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Endodontic management of permanent mandibular canine with two root canals: A case series

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Abstract

Knowledge of development of the teeth and their natural anatomy is relevant to clinical practice, particularly during root canal therapy. The mandibular canine usually consists of one canal and one root, but 15% may have two canals with one or two foramina, and even less frequent may have two roots.This paper describes three cases of root canal treatment of permanent mandibular canine with two root canals and its successful endodontic management.

Keywords: Mandibular canine, Vertucci type II, Vertucci type V.

Introduction

The aim of successful endodontic treatment is the elimination of infection from the root canal and the prevention of re-infection. There are various factors which are responsible for failure of root canal therapy such as persistent infection of the root canal, unsatisfactory intracanal procedures that may lead to poor canal preparation, broken instruments and incomplete root canal fillings.[1]Missed canal/root is one of the main reason for the failure of the root canal therapy. [2]

Canine is termed as the “cornerstone” of the mouth because of its location, which represents its dual function to complement the incisors and premolars during mastication.These teeth can withstand increased lateral pressure during mastication, thus being an important abutment for any prosthetic reconstruction. Mandibular canines have a complex internal anatomy. Generally, mandibular canines have a single root and a single root canal. [3]

A study conducted by Sikri and Kumar on permanent human mandibular canines showed anatomic variation in the root canal system. They found the canal configurations (Vertucci’s). Type I (70%), Type II (4-12%), Type III (4-6%), Type IV (4-10%), Type V (2%).Also he found that straight canals were (53.84-60.71%), curved canals (39-46%), apical foramen centrally located (34.61-57.14%), and apical foramen laterally located (42.85-65.38%).[4]

Endodontists should be aware of any morphological variations or additional canals to improve the predictability of root canal therapy. [5]This paper reports cases of three patients with mandibular canines with two root canals.

Case report

Case 1: A 35-year-old male patient reported to the department of conservative dentistry and endodontics with complain of sensitivity in his lower front teeth and pain on the right side .On clinical examination generalized attrition was present. Radiographs revealed wear of enamel and dentin in anterior teeth especially in relation with 43 and also two canals were noted with the same tooth.On vitality testing 43 showed exaggerated response and a diagnosis of acute irreversible pulpitis was made and hence it was decided to go ahead for endodontic treatment.Local anesthesia was administered and a rubber dam was placed. Endodontic access was achieved using a round diamond point . The two orifices were located one buccal and one lingual. Working length was established with #10 K file(Mani) for both canals.

Biomechanical preparation was performed using S one file(Fantadental) in crown down manner. A 3% solution of sodium hypochlorite(Septodont) and 17%

ethylenediaminetetraacetic acid(Sybron Endo) were used alternatively as irrigants at every change of instrument. The apical preparation was done until 25,4% size in both the canals and a final flush with saline(NS).The canals were obturated with gutta percha and sealapex sealer(Sybron Endo) using lateral condensation technique. Postobturation radiograph was recorded.

Case 2: A male aged 35 years was referred to the department of conservative dentistry and Endodontics with chief complain of pain in his lower front tooth region. Clinical examination revealed attrition and showed no response on pulp testing in 33.A diagnosis of pulpal necrosis was made and it was decided to go ahead with endodontic treatment. Preoperative radiograph gave the suspicion of two root canals in relation to left mandibular canine (33).Endodontic access cavity was prepared and root canal length of both canals were determined radiographically and later on confirmed with an electronic apex locator(Dentsply Propex Pixi). Finally canals were instrumented using rotary protaper F2(Dentsply)under copious irrigation with 3% sodium hypochlorite (Septodont) and normal saline(NS).Then the canals were obturated with gutta percha and sealapex root canal sealers(Sybron Endo). An IOPA was taken to ensure proper obturation.

Case 3: A 37-year-old patient was referred to the department with history of pain in the lower front tooth region for the past 3 days.On clinical examination, there was generalized attrition in the anterior teeth. The central incisor was endodontically treated and restored with composite resin.The left lower canine (33) was tender on percussion. The tooth showed delayed response to pulp vitality tests as compared to healthy contralateral tooth. Based on the clinical and radiographic examination, a diagnosis of chronic irreversible pulpitis was established and endodontic treatment was planned. The treatment was explained to the patient and informed consent was obtained. Intra-oral periapical radiographs revealed typical Vertucci's type V canal configuration in tooth 33. Under local anesthesia, after rubber dam placement, endodontic access was made. Working length was established with #10 K file(Mani) and the root canal were instrumented upto # 25,6% using S one file (Fantadental) under copious irrigation with 3% sodium hypochlorite (Septodont) and normal saline(NS). Sealapex sealer (Sybron Endo) was used and obturation was done by lateral condensation technique.

DiscussionSuccessful endodontic treatment requires knowledge of biology, physiology and root canal anatomy.It also requires proper instruments and knowledge to make effective use of these

instruments.Teeth with extra roots or canals are a particular challenge. Inability to identify and treat these additional root canals may cause endodontic failures. [1]The initial diagnostic radiograph is important because it allows for the identification or suspiction of root and root canal anatomical variations.A single radiograph made at the vertical and horizontal projection does not displays all the roots and canals.An ideal radiograph with mesial or distal angulations will provide information about the facio- lingual root canal orientation. [14]

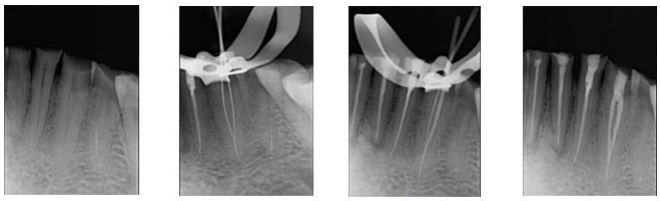

Fig.1(a) Fig.1(b) Fig.1(c) Fig.1(d)

Case 1- Fig.1: (a)- Pre-operative radiograph, Fig.1(b)- Working length determination,

Fig. 1(c)-Master cone, Fig.1(d)-Obturation

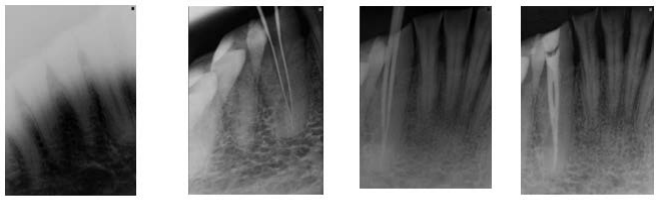

Fig.2(a) Fig.2(b) Fig.2(c) Fig.2(d)

Case 2- Fig.2: (a)- Pre-operative radiograph, Fig.2(b)- Working length determination,

Fig.2(c)-Master cone, Fig. 2(d)-Obturation

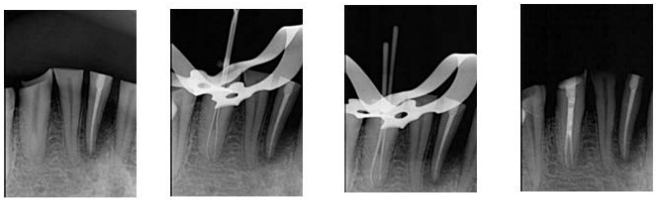

Fig.3(a) Fig.3(b) Fig.3(c) Fig.3(d)

Case 3- Fig.3: (a)- Pre-operative radiograph, Fig.3(b)- Working length determination,

Fig.3(c)-Master cone, Fig. 3(d)-Obturation

The mandibular canine is the second longest tooth in human dentition and it is few millimeters shorter than the maxillary canine.Usually one canal is present and it exits in a single foramen at the apex.Two / three root canals or two roots are rarely present. [6]We found vertucci type II in case 1 and 2 and vertucci type V case 3. Since it was clear radiographically that two canals were present, so extra investigations such as CBCT were not planned.

The Mandibular canine is often straight, but sometimes the root tip and the canal curve distally or labially.The root canals in the mandibular canine are more flattened and less round than in the maxillary canine, but they are quite large and usually does not cause much of technical problems during instrumentation. [6]

Pineda F and Kuttler Y (1972) reported 13.5% of the mandibular canines having 2-1 canal configuration in a study on 187 radiological images. [7]Pécora JD et al (1993) conducted a research on the internal anatomy, the direction and the number of roots of the mandibular

canines. The research was done on 830 mandibular canines, and the findings showed that 98.3% had only one root and 92.2% presented one canal and one foramen, 4.9% with two canal one foramen, 1.2% with two canal two foramen. [8]Bellizzi R et al (1983) conducted an invivo study and they studied 195 mandibular canines and the results showed that 95.9% had only one canal and 4.1% had two canals. [10]Kaffee I et al (1985) analyzed 200 mandibular canines by using radiographs. They detected the presence of one canal in 92.5% and two canals in 7.5% of the cases. [9]A study was conducted by Caliskan et al (1995) on permanent human mandibular canines in Turkish population and they found the canal configurations as (Vertucci's) Type I (80.39%), Type II (3.92%), Type III (13.73%), Type V (1.96%).[11]Soleymani A et al (2017) analysed root canal morphology of mandibular canine in an Iranian population. Based on the results, they found, Vertucci type I-89.7%, type II-3.7% ,type III-5.7% and type V-1%.[12] Somalinga Amardeep N et al (2014) conducted a study on permanent human maxillary and mandibular canines an Indian population using cone beam computed tomography. They found that Vertucci Type II (3.2%), Type III (13.6%), Type V (2%).[13]

Careful examination of preoperative radiographs can help to locate additional canal or roots.The clinician should be aware of the anatomical variations of the teeth and the clues which indicate the presence of additional canals. [15]

The presence of continuous bleeding in pulp space in case of pulpitis or normal pulp in spite of complete instrumentation, presence of an apical rarefaction on the lateral side of the root, extensive location of endodontic file, radiolucent line running parallel to the canal and use of magnification are other aids of determining the presence of additional canals. [3]

Radiographically a sudden change seen in the density of the pulp space usually indicates an additional canal, while a sudden narrowing or even disappearance of the root canal space indicates a bi- or tri-root furcation. Recent diagnostic techniques like RVG, dental operating microscope, CBCT will helps for complete diagnosis and treatment plan. [14]Necessary precautions should be taken during root canal therapy of these teeth and hence instrumentation of these canals were performed by NiTi files, due to its flexibility there is less chances of ledge formation and perforation. [1]

Conclusion- Failure to locate and treat extra canal is one of the most prevalent causes for failure of root canal treatment. This case report shows presence of two root canals in mandibluar canine. Although the probability of mandibular canine with two roots and

two or three canals is low. Clinicians should be aware of anatomical variations in the teeth and always search for the extra canal either with the presence one or two roots .

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