

# Pulp revascularization: a case report

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DOI: <http://dx.doi.org/10.14436/2358-2545.5.2.074-077.oar>

## ABSTRACT

**Introduction:** Revascularization is an alternative treatment for immature necrotic teeth, with biological basis. Unlike techniques of artificial apical barrier, it allows the continuation of root development and recovery of pulp vitality. **Objective:** To present the importance of diagnosis and treatment plan, and present a treatment protocol that includes pulp revascularization, through a clinical case of an immature necrotic tooth. **Case report:** After passive instrumentation of root canal walls and medication with calcium hydroxide, bleeding was

induced with subsequent clot formation and placement of a MTA barrier. Coronal sealing was performed with composite resin. **Results:** Clinical and radiographic control revealed that the tooth was asymptomatic and the lesion had disappeared. **Conclusion:** It was concluded that this treatment promotes thickening of dentin walls, preventing the tooth from being weakened.

**Keywords:** Apexification. Dental pulp devitalization. Endodontics.

**How to cite this article:** Limoeiro AGS, Santos AHB, Kato AS, Freire LG, Bueno CES. Pulp revascularization: a case report. *Dental Press Endod.* 2015 May-Aug;5(2):74-7.

DOI: <http://dx.doi.org/10.14436/2358-2545.5.2.074-077.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: April 23, 2015. Revised and accepted: August 15, 2015.

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## Introduction

Revascularization is a treatment option for cases of immature teeth with pulp necrosis. An alternative approach with organic bases that unlike the techniques of artificial apical barrier allows the continuation of root development and recovery of pulp vitality. Root canal preparation for revascularization consists in passive chemomechanical preparation performed with manual instruments and auxiliary chemical substances with antimicrobial property and low toxicity, antimicrobial medication placement and subsequent bleeding induction.

Revascularization was introduced as an alternative to apexification from 2001 onwards. Increased thickness of the dentinal wall, closing of the apical foramen and regression of apical periodontitis were observed over a period of five months, evincing the radiographic success of a case of immature tooth with pulp necrosis, in which root canal decontamination was performed with auxiliary chemical substances and antibiotic paste, followed by final coronal restoration.<sup>5</sup>

Conventional treatment of immature teeth is accomplished by inserting long-term calcium hydroxide paste with the aim of inducing the formation of a calcified barrier which will further allow for the subsequent filling of the root canal.<sup>8</sup> An alternative technique to the use of calcium hydroxide is to produce an apical MTA barrier, avoiding the periodical exchange of intracanal medication.<sup>10</sup> However, both techniques have

the same disadvantage of not allowing the continuity of root development, causing the root to remain weakened and thus increasing the risk of fracture.<sup>7</sup>

Revascularization is a treatment option for cases of young permanent teeth with pulp necrosis because it allows for the continuity of root development.<sup>7</sup>

The objective of this study was to present a case report of pulp revascularization, presenting the etiology of the disease, the difficulty establishing an accurate diagnosis and the right maneuvers to be followed by general dentists for the remission of the problem.

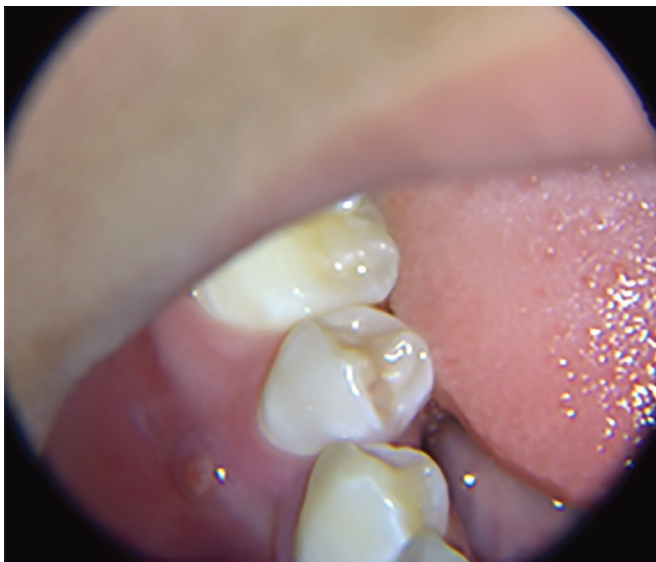
## Case report

A female 11-year-old patient attended the dental office after being referred for endodontic treatment. Because the patient was under age, her mother was asked to sign an informed consent form.

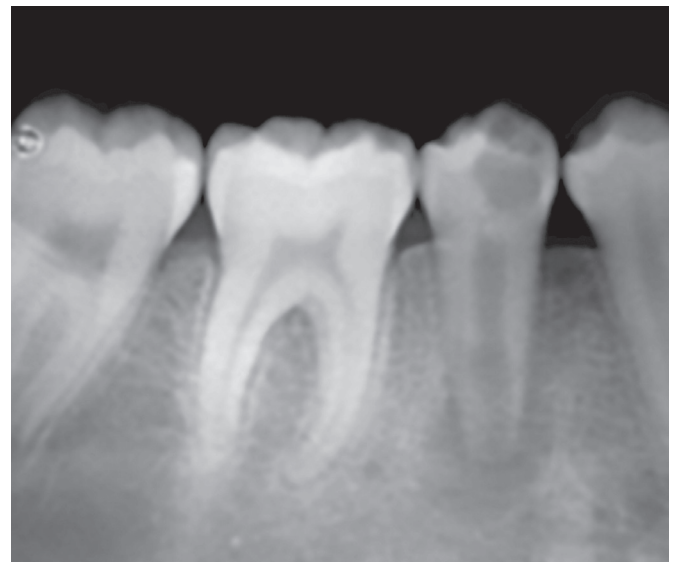
Clinical examination revealed the presence of fistula and lack of response to pulp sensibility tests, percussion, and palpation (Fig 1).

Radiographic examination revealed that tooth #45 had incomplete root formation, caries and periapical lesion (Fig 2). The diagnosis of pulp necrosis with chronic periapical abscess was confirmed. After evaluating the options, the treatment choice was for pulp revascularization.

After anesthesia and removal of the carious tissue, coronal opening was performed with a surgical microscope (Alliance, São Paulo, Brazil), followed by rubber



**Figure 1.** Presence of fistula.

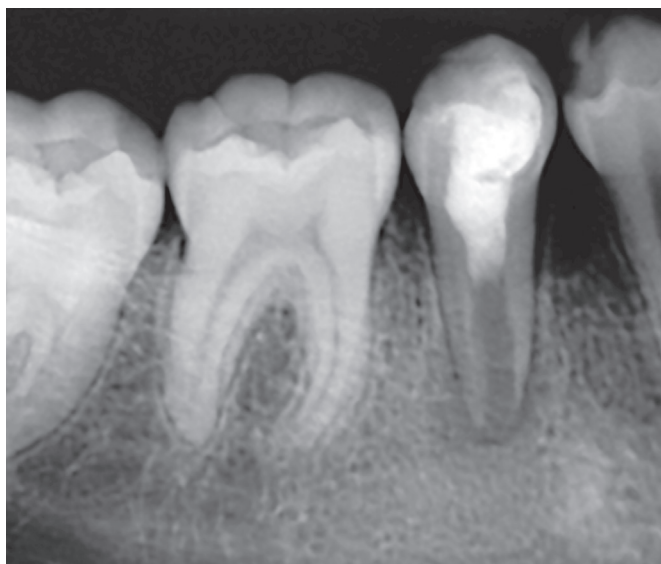


**Figure 2.** Initial radiograph.

dam placement and neutralization of toxic content through biomechanical preparation. The root canal was filled with 2% chlorhexidine gel (Fórmula e Ação, São Paulo, Brazil) and passively instrumented with manual K-files #60, #55, #50 and #45 (Dentsply Maillefer) by means of the crown-down technique up to the apparent length of the tooth subtracted by 2 mm, and irrigation with 20 ml of saline solution. 2% chlorhexidine gel was used as intracanal medication, followed by temporary tooth restoration with composite resin because the patient would travel. After 53 days, she returned and the fistula had not receded.

After anesthesia, the root canal was opened and flushed with 20 ml saline solution for chlorhexidine removal. New passive manual instrumentation was performed with 5 ml of 2.5% NaOCl (Fórmula e Ação, São Paulo, Brazil) between instruments. The root canal was dried with absorbent paper points (Dentsply Maillefer). The intracanal dressing used was calcium hydroxide (Calen, SS White) for 21 days. After this period, the fistula disappeared.

The tooth was irrigated with sodium hypochlorite at 2.5% and the induction of bleeding was performed with a manual instrument #40. After 15 minutes, blood clot was formed and white MTA (Angelus) was placed, followed by coltosol (Coltene), flow composite (Natural flow, DFL) and composite resin (Opallis, FGM) (Fig 3).



**Figure 3.** Final radiograph.

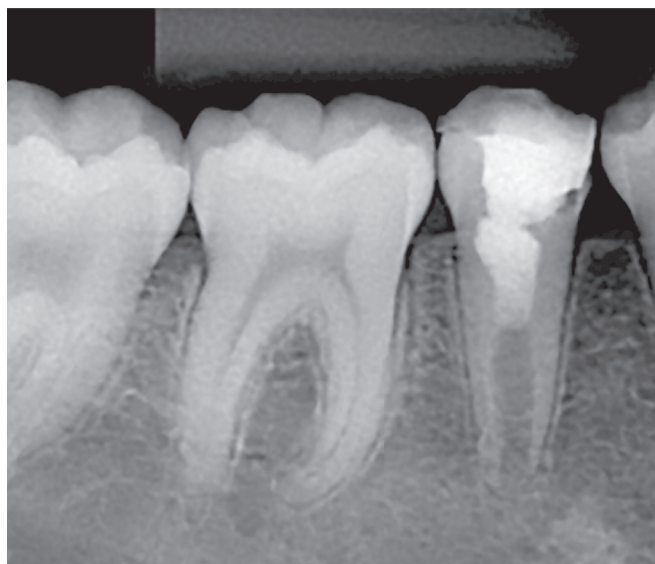
The radiographic control after one year of treatment revealed that the lesion had disappeared, and there was slight thickening of the dentin walls (Fig 4).

## Discussion

The removal of microorganisms by mechanical instrumentation in immature teeth is limited due to thin dentinal walls. Thus, cleaning these canals is generally achieved through irrigation and intracanal dressing.<sup>6</sup>

In cases of pulp revascularization, sodium hypochlorite at concentrations ranging from 2.5 to 6%<sup>5</sup> or chlorhexidine in concentrations of 2%<sup>11</sup> and 0.12%<sup>8</sup> have been used as auxiliary chemical substances, yielding satisfactory clinical results.

For intracanal dressing, various drugs have been tested, with clinical and radiographic success.<sup>5</sup> A mixture of ciprofloxacin, metronidazole and minocycline penetrates in the dentinal tubules and eradicates infected bacteria from the root dentin.<sup>9</sup> Calcium hydroxide is capable of solubilizing bioactive molecules, including growth factors of the human dentin matrix, which, in turn, can stimulate pulp stem cells to differentiate into odontoblast-like cells, thus producing a tissue similar to dentin.<sup>3</sup> On the other hand, Banchs and Trope<sup>1</sup> reported that it is not appropriate to use calcium hydroxide, so as to prevent damage caused to potentially remaining viable pulp tissue and epithelial cell rests of Malassez.



**Figure 4.** Radiographic control after 12 months.

Both calcium hydroxide and triple antibiotic paste, when used as intracanal medication, were effective in assisting the development of the pulp dentin complex.<sup>2</sup> These results were observed when calcium hydroxide placement was limited to the cervical third of the root canal. Clinical and radiographic control periods reported in the literature range from 6 to 26 months, and so do the responses of teeth which also vary.<sup>2,3,4,11</sup> Full root formation of immature teeth with pulp necrosis and periapical lesion can happen after 10 to 13 months after treatment onset.<sup>4</sup>

Teeth with incomplete root formation, necrotic pulp and apical periodontitis or abscess may have five different responses to pulp revascularization treatment: Type I, increasing the thickness of root canal dentin walls and continued root development; Type II, nonsignificant root development, but with closure of the apical foramen; Type III, continued root development, but without closing

the apical foramen; Type IV, calcification (obliteration) of the root canal; Type V, hard tissue barrier formed between the cervical MTA plug and the root apex.<sup>3</sup>

## Results

In the case presented herein, after the period of 14 months, the tooth was asymptomatic and in function. There was a slight thickening of dentinal walls and complete disappearance of the lesion, although complete closure of the apical foramen was not observed. Longer clinical and radiographic control is necessary so as to consider the case a success.

## Conclusion

It was concluded that pulp revascularization is a procedure that promotes thickening of the dentinal walls and closure of the apical foramen, thus preventing the tooth from being weakened.

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