Apexification with MTA for traumatized tooth: a case report

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ABSTRACT

Introduction: The treatment of traumatized young teeth requires special attention due to the possible presence of incomplete apex and thin dentin walls, which may hamper or compromise the conventional endodontic treatment. Therefore, it is necessary the accomplishment of a procedure that induces the formation of a mineralized barrier with the aid of biocompatible materials, such as calcium hydroxide and Mineral Trioxide Aggregate (MTA). **Objective:** To report a clinical case in which it was held apexification with MTA buffer on a traumatized maxillary lateral incisor. **Methods:** The chosen treatment protocol was perform the proper root canal chemical and mechanical disinfection followed by apexification with MTA in order to create an apical artificial osteoconductive barrier. **Results:** The use of MTA as filling material in incomplete apex showed to be efficient due the successful resolution of the case. **Conclusion:** The treatment protocol as effective and allowed the maintenance of the tooth in the arch exercising its primary functions such as aesthetics and chewing.

Keywords: Endodontics. Root Canal Obturation. Wounds and Injuries.

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Introduction

One of the possible consequences of the trauma on young permanent teeth is pulp necrosis. If the tooth presents incomplete rhizogenesis, the endodontic treatment technique must be held in a way to promotes the root development at the expense of the Hertwig epithelial sheath when this has viable cells (apexogenesis), or through the employ of calcium hydroxide to occur hard tissue deposition in the apical region (apexification).[1] The apexification is an apical closure induction procedure, in which is inserted a biocompatible material in the apical canal third in order to induce mineralized tissue formation, that is, to create a barrier and induce the closing of the apical foramen, thus avoiding the gutta-percha extravasation of the filling to the periapical tissues and bone.[2]

Despite the high success rates obtained with the formation of a mineralized tissue barrier, through the employ of calcium hydroxide paste, the long treatment time allied to the possibility of reinfection and root weakening have motivated the search for other biocompatible materials and that allow the execution of the treatment in one or two sessions.[3] Therefore, the employ of the mineral trioxide aggregate (MTA) has been suggested as a treatment modality for teeth with immature apices and pulp necrosis.[4]

The MTA has been highlighted by its biocompatibility, because it does not have a carcinogenic or mutagenic potential,[5] by stimulates the dentin neoformation and by promoting adequate sealing, preventing microleakage.[6] It overcomes, therefore, the main deficiencies of calcium hydroxide, which are the solubility and the lack of mechanical resistance. The MTA is a gray or white colored powder, with thin hydrophilic particles, composed mainly of tricalcium silicate, dicalcium silicate, tricalcium aluminate, tetracalcium alumina-ferric, dihydrate calcium sulfate and bismuth oxide. It is resistant to compression and has a prey time of around 2 hours and 45 minutes.[7] The formation of apatite deposits, during the maturation process of the MTA, promotes the filling of gaps during the material contraction phase, improving the frictional resistance of the MTA to the walls of the root canal.[8]

The use of MTA as an apical artificial osteoconductive barrier in the apexification process becomes even more common and indicated, with clinical success in humans, seeking to the faster conclusion of endodontic treatment.[9] In this context, the present study aimed to present a clinical case in which, by means of the apexification technique in an upper lateral incisor, who suffered trauma.

Case report

Female patient, 21 years, looked for the clinic of the Institute of Research and Education - IRE Palmas (TO), reporting as the main complaint, the not finalized endodontic treatment in the tooth 22. During the anamnesis was reported the trauma history for more than ten years and without present symptomatology. When performing the clinical examination, was not observed any change in the adjacent regions to the tooth, the absence of symptoms and negative response to pulp sensitivity test (cold) and the use of orthodontic braces, being diagnosed pulp necrosis. An initial periapical radiological examination was carried out, in which was noted the presence of root reabsorption and associated periradicular lesion (Fig 1).

Figure 1. Periapical radiography of the tooth 22, presenting periradicular lesion and apical reabsorption.

In the same session, infiltrated anesthesia was performed followed by the absolute isolation for the coronary opening (the orthodontic wire was removed to aid in the absolute isolation). Then, the pulp chamber was irrigated copiously with chlorhexidine gel at 2% (formula&ação, São Paulo, Brazil) and saline solution. The root canal exploration was done with the aid of the manual rasp K # 15 type (Dentsply, Maillefer, Ballaigues, Switzerland) at 3 mm from the tooth apparent length, making worth the initial radiograph. The working length was confirmed by foraminal locator and the instrument that better fitted the canal, in this length, was a K # 50 type (Dentsply, Maillefer, Ballaigues, Switzerland).

The canal preparation was delicate until the # 55 rasp and chlorhexidine gel at 2% (formula&ação, São Paulo, Brazil) was used as an irrigator. Then the canal was dry with sterile absorbent paper cone # 55 (Dentsply Maillefer, Ballaigues, Switzerland). Soon after this process was used EDTA 17% (formula&ação, São Paulo, Brazil) for three minutes, with mechanical ultrasound agitation (Enac, Tokyo, Japan). Irrigation was performed using saline solution, to remove the 17% EDTA and drying with absorbent paper cone number # 55 and filled with dressing delay with base of calcium hydroxide Calen® (SS White), followed by Coltosol (Vigodent, Rio de Janeiro, Brazil) and Glass Ionomer (Maxxion R, São Paulo, Brazil) (Fig 2).

In the second session, performed after 15 days, the patient reported the absence of symptomatology. The calcium hydroxide was removed with the aid of a manual rasp K # 55 type, irrigation with chlorhexidine gel 2% and saline solution. Was used the Easy Clean tip (Easy dental equipment, Minas Gerais, Brazil) to aid the chlorhexidine and saline solution in the calcium hydroxide removal. After noted the medication removal, the root canal was dried with absorbent paper tips # 55 and inserted in the same EDTA 17% for three minutes with mechanical ultrasound agitation (Enac, Tokyo, Japan). After this process was promoted irrigation with saline solution, to remove the 17% EDTA and dried with absorbent paper tips.

The filling was performed by stages, the MTA was introduced by small layers with the aid of a compactor type Schilder, at each layer of MTA introduced and compacted, a radiographic take with the aim to verify if the MTA filled the entire root canal. In this process was verified that the MTA did not adequately fill the root canal. Thus new compaction was performed. In the final radiography, it was verified complete filling of the conduit leaving the MTA below the amelo-cement line, later was introduced Coltosol (Vigodent, Rio de Janeiro, Brazil) and Glass Ionomer (Maxxion R, São Paulo, Brazil) 3).

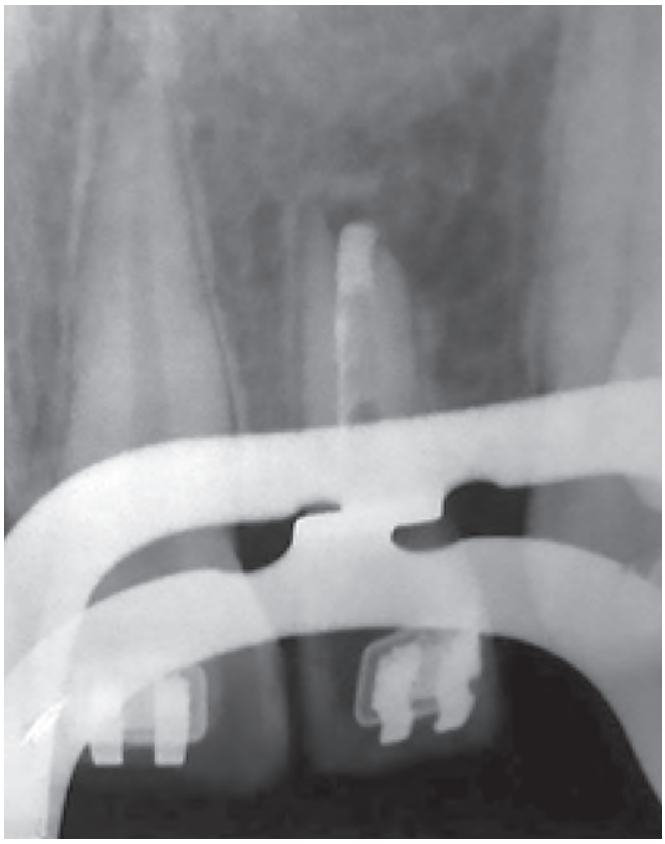

Figure 2. Periapical radiography showing intracanal medication filling with calcium hydroxide base.

Figure 3. Periapical radiography of the tooth 22, showing case finishing after the apical tampon was made.

Discussion

The apexification is the treatment performed in young permanent teeth, with pulp necrosis, to induce apical closure by stimulating the formation of a mineralized tissue, with the purpose of complementing the development of the root and allow the filling of the root canal.[2] The calcium hydroxide and MTA are apexification substances of choice due to their biological compatibility, bactericides properties, and mineralization inducing.[4]

In this study, the employ of the intracanal medication of calcium hydroxide base paste, between sessions, to complement the disinfection and/or mineralized tissue deposition through its antiseptic effect, bactericidal action and high pH, corroborated.[10,11] Due to the release of hydroxyl ions, there is inactivation of the intracellular and extracellular enzymes, disfavoring bacterial survival. However, other authors affirm that there are no advantages in performing exchanges of calcium hydroxide paste during the treatment of depulped teeth and contaminated canals.[12,13]

Regarding the clinical case presented, it is important to make some considerations about the use of the dressing with calcium hydroxide, at the choice by the MTA, as well as the prognosis for the treatment performed. Although, previous use of calcium hydroxide dressing has facilitated greater MTA leakage, we opted for the delay dressing with that substance for 15 days, to enhance the intracanal infection control.[13] The 17% EDTA was used for three minutes before the application of intracanal medication, in all sessions, as well as before of the definitive filling of the root canal, in order to remove the smear layer, because several works have shown that its removal is reached with the use of this drug.[14,15,16]

Studies have shown that MTA is a biocompatible material, with an osteoinductive capacity able of promoting adequate marginal sealing and present antimicrobial effect.[17] The treatment of immature depulped teeth, the most favorable prognosis occurs with the apexification stimulated by the MTA, which presented greater resistance to displacement with a thickness of 4mm when compared to 1mm. According to this work, it was chosen to fill the root canal with the MTA, so that the MTA layer was of greater in thickness and that it could exert its properties throughout the root conduit.[18]

The moisture present in the periodontal tissues can provide the necessary means for that the MTA adaptation happens over the walls of the apical region, and also happens to prey expansion, justifying its use in the present case, since it is a tooth with an incomplete apex, location of difficult to control the moisture.[19] In the presented case also was opted by the MTA employ because its radiopacity is higher to the dentine and bone tissue, MRI, Super Eba and gutta-percha, providing diagnostic observation, which makes it the material of choice.[5] In order to explain the induction mechanism of MTA mineral formation, concluded that even the MTA with no calcium hydroxide in its composition, was able to form mineralized tissue due to the presence of calcium oxide, which, when reacting with the periapical tissues, forms the calcium hydroxide.[11]

In concern of the difficulties of working the MTA with aqueous vehicle (distilled water), due to its initial prey time and, also to its difficulty of insertion, because, when manipulated with this vehicle, the MTA presents with a little agglutinable and sandy aspect. In this clinical case, condensers of the type Schilder[21] were used to aid in the insertion of the material. To verify if the material was adequately filling the root conduit, radiographs were performed and analyzed. In case of MTA's compaction failure, new material insertion was performed.[20,21]

According to Namazikhah,[21] is important to note that the MTA, when used in environments with inflammation, may suffer interferences in its physicochemical properties, making an acidic pH to prevent the prey of the MTA and reduce its strength and hardness. However, in situations in which the factors that initiate or perpetuate the inflammatory process are removed, as in the presented case, there is a possibility of, in a non-long period of time, the environment will return to its normality.

Despite the advantages and limitations of the MTA cited previously, several studies,[5,20,21] when analyzing the biological behavior of the materials employed in the teeth sealing with incomplete apex, the MTA has shown similar behavior or less toxic than the others. It proves its great ability to repair, as well as justifies its employ in the treatment of teeth with incomplete root formation and incomplete apex.

Conclusion

The treatment protocol chosen seemed to be satisfactory and adequate for the clinical case presented because it allowed the resolution and maintenance of the tooth exercising its functions regarding aesthetics and chewing. Thus, the implemented treatment can be indicated for the treatment of teeth with incomplete apexes and with the periradicular lesion.

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