Extensive asymptomatic apical periodontitis repair through endodontic treatment: case report

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DOI: https://doi.org/10.14436/2358-2545.8.1.065-070.oar

ABSTRACT

Introduction: Periapical lesions affect non-vital teeth because of infection by microorganisms that remain in the root canal. On radiographs, this type of lesion is a circumscribed radiolucent image in the apical region; it may be large, and dentists may indicate complementary surgery inadvertently. Therefore, clinical cases should demonstrate the possibility of extensive periapical lesion repair after endodontic treatment with intracanal medicaments and no endodontic surgery. **Case report:** After the collection and interpretation of signs and symptoms and the definition of a diagnosis of asymptomatic apical periodontitis because of a large radiolucent area in the region of tooth #22, coronal flaring was performed, the automated Logic system was used for cleaning and shaping and a calcium hydroxide intracanal medicament was applied and kept in place for 15 days. After that, the root canal was filled using a single gutta-percha cone and endodontic cement (Sealer 26). Radiographs obtained six months after endodontic treatment showed complete periapical lesion repair and confirmed treatment success. **Conclusion:** Carefully performed endodontic treatment and the application of antimicrobial agents during cleaning and shaping may result in apical repair regardless of lesion size or surgery.

Keywords: Apical periodontitis. Endodontics e Root Canal Therapy.

How to cite: Brunini SHS, Slusarski JP, Hidalgo LR, Tomazinho LF, Foroni RD. Extensive asymptomatic apical periodontitis repair through endodontic treatment: case report. Dental Press Endod. 2018 Jan-Apr;8(1):65-70.
DOI: https://doi.org/10.14436/2358-2545.8.1.065-070.oar

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» The authors report no commercial, proprietary or financial interest in the products or companies described in this article.

» Patients displayed in this article previously approved the use of their facial and intraoral photographs.

Submitted: December 06, 2016. Revised and accepted: August 15, 2017.

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Introduction

Endodontics is the dental specialization that studies the physiology and pathology of the dental pulp, not only to prevent, but also to treat pulp changes and their effects on periapical tissues.[1]

Periapical effects of pulp diseases are easily understood, because pulp tissues and the apical region are continuous and richly vascularized, which promotes a rapid inflammatory response.[2]

The action of inflammation mediators, together with that of microorganisms and their toxins, and their level of virulence determine the occurrence of different periapical pathologies. When microbial virulence is low or the organisms are more resistant, the disease is chronic and progresses slowly to asymptomatic apical periodontitis,[2] defined as an inflammatory pathology that results from the dynamic interaction of microbial action and host immune response.[3]

Understanding the disease is fundamental to treatment success, and the most common cause of endodontic treatment failure is the presence of microorganisms in the root canal system.[4]

Because of the effect of microbial control on endodontic treatment success, its role in endodontic infection has been intensively discussed in recent years, with the conclusion that the type of infection in each case should be defined.[5] Endodontic infection classification is based on its site and time of root canal infection. Primary canal infection is part of the etiology of primary acute and chronic periradicular lesions, whereas secondary infections result from endodontic treatment failure. Microbiota varies according to type of infection, and primary canal infection is associated with anaerobic Gram-negative bacteria.[5,6]

Non-surgical endodontic treatment is the first clinical option, and cleaning and shaping of the root canal should include the reduction of microorganism infection using several procedures, such as instrumentation, irrigation with antimicrobial solutions and the use of intracanal medicaments.

Cleaning and shaping, one of the most important phases of endodontic infection control, consists of cutting and removing tissues using endodontic files.[7] However, it is clear in the literature that cleaning and shaping alone is not effective in the elimination of microorganisms adhered to the root canal walls, and complementary resources, such as intracanal medicaments, should be used immediately after cleaning and shaping and before obturation, dividing endodontic treatment into several visits.

One of the agents indicated as an intracanal medicament is calcium hydroxide, one of the substances most often used for this purpose because of its antimicrobial and anti-inflammatory properties and its capacity to inhibit inflammatory resorption, as well as its capacity to create a physical barrier against bacterial multiplication in the root canals.[6]

This report describes a clinical case of a large periapical lesion in a tooth that was treated endodontically using an intracanal medicament that promoted lesion repair without endodontic surgery.

Case Report

A panoramic radiograph to plan the treatment of a 26-year-old man referred to a private practice for examination of tooth #22 showed a radiolucent image suggestive of periapical lesion in the region of that tooth (Figure 01). Clinically, the tooth had a well-adapted class III resin composite restoration on the mesiobuccal surface, but its color was different from the natural color of the tooth (Fig 2A). Palpation of the buccal area, as well as vertical percussion, revealed pulp sensitivity, but there was no sensitivity to thermal testing.

A periapical radiograph showed a large periapical lesion in the root apex of tooth #22 (Fig 2B). A diagnosis of asymptomatic apical periodontitis was made based on these signs and symptoms, and endodontic treatment was indicated. Before any procedure was performed, the treatment plan for this clinical case was approved by the Institutional Review Board for Research with Human Subjects of Universidade Paranaense, Main Campus, under number 51303515.6.0000.0109.

In the first visit, after infiltration anesthesia and isolation, coronal flaring was performed using #1014 and #3082 diamond burs for full access to the pulp chamber. After that, 1% sodium hypochlorite was used to neutralize the toxic and septic materials. A Largo 02 bur was used for the instrumentation of the cervical third, and, after that, an electronic apex locator was used to determine total length by introducing a #15 K-file to the point where

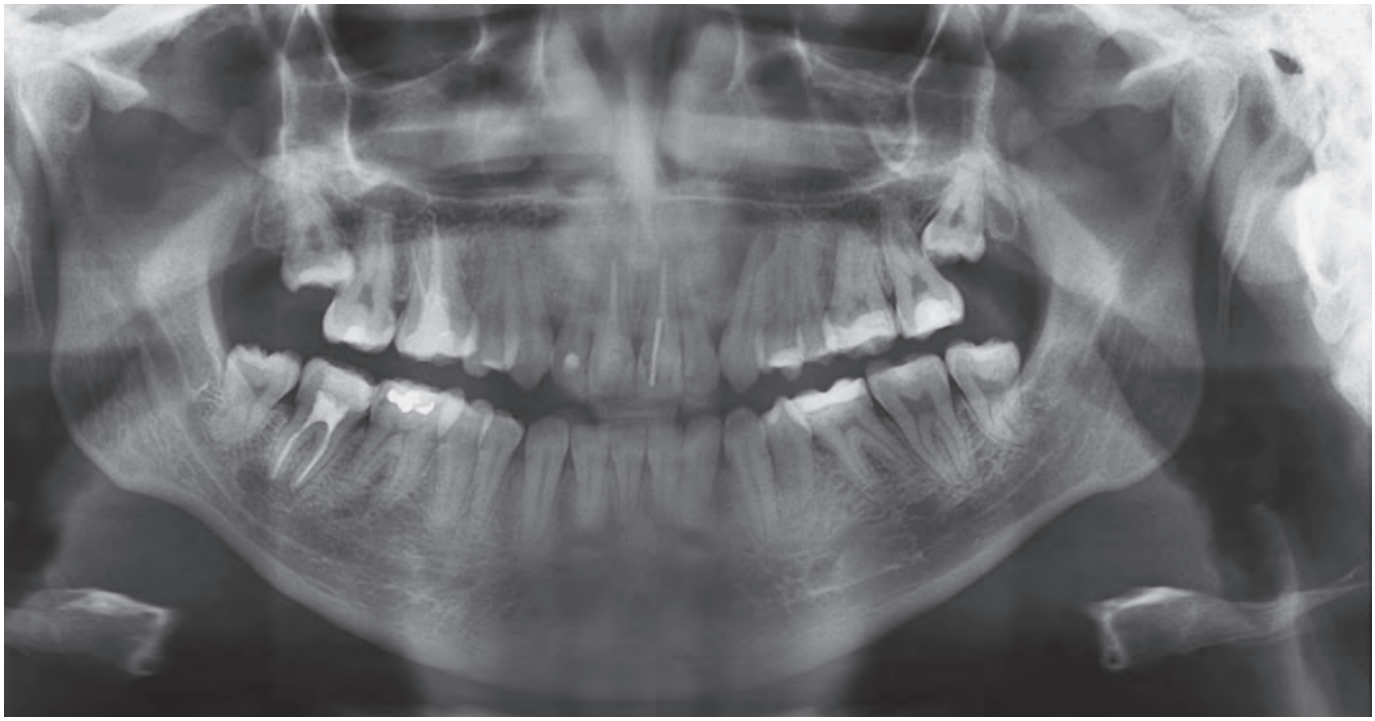

Figure 1. Panoramic radiograph brought by patient to first visit.

Figure 2. A) Clinical aspect of tooth #22 before treatment; **B**) Initial radiograph shows large periapical lesion.

the locator visor indicated that the root apex had been reached. Instrumentation was performed using the Logic rotary file system (Easy, Equipamentos Odontológicos, Belo Horizonte, Brazil) according to the manufacturer's instructions. First, a #30/01 file was chosen to match foramen diameter, and careful back-and-forth movements where used to push it to tooth length, followed by instrumentation with a #30/05 file that matched the diameter of the patency file, also using careful movements to working length. The file flutes were cleaned at every three back-and-forth movements, when the irrigating solution was changed. The engine parameters were 950 rpm and 4 N/cm^2.

After instrumentation was completed, the root canal was dried with #30 absorbing paper points to remove all signs of humidity. The visit was concluded with the application of a calcium hydroxide intracanal medicament paste (Ultracanal, Ultradent) using a syringe. A needle provided with the system (NaviTip) and a silicone stopper were used to inject the paste into the canal up to 2 mm short of working length to avoid extrusion. A sterile cotton dressing was applied over the intracanal medicament to separate it from provisional restorative material (Coltosol, Coltene).

The patient returned 15 days later to complete the procedures, when the provisional restorative material was removed and saline solution was used to remove the calcium hydroxide paste. A #30 K file was introduced into the canal to confirm patency and the complete removal of the intracanal medicament. The canal was dried with #30 absorbing paper points, and the size of the principal gutta-percha cone was tested, beginning with an F2 Pro Taper cone (Dentsply), to 1 mm short of the root apex. After radiographic confirmation of the position of the gutta-percha cone, the cone was covered with endodontic cement (Sealer 26, Dentsply, Petrópolis, Brazil) and inserted in the canal. Excess material was removed from the entrance to the root canal using a heated instrument. The visit was concluded with a composite resin restoration to seal the access cavity, after which a final periapical radiograph was obtained.

Six months after the conclusion of endodontic treatment, when the patient returned for radiographic control, the lesion had disappeared (Fig 3) and there were no signs or symptoms.

Figure 3. Control radiograph six months after treatment conclusion.

Discussion

Endodontic treatment, spurred by recent technological advances incorporated to clinical practice, has reached increasingly more significant success rates, ranging from 82.8%[8] to 90%.[9] However, contamination of the pulp cavity reduces success rates to 78.9%[8] and 74%.[9]

The mechanism of periapical lesion development is complex and involves variable resistance of patients to their progression,[2] but its major evidence is the infection in the root canal system.

Asymptomatic apical periodontitis is a usually painless inflammation with destruction of the apical periodontium. It affects teeth with pulp necrosis, is not detected by sensitivity to thermal testing[6] and may result in discrete sensitivity to palpation or percussion, which are the clinical signs and symptoms that closely apply to our clinical case.

A more serious characteristic of the case described here is the radiolucent image limits, as the size of the lesion may be a negative factor in the prognosis of possible repair,[5] as well as in the dentist's decision about a treatment plan, and a premature indication of surgery may be inadvertently made. According to Moura et al.,[2] non-surgical endodontic treatments are the first clinical treatment option, followed by clinical and radiographic follow-up after root canal obturation to evaluate lesion repair.

Therefore, the control of endodontic microorganisms becomes one of the challenges to be faced in the success of endodontic treatments. Cleaning and shaping strategies for the root canal should include procedures to promote canal emptying and enlarging by the action of instruments and irrigation, as well as the use of intracanal medicaments and coronal sealing.[8]

The root canal is sanitized during cleaning and shaping, which promotes the elimination of bacteria, their byproducts and the contaminated dentine and produces a surgical space for adequate sealing. However, during cleaning and shaping, dentin debris produced by instrumentation tends to be compacted at the foramen and block the space of the root canal, consequently shortening working length. Therefore, dentists should pay special attention to the debridement of the apical foramen to preserve patency, as the penetration of a file of adequate size during instrumentation prevents the accumulation of debris in this area and keeps the foramen clear. Patency and enlargement of the canals in case of teeth with necrosis and periapical lesions may promote the elimination of microorganisms from the foramen and prevent inflammation perpetuation.[10] This was one of the concerns in the performance of the clinical case described here, which was treated using the Logic system, in which a small taper file (0.01 mm) was used to keep patency at the apical foramen.

According to Rached,[11] root canal disinfection is the result of several events, such as: the mechanical action of endodontic files on the root canal walls; the chemical action of irrigants in the pulp cavity, such as the elimination of organic and inorganic material and microorganisms; and the kinetic energy of irrigation-aspiration, which, because of the reflux of the liquid stream, washes the debris that results from these events out of the root canal.

In summary, these substances have a fundamental role in cleaning and shaping because they are responsible for disinfection, the removal of debris and pulp or necrotic rests along all the root canal system where the endodontic files cannot reach. Because of that, sodium hypochlorite was used in the case described here. This solution is one of the main irrigants capable of achieving the objectives described above because of its properties as a solvent for organic tissue, deodorizing effect and antimicrobial action, already demonstrated in several studies.

However, despite careful sanitation and disinfection of the root canal system during cleaning and shaping using irrigation and instrumentation, routine or sporadic events in clinical endodontics may require the indication of an intracanal medicament. One of the principal intracanal medicaments is calcium hydroxide, because of its widely documented antibacterial action against most strains isolated in the root canals, as well as of its anti-inflammatory action and its function as a physical barrier.[11]

According to Estrela et al.,[8] some of the main clinical reasons to use intracanal medicaments are: preservation of the conditions achieved during cleaning a shaping of the root canal when the pulp is vital; control of microorganisms that resist cleaning and shaping of infected canals; control of root resorption; support in the control of persistent exudates; treatment of large periapical lesions; apexification and root perforations.

Trope et al,[12] among other authors, found that root canals with apical periodontitis treated with calcium hydroxide intracanal medicaments have better repair rates than canals treated in a single visit.

In our case, UltraCal XS, a manipulated calcium hydroxide paste, was selected because its action is similar to that of other medicaments in the market:[13] it prevents bacterial growth because of its high pH; it is biocompatible; and it promotes apical repair.

Conclusion

Carefully performed endodontic treatment and the application of antimicrobial agents in the form of irrigants or intracanal medicaments during cleaning and shaping may result in apical repair regardless of lesion size and without surgery.

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