An Atypical Case of Partial Displacement and Wash-out of the Mineral Trioxide Aggregate-based Sealer in Endodontic Surgery

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ABSTRACT

This clinical report described an atypical case where the mineral trioxide aggregate (MTA)-based sealer added with 20% calcium hydroxide was used for retrograde filling. The patient was subjected to endodontic surgery to remove persistent apical lesion. After the apicoectomy and apical cavity preparation using an ultrasonic device, MTA-based sealer (MTA Fillapex) added with 20% calcium hydroxide (w/w) was used for retrograde filling. After 48 hours, the radiographic analysis showed partial displacement and wash-out of sealer. The case was only clinically controlled and no surgery was performed. After 10 months, the postoperative control showed reduction of periapical radiolucent image and absence of symptoms, radiographic and clinical signs, presented bone periradicular repair showing partial absence of the sealer in cavity retrograde.

Keywords: Calcium hydroxide, Calcium release, Endodontics, Flow MTA, pH, Surgery.

How to cite this article: Guiotti FA, Kuga MC, Magro MG, Venção AC, Tonetto MR, Jordão-Basso KCF, Bandeca MC, Dantas AAR. An Atypical Case of Partial Displacement and Wash-out of the Mineral Trioxide Aggregate-based Sealer in Endodontic Surgery. World J Dent 2015;6(2):108-111.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Different materials are employed for the retrograde filling.¹ The mineral trioxide aggregate (MTA) is the most recommended due to its satisfactory biological properties, although presents critical drawbacks regarding handling property, such as easy displacement of retrograde cavity,

sandy property and wash-out tendency.^{2,3} These properties may adversely interfere with the clinical success of the endodontic surgery.^{3,4}

It had been proposed MTA associations with other materials in order to solve these problems, such as calcium chloride, polymers and resins.^{2,5,6} New materials containing calcium silicate were developed from these associations, some material are used as light cured liners for indirect pulp capping and as obturation sealer for the root canals.⁶

Mineral trioxide aggregate Fillapex (Angelus, Londrina, PR, Brazil) is an MTA-based sealer for the root canals obturation, but presents excessive flow and large setting time.⁷ These properties facilitate the sealer extrusion beyond the radicular apex during endodontic filling, especially in immature apex and/or apical large foramine cases.^{7,8}

So, in order to avoid these clinical incidents and to reduce the excessive flow, 10% calcium hydroxide (in weight) has been proposed in the sealer.⁸ It increases the sealer consistency, favors the clinical handling without significant changes in its properties of calcium release and pH.^{7,8}

The insertion of MTA cement in the radicular apical cavity in teeth with small apices and/or prepared using ultrasonic devices is a very difficult procedure.³ However, if a larger amount of calcium hydroxide (about 20% in weight) is added to the MTA Fillapex, the sealer presents suitable consistency to endodontic surgery and good clinical applicability and is a good option for the retrograde filling, as previous pilot tests had shown.

Thus, the aim of this case report was to describe an atypical clinical situation of a upper right lateral incisor with an apical endodontic radiolucent lesion submitted to surgery with retrograde filling with MTA-based sealer (MTA Fillapex) added with 20% calcium hydroxide (w/w). The radiographic control after 48 hours showed that the sealer was partially displaced from the retrograde cavity. However, after 10 months of follow-up, the radiographic evaluation presented periradicular bone repair and almost total elimination of the displaced material.

CASE REPORT

A 35 years old female patient reported an endodontic retreatment of the upper right lateral incisor carried out

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about 1 year ago. However, the symptoms of spontaneous pain, tooth sensitivity to vertical percussion and to palpation at alveolar mucosa next to the root apex were still persistent. The patient also related accidental trauma at the same place and the endodontic treatment of other upper incisors.

The alveolar mucosa presented normal features and sensitivity to digital palpation (Fig. 1A). Radiographic evaluation showed a radiolucent image at the upper right lateral incisor region and absence of endodontic filling in the radicular apical third (Fig. 1B). The other upper incisors presented endodontically treatment properly performed (Fig. 1C).

The selected treatment was the endodontic surgery with retrograde filling. After the local antisepsis and local anesthesia using 2% mepivacaine associated with

epinephrine 1:100.000 (Mepiadre; DFL, Rio de Janeiro, RJ, Brazil), a Luebke-Ochsenbein design flap was performed, the gingival margin was not involved and vertical incisions were performed in the distal face of the upper right canine and in the distal face of the upper left incisor (Fig. 2A). The divulsion was mucoperiosteal using the Freer 187-2 soft-tissue elevator tip (Golgran, São Caetano do Sul, SP, Brazil) (Fig. 2B).

The buccal bone face was partially destroyed (Fig. 2C). The bone cavity extension was performed with 699 carbide bur under irrigation with saline solution, allowing the radicular apex exposure and the removal of the periradicular lesion with a Lucas 86 curette (Golgran, São Caetano do Sul, SP, Brazil). Then apicectomy was performed with the 699 bur, perpendicular to the root long axis. The retrograde

Figs 1A to C: (A) Initial clinical case, (B) periradicular lesion image and (C) endodontically-treated teeth

Figs 2A to D: (A) Luebke-Ochsenbein flap, (B) mucoperiosteal flap, (C) partial destruction of the osseous cortical and (D) ultrasonic tip in retrograde cavity

cavity was prepared with P1 ultrasound tip (Helse, Santa Rosa de Viterbo, SP, Brazil), at the potency 2 of ultrasound unit (Various II; NSK, Tokyo, Japan) (Fig. 2D).

The MTA-based sealer (MTA Fillapex, Angelus, PR, Brazil) was added with 20% calcium hydroxide (Synth, Diadema, SP, Brazil) and a homogeneous compound was obtained. Following this, it was inserted into the retrograde cavity with a modified condenser. A radiographic was immediately taken to verify the reliability of the retrograde filling (Fig. 3A). The Luebke-Ochsenbein flap was repositioned over the alveolar bone and the suture using polyglecaprone 25 synthetic monofilament suture (Monocryl; Johnson & Johnson, São Paulo, Brazil) was performed.

After 1 week, the suture was removed and a new radiographic was taken. In this moment, in radiographic analysis was observed the partial displacement and wash-out of the retrograde filling in the retrograde cavity (Fig. 3B). The patient presented no symptoms and without clinical signs of immediate surgical failure. After 1 month at the postoperative control, a new radiographic revealed similar image like 7 days after the surgery (Fig. 3C).

After 6 months of radiographic control, the clinical case showed that partially the sealer was reabsorbed and only fragments remained in the periradicular region. The remaining sealer in the retrograde cavity showed

the same previous features (Fig. 3D). After 10 months, a new radiographic revealed practically total resorption of the displaced obturation filling and an advanced process of bone formation at the endodontic surgery region (Fig. 4A). The patient reported no more spontaneous pain or sensitivity to vertical percussion. No clinical significant changes were observed in the alveolar mucosa (Fig. 4B).

DISCUSSION

This case report described an atypical case of partial displacement and wash-out of the MTA-based sealer added with 20% of calcium hydroxide of the cavity retrograde, but with satisfactory clinical and radiographic success in the postoperative control. Mineral trioxide aggregate cement is one of the most recommend materials in problems resolution in endodontics.^{2,10} However, it presents some physical properties that hinders its clinical handling.^{3,9,11,12}

So, the chosen treatment was to add 20% calcium hydroxide in the MTA-based sealer (MTA Fillapex) to facilitate the sealer insertion into the retrograde cavity. The incorporation of 10% calcium hydroxide in the MTA Fillapex sealer reduced its flow without significant changes in pH and calcium release from the sealer.⁸ Low concentrations unfeasible this material for retrograde filling because its flow is similar to the sealer used in root canals obturation.⁷

The basic composition of the MTA Fillapex is silicate calcium, salicylate resin, natural resin and bismuth.¹³ The MTA cement contains bismuth as radiopacifier in its composition.^{2,13} However, this substance reduces the biological compatibility of MTA.¹⁴ Therefore, as the calcium hydroxide is the final product of MTA hydration reaction and its good biological properties are already known, it is a good substance to increase the final consistency of the MTA Fillapex.^{2,15}

The Sealapex (SybronEndo, Orange, CA, USA) is an endodontic sealer containing salicylate resin and calcium in its composition and presents high solubility.¹⁶ Mineral trioxide aggregate Fillapex also presents high solubility and similar composition to Sealapex and sandy surface

Figs 3A to D: (A) Immediate radiograph after endodontic surgery, (B) partial displacement and wash-out of the sealer after 1 week, (C) 1 month control and (D) 6 months control

Figs 4A and B: (A) Ten months control, local bone repair and the almost complete resorption of the sealer and (B) alveolar mucosa after 10 months

after its final set.¹⁷ In present clinical case, the incorporation of calcium hydroxide may have increased its solubility and facilitated the partial displacement of the retrograde filling of the retrograde cavity.

Despite of the partial displacement and wash-out of the retrograde filling, after 10 months of postoperative control, a decrease of the periapical radiolucent image was observed. An adequate endodontic obturation and/or the presence of the remaining retrograde filling, about 2 mm from the root apex, may have contributed to the apical bone repair, once these conditions favor the repair process after endodontic surgery.¹⁸

The sealer resorption image may be associated with its fragmentation in not visible particles in the radiography image, mainly because the MTA Fillapex presents relatively low radiopacity and the incorporation of 20% calcium hydroxide could negatively interfered in this property.¹⁹ Consequently, due to its high solubility and reduced radiopacity, it was observed a progressive disappearance of the sealer in the periapical region.

Despite the MTA Fillapex presents good biological properties, the addition of 20% calcium hydroxide is questionable due to the risk of material displacement in the retrograde cavity. Further studies should be conducted to improve the handling of the MTA-based cements for endodontic surgery use.

CONCLUSION

The MTA-based sealer (MTA Fillapex) added with 20% calcium hydroxide, when used as retrograde filling material has the risk of partial displacement and wash-out of the retrograde cavity. However, if there is partial persistence of the retrograde filling in the retrograde cavity, there is high probability of periradicular bone repair.

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