

Root Canal Treatment of Single Rootedmandibular Canine with Two Root Canals: A Report of Two Cases.

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Abstract:

The mandibular canines usually display single root and single canal. A few variations do exist in the anatomy of mandibular canine like presence of two root canals in a single root or two separate roots. These morphologic variations play an important role as they can cause errors during cleaning and shaping of root canals ultimately leading to failure of root canal treatment. The appropriate interpretation of radiographs for the presence of an extra canal and a thorough knowledge about the root canal anatomy is essential for a successful endodontic treatment. This paper highlights the endodontic management of single root mandibular canines with two root canals.

Keywords: Mandibular canine, two root canals, anatomic variations, radiography, root canal treatment.

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I. Introduction

The triumph of an endodontic treatment depends on a thorough biomechanical preparation and proper obturation of the root canals.¹ The external and internal anatomy of any tooth is of prime importance while performing root canal treatment. Studies have shown variations in the anatomy of teeth in the dental arch.^{2,3} An extensive knowledge of the normal and variations in anatomy of teeth is essential to ensure the success of a root canal treatment. Mandibular canines are mostly single rooted teeth with single root canals.⁴ However, variations have been reported as two roots with two separate canals or single root with two canals.³ This paper presents two case reports with respect to the endodontic management of mandibular canines with single root and two root canals.

II. Case Reports

Case 1

A 40year old female patient visited the dental clinic with chief complaint of pain lower front teeth regionsince two months. The patient described the pain as sharp, intermittent in nature and was stimulated by cold. On clinical examination, attrition was observed in the entire dentition. The mandibular right lateral incisor displayed caries on distal aspect and right mandibular canine (#43) displayed caries on mesial aspect. (Figure 1)

Figure1: Mesial caries on right mandibular canine(#43) with single root and two canals.



The mandibular canine was tender on percussion. A diagnostic radiovisiography (RVG)(VATECH, South Korea.)revealed deep mesial caries with mandibular right canine (#43) and widening of lamina dura. The radiograph also revealed two root canals in #43 which bifurcated at middle third and united at apical third of root. On the basis of clinical and radiographic examination, it was diagnosed as irreversible pulpitis. The treatment plan was explained to the patient and consent was obtained for the same.

Local anaesthesia was administered, followed by placing the rubberdam. Access opening was attained with round diamond bur. After extirpation of pulp tissue located in the chamber, thebuccal and lingual orifices were observed. Working length measured radiographically by VATECH (VATECH, South Korea) and confirmed using an electronic apex locator (i-rootapex by Meta-Biomed, South Korea) (Figure2).

Figure 2: Working length determination in #43



The working length was 20mm for buccal and 22 mm for lingual canal respectively. The canals were initially instrumented with #8 K-file(Mani, Japan) followed by # 10 and #15 stainless steel K-files to create a glide path.This was followed by use of HERO Shaper instruments (Micro Mega, Becacon, France) using crown down technique for further cleaning and shaping till 4 % # 20 and 4% #25and irrigating with 3% sodium hypochlorite and 17% ethylenediaminetetraacetic acid(EDTA). The instrumented root canals were obturated with 4% #20 and 4% #25 gutta percha cones (Meta-Biomed, South Korea) and Sealapex calciumhydroxide root canal sealer(Sybron-Kerr, Romulus, MI, USA).The technique used for obturation was vertical compaction using Sybron Endo Touch N HeatTM5004 (Kerr Dental,United States of America). The final radiograph shows two well obturated root canals. (Figure 3). Post obturation restoration was done by composite resin. (Ivoclar Vivadent, Switzerland)

Figure 3: Obturation of root canals in #43



Case 2

A 50year old woman reported to the dental clinic with painin mandibular right canine (#43). Clinical examination revealed pain on tender percussion with caries on distal aspect of #43. Radiographic examination revealed bone loss and caries on distal aspect of #43 (Figure 4).

Figure 4: Distal caries on right mandibular canine (#43) with single root and two root canals.



The anatomy of root canals in the single rooted #43 were similar as in case 1. It was diagnosed as irreversible pulpitis. The same steps as in case 1 were repeated for determining the working length and root canal preparations. The working length was 24 mm in buccal and lingual canal. Cleaning and shaping of the root canals were done similar to case 1. A glide path was created using # 8, #10, #15 stainless steel K files and crown down technique was used using Hero Shaper (Micro Mega, Beacon, France) till 4% #20. The obturation was done using gutta percha with Sealapex calcium hydroxide root canal sealer using 4% #25 gutta percha cone for both canals. and the technique used was vertical compaction using Sybron Endo Touch NHeat™5004 (Kerr Dental, United States of America) . (Figure 5) Post obturation restoration was done by type II glass ionomer cement. (GC Gold Label 2, GC Corporation, Japan)

Figure 5: Obturation of #43



III. Discussion

The diagnosis and identification of canals are the crucial factors which form the backbone of a successful endodontic treatment.⁵ Thus, the preoperative radiograph is of utmost importance as it helps in detecting the anatomical variations in roots and root canals. The radiographs should be taken at different angulations to avoid missing an extra canal.⁶ The failure to locate an extra canal or root can lead to failure of endodontic treatment.

Studies have revealed bifurcation of roots/ root canals in mandibular canines.^{7,8,9}This bifurcation is seen at cervical and middle thirds which was observed in 43.1% of the cases.¹⁰

In our present cases, mandibular canine with single root and bifurcation of canals are seen in the middle third which fuse at the apex. This type of two root canals which bifurcate at middle third and then again fuse at apex are classified as Vertucci's Type III(1-2-1).¹¹This is similar to study by Green observed two canals in a single root in 13 out of 100 mandibular canines examined.¹² In a cone beam computed tomography study conducted on Indian population, the incidence of single rooted canal with one root canal which bifurcates to two canals and unites as one at apex(Type III) was found to be 13.6%.⁹

Similarly, Hess observed two canals in 15% of the cases.¹³ In addition, Vertucci reported the presence of two canals in 18% of the mandibular canines.¹¹ In an in-vitro study by Bakianian *et al*, the presence of two root canals in mandibular canine was detected in 12% of the samples.¹⁴The endodontists should thus carefully analyse and interpret the radiograph for the presence of a second root canal, bifurcation or trifurcations, such as a sudden discontinuity in root canal.¹⁵

Numerous studies have demonstrated the anatomic variations anatomy of root and root canals in mandibular canines with respect to human population and the techniques used to detect these variations.^{8,9}

Calcium hydroxide sealer (Sealapex) was used as a root canal sealer in both cases. The rationale for using calcium hydroxide sealer is based on its two important properties which are:1) antimicrobial effect due to release of hydroxyl ions which make the surrounding pH alkaline,^{16,17} 2) dissociation of calcium ions which help in inducing mineralization of tissue.¹⁸

A proper tug-back of the master gutta-percha cone is essential. According to American Academy of Endodontists, tug-back can be defined as," as a slight frictional resistance of a master point to withdrawal, which indicates a relative degree of adaptation at least in 2 dimensions.¹⁹ It is essential to ensure that gutta percha cone has a good apical seal. In an in-vitro study comparing tug-back pulling force with apical cone adaptation, Jeon *et al* concluded that degree of tug- back was a definitive determinant for adaptation of master cone in root canal.²⁰

To detect anatomic variations like two root canals or two roots in a mandibular canine is imperative before beginning the endodontic treatment. This will help prevent iatrogenic errors and will ensure success in endodontic treatment.

IV. Conclusion

Though most of the times mandibular canines have single root and single root canal, anatomic variations in the form of two roots and two canals exist. A detailed knowledge about the internal anatomy of the teeth, methodical clinical examination and thorough interpretation of radiographs is essential to ensure successful endodontic treatment.

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