

Endodontic regenerative procedures with 2% chlorhexidine and calcium hydroxide: case report

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ABSTRACT

Introduction: Many substances have been used as irrigating solutions to promote pulp regeneration and root development in teeth with incomplete rhizogenesis. The use of 2% chlorhexidine as an irrigating solution in association with Calcium Hydroxide could be an alternative. **Methods:** In the case of the patient, a 13-year-old boy, here presented, tooth 45 with apical periodontitis was treated with 2% Chlorhexidine solution as irrigant adjuvant to instrumentation, in association with Calcium Hydroxide used as a dressing for 14 days. After this period, the canal was cleaned with a physiological solution and under mandibular alveolar anesthesia, a # 70 K file

was used slightly over the apex to cause bleeding. After observing that blood inside the canals had reached the cervical portion. White MTA was placed in the cervical portion of the canal. **Results:** Induced apexification and development of increasing root length and width could already be observed in the three-month control exam, and this continued until the last review in the one-year control exam. No color changes were observed in this follow-up period. **Conclusions:** Chlorhexidine and calcium hydroxide could be used as an alternative to pulp regeneration procedures.

Keywords: Regenerative endodontics, Apexification, chlorhexidine.

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Introduction

In the last two decades many successful cases of pulp regeneration in teeth with necrotic pulp and apical periodontitis have been shown.¹⁻⁴ This relatively new approach promoted apexification, root canal development with increasing root length and thickness. Disinfection of the root canal space with antibiotics has been commonly used.^{1,5,6} Although, the use of antibiotics can lead to resistant bacterial strains and crown discoloration.⁷⁻⁹ To avoid these undesirable effects of antibiotics some authors have demonstrated that a paste consisting of 2% chlorhexidine gel mixed with calcium hydroxide powder can be used for the treatment of immature teeth and with incomplete rhizogenesis.^{7,10,11} Calcium hydroxide, in addition to being bactericidal, has inducing properties of dentin formation, helping to stimulate the apexification and thickening of dentinal walls.^{9,12,13} Mixing chlorhexidine gel with calcium hydroxide may enhance its antimicrobial activity¹³ and the ultrasonic activation of irrigant enhances growth factors release from human dentine that promote odontoblast-like cell differentiation at the dentine interface.¹⁴

The case of a young patient who had an immature tooth with necrotic pulp, reported in this study, describes the treatment performed with 2% chlorhexidine as irrigating solution adjuvant to instrumentation and dressing in paste form consisting of 2% chlorhexidine gel mixed with calcium hydroxide. The success of the treatment could already be observed in the 3-month follow-up review and this continued until the last review in the 4-year control exam.

Case report

The general dentist attended the patient, a 13-year-old boy with the mandibular right second premolar presenting pain and swelling. Procedures of opening and draining the acute abscess were performed. The

tooth remained open, as instructed by the general dentist, who prescribed antibiotics for one week until the patient could come to our office for treatment.

After the treatment options had been explained to the boy's mother, she gave her permission for the regenerative pulp treatment to be performed, and following procedures were carried out.

After irrigation with 5 ml of physiological solution, slight instrumentation was performed with a #70 K file (Dentsply Maillefer, Ballaigues, Switzerland) and 2% chlorhexidine solution (Biodinâmica, Paraná, Brazil) as adjunct to instrumentation. Then, 3 sets lasting 20 seconds each of passive ultrasonic irrigation were made with 2% chlorhexidine solution. After this, final irrigation with 5 ml of physiological solution was made. The tooth was closed with a dressing in paste form consisting of 2% chlorhexidine gel mixed with calcium hydroxide (Biodinâmica, Paraná, Brazil), in the 1:1 proportion. After 7 days, the dressing was replaced, and treatment of the tooth with this medication continued for another 14 days. After this period, the canal was cleaned with a physiological solution and under mandibular alveolar anesthesia, a # 70 K file was used slightly over the apex to cause bleeding. After observing that blood inside the canals had reached the cervical portion, White MTA (Angelus, Paraná, Brazil) was used to fill the canal from the open orifice up to 3 mm above the cervical portion, and the crown was restored with glass ionomer, Maxxion R[®] (FGM, Joinville - SC, Brazil) and photoactivated Luna resin (SDI, Victoria, Australia).

Follow-up control visits were made after time intervals of 3, 6, 9, 12 and 54 months (Fig 1). A post-treatment cone beam computed tomography (CBCT) scan was performed after 54 months (Fig 2). The radiographs demonstrated significant root and dentine development. Furthermore, there was no color change during this period (Fig 3).

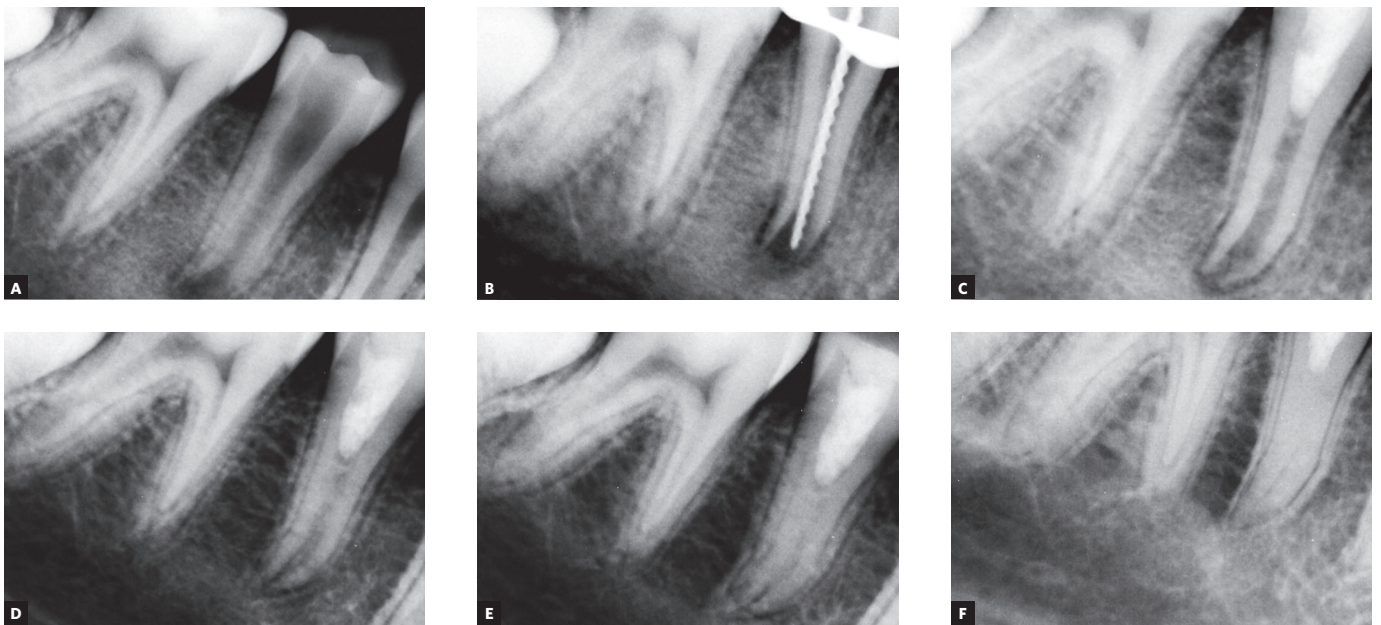


Figure 1. Diagnostic radiograph (A); working length radiograph (B); follow-up radiographies: 3 months (C), 6 months (D), 12 months (E) and 54 months (F).

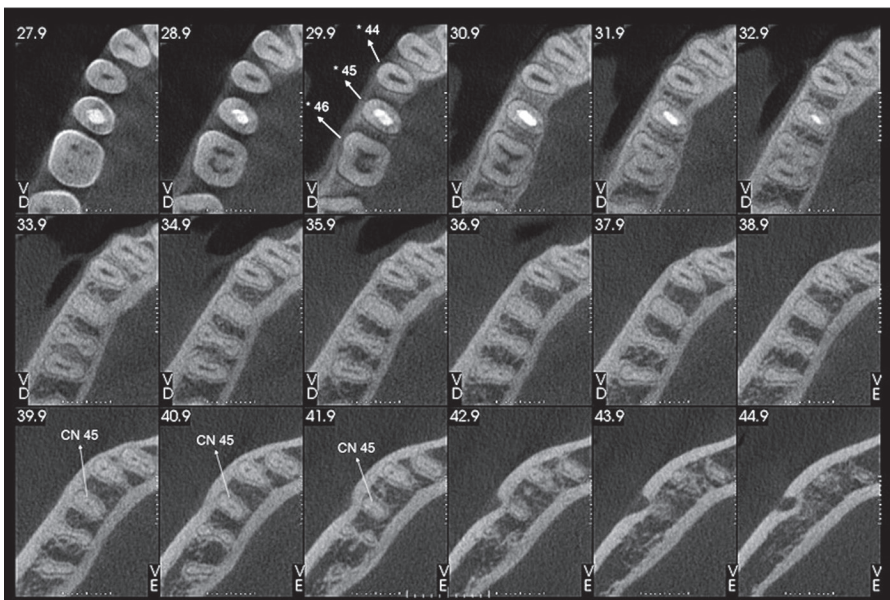


Figure 2. Axial cross sections of cone beam computed tomography in the 54-month follow up.

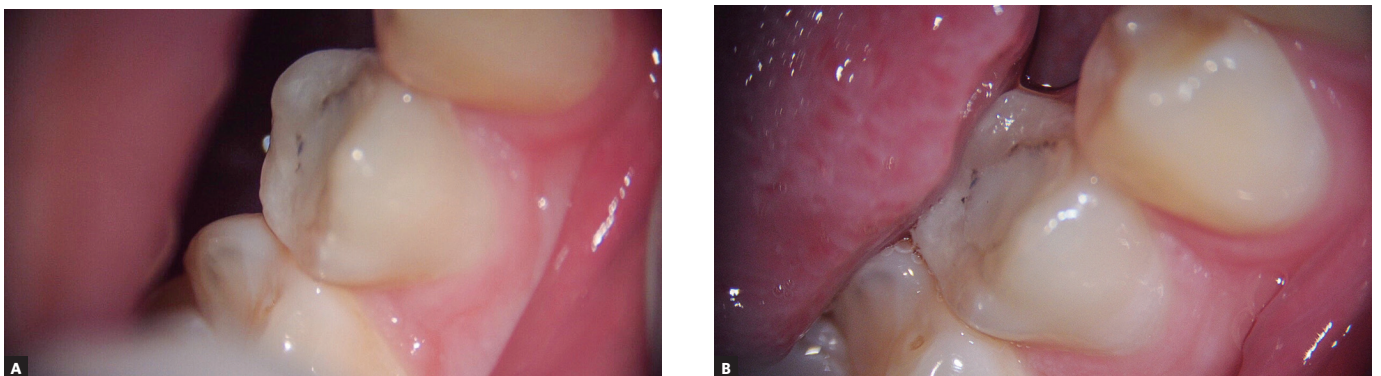


Figure 3. Photographies taken in the one-year (A) and 54-month (B) follow-up showing no color change.

Discussion

Disinfection is an important factor for the success of regenerative procedures in teeth with apical periodontitis (15). The use of high concentrations of sodium hypochlorite and triple antibiotic paste (TAP) has been advocated as the protocol for regenerative procedures. In this case report, however, the tooth remained open for one week; no sodium hypochlorite in high concentration and antibiotic pastes were used. In this study, the 2% chlorhexidine gel mixed with calcium hydroxide was shown to be an alternative to the use of this more common protocol with aggressive substances and antibiotics, which could lead to resistant bacterial strains and coronal discoloration.^{4,8,9}

Other approaches to reaching disinfection and the goal of pulp regeneration could be the construction of a scaffold with the use of platelet-rich plasma (PRP)¹⁵ that could increase the delivery of growth factors, however, this would increase costs and require special techniques. Furthermore, we would

have needed the permission of the young patient's parents and that of patient himself for collecting blood. Another task of pulp regeneration procedure would have been to use the ability of the stem cells to proliferate into the root canals and adhere to dentin. Studies with nanofiber-based drug delivery systems have shown good results.^{16,17}

Conclusion

Within the limits of this case report, the protocol with chlorhexidine and calcium hydroxide was shown to be an inexpensive, uncomplex method for disinfecting the root canal for regenerative procedures. This could have been an alternative to the more expensive and complex methods as PRP and TAP, the former has considered the golden standard method of disinfection. Further histologic researches should be conducted to identify the types of tissue we have to deal with in each technique and their clinical relevance.

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