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Missed canals: The Usual Suspects of Endodontic Failure

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Anomalous root and root canal morphology has been found to be associated with any tooth with varying degree and incidence. Especially in case of mandibular anteriors, incidence of two root canals in have been reported to be as low as 0.1% to as high as 62.5%. Knowledge of the root canal anatomy is the basic pre requisite for successful completion and outcome of endodontic treatment. Missed canals harbor bacteria which lead to treatment failure. This paper reports the case of a patient with mandibular lateral incisor and canines with two roots and two root canals.

KEYWORDS: Endodontics, Mandible, Lateral Incisors, Failures.

INTRODUCTION

In recent years, significant advancements in the delivery of conservative and endodontic services have increased public expectations for the successful retention of natural dentition. The perfect health of the tooth and the surrounding tissues and preventing any periapical lesions has become the necessity.¹

It is universally accepted that a successful outcome in endodontic treatment depends on three factors: cleaning and shaping, disinfection and three-dimensional obturation of the root canal system.¹ Each stage of root canal treatment should be carried out to the highest possible standard.² However, there is one step that precedes these three factors and that is identification of canals and preparation the correct cavity access.³ The success of endodontic treatment highly depends on precise, proper execution of this step. It also requires adequate knowledge of the internal anatomy of the teeth and possible variations in relation to those teeth.³ Inadequate access can lead to canals being left untreated, poorly disinfected, difficult to shape and obturate, and may ultimately lead to the failure of the treatment. The objective of the case report is to present a clinical case of endodontic treatment of a mandibular lateral incisor and mandibular canine with two roots and two root canals, demonstrated by radiographical

examinations and emphasizes the clinical benefits of treating previously missed root canals.

CASE REPORT

A 45-year-old Indian adult reported to the Department of Conservative Dentistry and Endodontics, KD Dental College and Hospital Mathura with a chief complaint of mild pain since past one month. It had increased in intensity over last two days. The pain was reported in left mandibular anterior region. It was dull, throbbing, mild in intensity and continuous in nature. It was non-radiating and no nocturnal variations were reported. No associated history of sensitivity was reported by the patient. Subsequent case history revealed that this was patient's second dental visit. The patient had undergone treatment in relation to the same tooth at a private clinic one month back. Due to some reason patient was unable to get the treatment completed and since then he started to feel pain. The vital signs were found within the normal limits on general examination. Extra oral examination revealed palpable sub mental lymph nodes. On intraoral examination, the teeth were found to be non-vital with mild apical tenderness present with respect to both lateral incisor and canine. Based on the complete history and clinical examination, a provisional diagnosis of pulpal necrosis with apical periodontitis was made in respect to mandibular

left lateral incisor and canine.

Radiographic Features

An intra-oral radiograph and orthopantomogram revealed radiolucent lesion surrounding root apex of mandibular lateral incisor, and presence of two canals was suspected. There was discontinuity in the lamina dura of the same tooth. No signs of bone loss were seen on the radiograph.

Intervention

The medications were prescribed and root canal treatment was performed in relation to 32,33

TREATMENT

The tooth was isolated with a rubber dam and disinfected. After the initial radiographic examination the presence of two roots and two root canals was evident, with one mesial and the other distal (Figure. 1). The access surgery was performed with high-speed round diamond burs No. 1015 (KG-Sorensen, Barveri, SP), under continuous irrigation with water spray. Compensatory wearing was carried out with a high-speed Endo-Z stainless steel bur (Maillefer, Dentispily, Brazil), under continuous irrigation with water spray. The root canals were irrigated with 1% sodium hypochlorite solution. After this procedure, the root measurement was carried out and the biomechanical preparation was done with Hyflex CM rotary files upto 25 (4%) in lateral incisor and 30 (4%) in canine. The working length was taken for mandibular incisor, it was 19 mm and for canine, both the buccal and lingual canals were fusing in the apical third and length was 24 mm. The single cone obturation was done with AH plus sealer. The post obturation restoration was done with composite. The patient was followed up for 1 year.

DISCUSSION

The literature has referred that for nonsurgical endodontic treatment, elimination of infections from the root canal system and the prevention of reinfection of the root canal system is the basic requisite.⁴

Along with these successful root canal treatments there comes inevitable percentage of non-healed and endodontic failures.⁴ Clinical observation of endodontic failure reveals multiple etiologies. The causes of endodontic failure include coronal

leakage, radicular fractures, post errors due to diameter, length and direction, missed canals, short fills, overextensions with internal underfilling, blocks, ledges, perforations, transportations, broken instruments, surgical failures, and hopelessly involved periodontal teeth.^{1,2,3}

Endodontic failures invite confusion, anxiety, and frustration among both the clinicians as well as the patients.⁵ Focussing the patient's attention on the stepping stones to endodontic health alleviates concerns and creates a clinical pathway to successful retreatment. Certainly, missed canals hold irritants that inevitably contribute to clinical symptoms, attachment apparatus diseases, and radiographic lesions of endodontic origin.⁴

The literature till date reports that, there is no limits for the morphological variability of the root canal.⁶ It does presents a challenge to the clinician during endodontic treatment and often results in a missed canal or an unfilled canal. This reinforces the practitioners need to take into consideration anatomical variations in number and architecture of the root canal systems while performing non-surgical endodontic treatment. All measures available to the clinician to maximize canal identification should be used.⁷

The present report highlights the case of two roots and two canal system in mandibular incisors and canines. Studies on mandibular incisors have shown that about 11%-70% of these teeth possess two canals. 8-10 The prevalence of two separate apical foramina in these teeth has been reported to be 0.3%-10%.⁸⁻¹⁰

The prevalence of two separate canals in mandibular canines has ranged from 1.96%-6% in various studies. 6-10 These variations may be due to geographical differences or differences in detection techniques.^{2,4} Studies conducted on varied age groups, also show varied results. Secondary dentin deposition, in response to either pathological or physiological insults might have concealed the canals in older age. As, the mandibular incisors are usually retained by the patients for longer time, it can be assumed that maximum samples for the above stated studies might have been withdrawn from older age-

groups. Also, in most of these mandibular anterior teeth the canals merge in the apical third of the canal, the clinicians suppose that treating one canal is sufficient since the apical foramen would be sealed. This is probably true in most of the cases; otherwise the failure rates in these teeth would have been higher. However, it is important to be aware that if only one canal is treated, the pulp remnant in the second canal will remain and the treatment may fail. The canals usually merge about 1-2 mm above the apex and while treating one canal if the filling does not extend up to the point where the canals merge, failure would occur.

The etiology of endodontic failure is multifaceted, but a statistically significant percent of failures are related to missed root canal system anatomy.^{1, 2} A thorough knowledge of root anatomy, number of canals and their divisions will help in locating and negotiating through them, thus facilitating in their management. These dead spaces are home to the microorganisms, which proliferate and spread causing an infection, resulting in a periapical infection.⁴ The success of endodontic treatment is maximum when root canal systems are cleaned, shaped, and sealed in all dimensions. Endodontic treatment, if performed in a proper way, still remains the cornerstone of restorative as well as reconstructive dentistry.

CONCLUSION

Teeth with aberrant anatomy present a challenge to the endodontist. Lack of sound knowledge of the pulp anatomy, possible root canal anatomical configurations and the nonuse of different diagnostic resources can contribute to unsuccessful endodontic treatment. Dental surgeons striving for excellence in their clinical practice can truly appreciate these above mentioned elements that comprise the success of endodontic treatment. Thus, this case report highlights the importance of a correct diagnosis for the endodontic practice.

Consent Statement

Written informed consent was obtained from the patient prior to the investigations and treatment. The same was also procured for publication of this case report and any accompanying images.

Competing Interests

The authors have not been influenced by any financial or personal relationship with people or organizations in preparation of this study.

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LEGENDS



Figure 1. Preoperative X-ray

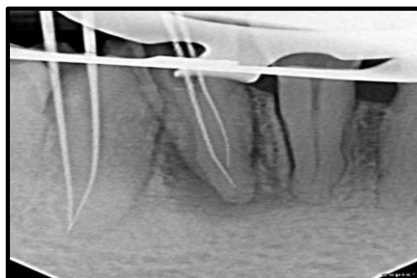


Figure 2. Working length X-ray



Figure 3. Master cone X-ray

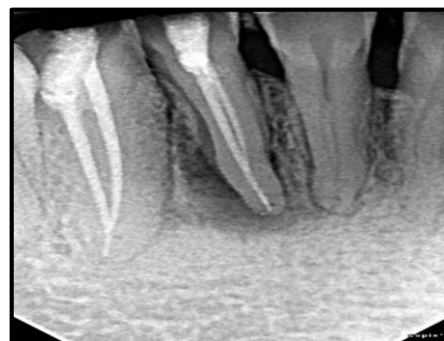


Figure 4. Post operative X-ray