treatment for lower canine with anatomical variation to serve as a surveyed crown for the RPD. Tooth number 43 that was previously restored by the general dentist, the past dental history included multiple missed teeth and edentulous areas with multiple endodontic and prosthetic treatments. The patient suffered no pain, no facial swelling, no lymph node swelling, soft tissues were normal, and restoration amalgam IRM was performed. The radiograph showed that the alveolar bone was normal, and lamina dura was normal too; the roots were bifurcation, the pulp camper was normal, pulp canal was bifurcated, there was a change in the density that may cause the additional canal. The diagnosis revealed that there was irreversible pulpitis (Asymptomatic) and normal apical tissue, the etiology of the complaint was caries. The treatment started in Jan 2019 and completed in Jan 2019; the plan of treatment included endodontic (RCT), followed by periodontal (S/RP) and restoration (onlay/crown). The first visit of treatment involved application of 1.8 ml xylocaine (lidocaine 2%) with adrenalin (1:100000), RD isolation was performed, soft caries was removed, and the access cavity was performed (FIG. 7). The two canals were identified under DOM, WLs were determined by EAI using root ZX and confirmed radiographically. All canals were cleaned and shaped by PTN rotary files, 5.25% NaOCL, 17% EDTA were activated with endo activator, 5.25% NaOCL flushed with saline dried. The disinfection of GP was performed using NaOCL for one minute. Canals were obturated by GP and Ah plus sealer with continuous-wave compaction techniques using super endo $\alpha 2$, B; tooth temporized referred back to COD.

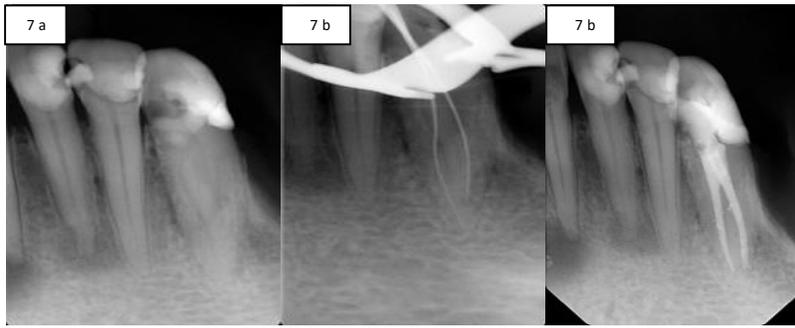


FIG. 7. a,b Showed a dental radiographic examination revealed a sudden loss in the continuity of the canal; c, the final radiographs show well obturated canals.

3.4 Case 4

This case was a 58 years old Saudi female who was referred to the endodontic department in (King Abdulaziz Medical City, Ministry of National Guard, Riyadh, Saudi Arabia) by her prosthodontic specialist for endodontic treatment to her lower left canine. Before starting the examination, the medical history of the patient was taken and showed that the patient was medically free. After that, a clinical examination for the lower-left canine was done. The patient didn't suffer from any pain in the tooth. Radiographic examination was done for the tooth, which revealed a normal tooth structure with two roots and two root canals (FIG. 8).



FIG. 8. Radiographic examination was done for the tooth which revealed normal tooth structure with two roots and two root canals.

After that, endodontic treatment started by the first local anesthesia administration followed by a rubber dam application for proper isolation to the tooth. High-speed contra with round bur No. 2 was used for access cavity preparation. The pulp tissues debridement was removed from the pulp chamber, then two canal orifices appeared on the floor of the chamber, one was labial, and the other was lingual. A magnifying dental loupe 2.5 x (Carl Zeiss, USA) was used for proper easy negotiation to the canals. K files No. (6,8,10) were used respectively as initial files in the canals. After that, the root canal length for both the canals was determined using an electronic Apex Locator (Root ZX, J Morita, Japan). Profile taper 04/06 rotary NiTi instruments (Maillefer-Dentsply, Ballaigues, Switzerland) was used to prepare the canals in the crown down the system. Canal irrigation was done after each file with 2.5% sodium hypochlorite irrigation. The canals were prepared

biomechanically using the profile taper rotary system to file No. 35. After that, canals were dried using paper points before starting obturation. Then, gutta-percha and AH- plus sealer were used to obturate the canals using the lateral compaction technique. Glass ionomer cement was used as a temporary filling for the access cavity after the complete canal obturation. Postoperative x-ray was taken for insurance of successful appropriate obturation of the canals (FIG. 9).



FIG. 9. Postoperative x-ray was taken for insurance of successful appropriate obturation of the canals.

4. Discussion

The advances in the technology revealed presence of different anatomy of the mandibular canine such as the presence of 2 roots and 2 root canals [14]. The most of the problems that result during root canal treatment return to the lack of knowledge about the anatomy, so the anatomy of the root canal system affects the success of the root canal treatment process [10], hence identification of such variations is very necessary. Several case reports presented cases with this variations, one case report from Mexico presented a case with 2 roots and two root canals of mandibular canine, the report revealed that meticulous exploration and timely diagnosis of these variations in mandibular canine permitted the planning of an individualized protocol for treatment of the case to obtain good results and avoid excessive weakening or perforation of the roots [14]. Another Case from India reported a patient with 2 distinct canals, the authors demonstrated that radiograph and magnification devices could be helpful in the diagnosis and treatment of these cases [2]. The importance of radiograph for the anatomy of roots and root canal was referred [15]. There were 2 cases reported having endodontic treatment for the mandibular canine with two roots [8]. A previous case report from Saudi Arabia described two instances of root canal treatment of changeless mandibular canine beside two root canals and one type II apical foramen in one root and canine with two separate roots; the authors also confirmed the importance of radiographs to interpret the case [16]. In the present case series, we present 3 cases with 2 root canals, these variations were discovered by the use of radiographs and this reveals the role of radiograph in the identification of the anatomy of the teeth before treatment. Also, the three cases were successfully treated and this confirmed that the good diagnosis of the case results in good outcome.

5. Conclusion

The success of endodontic treatment of mandibular canine with 2root canals depends on the proper diagnosis and identification of the number of roots and canals of the tooth, then proper endodontic treatment for the both canals. Radiographic x ray has an important role in both diagnosis and treatment.

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