

Iatrogenic apical root perforation performed during retreatment of a mandibular central incisor: A five-year follow-up case study

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ABSTRACT

Introduction: Iatrogenic root perforations occur in approximately 2% to 12% of cases involving inaccurate root canal access, attempt to locate canal orifices, instrumentation or re-instrumentation and bypassing or removal of fractured instruments. When these perforations are performed in the apical thirds, they may even lead to tooth loss due to the greater complexity of treatment. **Objective:** The aim of this paper was to report the occurrence of an iatrogenic apical root perforation during retreatment of a mandibular central incisor. **Methods:** Based on clinical and radiographic examinations, a mandibular right central incisor was diagnosed with pulp necrosis and asymptomatic apical periodontitis. Nonsurgical endodontic therapy was recommended. The final radiographic examination

revealed poor endodontic treatment; for this reason, nonsurgical reintervention was the therapy of choice. The final radiograph showed apical perforation due to deviation near the apical limit. It was therefore decided that the case should be merely monitored. **Results:** Clinical and radiographic follow-ups after 5 years showed the successful outcome of this decision. **Conclusion:** In clinical situations similar to what is shown in this case report, making the correct clinical decision, considering the characteristics of each case, is more important to long-term success than effective action.

Keywords: Root canal therapy. Retreatment. Periapical diseases.

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Introduction

Iatrogenic root perforations are accidents that occur during access, instrumentation/reinstrumentation or attempted bypassing or removal of fractured instruments during endodontic treatment or retreatment.^{3,7,9,15,18}

The scientific literature shows that root perforations located in the apical thirds have less favorable prognoses because of fewer possibilities for effective sealing.^{5,19} Thus, more important than acting effectively is knowing how to make the correct clinical decision, considering all the limitations and difficulties inherent in clinical situations of this type.^{2,13}

With this in mind, the aim of this paper was to report the occurrence of an iatrogenic apical root perforation in the apical third of a mandibular central incisor after retreatment completion. Owing to the peculiarities of the case, it was decided that no intervention should be performed. Clinical and radiographic follow-ups after 5 years showed the successful outcome of this decision.

Case report

A 64-year-old female patient was referred for endodontic treatment of her mandibular right central incisor. The medical history was noncontributory. An extraoral examination revealed no swelling, sinus tracts, or lymphadenopathy. The intraoral examination revealed no swelling or sinus tracts, and all teeth in the region exhibited normal physiological mobility. Periodontal probing depth of teeth was also within normal limits. Palpation of the buccal and palatal aspects of the tooth did not reveal any tenderness. The tooth responded negatively to cold testing (sensitive and lingering) with Endo Ice (Hygenic, Akron, OH, USA), and was slightly sensitive to percussion. Radiographically, a periradicular disease was observed in relation to this tooth (Fig 1A). Based on the clinical and radiographic examinations, the mandibular right central incisor was diagnosed with pulp necrosis and asymptomatic apical periodontitis. Nonsurgical endodontic therapy was recommended.

After infiltrative anesthesia with 4% articaine and epinephrine 1:100,000 (Articaine – DFL Indústria e Comércio Ltda., Rio de Janeiro, Brazil), initial access was performed using 1014 HL spherical burs (KG Sorensen, Barueri, Brazil), complete removal of the roof of the pulp chamber with 3083 bur (KG Sorensen, Barueri, Brazil), and preparation of the canal orifice using

LA Axxess instruments (SybronEndo, Lone Hill, USA). A rubber dam was then positioned and the operative field was cleaned with 2.5% sodium hypochlorite (Formula & Ação, São Paulo, Brazil). After preparation of the cervical and middle thirds with SX, S1 and S2 files (Dentsply/Maillefer, Ballaigues, Switzerland), the working length was determined using an electronic apex locator – Elements Diagnostic Apex Locator – (SybronEndo, Orange County, USA), and instrumentation was carried out using Profile System 04 (Dentsply/Maillefer, Ballaigues, Switzerland), according to the crown-down technique,^{8,14} up to file 35. Irrigation was performed with 2.5 ml of 2.5% sodium hypochlorite (Fórmula & Ação, São Paulo, Brazil) at each change of instruments. After instrumentation, 5 ml of a chelator solution (17% EDTA) were applied for 5 minutes, and 5 ml of saline solution was used to perform a final rinse before drying with paper points. Filling was performed according to the Tagger hybrid technique¹⁶ and with AH Plus (Dentsply DeTrey, Konstanz, Germany). A subsequent temporary sealing was carried out with Cimpat (Septodont, São Paulo, Brazil). Final radiographic examination revealed poor endodontic treatment (Fig 1B); for this reason, retreatment was the therapy of choice.

In the next visit, the preliminary procedures described above were performed, followed by removal of the filling material with Gates Glidden drills 3, 2 and 1, and Hedstroen manual files (Dentsply-Maillefer, Ballaigues, Switzerland). After the filling was completely removed, the working length was again established, showing a slightly shorter reading. In order to expand the instrumentation obtained as a result of the previous intervention, it was decided that manual K-files would be used at the working length, seeking greater apical enlargement. In this second intervention, the last file used was 45.02 (Dentsply-Maillefer, Ballaigues, Switzerland).

Irrigation was performed with 2.5 ml of 2.5% sodium hypochlorite (Fórmula & Ação, São Paulo, Brazil) at each change of instruments. After instrumentation, 5 ml of a chelator solution (17% EDTA) were applied for 5 minutes, and 5 ml of saline solution was used to perform a final rinse before drying with paper points. Filling was performed according to the Tagger hybrid technique¹⁶ and with AH Plus (Dentsply DeTrey, Konstanz, Germany). A subsequent temporary sealing was

performed with Cimpat (Septodont, São Paulo, Brazil). Final radiograph (Fig 1C) showed apical perforation due to a deviation near the apical limit. It was therefore decided that the case should be merely monitored. The 5-year follow-up showed complete healing of the periradicular tissue with no further damage caused by the apical perforation (Figs 1D and E).

Discussion

Apical root perforations occur most frequently during instrumentation/reinstrumentation, or as an attempt to bypass or remove fractured instruments. Whatever the cause, treatment consists of location, decontamination and sealing of these areas with a bio-compatible material.^{13,18}

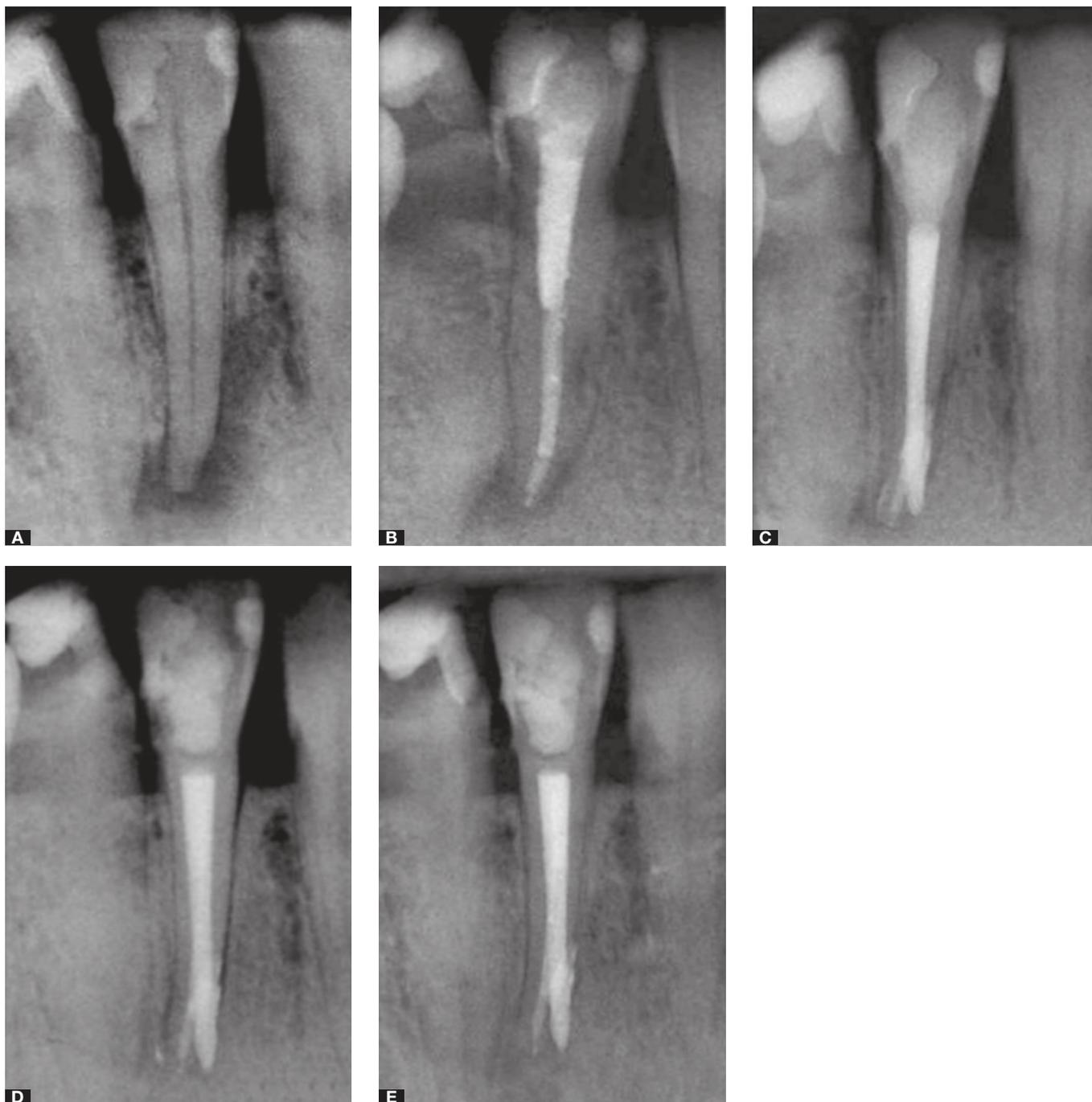


Figure 1. A) Initial radiograph; B) Final radiograph; C) Final radiograph showing deviation and perforation; D) 3-year follow-up; E) 5-year follow-up.

Several *in vitro* and *in vivo* studies have demonstrated the superiority of material such as mineral trioxide aggregate and Super EBA to treat root perforations due to their high biocompatibility.^{4,7,11,12,17,20} However, cleaning and disinfecting these areas is crucial, regardless of the type of sealing material.^{1,6,10} Another highly relevant factor is the time elapsed from the occurrence of the accident to its correction. Most clinical studies published to date consider that the earlier the diagnosis and treatment, the greater the chances of success.^{7,11,12,17,18}

However, in the present case, there was no clinical evidence of communication with the periodontium during the course of retreatment, and, therefore, no previous diagnosis was performed. Consequently, no specific clinical approaches for sealing the perforation were performed because of ignorance of this occurrence. Even though treatment was conducted in a single session, an effective process of cleaning the perforation was carried out by

continuous use of the irrigating solution, and sealing of the perforation was conducted immediately with the filling material. This is in line with previous research that has shown the effectiveness of sodium hypochlorite and gutta-percha for cleaning and sealing root perforations, respectively.^{3,15}

Based on the aforementioned facts, the result observed and the total absence of symptoms after completion of retreatment, it was decided that no immediate intervention would be performed. The radiographic 5-year clinical follow-up shows the success of the case.

Conclusion

Considering the evolution of the present case, it may be concluded that successful treatment of iatrogenic apical root perforations depends on an effective disinfection process and early sealing of the area. However, making the correct clinical decision, considering the characteristics of each case, is more important to long-term success than effective action.

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