

Single-session endodontic treatment of six teeth with extensive periapical lesion

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ABSTRACT

This paper aims to report a single-session endodontic treatment of a periapical lesion, while highlighting the effectiveness and safety of the technique. The patient presented with no painful symptoms at the clinic to have his maxillary anterior teeth examined due to trauma suffered two years earlier. Radiographic examination revealed a lesion in the apical periodontium, extending from the region of tooth #13 to tooth #23. The teeth were isolated, and access surgery was performed in all crowns. Cleaning and shaping (6% NaOCl) were carried out with Gattes-Glidden drills with step-back instrumentation from #2 to #4. Catheterization was performed with manual files #25 up to the working length (6% NaOCl), and confirmed with foramen locator. Cleaning and shaping of all root canals were performed with the aid of ProTapers F4 and F5 instruments (Dentsply/Maillefer) (6% NaOCl).

Passive ultrasonic irrigation was performed for 3 minutes in each tooth with continuous irrigation of 17% EDTA and Irrisonic ultrasonic insert (Helse). Final irrigation with 6% NaOCl and drying with paper points were performed. There was placement of methylene blue at 0.05% for 5 minutes on each tooth, followed by laser application (photodynamic therapy) for 80 seconds on each tooth. New irrigation with 6% NaOCl was carried out to remove the remaining methylene blue. Drying with paper points was performed for a second time, followed by filling with gutta-percha ProTapers F5 cones thermoplasticized with gutta-percha condenser #60 and AHPlus paste. In checking the conditions two years later, it was found that the procedure had been performed with integrity, thereby confirming the success of single-session endodontic treatment of infected root canals.

Keywords: Endodontics. Root canal therapy. Odontoplasty.

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Introduction

During day-to-day work, dentists adopt routines that meet their needs and use techniques they deem appropriate in each case based on individualized patient examination and treatment plan based on their technical and scientific competence.

As regards endodontic treatment, disagreement has long endured concerning whether or not it should be held in one or multiple sessions, especially considering postoperative pain and success rate. The difference between the two approaches lies in the presence or absence of intracanal medication of which aim is to enhance disinfection of the root canal system through definitive filling.^{1,2}

A major goal of endodontic treatment is to eliminate microorganisms from the root canal, especially in the event of necrotic pulps. To eliminate microorganisms, mechanical preparation is one of the most important phases. Furthermore, joint action with irrigating solutions and intracanal medications, it provides significant conditions which can alter the microbiota present in the root canal.^{3,4,5}

Traditionally, endodontic treatment in teeth with pulp necrosis has been performed in several sessions, with medication being used between preparation and filling of the root canal, primarily aiming to reduce or eliminate microorganisms and their by-products from the root canal system before obturation. This type of treatment is common and widely accepted. However, in recent years, there have been no significant differences in the effectiveness of antimicrobials in either single or multiple treatments.⁶

Several arguments have been used both against and in favor of this procedure, many of which are backed by pragmatism. Both the complexity of endodontic therapy and the need to monitor the pace of modern professionals and clients require a more detailed analysis of this issue by drawing on literature reviews and case studies. This is the main focus of this study.^{6,7}

Some authors argue that biomechanical preparation and antibacterial irrigating solutions are not effective in ensuring complete disinfection. These authors therefore indicate the use of intracanal medication in multiple sessions in the belief that it is important to achieve disinfection and consequently a better postoperative phase as well as successful prevention and repair of the apical periodontium.⁴

In showing how this clinical case was addressed, it became clear that proper cleaning and shaping of the root canal with the aid of cutting-edge technology is capable of reducing the microorganisms present in the area, in addition to removing the irritants and preventing the exudative seepage resulting from the lesion in the apical periodontium. Moreover, through the three-dimensional obliteration of the root canal system during the filling procedure, tissue regeneration is achieved, thereby promoting healing in a single session.

Clinical case report

The patient, a 29-year-old man, presented at the clinic with no painful symptoms on April 24th, 2010 to have his maxillary anterior teeth examined due to of trauma suffered two years earlier.

Visual examination and palpation did not reveal swelling or gingival abnormality. None of the teeth responded positively to vitality tests with cold or heat. Radiographic examination showed a lesion in the apical periodontium, extending from the region of tooth #13 to tooth #23 (Fig 1).

All teeth were subject to single-session endodontic treatment followed by paraendodontic surgery with the purpose of enucleating the lesion 24 hours later, given that performing the two procedures in a row might be too time-consuming. After anesthesia with prilocaine/epinephrine teeth #13 to #23 were isolated and subjected to surgery to access the pulp chambers.

Thereafter, procedures for cleaning and shaping were performed in crown-apex direction (crown-down) with Gattes-Glidden drills and 6% NaOCl solution, with step-back instrumentation of teeth #2 to #4.

Catheterization was then carried out with manual files #25 (Dentsply/Maillefer) up to the working length (6% NaOCl), which was confirmed with NowApex foramen locator.

Cleaning and shaping of all root canals were performed using ProTapers F4 and F5 instruments (Dentsply/Maillefer), and irrigation with 5 ml of 6% NaOCl (pH 8.0) between instruments.

After this process, Passive Ultrasonic Irrigation (PUI) was performed for 3 minutes in each tooth with continuous irrigation of 17% EDTA and Irrisonic ultrasonic insert (Helse).

The final irrigation consisted of 6% NaOCl solution (pH 8.0), followed by drying with paper points.

Methylene blue at 0.05% was placed for 5 minutes in each tooth, followed by laser application and Dynamic Photo Therapy (DMC) for 80 seconds on each tooth.

Irrigation was once again performed with 6% NaOCl to remove the remaining methylene blue, followed by drying with paper points.

Finally, filling was carried out with gutta-percha ProTapers F5 cones, thermoplasticized with

gutta-percha condenser #60 and AHPlus paste. Temporary sealing was carried out with Coltisol (Fig 2).

The patient did not return for surgery on the following day, and finally showed up on April 25th, 2012, when tissue integrity was observed with total repair of the region where the procedure had been performed, thus confirming the success of single-session endodontic treatment of infected root canals (Fig 3).

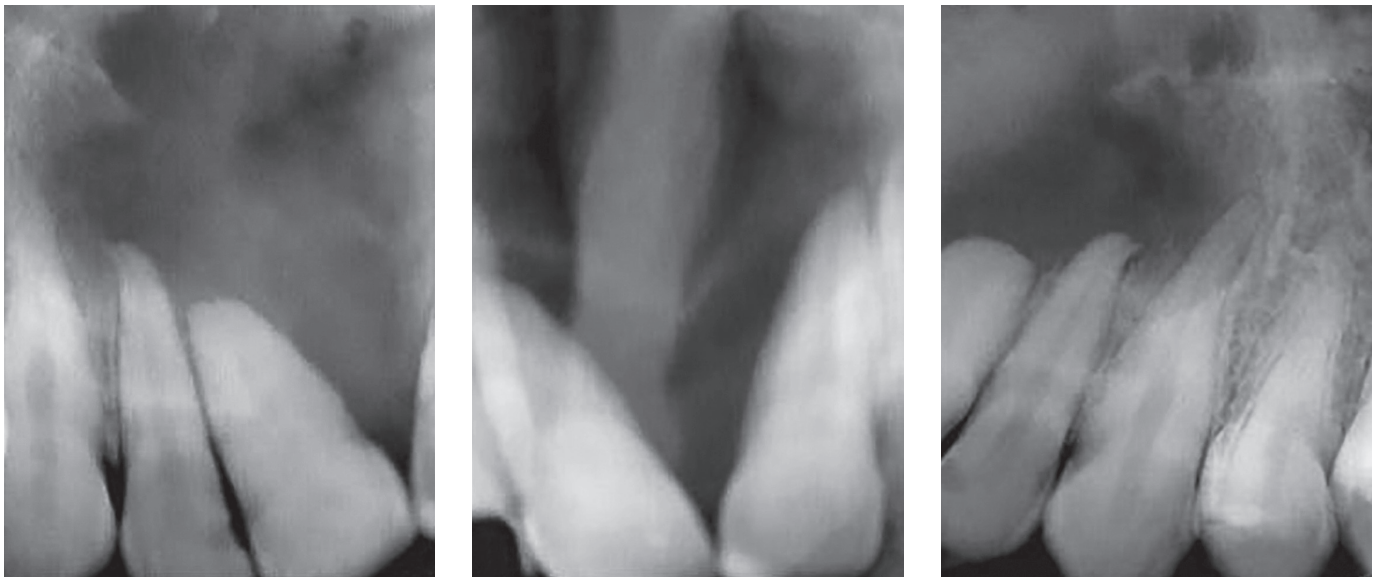


Figure 1. Radiographic images of the region extending from tooth #13 to #23.

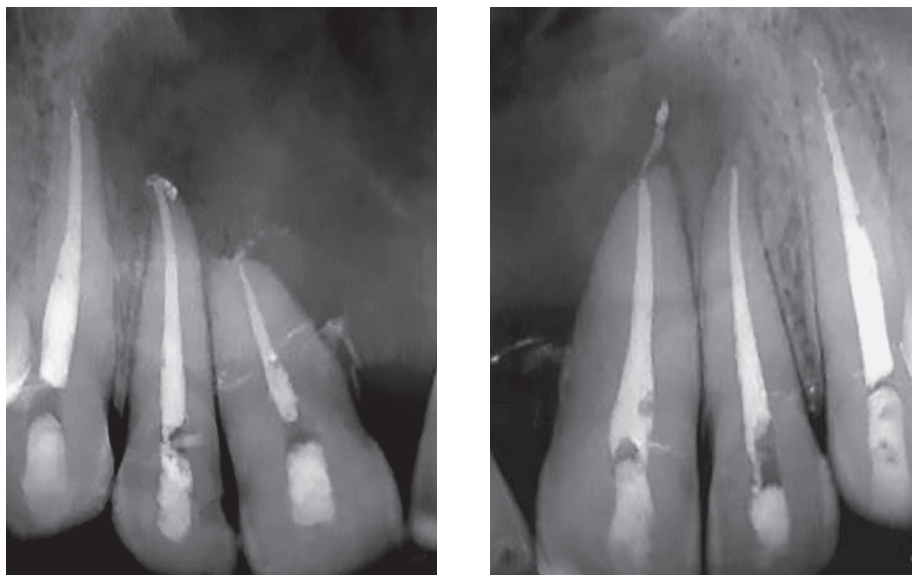


Figure 2. Radiographic images of teeth after treatment.

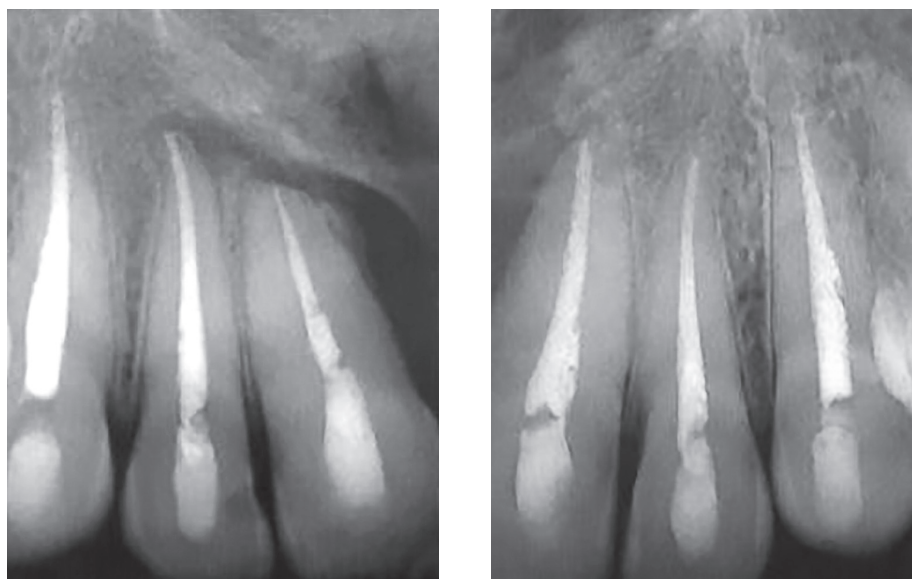


Figure 3. Radiographic images of examination performed two years after endodontic treatment.

Discussion

The literature shows that single-session endodontic treatment has been performed for a very long time. Several authors have conducted studies on single-session endodontic treatment and concluded that root canals can be cleaned just as well in one session as in multiple sessions, and that the differences between the two procedures is statistically insignificant.^{8,9,10}

According to Friedman,¹¹ if instrumentation and irrigation of the root canal are performed with the appropriate technique and proper use of irrigating solutions, removal and/or elimination of all microorganisms from the system can be predictably accomplished in the first visit, which allows treatment to be completed in a single session, thus averting the need for intracanal dressings. Therefore, it was decided to perform all endodontic treatment within a single session, while surgery for the removal of the lesion was scheduled for 24 hours later, since the time required to complete all procedures at once would be too long.

It is a well known fact today that the success of endodontic treatment is closely associated with endodontic infection control. Thus, treating teeth with pulp vitality in one session is widely accepted. However, in cases of pulp necrosis, single-session treatment remains a very controversial issue within the scientific community.¹²

The success rate of endodontic treatment is quite high when therapy is conducted in accordance with satisfactory biological and technical principles. Failures in this

process are related to professional negligence and persistence of microbial infection in the root canal system and periapical region.¹³ Therefore, Photodynamic Therapy (PDT) was applied to all teeth with the purpose of enhancing disinfection of root canals.

Enterococcus faecalis is among the most deleterious microorganisms found in root canal infections, a gram-positive bacterium transiting in the oral cavity of patients with inadequate hygiene. These bacteria can invade the canal at any time, even before endodontic treatment.¹⁴

During endodontic treatment, there was a concern to promote patency and foramen debridement. There is a difference between the prognosis of endodontic treatment in which foramen patency is performed in comparison to treatment in which such patency is suppressed. This procedure takes place as instrumentation advances down to “apical zero,” which is achieved with the aid of a foramen locator. The aim here is to perform biological cleaning, thereby eliminating the infection present in the cement canal.¹⁵

Irrigating solutions with antimicrobial and lubricant potential are used to clean the root canal system. The substances most widely used for this procedure are sodium hypochlorite at concentrations of 2.5% to 5.25% and EDTA at 17%. The former have the ability to dissolve organic debris and kill bacteria. The latter features chelating properties and, for this reason, removes the inorganic part of the smear layer, exposing best access into the dentinal tubules on the canal wall, which improves

disinfection and increases the bonding properties of the filling cement.¹² NaOCl at 6.0%, buffered at pH 8, was used due to a more effective release of active chlorine. Besides, it is not highly alkaline, which makes it a less irritating substance.

Passive Ultrasonic Irrigation with 17% EDTA was required for removal of the smear layer and debris.¹³

In the view of Van der Sluis et al,¹⁶ as well as a judicious selection of irrigating solutions, a sufficient volume of irrigator, a high flow rate and unrestricted flow of the irrigator along the canal walls are crucial for a deep debridement of the root canal system.

The absence of pain and edema, closure of the fistula and absence of exudate, provided the tooth exhibits normal function and physiology, in addition to the disappearance of periapical bone rarefaction, are all clinical and radiographic criteria that point to a successful endodontic treatment.¹⁴

Flare-up or postoperative pain is a frequent and often annoying problem in Endodontics. It emerges during or after endodontic therapy, and in some cases it can occur after an access has been opened without proper root canal instrumentation. The clinical symptoms may be of such magnitude that both the professional and the patient may be baffled.¹⁷

Although the reasons for this painful flare-up are not always clear, a number of assumptions, some of which may be interconnected, are provided and discussed. Among these are the following: (A) changes in the local adaptation syndrome; (B) changes in the pressure of the periapical tissue; (C) microbial factors; (D) effects of chemical mediators; (E) changes in cyclic nucleotides; (F) immunological phenomena; and (g) diverse psychological factors.¹⁷

Extrusion through the apical foramen of microorganisms and their by-products, contaminated dentin shavings, drug substances and filling material, all contribute to the induction of pain. Conversely, prevention is largely related to the professional's compliance with the physical, chemical and biological principles of endodontic treatment.¹²

In some cases, the patient may ascribe postoperative pain to lack of confidence in the professional, thus inducing patient dissatisfaction with treatment. The etiologic factors involved in pain have not yet been accurately determined. It is known, however, that pain intensity depends on the severity of tissue damage whereas

treatment outcome is influenced by the persistence of the source of infection.¹²

When the professional fails to adopt aseptic measures, or these measures are not implemented during treatment, bacteria that were not original components of the endodontic microbiota can be dragged into the canal. If they can survive in this microenvironment, they may likely also cause severe infection.¹²

Several studies have been conducted to determine the best strategy for endodontic treatment in terms of the number of sessions and the various aspects to be considered in this process.^{18,19,20}

Araújo Filho et al,¹⁸ in their clinical and radiographic evaluation of single-session endodontic treatment, found that among 100 cases examined, 87% were successful. They took into account the presence of pain and a comparison of the periapical region with its initial appearance.

In a study on teeth with necrotic pulp, Batista and Berger¹⁹ posited that it is only possible to achieve the elimination of bacteria by combining mechanical cleaning with the germicidal action provided by irrigating solutions, and that the use of such effective medication in the root canal between sessions is an essential complement to the treatment.

Moreover, studies suggest that single-session treatment has many advantages, such as reducing the number of patient visits, eliminating the possibility of contamination in the following session, and the possibility of immediate root canal filling, although it should be stressed that this technique is directly related to endodontic infection control.^{1,20}

Single-session treatment features other advantages besides those mentioned above. It is more affordable to the patient as well as less painful and traumatic than in multiple sessions. However, it should only be undertaken by skilled professionals with extensive clinical experience. Besides, each case must be assessed individually and the technique to be used should be properly selected.

Crown restoration should be performed in a way that provides proper sealing, preventing reinfection of the root canal system and rebuilding the lost tooth structure in order to restore function and aesthetics to the patient.²¹

Furthermore, it is necessary to keep the sealed canal as airtight as possible to create an environment conducive to the repair of a potential apical periodontitis, thus keeping the apical periodontium healthy.²¹

Conclusions

At the end of this investigation, it would be appropriate to return to the initial questions about the viability and quality of single-session endodontic treatment. Several factors must be considered when selecting the technique to be used, including the skill and experience of the operator, the condition of the teeth to be treated, patient's physiological constraints and the anatomical complexity of the root canal system.

In this case report, radiographic examinations supported the choice of single-session treatment, mainly because no painful clinical manifestations were noted during consultation.

All injured teeth were treated and filled within a single session, which reduced the likelihood of infection in later sessions.

Another factor that contributed to the safety of the procedure was the use of techniques recommended for single-session endodontic treatment, i.e., cleaning the

canal in the crown-apex direction (crown-down) significantly reduces the extrusion of contaminated material and minimizes flare-up.

Given the above, it can be stated that, despite controversy in Endodontics regarding single-session *versus* multiple-session treatment, single-session treatment proved successful, as observed in a follow-up examination performed two years after treatment.

This success was achieved thanks to the training of professionals for this type of procedure, advances in the technology and material used in the case, as well as studies that prove the safety of these treatments.

Clinical application

This case report aimed to focus in a safe, straightforward manner on how to perform endodontic treatment in multiple teeth within a single session by relying on the knowledge acquired in the specialized literature and existing technology to achieve therapeutic success.

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