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Case Report

ELUSIVE CANALS: GAME OF HIDE AND SEEK – A CASE REPORT

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ABSTRACT

The success of endodontic treatment requires the knowledge of tooth morphology and its variations. Clinicians need to completely understand and fully appreciate the anatomy of human teeth, its complexities and use this knowledge to locate calcified, aberrant, or previously missed canals. One of the common causes of failure in endodontics is missed/eluded canals which hold tissue, and at times bacteria and their related irritants. These breakdown products inevitably contribute to clinical symptoms and lesions of endodontic origin. Mandibular incisor's anatomy presents a challenge when an endodontic access is made, because of its small size and high prevalence of two canals. We are describing a Weine's Type IV root canal configuration that was detected in a mandibular central incisor, which was demonstrated by a radiographic examination. This article also focuses on the successful endodontic retreatment of a mandibular central incisor with a single canal at the pulp chamber, which divided into two distinct and separate canals (buccolingual) at the middle third of the root.

Keywords: Non surgical, Retreatment, Mandibular anterior teeth, missed canal, Type IV morphology.

INTRODUCTION

The key objective of Root canal therapy is to prevent and cure apical periodontitis when required which can be achieved by proper preoperative diagnosis and correct access cavity preparation followed by thorough cleaning and shaping then 3- dimensional obturation of canal with an inert material. As Ingle et al have suggested that the major cause of endodontic failure is apical percolation which can be either due to incomplete obturation or any untreated canal¹.

Weine categorized the root canal systems in any root into four basic types -:

Type I - Single canal from the pulp chamber to the apex.

Type II - Two separate canals leaving the chamber but merging short of the apex to form one canal.

Type III- Two separate canals leaving the chamber and exiting the root in separate apical foramina.

Type IV - One canal leaving the pulp chamber but dividing short of the apex into two separate and distinct canals with separate apical foramina².

Vertucci³ further developed a system for canal anatomy classification using cleared teeth; they identified pulp space configurations, which can be briefly described as follows:

Type I: A single canal that extends from the pulp chamber to the apex¹.

Type II: Two separate canals leaving the pulp chamber and joining near the apex forming a single canal (2-1).

Type III: A canal that leaves the pulp chamber, divides into two within the root, and unites again in a single canal (1-2-1).

Type IV: Two separate and distinct canals extend from the pulp chamber to the apex².

Type V: A canal leaves the pulp chamber and divides into two near the apex, with distinct apical foramen (1-2).

Type VI: Two separate canals leave the pulp chamber, unite the body of the root and re divide close to the apex, with distinct apical foramen.

Type VII: A canal leaves the pulp chamber, divides into two, unite in the body of the root and finally re divide on two canals near the apex (1-2-1-2).

Type VIII: Three separate and distinct canals, extending from pulp chamber to the apex³.

Amongst the anterior teeth the highest prevalence of extra canals is found in the mandibular incisor (22.5%), followed by the mandibular canines (10.6%). For mandibular premolars the incidence for two or more canals is as high as 27.8%^{4,5}.

This case report describes management of missed canal in mandibular incisor with Vertucci type IV root canal configuration by non surgical approach.

CASE REPORT

A 25-year-old male patient reported to the Department of Conservative Dentistry and Endodontics with dull pain in the lower right front tooth region, of one month's duration. The medical history was non-contributory, but the patient had undergone root canal treatment with 31 and 41 one year back and there was a history of periodic tooth discomfort on biting. The clinical examination revealed dull pain on percussion wrt (with respect to) 41. A pre-operative radiographic examination revealed a large periapical radiolucent area wrt 41 and 31 [Fig-1]. Some amount of horizontal bone loss was seen in the whole anterior teeth region, but clinically, no mobility was seen. The diagnosis which was made was a 'Chronic Periapical Abscess'. An endodontic treatment was indicated. The periodontal prognosis of the tooth was estimated to be good. Post obturation restoration has been removed. An access opening was modified as extending the access to the incisal edge⁶ to access for straight line access the lingual canal and even for labial access for straight line access in mandibular incisor has been suggested⁷, guttapercha removal is done with 41, irrigation is done and Ca(OH)₂ as an intracanal medicament is placed inside the canal. Calcium hydroxide paste is a simple and remarkably effective antimicrobial medicament⁸. A closed dressing was given and the patient was recalled after 7 days.

The right mandibular central incisor (41) showed a radiolucent canal that stopped abruptly in the middle third of the root, which indicated a multicanal morphology.

At this visit, a careful exploration of the canal orifice and root canal revealed Weine's Type IV morphology of root canals, i.e one canal left the chamber and divided into two separate and distinct canals (buccolingually, in this case). The working length was estimated by using an apex locator and it was also confirmed radiographically, to determine the anatomic relationship of the root canal of 41 by taking different radiographic angulations [Fig-2,3]⁹.

The biomechanical preparation of 41 was done and the tooth was given closed dressing with calcium hydroxide. In such a type of canal variation, generally, preferred technique of obturation is thermoplasticized gutta percha. But in this case, it was decided to perform a lateral condensation technique, because the pulp chamber was wide and negotiation of both the canals was possible. After a week, the tooth was obturated with gutta percha and zinc oxide eugenol by using a lateral condensation technique [Fig-4,5]. Retreatment of lower left incisor (31) was also done which shows weins type II morphology [Fig-6,7].

As less crown structure was remaining, fibre post and core build up with composite material was done [Fig-8,9]. After six months of follow up, radiographs showed the initiation of

healing of periapical lesion. Hence, a surgical intervention was not considered this time, as the patient was asymptomatic.

DISCUSSION

It is generally accepted that a major cause of the failure of root canal therapy in mandibular incisor is an inability to localize and treat second root canal^{10,11}. The risk of missing anatomy during root canal treatment is high because of the complexity of the root canal system. In addition, lateral ramifications of the root canal system may be present in all teeth with a significant frequency, increasing the probability of leaving untreated spaces after root canal therapy. Prevention of missed anatomy starts with good pre-operative radiographs, even though radiographs have limitations in assessing the number of canals and the presence of accessory canals and anastomoses. A correct access cavity preparation is of central importance in localizing the orifices of the root canals.

However, to find hidden canals, an adequate armamentarium is required; the dental operating microscope and/or high-power loupes, used in conjunction with a headlight system, will provide enhanced lighting and visibility, whereas ultrasonic tips and long shank round burs with small shaft diameters will allow a controlled and delicate removal of calcifications and other interferences to the canal orifices. The impact of missed anatomy on the outcome of endodontic treatment is difficult to assess, and the literature on this subject is limited; a promising approach for future investigation may be a comparison of the number of canals found in failed treatment cases and after retreatment. Localization and treatment of this missed anatomy typically leads to complete clinical and radiographic healing.

It is generally accepted that many mandibular incisors have 2 canals, which may merge into 1 canal before reaching the apex. In rare cases, separate foramina may form. In a radiographic study done on 364 specimens, Benjamin and Dowson reported that 41.4% of the mandibular incisors that they studied had 2 separate canals; among these, only 1.3% had 2 separate foramina¹². In a study done on 1,085 specimens, Miyashita et al. reported that only 3.1% of the samples had separate canals and foramina¹³.

In most of the cases with two root canals, they merge into a single canal which is short of the apex. A careful interpretation of the radiographic features is essential to ensure that the additional root canals are not overlooked. This may necessitate imaging the tooth from different angles, so that the multiple root canals may be distinguished¹⁴. Nevertheless, manual exploration of the root canal system with an endodontic file or an explorer is a reliable method for identifying the exact configuration of the root canal, especially the number of foramina¹⁵.

The most commonly used obturation technique for filling such a type of canal anatomy is thermoplasticized gutta percha. In this case, lateral condensation obturation was performed, because the pulp chamber was wide and negotiation of both the canals was possible.

CLINICAL PHOTOGRAPHS



Figure 1: Pre-op Radiograph



Figure 2: Gutta Percha removal with 41



Figure 3: Working length determination with 41



Figure 4: Master cone radiograph of 41



Figure 5: Obturation with 41 and Gutta Percha removal with 31



Figure 6: working length of 31



Figure 7: Obturation with 31



Figure 8: Post space preparation with 31 and 41

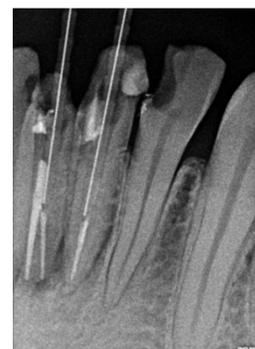


Figure 9: Fibre post cementation with with 31 and 41

CONCLUSION

Root canal anatomy of mandibular incisors shows a high incidence of complexity, which includes variations in canal configuration, number of canals and presence of an isthmus. A thorough knowledge on root canal anatomy and morphology, proper interpretation of the radiographs, are important for recognizing and treating such cases.

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