

# Therapeutic proposal for avulsed teeth using calcium hydroxide associated to 2% chlorhexidine gel and zinc oxide

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## ABSTRACT

Tooth avulsion deserves great attention in dentistry due to its esthetic and functional implications. The prognosis of tooth replantation is usually related to the need of endodontic treatment, and several substances have been used as intracanal dressing. The objective of this study was to present a case of a dental replantation that was endodontically treated with a new therapeutic proposal for avulsed permanent teeth that associates calcium hydroxide P.A., 2% chlorhexidine gel and zinc oxide. A 10-year-old patient suffered tooth avulsion of both right and left central incisors due to a bicycle accident. Both teeth were replanted and endodontically treated, with different protocols. The right

incisor was conventionally treated with periodic changes of calcium hydroxide intracanal medication and the left incisor was maintained with the filling paste composed of calcium hydroxide, 2% chlorhexidine gel and zinc oxide during all the period of apexification, without changes. During 3 years of follow-up, both teeth showed absence of symptomatology and apical repair. This intracanal dressing played an important role as a filling paste with effective elimination of microorganisms present in the root canal system, stimulated the formation of a mineralized apical barrier, and stabilized root inflammatory resorption.

**Keywords:** Chlorhexidine. Dental Trauma. Calcium Hydroxide. Intracanal Dressing.

**How to cite this article:** Marion J, Nagata JY, Senko RAG, Lima TFR, Soares AJ. Therapeutic proposal for avulsed teeth using calcium hydroxide associated to 2% chlorhexidine gel and zinc oxide: case report. *Dental Press Endod.* 2012 July-Sept;2(3):48-53.

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» The authors report no commercial, proprietary or financial interest in the products or companies described in this article.

Submitted: August 07, 2012. Accepted: November 20, 2012.

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## Introduction

Dental trauma may be considered a dentistry urgency condition since its consequences may damage pulp and periodontal tissues and cause irreversible injuries that may lead to tooth loss.<sup>1</sup> The prevalence of dental trauma is still considered high, affecting 13-30% of permanent dentition in young patients, being upper central incisors the most frequently traumatized.<sup>2,3,4</sup> The treatment of this injury is complex and requires multidisciplinary planning. With this, the prognosis is directly related to conduct adopted in the moment of traumatic accident.<sup>5</sup>

Dental trauma affects not only hard tissues and pulp, but also periodontal tissues, isolated or in association. Considering the diversity of trauma modalities, it is observed that tooth avulsions present more severe consequences, being external inflammatory resorption and replacement resorption the most common complications.<sup>6</sup> The mechanisms involved are little defined, however it is known that extra-alveolar time and storage medium are the main factors related in the progression of resorption.

Treatment protocol of avulsed teeth is contradictory. According to International Guide of Dental Trauma, it is suggested the reposition of the tooth, stabilization with flexible splint, which avoid excessive movement during healing period.<sup>7</sup> Clinical and radiographic follow-up are very important considering preventive diagnosis of pulp necrosis and root resorption would direct the professional to rapid intervention with endodontic therapy.<sup>8</sup> During endodontic treatment in replanted tooth, it is recommended the use of intracanal dressing to complement disinfection, paralyze or prevent inflammatory resorption,<sup>9-14</sup> and stimulates mineralized barrier formation in immature teeth.<sup>16-21</sup> Meantime, intracanal dressing dissolve inside root canal, and some authors recommend periodic changes of this in a period of one to six months.<sup>22,23</sup> Recently, a new therapy has emerged for the treatment of avulsed teeth, which associates calcium hydroxide, 2% chlorhexidine gel and zinc oxide.<sup>24,25</sup> This association allows the formation of an obturation paste that is kept in root canal during long periods, not being necessary to perform periodic changes.

Considering this new proposal, the aim of this study is to present a case treated with a new therapeutic

protocol, composed of calcium hydroxide, 2% chlorhexidine gel and zinc oxide as an obturation paste, without periodic changes in an avulsed tooth.

## Case report

A 10-year-old female patient was referred to Dental Trauma Service of Piracicaba Dental School (FOP-UNICAMP) for evaluation of upper right and left central incisors. The parents reported that patient suffered a bicycle fall in the previous month. In the accident moment, there was tooth avulsion of left central incisor and extrusion of right central incisor. The avulsed tooth was kept in dry conditions for 60 minutes and for 30 minutes in milk. Immediate attendance was performed by a dentist that replanted left incisor and repositioned right incisor. After this, it was confectioned a flexible splint.

After 30 days, the patient was attended in Dental Trauma Service of Piracicaba Dental School. It was observed negative responses of right and left central incisor to cold sensitivity test (Endo-Frost, Roeko™, Germany), and patient reported pain on vertical percussion. It was also noted that left incisor presented crown discoloration and that flexible splint was not removed. Radiographic exam revealed immature teeth and radiolucent image suggesting root inflammatory resorption in the left central incisor (Fig 1). Considering clinical and radiographic exams, teeth were diagnosed with pulp necrosis.

Patient's parents were clarified about the complications of late replantation of the avulsed tooth and agreed with the proposed treatment. It was proposed an obturation paste composed of calcium hydroxide (Biodinamica™, Ibiporã, Brazil), 2% chlorhexidine gel (Endogel, Itapetininga, Brazil) and zinc oxide (Biodinamica™, Ibiporã, Brazil) in 2:1:2 proportion, without periodic changes, which was suggested by Soares<sup>24</sup> and Buck,<sup>25</sup> to induce apical closure of traumatized teeth and prevent or paralyze root resorption.

Initially, flexible contention was removed and then it was performed cavity access, isolation with rubber dam, neutralization of toxic content and crown-down chemical-mechanical prepare with gates-glidden burs numbers 5, 4 and 3 (Dentsply Maillefer™, Ballaigues, Swiss) in the cervical and middle thirds of right central incisor. Working length was established with periapical radiographs with a K-file #35 (Dentsply Maillefer™,



**Figure 1.** Initial radiography: It is observed immature teeth and external root resorption on the upper left central incisor.

Ballaigues, Swiss) introduced inside root canal. Apical instrumentation was performed manually till k-file diameter of #50 (Dentsply Maillefer™, Ballaigues, Swiss). During chemical-mechanical prepare of 2% chlorhexidine gel (Endogel™, Itapetininga, Brazil) it was used as chemical substance which was changed in each instrument change, followed by copious irrigation with 5 mL sterile solution. After these procedures, it was observed presence of exudate inside root canal, being used intracanal medicament composed of calcium hydroxide (Biodinamica™, Ibioporã, Brazil) and 2% chlorhexidine gel (Endogel™, Itapetininga, Brazil). The tooth was sealed with composite resin (Z250, Filtek 3M Espe™, Sumaré, Brazil).

The same protocol composed of cavity access, isolation with rubber dam and decontamination was performed in left central incisor. After this, the root canal was dried with absorbent paper points (Konne™, Belo Horizonte, Brazil) and filled with the obturation paste composed of calcium hydroxide (Biodinamica™, Ibioporã, Brazil), 2% chlorhexidine gel

(Endogel, Itapetininga, Brazil) and zinc oxide (Biodinamica™, Ibioporã, Brazil). Paste was manipulated in 2:1:2 proportion, in consistency similar to coltosol and inserted with condensers sized medium and fine medium (Konne™, Belo Horizonte, Brazil) in the whole extension of root canal. Canal filling was conferred with periapical radiographs, followed by sealing with coltosol (Coltene/Whaledent™, New Jersey, USA) and restored with composite resin (Z250, Filtek 3M Espe™, Sumaré, Brazil) (Fig 2).

After one month, patient missed the appointment and returned only one year later. In the radiographic exam, it was noted apical closure of both right and left central incisors, presence of obturation paste in the left incisor and stabilization of inflammatory resorption (Fig 3). Soon after, it was planned obturation of right central incisor and conservation of obturation paste on left incisor.

For the obturation of right incisor (Fig 4), intracanal medicament was removed using k-file number #35 (Dentsply Maillefer™, Ballaigues, Swiss) in working length, in association with decontamination with 2% chlorhexidine gel (Endogel™, Itapetininga, Brazil) and irrigation with sterile saline solution. Smear layer was removed with 3 mL of EDTA 17% (Biodinamica™, Ibioporã, Brazil) for 3 minutes, followed by drying root canal with medium paper points sized #55 (Konne™, Belo Horizonte, Brazil). Obturation cement was Endomethazone (Septodont™, Saint-Maur-De-s-Fosse's, France) through lateral condensation technique.

After these procedures, it was emphasized to the patient the importance of clinical and radiographic follow-up. Patient returned to follow-up and after 3 years it was not observed clinical pain on percussion neither to palpation, and it could be noted the presence of obturation paste in all the extension of left central incisor (Fig 5).

## Discussion

The prevalence of dental trauma is high, mainly between children and young adults.<sup>2,3</sup> Some etiological factors are very common such as falls, bicycle accidents, sports practice and aggression.<sup>26,27</sup> In the present case, dental trauma occurred in a 10-year-old patient due to a bicycle fall.

An immediate conduct front a dental trauma may influence significantly its prognosis, and incorrect



**Figure 2.** Intracanal dressing in the right central incisor and obturation paste in left central incisor.



**Figure 3.** Periapical radiograph one year later.



**Figure 4.** Obturation in right central incisor.



**Figure 5.** Radiograph follow-up after 3 years.

treatment may determine future complications.<sup>6</sup> In avulsion cases, immediate replantation refers to the better option of treatment and factors that may interfere in the prognosis are: Stage of root development, extra-alveolar time, storage medium and immobilization.<sup>28-33</sup> Studies report that after 30 minutes of extra-alveolar period, periodontal ligament cells become non-vital and it is possible to initiate root resorption process. In the present case, it is believed that long periods of extra-alveolar time in dry conditions and delay to seek endodontic treatment contributed to necrosis and development of inflammatory root resorption.<sup>21</sup>

Many therapeutic protocols have been proposed to minimize complications after tooth replantation, and some authors<sup>23,34,35</sup> proposed periodic changes of intracanal medicament in variable intervals. Recently, an obturation paste composed of calcium hydroxide, 2% chlorhexidine gel and zinc oxide without periodic changes was proposed as an alternative to avulsed teeth treatment with both immature and completed developed apexis. This association was also studied *in vitro* and demonstrated antimicrobial activity and capacity of keeping alkaline pH.<sup>36-38</sup> Literature reports demonstrated that this association presents high capacity of diffusion in root dentin, producing bacterial inhibition in external root surface.<sup>39,40</sup> In the present case report, obturation paste was inserted in left central incisor, and in right central incisor it was not possible due to presence of exudate, which prevented immediate insertion of the paste. Considering it, right central incisor was dressed with calcium hydroxide and 2% chlorhexidine gel.

Patient did not attend to follow-up visits due to personal reasons, returning to Dental Trauma Service

one year after the beginning of the treatment. According to Soares,<sup>24</sup> obturation paste may be kept for long periods of time inside root canal without changes, promoting decrease in clinical symptoms and signals, with exception of replacement resorption which is a progressive process. This protocol also is supported by Chawla;<sup>41</sup> Felipe et al;<sup>23</sup> Steiner et al,<sup>42</sup> that advocated the maintenance of intracanal medicament for long periods of time.

Obturation was performed only in right central incisor, after being confirmed presence of mineralized tissue barrier in the apical region. It was decided to maintenance of obturation paste in left incisor, because according to Buck,<sup>21</sup> the association of calcium hydroxide, 2% chlorhexidine and zinc oxide acts as an temporary obturation in avulsed teeth, remaining inside root canal for long periods of time. In addition, this author reinforced some advantages of this paste such as reduction in clinical attendance visits, low costs, and the maintenance of teeth and periodontal structures till future rehabilitation with implants, when replantation was unsuccessful.

## Conclusion

The paste composed of calcium hydroxide, 2% chlorhexidine and zinc oxide may be used as an obturation paste and it proved to be a promising alternative with satisfactory results for avulsed permanent teeth. The present case report showed absence of clinical signals and symptoms in the treated tooth. In addition this paste remained without dissolution for 3 years. More studies are necessary to prove the efficiency of this paste in the treatment of permanent traumatized teeth.

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