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Nonsurgical endodontic retreatment, first choice in recurrent infections: Case report

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Abstract
Introduction: Nonsurgical retreatment of the canal system has become a routine procedure in modern dentistry, aimed at eliminating bacteria and achieving a three-dimensional seal to eliminate signs and symptoms and heal periapical lesions.
Clinical case description: A 45-year-old female patient presented to a dental consultation due to infection in a previous root canal treatment of the upper right first molar. The patient reported the presence of a sinuous tract for two years. Diagnostic tests revealed positive percussion and palpation, and Grade I mobility. Radiographically, a well-circumscribed radiolucent area was observed at the apex of the palatal root.
Pulp and Periapical Diagnosis: Previously treated tooth with chronic apical abscess. In the first session, the furcation perforation was sealed with bioceramic material, the canals were reopened, and calcium hydroxide intracanal medication was used. In the second session, the medication was replaced, and in the third session, the canals were sealed.
Results: One month after the treatment was completed, considerable healing was observed, with no signs or symptoms.
Discussion: We agree with the report by Matos G and Tanomaru Filho M. (2011) regarding the use of intracanal medication in this case. The advancement of technology has led to the use of different diagnostic methods, such as cone beam computed tomography (CBCT), magnification with a microscope, and rotary retreatment systems that help in more precise preparation with fewer traumatic injuries, as well as the use of various irrigants and irrigation techniques for canal decontamination and biocompatible filling materials with periapical tissue.
Conclusion: Today, we have technology that makes these treatments increasingly easier to perform. Nonsurgical retreatment is an option for tooth preservation, avoiding more radical treatments, such as apical surgeries and extractions, with a demonstrated success rate of 86.8%.

Keywords: Nonsurgical retreatment, calcium hydroxide, bioceramics

Introduction

Endodontic treatment is a nonsurgical procedure with success rates ranging from 86% to 98%. [1] This method is the method of choice to preserving the tooth in an integral manner. However, the presence of clinical signs and symptoms, along with radiographic evidence of periapical bone destruction, indicate the need for retreatment. [2] One of the most common reasons is the inability to eliminate microorganisms from the canal system. The survival of microorganisms after endodontic procedures occurs because chemomechanical instrumentation sometimes fails to reach all parts of the canal system. Other procedural errors include perforations, ledge formations, and transportation of the canals or separated instruments. [3] Nonsurgical endodontic retreatment has become a routine procedure in modern dentistry, aimed at improving the quality of previous treatment, overcoming limitations, eliminating bacteria, and achieving a three-dimensional seal to eliminate signs and symptoms, and heal periapical lesions. The preservation of a natural tooth with a good prognosis is universally accepted as a better choice than its loss and replacement. [4] Retrospective and prospective studies on endodontic retreatment have shown varying results, with success rates ranging from 40% to 85% [5].

A controlled prospective clinical study of 452 teeth with a 2-year follow-up indicated that retreatment achieved a clinical success rate of 86.8%. On the other hand, in the group where the original canal morphology was altered (presence of steps, instrument fractures, zip formations, or perforations), the success rate was only 47%. [6] These results provide evidence that the success of a retreatment depends on modifications to the root canal anatomy caused by the initial treatment. Radiographic evaluation is the primary method used to monitor the outcome of endodontic treatment. However, it is limited by visual interpretation, which is not an objective method and depends on the observer. Another limitation is that radiographs show only two dimensions. A lesion is radiographically visible only if there is significant bone destruction. [7] Today, the technology at our disposal allows investigations that yield reliable and accurate results, such as cone beam computed tomography (CBCT), which provides axial sections and three-dimensional images of the teeth and maxillofacial skeleton. Unlike radiographs, which remain the most commonly used diagnostic method in dental practice, they are limited to two-dimensional images. [8] A literature review was conducted on the most relevant concepts related to nonsurgical endodontic retreatments in high-impact journals such as the *Journal of Endodontics* and *International Endodontic Journal*, among others. These reports indicate that the most common causes of failure of initial root canal treatment are more frequently within the first 24 months, although they can manifest even after 10 years or more. The most recommended follow-up periods are 6, 12, 18, and 24 months. [9] In 76% of failures, operator errors, such as poorly sealed or unsealed canals, perforations, overfilling, and overlooked apical ramifications, were the primary cause. [3] The present research aims to show the methods and tools necessary to develop an appropriate treatment plan to solve the problems presented by the initial root canal treatment.

Case Report

A 45-year-old female patient classified as ASA I [10] presented at the Endodontics Master's Clinic of the Faculty of Dentistry at the Autonomous University of Coahuila, Torreón Unit. The patient's reason for consultation was that her private dentist mentioned that she had an infection in a previous root canal treatment on the upper right first molar (16). The patient reported the presence of a sinuous tract at intervals for two years. During clinical examination, tooth 16 was observed with resin restoration. Both the vertical and horizontal percussion tests were positive, palpation in the buccal area was positive in relation to the apices and palatal area, and Grade I mobility was noted according to the Miller classification [11].

Radiographic examination

Radiographically, previous root canal treatment was performed on teeth 15 and 16 (Figure 1), with the absence of bone crests and a well-circumscribed radiolucent area at the apical area of the palatal root of tooth 16. A CBCT scan was requested to obtain a better analysis and diagnosis of the apparent lesion in the apical area.

In the CBCT scan, the sagittal and coronal sections revealed a well-circumscribed radiolucent lesion around the entire apical portion of the palatal root, corresponding to the PAI Index 4 on the Orstavik Periapical Index Scale [12], characterized by a well-defined radiolucency of small size with no significant bone loss, with short canal filling and a slight canal lumen continuation (Figure 2).

In the coronal and transverse sections of the CBCT scan (Figure 3), a furcation perforation was observed. In Figure 4, the circumference of the lesion on the palatal root is highlighted.

Fig 1: Initial radiograph showing previous root canal treatments

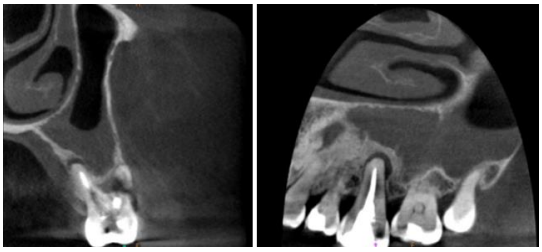

Fig 2: Sagittal and coronal sections of the CBCT scan.

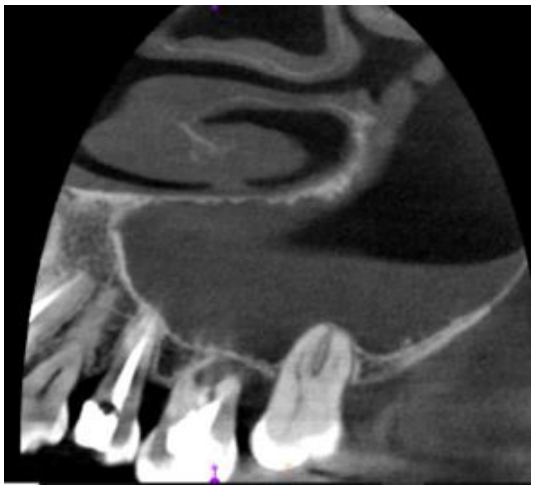

Fig 3: Coronal section

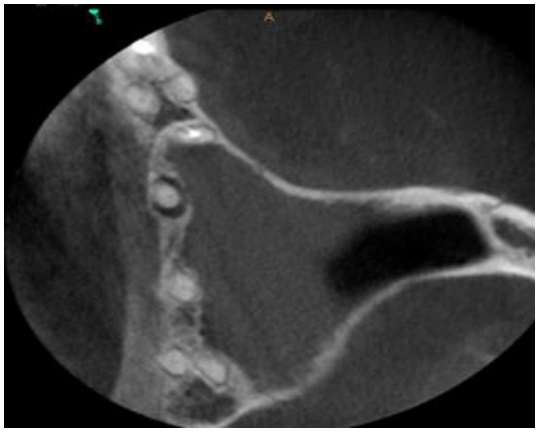

Fig 4: Transverse section.

On the basis of the consensus of the American Association of Endodontists, according to the diagnostic tests conducted and radiographic findings, the pulp diagnosis was a previously treated tooth with a chronic apical abscess as the periapical diagnosis.

Treatment: The furcation perforation was sealed with tricalcium silicate cement (Biodentine), and subsequently, root canal retreatment was initiated.

Treatment process: Furcation perforation sealing

The standard procedure for each group during the first appointment included isolation with a rubber dam and removal of the restoration and root canal filling materials. Chamber access was achieved via a #4 diamond round bur and a linear opening. Upon complete removal of the restoration, gutta-percha material was observed in the middle coronal third. Using heat with a Glick #2 spatula, the excess material was cut, revealing obvious furcation perforation (Figure 5). The decision was made to remove the canal filling material without the use of irrigants that could irritate the periradicular tissue through the perforation. Once the root canal filling material was removed, Hygienic® Fine gutta-percha was placed in the canal entries to avoid sealing the canal entries with the BiodentineTM cement.

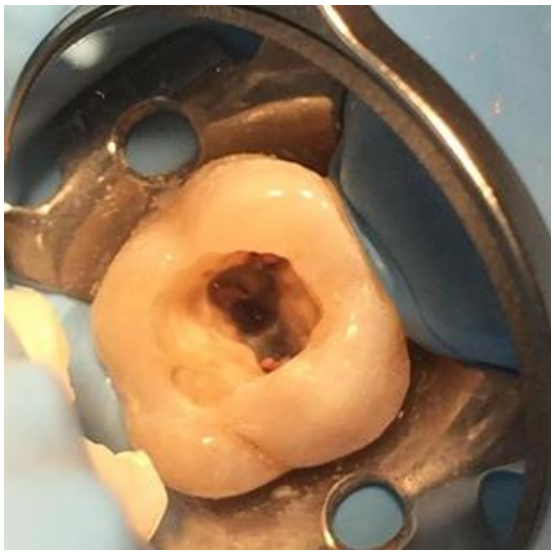

Fig 5: Access to the chamber showing an evident perforation in the pulpal floor.

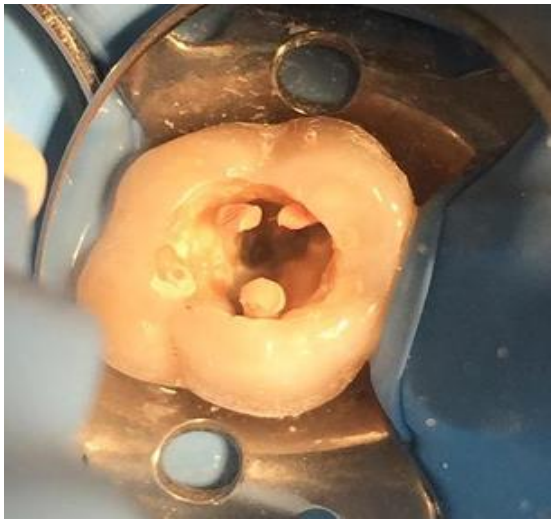

Fig 6: Placement of gutta-percha in the canal entries

With the operative field ready, a BiodentineTM paste mixture was prepared using a digital amalgamator (AM-21 Lorma®) (Figure 7C). Once mixed according to the manufacturer's instructions, a Porta MTA (Figure 7B) was used to directly place it in the perforation, condensing it with a Schilder Plugger (Dentsply) no. 2/4 (Figure 7A).

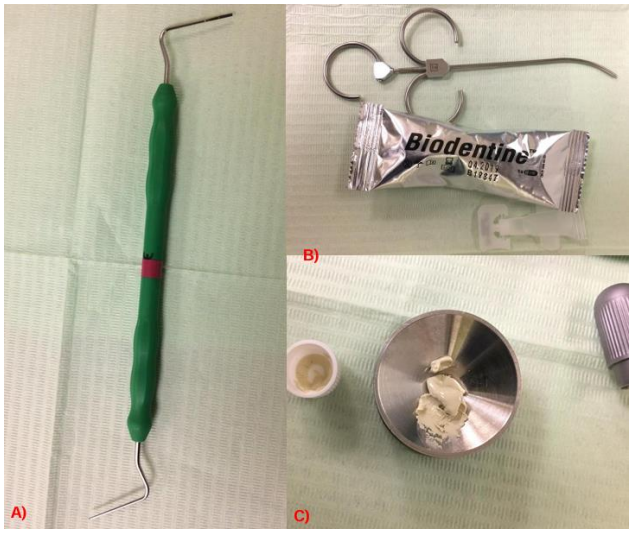

Fig 7: A) Schilder Plugger used for condensation. B) Biodentine capsule, activator ampoule, and Porta MTA. C) Mixed Biodentine ready for use.

Once the material was placed, the gutta-percha was removed from the entrance of the canals to proceed with the endodontic retreatment.

Canal deobturation (ProTaper Retreatment).

Using the D1 file (16 mm) with an active tip allowed us to remove the coronal filling. The D2 file (18mm) with an inactive tip was subsequently used for the removal of the filling in the middle third. We subsequently used the D3 file (22 mm) with an inactive tip for the removal of the apical filling. Once the ProTaper endodontic retreatment system was used, the canals were deobturated. During the removal of the root canal filling material, a large amount of 5.4% sodium hypochlorite solution (NaOCl) was used as irrigation. No chemical solvents were used to remove the gutta-percha or sealer. Apical permeability was achieved in all root canals before cleaning and shaping.

The working length was determined via K-type files (Dentsply) and the Apex ID apex locator (SybronEndo) (Figure 8).

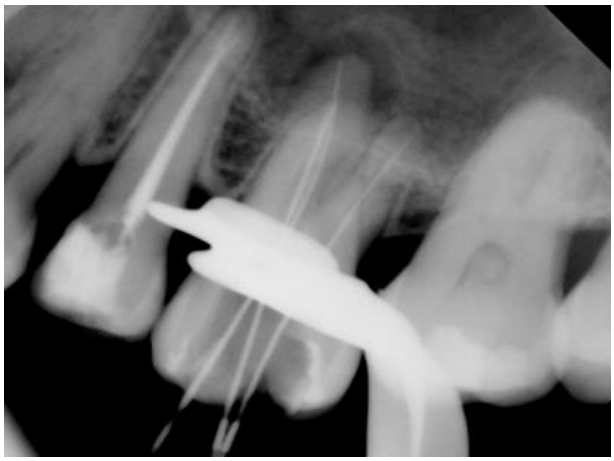

Fig 8: Radiograph with working length

The instrumentation of the canals was performed with the TF Adaptive ML rotary system, instrumenting to the previously determined working length, starting with the ML1 file and finishing with ML2 for the buccal canals, alternating with a #10 K-type file and sodium hypochlorite between each rotary instrument. The palatal canal was instrumented via the same protocol but with the ML3 file. Irrigation was performed with 5% NaOCl after each instrument was used. At the end of the instrumentation, final irrigation was performed with 2.5 ml of 5% EDTA, 2.5 ml of 5% NaOCl, and 5 ml of distilled water.

A mixture was prepared using a viscous vehicle (propylene glycol) and chemically pure calcium hydroxide to act as an antibacterial agent in the root canal. Over three monthly appointments, the canal medication was changed until the patient reported no apparent symptoms.

All the root canals were dried with paper points (Hygienic® Coltene) before the root canal filling procedure. The root canal sealer (MTA Fillapex Angelus®) was introduced into the canal with master cones via a brushing motion. Accessory gutta-percha cones (Fine-Fine Hygienic® Coltene) were used. A total-etch technique (Single Bond 2; 3M ESPE, St Paul, MN) was used for the restoration. A flowable resin composite (Filtek Ultimate, 3M ESPE) was introduced into the pulp chamber as a base material to seal the root canal orifices before incrementally constructing the permanent restoration with composite filling material (Filtek, 3M ESPE), (Figure 9).

Fig 9: Radiograph showing complete root canal obturation and final restoration with resin

Results

The patient was recalled one month after the treatment (Figure 10), where a slight reduction in the radiolucent area in the palatal root was observed. A new CBCT study was requested (Figure 11) to evaluate the progression of the apical lesion and the sealing of the perforation.

Fig 10: Follow-up radiograph one month after endodontic retreatment

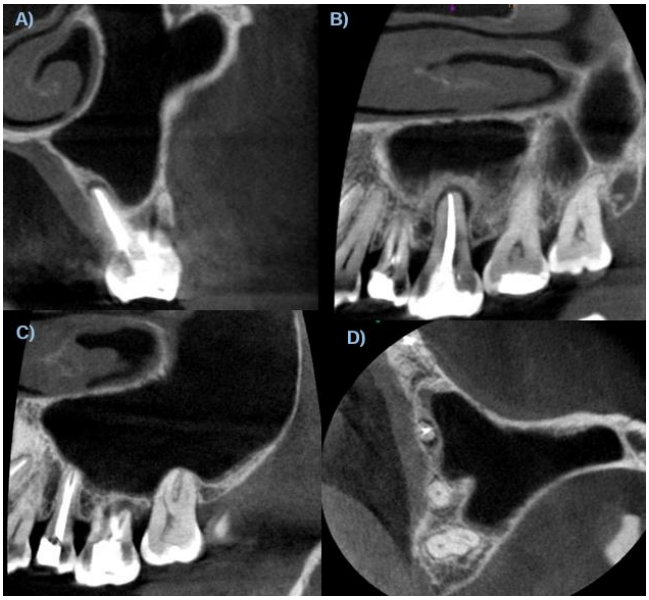

Fig 11: A, B, and D. The obturation of the palatal canal can be observed, sealing the apical portion of the palatal root. C) Furcation perforation completely sealed with Biodentine.

Discussion

The advancement of technology has led to the use of various diagnostic methods such as cone-beam computed tomography (CBCT), magnification with a microscope, and rotary retreatment systems, that facilitate more precise ultrasonic preparation with fewer traumatic injuries, as well as the use of different irrigants and irrigation techniques for canal decontamination, and biocompatible filling materials with periapical tissue to achieve the rehabilitation of dental pieces. Nevertheless, many controversies still exist regarding which retreatment method to use, as well as the technique that provides the most benefits in terms of final results.

In the report by Matos G and Tanomaru Filho M. in 2011, which followed a retreatment case for two years and eight months, they mention that adequate disinfection and the use of calcium hydroxide-based medication prior to obturation promoted a successful resolution of the case. [13] Regarding the use of files, Faria-Júnior *et al.* recently tested a new generation of nickel-titanium rotary files, ProTaper Retreatment, R-Endo, and Mtwo R, for the removal of filling material in retreatment cases, achieving successful outcomes [14].

Conclusion

Endodontic retreatment is a good option when the primary treatment has failed, and there is a desire to preserve the tooth. It still represents the most conservative option for tooth preservation, avoiding more radical treatments such as apical surgeries and extractions. It has been shown to have an 86.8% success rate. It is essential to perform a thorough prior analysis of the case to address the issues of the initial treatment that need correction. The American Association of Endodontists recommends an annual follow-up from the completion of the retreatment. If no symptoms are present in the patient by the fifth year, the retreatment can be considered successful.

Root canal retreatment, when the primary treatment has failed, offers alternatives to correct errors from the first treatment and achieve three-dimensional obturation without the need for surgery or more invasive techniques. Understanding the anatomy and apical morphology of each tooth with precision, having the necessary technology and

knowledge of instrumentation techniques and methods, and having the ability to improve initial treatments are crucial. It is also important to communicate to the patient the advantages, disadvantages, prognosis, and possible alternatives if needed.

When performing retreatment, it is vital to always consider the cause of the failure to eliminate the causal agent and work in an interdisciplinary environment, as a periodontal and prosthetic evaluation may often be needed.

Conflict of Interest

Not available

Financial Support

Not available

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