

CASE REPORT

Post-treatment apical periodontitis associated with a missed root canal in a maxillary lateral incisor with two roots: A case report

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Abstract

Missed canals can be a common cause of persistent intraradicular infection and post-treatment apical periodontitis. This article reports on a rare case of a maxillary lateral incisor with two roots exhibiting symptomatic post-treatment apical periodontitis regardless of a radiographically adequate root canal treatment. The second root, which was only revealed by cone-beam computed tomography, had passed unnoticed during the first treatment, and its missed canal was the most likely cause of symptoms and treatment failure. Reintervention including the proper management of the extra root canal and retreatment of the main canal resulted in the resolution of symptoms and periradicular tissue healing. This case report reinforces the need for three-dimensional radiographic diagnosis to search for the cause of post-treatment disease and guide the decision-making process for proper management.

KEYWORDS

maxillary lateral incisor, missed root canal, post-treatment apical periodontitis, root anatomy, root canal infection

INTRODUCTION

Successful root canal treatment of infected teeth with apical periodontitis is reliant upon adequate cleaning, shaping, disinfection and obturation of the root canal system, followed by an adequate coronal seal [1]. The purpose is to establish environmental conditions that are conducive to periradicular tissue healing by controlling infection and preventing further reinfection of the canal system [2]. Studies have demonstrated that when both root canal treatment and coronal restoration are ranked as inadequate, there is a significantly increased risk of post-treatment apical periodontitis [3–5]. Moreover, studies revealed a high prevalence of post-treatment apical periodontitis in teeth associated with a missed canal [6–8]. If a single infected canal passes unnoticed in multirrooted teeth and remains untreated, residual bacteria may be in

sufficient numbers to maintain or cause periradicular inflammation [9].

Cone-beam computed tomography (CBCT) has become an invaluable diagnostic tool in endodontics [10]. Several studies have successfully used CBCT to investigate the association between missed canals and post-treatment apical periodontitis [6–8]. Periapical radiographs provide only two-dimensional information and may fail to detect additional canals; this limitation can be overcome by CBCT examination, which provides three-dimensional information and is less prone to errors in detecting root canals in comparison with periapical radiographs [11, 12].

This article reports on a maxillary lateral incisor with post-treatment apical periodontitis presenting with symptoms regardless of a radiographically adequate root canal treatment. The cause was a missed canal in an extra root, and the case was solved after proper reintervention.

CASE REPORT

This case report has been written according to Preferred Reporting Items for Case reports in Endodontics (PRICE) 2020 guidelines [13]. An 18-year-old female patient was presented to the office of one of the authors (V.P.), a specialist in Endodontics, for evaluation of the left maxillary lateral incisor (#10), which had been endodontically treated 2 years previously and was associated with acute symptoms (Figure 1). Written informed consent was obtained from the patient for the present report.

The patient reported that 10 days before, she began to feel pressure on the tooth and the sensation of a 'grown tooth'. Clinical examination revealed the presence of resin restoration on the palatal surface, and the presence of a palatal groove in the crown, with periodontal probing depth no more than 4 mm (Figure 2). The soft tissues had a normal appearance. The tooth showed mild tenderness to percussion. The periapical radiograph showed an apparently adequately treated root canal, considering the length (approximately 1 mm short of the root apex), taper and homogeneity of the filling. The periodontal ligament space was lightly thickened, and no apparent cause for the acute symptoms was apparent. The medical history was non-contributory. The first



FIGURE 1 Initial periapical radiograph. No apparent reason for the persistent symptoms is evident

formulated diagnostic hypothesis was post-treatment apical periodontitis, with persistent intra- or extraradicular infection, and a periapical surgical was initially discussed as a treatment option.

In search of the possible cause of symptoms, the patient was subjected to CBCT examination, which was performed on a PreXion 3D device; PreXion 3D (PreXion Inc.), FOV 5 × 5 cm, exposure time 37 s and slice thickness of 0.10 mm. CBCT image revealed an additional root in tooth #10 located in the mesiopalatal angle of the main root and associated with a small apical periodontitis lesion (Figure 3). This additional root was about 19 mm in length and the separation point from the main canal was located 12 mm from the incisal edge. A small radiolucent lesion was also observed around the apex of the previously treated main root. The diagnosis was symptomatic apical periodontitis, related to a missed canal in an extra root, and non-surgical root canal retreatment was indicated.

Non-surgical retreatment was performed under magnification (10–20×) provided by an operating microscope. The filling material was removed from the main canal, and the access cavity was extended by making selective abrasions in the mesiopalatal angle with the ultrasonic tip E3D (Helse Ultrasonic) to permit approaching the extra canal. Apical patency was established in both canals, and the working length was set using an electronic apex locator I PEX II (NSK Latin América Ltda) and radiographs taken in orthoradial and angled projections. The canals were prepared using 5% sodium hypochlorite (NaOCl) irrigation. After apical preparation was completed, the canals were subjected to passive ultrasonic activation (PUI) of NaOCl and then 17% EDTA for 1 min. A calcium hydroxide paste in propylene glycol was placed in both canals, and the coronal cavity was temporarily sealed with restorative glass ionomer Maxxion R (FGM Dental Group). An analgesic was prescribed in case of pain, which was not necessary.

The patient returned 21 days later with complete absence of symptoms. Calcium hydroxide medication was removed under irrigation with 60 ml 5% NaOCl, followed by 5 ml 17% EDTA activated with PUI. Photodynamic therapy (aPDT) was also applied using methylene blue photosensitizer and red laser application for 120 s in each canal, using the Laser Duo MMO device (MMOptics). The canals were filled using gutta-percha and Pulp Canal Sealer EWT (Kerr Endodontics) by the vertical compaction technique and MTA Repair HP (Angelus) was used as an intraorifice barrier (Figure 4). The coronal cavity was restored with composite resin.

The patient was satisfied with the immediate results of the treatment and was advised about the importance of the continued follow-up. Follow-up examination after one year showed that the lesions on both roots

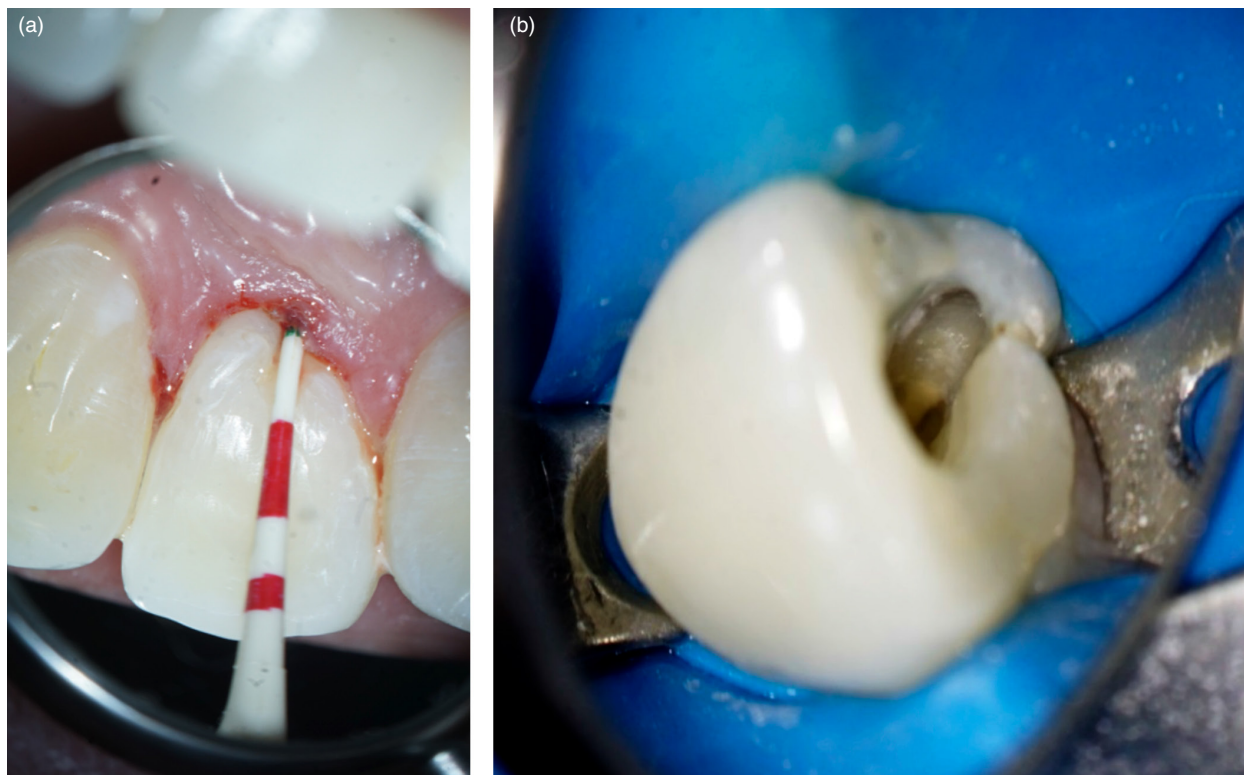


FIGURE 2 (a) Periodontal probing of the area with a palatal groove in the crown. (b) Entrance of the missed canal after the palatal extension of the access cavity

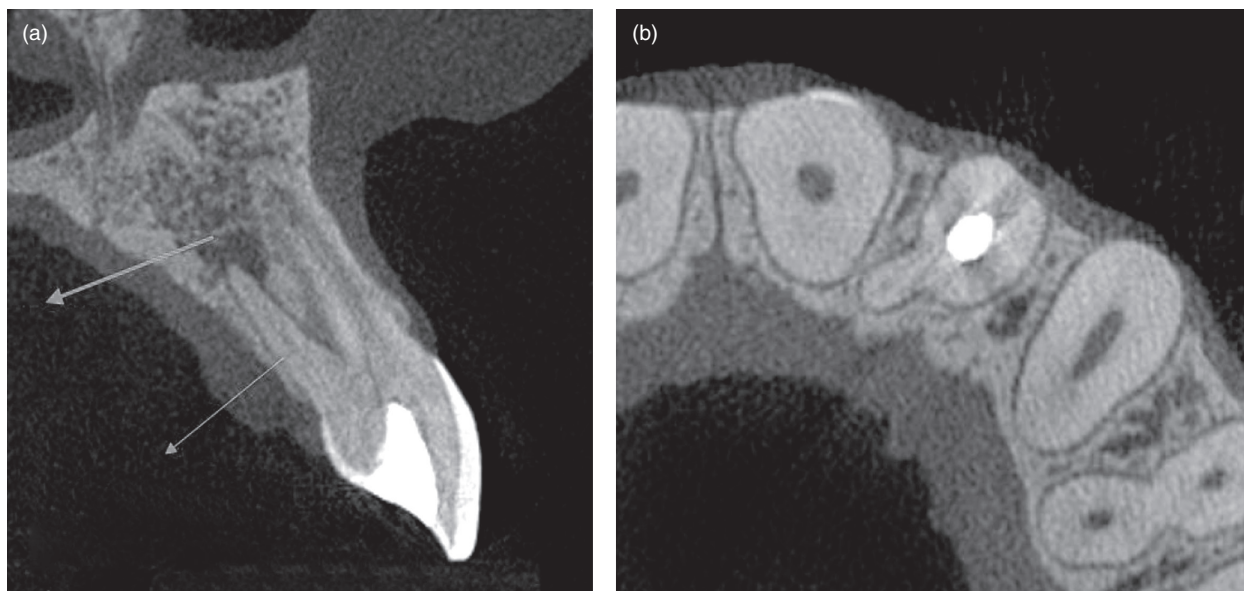


FIGURE 3 Cone-beam computed tomography. (a,b) Scans showing the extra root at palatal level with associated apical periodontitis

were healing and the patient was asymptomatic. After 3 years, both radiographs and CBCT revealed that the lesion on the second root was completely healed and the one on the main root reduced in size and was almost completely repaired (Figure 5). The patient remained asymptomatic.

DISCUSSION

Evidence has mounted that missed canals are important risk factors for post-treatment apical periodontitis [6–8]. Canals that are left untreated may contain sufficient necrotic and infected pulp tissue to cause or maintain apical

periodontitis. In the present case, apical periodontitis lesions were observed in both roots of the lateral incisor.

Canals can usually be missed when they are extra canals that are unexpected or have been neglected by the clinician. Knowledge of the possible variations in anatomy is important to prevent additional canals from passing

unnoticed. For instance, the MB2 canal in maxillary molars is the most commonly missed canal reported in the literature [6–8], even though the occurrence of this second mesiobuccal canal in those molars is rather a rule than an exception [14, 15]. Moreover, clinicians may be suspicious of the presence of additional canals when the main root canal is not centred but laterally displaced in the root. A careful inspection of the pulp chamber floor with magnification and abundant illumination, along with horizontal angulation of periapical radiographs and CBCT examination, may be of great help to detect extra canals.

Although rarely observed in prevalence studies [16, 17], there are reports of maxillary lateral incisors with two roots/canals [18–22]. Because abnormal double root formation is rarely observed in maxillary incisors, this condition may pass unrecognised by the clinician, especially when not quite evident on conventional periapical radiographs. This was the case in the present report during the primary treatment and during re-evaluation because of the persistent symptoms. The coronal anatomy of these anomalous double-rooted teeth may show little variation in shape, and a definite diagnosis can only be achieved by means of radiographic, particularly by changing the projection angle, or tomographic examination.

Complementary procedures used after root canal preparation can further reduce the number of residual bacteria. A recent study showed that supplementary disinfection approaches such as PUI and/or PDT significantly reduce the number of bacteria after chemomechanical preparation [23]. Also, the placement of an antimicrobial intracanal medication has been shown to substantially reduce the bacterial counts [24, 25] and enhance



FIGURE 4 Angled periapical radiograph taken immediately after filling

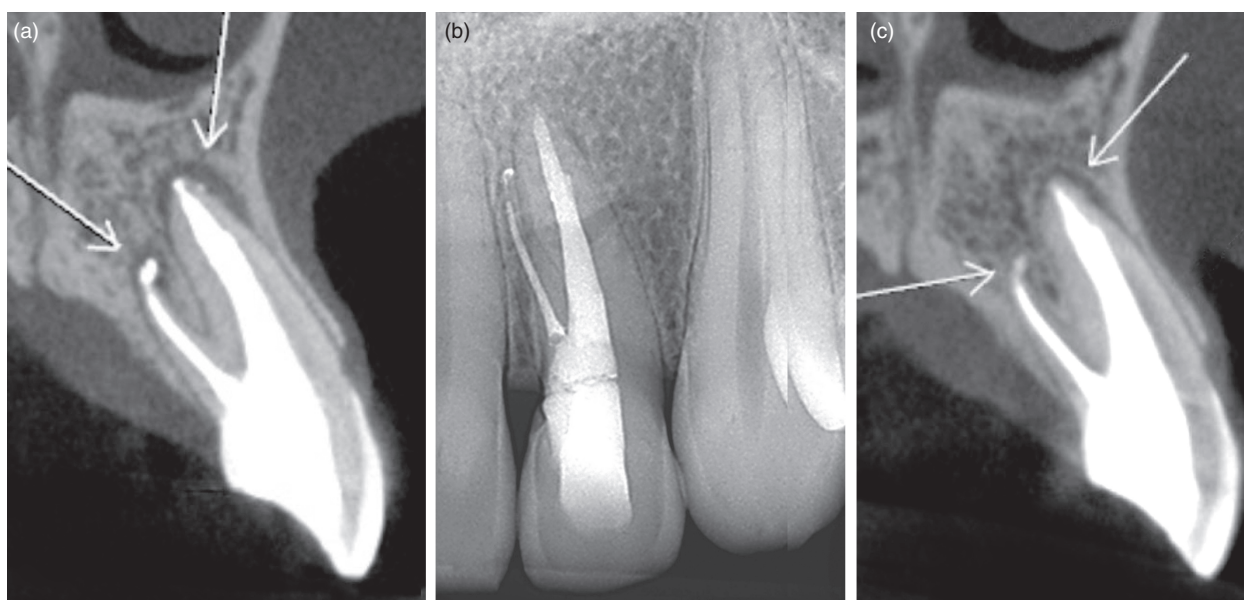


FIGURE 5 Follow-up examination. (a) After one year, cone-beam computed tomography. (b) After three years, periapical radiograph, and (c) cone-beam computed tomography

the treatment outcome of teeth with infected canals [26]. These complementary disinfection strategies were used in the second intervention to increase the possibility of a satisfactory outcome.

CBCT is not commonly recommended for routine diagnosis in endodontic practice because of radiation concerns [27, 28]. Nevertheless, it can be of invaluable help in cases with a difficult diagnosis [10]. In the present case, the previous quality of the endodontic treatment was very good, and no apparent reason for persistent symptoms and periapical inflammation was evident. However, CBCT was fundamental to show the missed canal in the previously undetected extra root. This reinforces the use of CBCT as an auxiliary diagnostic tool to help identify the possible cause of post-treatment decision apical periodontitis and guide the decision-making process for proper management.

In conclusion, this article presents an unusual case of a maxillary lateral incisor with two roots and two independent canals, which exhibited symptoms associated with the second canal that was left untreated in the first intervention. Detection of the missed canal by CBCT and proper reintervention resulted in the resolution of the symptoms and periradicular tissue healing.

CONFLICT OF INTEREST

The authors deny any conflicts of interest.

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