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Treatment planning and therapy of a severely compromised two-rooted maxillary central incisor

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Abstract

This case report presents the diagnosis, treatment planning, and therapy of a two-rooted maxillary central incisor. A 21-year-old female was referred for treatment of a severely compromised tooth #21. Clinical and radiographic evaluation with periapical radiographs and CBCT revealed the presence of a two-rooted central incisor with significant

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Abstract:

This case report presents the diagnosis, treatment planning, and therapy of a two-rooted maxillary central incisor. A 21-year-old female was referred for treatment of a severely compromised tooth #21. Clinical and radiographic evaluation with periapical radiographs and cone-beam computed tomography (CBCT) revealed the presence of a two-rooted central incisor with significant bone loss. Root canal therapy was performed. Two years post-operatively, the tooth was fully functional, with complete healing of the periapical tissues. Root canal treatment with meticulous treatment planning is a valid option even in most complicated and compromised cases.

Keywords: Two rooted central incisor, CBCT, Root canal treatment

Introduction:

The major goal of endodontic therapy is to three-dimensionally shape, disinfect, and obturate the canal system in order to promote healing of the periapical tissues (1). Clinicians are expected to treat the entire canal system, necessitating robust knowledge of endodontic anatomy. The most common reason of failure is untreated anatomy and is more common in the maxillary molars and mandibular premolars (2).

In the literature, maxillary central incisors are usually referenced as single-rooted teeth (3-5). The anatomic variation of two roots in a central incisor is rare and sometimes difficult to diagnose. Some cases of two-rooted maxillary central incisors have been reported in the past (6-20). Comprehensive diagnosis and treatment planning are fundamental in these cases for a successful outcome. Nevertheless in none of the cases previously

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reported in the literature, the state of the tooth under treatment has been that compromised, as the present case report.

In the present case, non-surgical endodontic treatment of a severely compromised two-rooted maxillary central incisor was completed.

This case report has been written according to Preferred Reporting Items for Case reports in Endodontics (PRICE) 2020 guidelines (21). PRICE flowchart (Figure 1) and PRICE checklist were followed. The patient was fully informed and agreed for the treatment.

Case Report:

A 21-year-old female Caucasian patient was referred for the evaluation of a central incisor due to mobility and a sinus tract. The patient had previously completed orthodontic therapy, after which a fixed retainer was placed lingual to the six maxillary anterior teeth. She reported a history of trauma with a fork, after which she began experiencing mobility of the tooth and sensitivity while eating. Clinical evaluation revealed that tooth #21 presented with grade III mobility, pain upon palpation and percussion, and no response to cold or hot stimuli. Furthermore, an active sinus tract was present clinically in the area corresponding with the apex of tooth #21.

Radiographic evaluation with intraoral radiographs revealed the presence of a periradicular lesion in the mesial part of the root, corresponding to irregular anatomy in the same area (Figure 2a). In order to further evaluate the periradicular lesion and the anatomy of the canal system, cone-beam computed tomography (CBCT) was advised. An evaluation of the CBCT images revealed a dilaceration of the main root into two individual root canals in the apical area. The mesial root was found to extend into the mesial-buccal part of the tooth, as seen from occlusal slices (Figure 3a-3e). In addition, a complete loss of the buccal wall was noted, which made the prognosis of endodontic treatment much worse than initially believed. Since no evidence of previous carious lesions were found, the pathology might have occurred due to intense orthodontic movement or a previous trauma which the patient did not recall. The treatment options were either to treat endodontically, or proceed with extraction and restore the #21 territory either with a fixed partial bridge or placing an implant.

The patient was informed about the overall condition of the tooth and the treatment alternatives. She elected to proceed with the more conservative treatment option of saving tooth #21 with a root canal treatment and repositioning of the orthodontic palatal splint, which was broken.

The tooth was anaesthetised, and isolation was achieved by placing a rubber dam over the six maxillary anterior teeth and then isolating the palatal of tooth #21 with a chemical dam. Access was gained with a long round bur mounted in a high speed handpiece. The pulp chamber was found to be dark and void of biological content. Through scouting with a 10 k file, the main canal exit was located, and the working length was measured with the use of an apex locator (Morita Root ZX, Tokyo, Japan). Afterwards, the hand file was pre-shaped in the last one millimetre, and the lateral walls were precisely scouted to locate and enter the second mesio-buccal canal of the tooth. The working length of the second canal was also measured with an apex locator. K-files were used to radiographically confirm the working length (Figure 2b).

Chemomechanical preparation of both canals was performed with 35.04 rotary files (Race Evo, FKG Dentaire, LaChaux de Fonts, Switzerland). The root canals were copiously irrigated with a 5.25% sodium hypochlorite solution in a Luer lock syringe with an Iriflex (PD, Le Lochle, Swicherland) needle. A premixed calcium hydroxide paste was placed into the canals (Multi-Cal, Pulpdent, Watertown, USA) for a week. During the second appointment, calcium hydroxide was removed with an Xp Endo Finisher at 1000 rpm/1 torque (FKG Dentaire, LaChaux de Fonts, Switzerland) ; then, the same file was used to activate a 5.25% sodium hypoclorite solution for 30 sec. Afterwards, the canals were irrigated for 2 min with 17% EDTA, which was also activated for 30 sec. The final irrigation was performed with sodium hypochlorite for 3 min. Gutta percha cones were fitted, and the canals were dried with paper cones. A bioceramic sealer was placed in the canal space (BC sealer, FKG Dentaire, LaChaux de Fonts, Switzerland), and then the cones were inserted and

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cut in the canal orifice using a cold hydraulic technique. (Figure 2c) A temporary filing was placed (Figure 2d), and the patient was referred back to her general dentist for the final restoration and repositioning of the orthodontic splint. Since there were no complaints and due to the restrictions of the COVID-19 pandemic, the follow-up was performed after two years. Clinically, the tooth was functional and stable, and the lesion demonstrated radiographic healing (Figure 2e). After the finishing the treatment and until the follow-up, the patient did not experience any pain or discomfort in the area. In the two year follow-up no discoloration was evidenced in the tooth #21.

Discussion:

The central incisor is typically considered a simple tooth to treat endodontically. Even though the canal space may be excessively wide or narrow due to a history of trauma, the presence of two root canals is rare but must be taken into consideration to avoid a negative outcome. Clinicians should be able to evaluate the case and prepare for anatomical anomalies (22).

Even though the case repot is weak of evidence (23), anatomical variabilities are always important to be reported since as mentioned before the main cause of endodontic failure is untreated anatomy (2)

After two years of follow-up the tooth presented no clinical or radiographic symptoms, and healing was confirmed. Nonetheless follow-up must continue until at least five years. It might be of a great interest also to evidence a three dimensional healing through a second CBCT image, but because of the age of the patient and the absence of other indications this might not be necessary.

In complex cases, treatment planning is fundamental after assessing all the necessary information. In particular, radiographic imaging is essential for the initial evaluation of an endodontic case. In the majority of cases, two-dimensional intraoral radiographs are adequate to assess intracanal anatomy. However, cases with anatomical irregularities or pathologies require the use of CBCT for three-dimensional imaging. CBCT imaging helps assess the anatomy of the canal system and the condition of the periapical tissues.

Although in many cases, irregularities in the number and shape of the roots are bilateral (24), in the present case, the contralateral central incisor (tooth #11) presented with no anatomical variations upon evaluation by CBCT. Thus, the abnormal anatomy of the central incisor was unilateral in this case.

In addition, the crown of the tooth was normal in shape and identical to the shape of the contralateral central incisor (25). Thus, developmental abnormalities such as gemination and fusion were ruled out.

This case report highlights the importance of treatment planning and meticulous evaluation of the initial internal anatomy of the root canal before initiating endodontic therapy. It is well known that the internal anatomy of each individual tooth is unique, and this must always be taken into consideration while treating a root canal space. Within the limitations of this report, it is important to highlight the ability of the root canal treatment to maintain, heavily compromised anatomically unique teeth.

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Figure Legends:

Figure 1: PRICE flow chart

Figure 2: a. Preoperative radiograph b. Working length c. Obturation d. Obturation with temporary filling e. Two-year follow-up

Figure 3: CBCT slices from coronal (a.) to apical (e.)

Disclosure statement: The authors have no conflicts of interest to declare.

Written informed consent was obtained from the patient to publish this report in accordance with the journal's patient consent policy

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