

Non-surgical endodontic retreatment of extensive periapical lesion

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Fernando Muñoz Ayón, Jorge Paredes Vieyra and Victor Manuel Delatorre Martínez demonstrate a nonsurgical endodontic retreatment of extensive periapical lesion of endodontic origin with Vitapex

Apical periodontitis and its accompanying periapical bone resorption are an inflammatory disorder of periradicular tissues caused by persistent microbial infection within the root canal system of the affected tooth (Safavi and Nichols, 1993).

Incessant apical periodontitis after root canal treatment often portrays a more complex scenario than primary apical periodontitis (Nair, 2006).

The most common causes for failure in endodontics include: the inability to eradicate bacteria from the root canal system after treatment, reinfection of the root canal by coronal leakage (Haapasalo et al, 2007), extraradicular infection, foreign body reaction and true cysts (Cohen, Hargreaves and Berman, 2011). In such cases where primary endodontic therapy does not succeed, a non-surgical endodontic retreatment approach is the best option.

The main difference between treating primary endodontic disease versus post-treatment disease is the need to regain access to the apical third of the root canal previously treated. Once this is achieved, all of the principles of endodontic therapy apply to the completion of the retreatment case (Cohen, Hargreaves and Berman, 2011), including cleaning, shaping and interappointment dressings. The most widely used intracanal medication to date continues to be calcium hydroxide $\text{Ca}(\text{OH})_2$; its antimicrobial mechanism and high pH (12.5) provide an environment where few microorganisms are able to survive. Another drug used with high antibacterial activity is iodoform (CHI_3), which has been used successfully as a medicament and filling paste for many years (Pallota et al, 2010). Vitapex is a commercial $\text{Ca}(\text{OH})_2$ paste used as root canal dressing in primary and permanent teeth; it also contains CHI_3 and inhibits or kills the pathogen in the root canal; furthermore, it can promote bone repairment and regeneration, as shown by Xia and colleagues (2013).



Figure 1: Patient reported pain on mastication but no contact surfaces could be observed. Palatal groove housing bacteria (caries) could be seen with microscope

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Figure 2: Previously acceptable root canal filling with a persistent large periapical lesion (approximately 10mm in diameter).

Figure 3: Gutta percha filling was removed and calcium hydroxide powder was placed inside the canal to control exudate. The tooth was re-evaluated 10 days later and was asymptomatic.

Figure 4: Working length with Root ZX apex locator.

Although very effective eliminating bacteria inside the canal, removal of these Ca(OH)₂ pastes is often difficult. Passive ultrasonic irrigation (PUI) has proven to be effective in Ca(OH)₂ removal (63.3%) from the root canal wall due to its cavitation and microstreaming effect on NaOCl compared with syringe delivery. However, whether PUI can effectively remove Ca(OH)₂ from the root canal wall is not well known (van der Sluis, Wu and Wesselink, 2007).

During root canal treatment Ca(OH)₂ pastes might sometimes unintentionally escape through the apex of the tooth. The deliberate placement of Ca(OH)₂ beyond the confines of the root canal in the presence of large and chronic periapical lesions has been advocated. Some speculate that this favours periapical healing and encourages osseous repair. Such deliberate overextension is not, however, widely advocated (Orocoglu and Cobankara, 2008).

Case report

A 42-year-old female patient was referred to our office for treatment of maxillary left lateral incisor tooth. The reason for consultation was completion of root canal therapy, which had been left unfinished two to three years to date.

Upon questioning, the patient reported mild pain with the

presence of a sinus three months previously. The patient also reported pain on mastication three days prior to this appointment and clinical examination confirmed the presence of purulent exudate on palpation at the gingival margin, as well as a palatal groove and composite filling on access cavity (Figure 1). The right lateral incisor was slightly sensitive to percussion and palpation. Radiographic evaluation (Schick CDR, Schick Technologies) demonstrated a very acceptable endodontic treatment accompanied with a radiolucent lesion approximately 10mm in diameter around the apex (Figure 2).

Non-surgical retreatment approach was planned and informed consent was given and signed by the patient. Treatment was performed without local anesthesia and with rubber dam in place. The access cavity was prepared with carbide bur #2 (Mani, Inc) and Endo-Z (Dentsply International). Removal of gutta percha was attempted via Protaper Universal Retreatment files. Once inside the canal, a calcium hydroxide paste was found, removed and 2.5% sodium hypochlorite irrigating solution was administered as final rinse. Canal was dried with sterile paper points (Coltène Whaledent Group, Hygienic) and calcium hydroxide powder (Sultan Healthcare Inc) was placed into the canal to

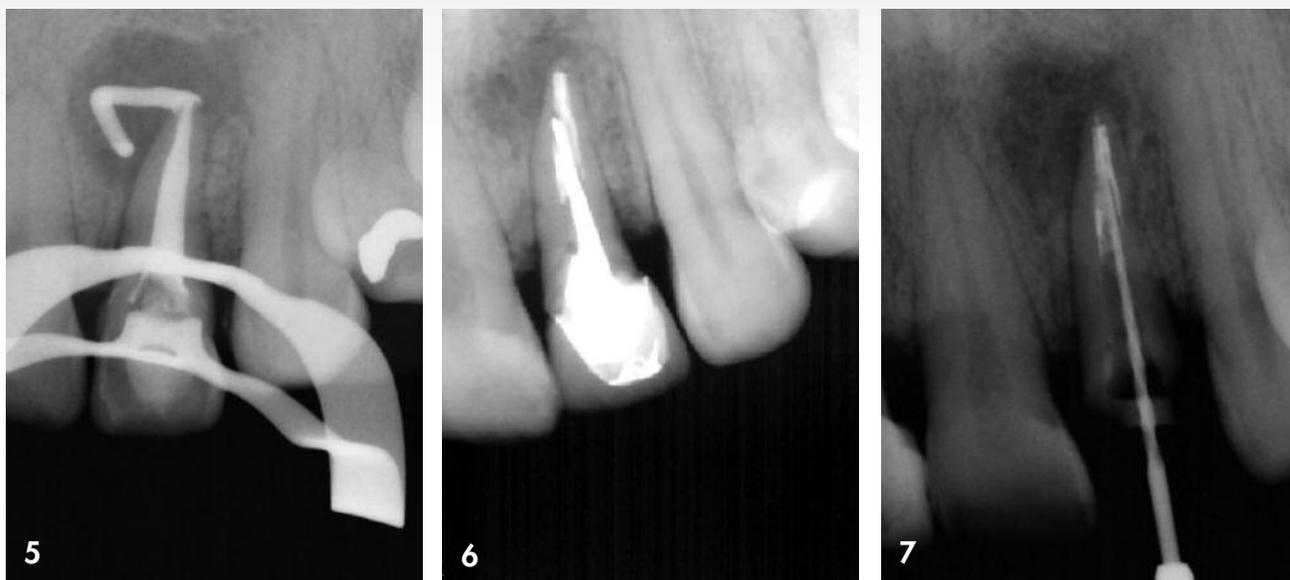


Figure 5: Vitapex was placed as intracanal medication and intentionally extruded past the apex.

Figure 6: After more than a year (17 months) the patient returned with mild pain and a cast post crown restoration on the tooth. Lesion was smaller, showing healing process but still present. Coronal leakage as well as poor sealing of crown was present.

Figure 7: Canal preparation, as well as Vitapex removal, was performed with F4 and F5 Protaper universal files.

control the exudate. The tooth was temporarily restored with intermediate restorative material (IRM Caulk; Dentsply).

Clinical evaluation was performed after 10 days (Figure 3). The tooth was asymptomatic and isolated in the same manner as that described in the previous appointment. Working length was then determined by an electronic apex locator (Root ZX, J Morita) with a #45 K-file (Mani, Inc) (Figure 4).

During this appointment 2.5% NaOCl was administered; the canal was then dried in the same manner as previous appointment and Vitapex (Neo Dental Inc) was placed as intracanal dressing and intentionally placed in the periradicular area through the apex (Figure 5). A cotton pellet was placed in the pulp chamber and the tooth was temporarily restored with intermediate restorative material (IRM Caulk; Dentsply).

The patient lost all contact with our practice and returned 17 months later with mild pain and a cast post and metal porcelain crown in the unfinished root canal treatment. After removal of cast post and crown the canal preparation was accomplished with F4 and F5 Protaper Universal files (Figures 6-7). Canals were obturated by means of the lateral condensation technique and Sealapex sealer. After one month (Figure 8) the patient was asymptomatic and mild healing of the periradicular lesion was observed, even though

no permanent crown had been placed.

The patient lost contact once again but one year later returned, asymptomatic, and the tooth and periapical tissues appeared to be healing correctly with total repair and proper function of the tooth (Figure 9).

Discussion

From a microbial perspective, after pulp necrosis, infection of the root canal system occurs. Microorganisms then inhabit the oral cavity like bacteria and fungi invoke a protective inflammatory response in the periradicular tissues.

However, when host defense systems cannot enter the necrotic root canal and eliminate the invading microbes, the inflammatory process results in the formation of abscesses, granulomas and/or periapical cysts, as shown by Love and Firth (2009) and Soares and colleagues (2008).

Such lesions can only be detected radiographically when alveolar bone loss has been accompanied by cortical bone involvement during lesion development (Soares et al, 2008; Arslan et al, 2012). The mean diameter of apical lesions range from 5-8mm: lesions of 10mm or more are considered granulomas or apical cysts (Soares et al, 2008; Soares et al, 2006). Even though the incidence of radicular cysts is approximately 15% of all periapical lesions, healing of all



Figure 8: One month after finishing treatment the lesion appears to have mild repair even though no permanent crown has been placed on the tooth.

Figure 9: One year after finishing treatment the lesion appears to be healing correctly with total integration and proper function of the dental structures.

apical periodontitis ranges from 80–95% after root canal treatment, which alone suggest that cysts may heal without surgery (Love and Firth, 2009; Soares et al, 2008; Arslan et al, 2012; Soares et al, 2006). Therefore, management of large periapical lesions by nonsurgical procedures should always be considered.

Because surgical procedures come with many drawbacks (for example, possible damage to adjacent vital teeth and anatomic structures in the vicinity, pain and discomfort) its use is limited in the management of periapical lesions, as shown by Thomas, Dhanapal and Simon (2012). However, non-surgical endodontic treatment focuses on the removal of all bacteria and their by-products from the root canal system (Tavares et al, 2012; Torabinejad et al, 2005); adherence to these treatment objectives should result in maintaining normal radiographic and clinical conditions in teeth with and without preoperative periradicular lesions (Torabinejad et al, 2005). Based on available studies that offer the best evidence, it appears 92-98% of teeth without periapical lesions remain free of disease after root canal therapy and 74-86% of teeth with apical lesions completely heal after initial treatment or retreatment. In addition, similar data shows that 91-97% of teeth that have had root canal treatment remain functional over time (Torabinejad et al, 2005). Still,

in some cases, a bone lesion takes a considerable time to heal, which means that conclusions about outcome are sometimes uncertain. Apical periodontitis may also heal with fibrous tissue rather than bone. Such scar tissue healing is usually thought to have a typical radiographic appearance and is mostly seen after endodontic surgical procedures (Peterson et al, 2012).

Bron and colleagues showed that the inability to achieve infection control after root canal treatment can result in a chronic inflammatory process (2007). For such cases, the use of intracanal medication is widely advocated. Various studies found that the use of Ca(OH)₂ dressing for one to four weeks efficiently removed bacteria from the root canals (Estrela et al, 2001; Zmener, Pameijer and Banegas, 2007; Han, Park and Yoon, 2001).

Although the use of these Ca(OH)₂ pastes is highly effective, its removal from the root canal is often a difficult task. Removal of pastes like Vitapex is often done by instrumentation of the root canal with the master apical file combined with abundant irrigation of both NaOCl and EDTA.

In a recent study, passive ultrasonic irrigation (PUI) proves to be effective in Ca(OH)₂ removal (63.3%) from the root canal wall due to its cavitation and microstreaming effect on NaOCl compared with syringe delivery (van der Sluis, Wu

and Wesselink, 2007). In the present case, the extrusion of Vitapex through the apex possible delayed the apical healing, but did not prevent it. Our case results agree with findings by Arslan, Broon, Soares, Thomas, van der Sluis and Xia (2012; 2007; 2006; 2012; 2007; 2013), as the large periapical lesion was retreated without surgical intervention, the intentional extrusion of Vitapex promoted the periapical healing and PUI served as an excellent Ca(OH)₂ paste (Vitapex) remover from the root canal as well as the diffusion of NaOCl into the dentinal tubules.

Conclusion

When endodontic therapy cannot eliminate bacteria from the canal and large periapical lesions develop on previously treated teeth, non-surgical root canal retreatment should always be considered before a surgical approach. In the present case, a non-surgical approach in combination with calcium hydroxide/iodoform paste as an intracanal medicament contributed effectively in limited healing of periapical lesion at one month and nearly fully repaired at one year. This confirms that large periapical lesions can respond positively to non-surgical retreatment.

Acknowledgement

The authors deny any conflicts of interest related to this study. We thank Professor Dr Michael Hülsmann (Göttingen, Germany) for his valuable assistance in reviewing this manuscript.

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