Repair of apical root resorption associated with periodontitis using a new intracanal medicament protocol

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Abstract: Endodontic therapy is indicated for cases of traumatic tooth dislocation associated with pulp necrosis and/or inflammatory resorption. Here we describe the management of a maxillary left lateral permanent incisor that suffered lateral luxation, leading to pulp necrosis and root resorption, in a 13-year-old boy. The traumatized tooth was treated successfully by intracanal medication with calcium hydroxide, 2% chlorhexidine gel and zinc oxide for 12 months without any need to change the dressing, followed by conventional root canal filling. The post-operative course was uneventful and a stable clinical outcome was obtained with evidence of periapical lesion repair and stabilization of the resorption process. (J Oral Sci 56, 311-314, 2014)

Keywords: calcium hydroxide; intracanal medication; chlorhexidine; dental trauma.

Introduction
Any delay in the treatment of dental trauma may influence the pulpal and periodontal prognosis, leading to post-traumatic complications such as pulp necrosis, inflammation and root resorption (1). Such sequelae may be prevented if patients seek immediate dental treatment and are followed up continuously. In severe cases, lack of treatment generally leads to pulp necrosis followed by the development of periapical lesions and root resorption.

Teeth with chronic periapical lesions resulting from dental trauma are at risk of apical external root resorption (2). In these situations, endodontic therapy must be initiated as soon as possible to eliminate irritant factors and stabilize the resorption process. Endodontic treatment creates conditions necessary for periapical repair, and it has been reported that this may be achieved through chemo-mechanical preparation (CMP) and the use of intracanal medicaments (ICM) (3). Application of ICM between CMP sessions acts as a complementary factor for elimination and reduction of microorganisms, preventing or stabilizing root resorption, inducing the formation of dentin and promoting periapical tissue repair (4). After root canal decontamination and use of ICM, the traumatized root canal may be conventionally obturated. Depending on certain conditions such as root development and the presence of exudates, the timing of obturation may need to be delayed. In these situations, ICM must be performed repeatedly until apical closure and disappearance of exudates. Repeated ICM presents certain difficulties such as lack of patient cooperation, long-term weakening of the root considering the hygroscopic and proteolytic properties of calcium hydroxide Ca(OH)₂, an increased risk of fracture, and pulp space...
contamination (5). Considering the disadvantages of repeated ICM for traumatized teeth, it has been performed using an obturation paste composed of Ca(OH)$_2$, 2% chlorhexidine gel (CHX) and zinc oxide (6,7), which does not require repeated renewal.

Considering this promising ICM alternative for traumatized teeth, we applied it for the repair of a large periapical lesion associated with apical inflammatory root resorption, and here we report our experience.

**Case Report**

A 13-year-old boy was referred to a private endodontics clinic (CMH), having suffered a bicycle fall 36 months previously. Clinical examination revealed an enamel/dentin fracture of the maxillary left lateral permanent incisor (#22) with restoration and no pulpal exposure. The crown showed slight discoloration and the tooth had remained asymptomatic up to the time of initial presentation. The cold-thermal pulp test (Endo Frost, Roeko, Langenau, Germany) gave a non-vital result, and periapical percussion and palpation tests indicated sensitivity. The affected tooth had an associated palatal sinus tract and showed mobility. Radiographic examination detected no alveolar root or bone fractures and an open apex, probably due to inflammatory root resorption as a consequence of the dental trauma, with a large periapical lesion (Fig. 1). These clinical and radiographic data indicated that tooth #22 had suffered lateral luxation and fracture to the enamel and dentinal crown.

At the first visit, after administration of local anesthesia, the tooth was isolated with a rubber dam and an access cavity was prepared with high-speed burs. When the pulp chamber was accessed, a purulent exudate was observed. After copious irrigation with saline solution...
(SS) the working length was checked using an apex locator (VDW Gold; VDW GmbH, Munich, Germany) and confirmed radiographically (Fig. 1). CMP was performed with CHX (Endogel, Itapetininga, SP, Brazil) as an auxiliary chemical substance and a 25/0.06 Mtwo rotary file (VDW GmbH). The CHX gel consists of a gel base (1% Natrosol, hydroxyethylcellulose, pH 6-9) and chlorhexidine gluconate, with an optimal pH range of 5.5 to 7. The tooth was copiously irrigated with SS during CMP. Afterwards, 3 mL of a solution of 17% EDTA (Odhacam/Dentsply, Rio de Janeiro, RJ, Brazil) was applied, and finally the root canal was irrigated with 5 mL of SS.

Afterwards, the root canal was dried and ICM was applied using a mixture of Ca(OH)$_2$ (Biodinâmica, Ibiporã, PR, Brazil), CHX and zinc oxide (Biodinâmica) in a proportion of 2:1:2, being inserted into the root canal in small increments using an endodontic condenser (Fig. 2a-2c). The tooth was then coronally sealed with coltosol and composite (Fig. 3).

The patient was followed up for clinical and radiographic evaluation. No clinical symptoms were recorded during recalls. A gradual reduction of the periapical lesion was observed at the 3-month (Fig. 4a), 6-month (Fig. 4b) and 12-month follow-up points (Fig. 4c). The ICM did not need to be changed during recalls. After 12 months, there was radiographic evidence of ICM dissolution. At this time, a barrier of MTA (MTA Angelus, Angelus, Londrina, Brazil) was inserted up to the apex (Fig. 5a), allowing root canal obturation with gutta-percha. After obturation, the crown was definitively restored using composite (Fig. 5b). Figure 6 shows a periapical radiograph after 24 months of follow-up, with no radiographic evidence or any clinical symptoms of periapical disease.

**Discussion**

Endodontic therapy is indicated for cases of traumatic tooth dislocation involving pulp necrosis and/or inflammatory resorption. Most authors have recommended the use of Ca(OH)$_2$, which may be associated with different vehicles, and should be applied 3-4 weeks prior to root canal filling (8). According to Andreasen and Andreasen (9), in cases of apexification it is not always necessary to renew the Ca(OH)$_2$ dressing, since a single application should be enough to trigger the formation of an apical barrier. Other clinical studies have indicated that a very broad root apical foramen or the presence of exudate in the periapical region increases the drug dissolution rate and makes periodic exchange necessary (10). However, proponents of this idea differ in opinion regarding the period and frequency for ICM changes, and radiographic evidence of ICM dissolution. Soares et al. (7) suggested a new protocol for ICM with Ca(OH)$_2$, CHX and zinc oxide, which proved to be effective for treatment of traumatized teeth, either with or without complete root formation, as in cases involving immature teeth. In the present case, it was decided that this ICM could remain in the root canal for a long period without any need to change it, thereby eliminating the major cervical weakness resulting from constant changes in medication. As shown in Fig. 4c, there was radiographic evidence of ICM dissolution after 12 months, but it was also possible to observe periapical lesion repair. Thus it was decided to proceed to conventional root canal filling using a plug of MTA, a well-established material for this purpose.

There are several protocols for the treatment of teeth...
with pulp necrosis and incomplete rhizogenesis, including approaches to achieve revascularization. However, it is important to evaluate the advantages and disadvantages as well as the indications and contraindications of each protocol, and to decide the most appropriate treatment for each individual patient. The ICM used in the present case is applicable regardless of root development, being a low-cost, high radiopacity mineralizing material that is easy to use and does not require periodic changes of dressing.

References