



Conservative Treatment of an Infected Lateral Canal: A Case Report with a 4-Year Follow-up

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Connective tissues in lateral canals mostly remain vital even after pulp necrosis of the main canals. However, lateral canals may become necrotic following the pulp necrosis of the main root canal or after root canal therapy. This case report presents a maxillary central incisor with a necrotic lateral canal and a sinus tract that initially showed healing following the primary endodontic treatment but showed infection after fiber-post placement and permanent restoration with composite resin. Tracing the sinus tract did not reveal the reason for the infection; however, cone beam computed tomography (CBCT) confirmed a lateral radiolucency of the maxillary right central incisor as the only reason for the return of the infection. A conservative re-treatment approach was performed, replacing the fiber post with gutta-percha and root canal sealer. Successful outcome was achieved with a conservative approach; however, it took some time for the sinus tract to heal. In the case of lateral canal infection, sealing the main root canal space could heal the lesion even without lateral canal negotiation. If the main root canal seal is disturbed, re-cleaning and obturating the main root canal could be successful.

Keywords: Cone Beam Computed Tomography; Fiber Post; Lateral Canal; Retreatment; Sinus Tract

Introduction

One of the important purposes of root canal treatment in teeth with pulp necrosis is to eradicate all bacteria and necrotic tissues from the root canal space using various types of endodontic instruments and antibacterial irrigants. After preparation, it is also crucial to fill the root canal space with gutta-percha and root canal sealer [1-3]. Numerous investigations have been performed to introduce root canal preparation and irrigation methods with maximum antibacterial efficacy and conservative dentin removal [4-7]. In addition, it has been emphasized that a root canal should be obturated, and the tooth should be permanently restored to prevent further contamination of the root canal space [3, 8].

Ramifications of the main root canal space could mostly be found in the apical part of the root; however, they may also be found in the middle and coronal third of the root [8]. The

prevalence of anatomical complexity comprised of accessory canals and apical ramifications in central incisors of the maxilla has been reported in 24 to 60% of cases [9]. Most of the time, the connective tissue inside the lateral and accessory canals remains vital; however, sometimes, the tissues become necrotic and provide a pathway between the main root canal and periodontal ligament through which bacteria could induce lateral radiolucency as well as clinical signs of infection, such as swelling and sinus tract formation [1]. It has been shown that in a case with lateral radiolucency due to lateral canal infection or connective tissue inflammation, the lesion could be healed after preparation and disinfection of the main canal with antibacterial irrigants such as sodium hypochlorite [10].

This case report presents a conservative approach to managing a sinus tract that had healed following primary root canal treatment but became infected following a restorative procedure.

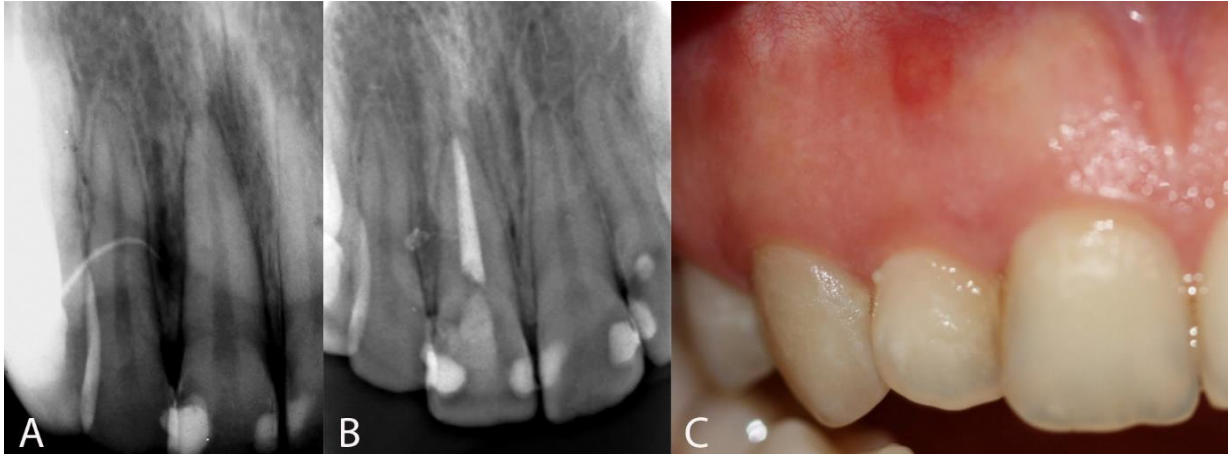


Figure 1. A) Gutta-percha tracing of right maxillary central incisor; B) A lateral canal obturated with root canal sealer; C) Recurrence of sinus tract one year later

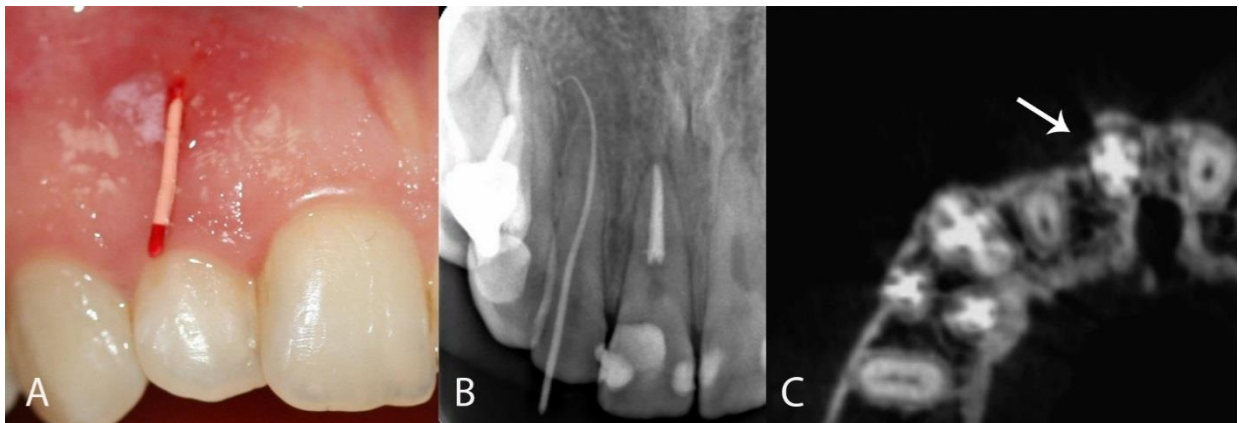


Figure 2. A) Tracing the sinus tract; B) Gutta-percha stopped between tooth # 7 and #6; C) Axial view of the CBCT: a radiolucent area was detected around the distal part of tooth #8 at the level of the previously detected lateral canal

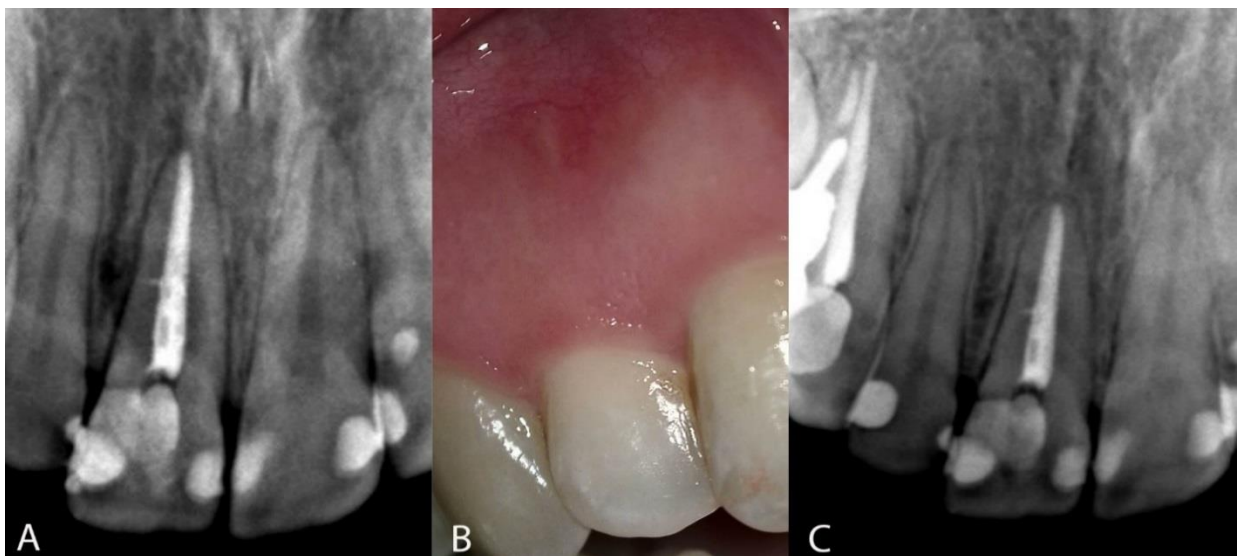


Figure 3. A) No periapical pathosis could be detected in the apical area of right maxillary central incisor; B) Four years follow-up photography showed the sinus tract was healed; C) Four years follow-up radiograph showed that the radiolucency was healed

Case Report

A 27-year-old female with ASA I health classification referred to a dental office specializing in endodontic practice with the chief complaint of a sinus tract on the anterior part of the maxilla. Clinical evaluation revealed a sinus tract at the distal part of the root of the maxillary right central incisor. The patient had a periapical radiograph with a gutta-percha tracing that showed lateral radiolucency in the distal part of the tooth, and the gutta-percha tracing reached the radiolucent lesion (Figure 1A). Pulp sensibility tests, *i.e.*, cold, heat, and electric pulp testers, were negative. The tooth had a previous composite resin restoration.

The patient was informed about the sinus tract formation, treatment options, and outcome possibilities. In a shared decision-making process, the patient preferred to receive a root canal treatment and follow-up as the first step of the treatment protocol. In a single-visit treatment, after placing an anesthetic gel (20% Benzocaine; Premier, Philadelphia, PA) on the mucosal surface of the apical part of the maxillary right central incisor, 3% prilocaine with 0.03 IU/mL felypressin (Dentanest, Daru Pakhsh, Tehran, Iran) was used as the anesthetic agent. After rubber dam placement, an access cavity was prepared. The tooth length was measured by a Root ZX apex locator (Morita Corporation, Kyoto, Japan) and confirmed by periapical radiography. The root canal was irrigated with 5.25% NaOCl and prepared with RaCe rotary instruments (FKG Dentaire, LaChaux-de-Fonds, Switzerland) in a crown down manner with file # 35 4% as the file apical preparation. Between each file, 2 mL 5.25% NaOCl was used as an irrigant. The final rinse was done with 5 mL 5.25% NaOCl, 10 mL 17% EDTA (Asia Chimi Teb Co., Tehran, Iran), 2 mL 5.25% NaOCl, and finally 5 mL normal saline. Then the root canal was dried and filled with gutta-percha and AH26 root canal sealer (Dentsply De Tery, Konstanz, Germany), with lateral condensation in the apical part and vertical condensation in the coronal part. The access cavity was restored with Cavisol (Golchai, Karaj, Iran). Final periapical radiography showed a lateral canal that seems obturated with the root canal sealer at the distal side of the midroot (Figure 1B). A week following the initial treatment, the clinical evaluation showed the sinus tract no longer existed, and the patient was referred for the final restoration. One year later, the patient returned with the chief complaint of returning sinus tract (Figure 1C). A number 25 gutta-percha cone (Meta Biomed Co., Chungcheongbuk, Korea) was used for tracing the sinus tract; however, the tracing stopped somewhere between teeth #7 and #6 (Fig2-A, B). No periapical radiolucency was observed in tooth #7 or #6. Tooth #7 was vital, and number #6 had received root canal treatment several years earlier and had no

clinical pathosis. The radiograph showed that the root canal filling materials were removed up to 1 mm coronal of the position of the lateral canal, and it seemed that a fiber post had been placed inside the root. A phone call was made to the dentist who had treated the tooth, and he confirmed that the fiber post was placed inside the root canal. A cone beam computed tomography (CBCT) was ordered to determine the reason for sinus tract formation. The axial view of the CBCT (Figure 2C) showed a radiolucent area around the distal part of the midroot in tooth #8 at the level of the previously detected lateral canal. The apical area of tooth #8 showed no periapical pathosis (Figure 3A). The reason for the returning sinus tract was assumed to be the disturbance of the main root canal obturation due to the removal of the obturation and the placement of a fiber post. Therefore, the first option was to remove the fiber post and clean and obturate the main root canal. Informed consent was obtained from the patient, and she agreed to refill the main root canal. After anesthesia with 3% prilocaine and 0.03 IU/mL felypressin (Daru Pakhsh), an access cavity was prepared, and the fiber post was removed using a Muncie Discovery round bur (CJM, USA). After removing the gutta-percha up to the apical level of the lateral canal, the main root canal was irrigated with 5.25% NaOCl which activated with ultrasonic and cleaned with a Hedstrom hand instrument. Then the smear layer was removed with 2 mL 17% EDTA and the root canal was obturated with gutta-percha and AH26 root canal sealer by vertical condensation. The orifice was filled with a thin layer of light-cured glass ionomer, and the access cavity was filled with light-cured composite resin (Coltene, Apadana).

The patient was called back a week later; however, the sinus tract had not healed. Another recall one month following the treatment still showed the presence of the sinus tract. The patient was given the second option of surgical intervention to find and fill the lateral canal. However, she did not agree with the treatment plan. She went to the office 4 years later to treat another tooth. No sign of sinus tract was observed (Figure 3B), and the follow-up radiograph showed the radiolucency had healed (Figure 3C). The patient reported that the sinus tract had healed shortly after the visit. She received a surgical offer and, since then, has not reappeared.

Discussion

Despite several case reports that had been able to reach and clean lateral canals successfully, it has been generally accepted that they are very challenging to negotiate, properly disinfect, and obturate [11, 12]. It has been shown that the presence of the root canal filling materials in lateral canals does not mean they are properly cleaned or filled. Histologic evaluations reveal root

canal filling materials in lateral canals in the final radiography do not indicate the superiority of different obturating materials or techniques compared to others [13].

Lateral canals are usually not detectable in the preapical radiograph; however, one of the reasons for a rarefaction observed in the lateral part of a root may be the existence of a lateral canal [14]. Histologic observations have shown that the presence of a lateral lesion does not always mean the connective tissue of the lateral canal has become necrotic [1]. Sometimes the connective tissue may become inflamed and induce lateral radiolucency. In that case, focusing on bacterial reduction and obturation of the main root canal space would be the best method to solve the lateral lesion. The follow-up to this case will show if this method has overcome the lesion and led to a successful outcome [15].

There is no way for a practitioner to be sure if the connective tissue of the lateral canal is inflamed or has become necrotic when a lateral lesion is observed in the patient's periapical radiography. In this case report, a combination of using sodium hypochlorite activated by ultrasonic energy used for cleaning root canal space before root canal obturation. Byakova et al. reported that this strategy is significantly more effective on bacterial contents of dentinal tubules compared to placing two weeks medicament inside the root canal [16]. Most of the time, the lateral canals could not be reached, and therefore, their necrotic or inflamed tissues would remain untouched [1, 17]. Therefore, the patient should be aware of this limitation, and the treatment provider should give it a chance to heal. The decision on the treatment plan should be made in a shared decision-making process, and all treatment options should be discussed. Orthograde root canal treatment followed by an endodontic surgery in case of treatment failure would be the method of choice for retaining the tooth [18]. In case of an unsuccessful outcome, intentional replantation would be the next option. Finally, if all efforts fail, extraction of the tooth and replacement with an implant would be the last treatment option [19, 20].

If the patient agrees with an orthograde treatment, focusing on cleaning the main root canal space, irrigating with antibacterial solutions, removing the smear layer, and filling the root canal space with a reasonable obturating method are of utmost importance to overcome the lateral lesion induced by a lateral canal [21].

It has been shown that the concentration of sodium hypochlorite decreased over time following production. Therefore, it is very important to use the irrigant as freshly produced as possible to get maximum effect [22].

Cone beam computer tomography is a technology that gives 3-dimensional information on a tooth and its surrounding

structures to practitioners. In this case, tracing the sinus tract failed to show the cause of infection; however, CBCT showed a lateral radiolucency at the distal part of tooth #8 at the level of the previously infected lateral canal. However, this does not mean all patients should do a CBCT when a sinus tract is present. Firstly, it would be wiser to try to order a periapical radiograph with a gutta-percha tracing inside the sinus tract and order a CBCT only if tracing radiography is inconclusive and no apparent reason for the presence of sinus tract could be detected [23, 24]. Providing a hermetic seal in a root canal following root canal preparation and irrigation with an antibacterial solution is essential [25]. In this case report, the reason for sinus tract healing following the primary root canal treatment could be attributed to the reduction of bacteria and the obturation of the main root canal space. The return of the sinus tract after fiber-post placement may be due to damage to the seal of the main root canal space close to the lateral canal. However, removing the fiber post followed by irrigation with NaOCl, removing the smear layer using 17% EDTA, and finally obturating the space with gutta-percha and root canal sealer provided an environment suitable for recovery [26]. It has been reported that most sinus tracts heal during the first week following the root canal treatment; however, in this case, it took about a month to observe sinus tract healing [27]. It has been reported that self-medication with antibiotic frequently used by the patients before attending dental clinics. It may prevent precise judgement for the reason of the infection. In this case fortunately no antibiotic was used by the patient [28].

In this case report, the main reason for sinus tract return was damage to the main root canal space seal. If the practitioner who had done the root canal treatment had considered restoring the tooth without interfering with the main root canal space seal, they might have prevented the recurrence of the infection. When an endodontist refers the patient back to the general practitioner, it would be wise to inform them of the presence of the lateral canal, so they might choose a method of restoration that would avoid interrupting the seal of the root canal [29].

Conclusion

In conclusion, bacterial reduction and sealing of the main root canal space are crucial factors for a successful outcome; if the seal of the main root canal is disrupted due to post-placement, restoring the seal through a conservative approach could be the first option for treating the infection.

Conflict of Interest: 'None declared'.

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