Nonsurgical endodontic management using MTA for perforative defect of internal root resorption: report of a long term follow-up

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Internal root resorption is an uncommon lesion following a dental injury. The use of mineral trioxide aggregate (MTA) is a conservative approach to repair lesions with periodontal communication. This case report presents a long-term follow-up of a nonsurgical endodontic management using MTA for perforative defect of internal root resorption. During the endodontic treatment, the granulation tissue was removed and the root canal prepared. Calcium hydroxide was placed as a temporary dressing for 30 days. After this period, the root canal space and the perforation defect were filled with MTA. The clinical findings and periapical radiographs indicated success of treatment until 2 years of follow-up. However, the radiograph after 8 years showed an extensive radiolucent area in the middle third of the root with separation of the apical and coronal root segments. These findings were observed more accurately by using cone-beam computerized tomography. (Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2010;110:784-788)

Clinically, internal resorption is commonly an asymptomatic condition that is detected upon routine evaluation of radiographs. Radiographic examination reveals a round-to-oval radiolucent enlargement of the pulp space. The margins are smooth and clearly defined with distortion of the original root canal outline. 1 When the lesion is symptomatic, clinical features vary from a small defect at the gingival margin to a pink coronal discoloration of the tooth crown. 2,3 The process of resorption involves a complex interaction of inflammatory and resorbing cells, resulting in the formation of multinucleated giant cells and resorption of dental hard tissues. 4

The treatment of this condition should be initiated as soon as possible to prevent an eventual root perforation.

In cases without perforation, the complete removal of the resorptive tissue from the root canal should be performed to prevent further loss of hard tissue. 1,4 However, if the internal resorption has extended and reached the external root surface, a pathway between the root canal and the periodontal space is present and destruction of the adjacent periodontal tissues may occur. In this case, root canal treatment should be followed by repair of the perforation. 4,5

An available material for repair of this defect is mineral trioxide aggregate (MTA). In recent years, several reports show the success of MTA for the surgical or non-surgical treatment of perforation and internal root resorption. 6–10 The present case report of an 8-year follow-up describes a nonsurgical endodontic management using MTA for restoring a perforative defect caused by internal root resorption. Radiographic and cone-beam computerized tomographic (CBCT) assessment were performed during the follow-up period.

CASE REPORT

A 45-year-old man was referred for evaluation of a right maxillary central incisor that presented with a radiolucency in...
the root canal, as observed in a periapical radiograph. The patient reported a traumatic injury to this tooth 20 years before during a soccer match. His medical history was non-contributory. Clinical examination revealed localized swelling on the mucosa over the root area. The tooth did not respond to thermal or electric pulp tests. Radiographic examination revealed a well circumscribed oval radiolucency in the middle third of the root (Fig. 1, A). Based on the clinical and radiographic findings, the lesion was diagnosed as a perforating internal root resorption. A treatment plan was presented to the patient including nonsurgical root canal therapy and repair of the perforation with an orthograde approach with gray MTA (Angelus Soluções Odontológicas, Londrina, PR, Brazil). A poor prognosis was considered owing to the extension and location of the resorptive lesion. The patient agreed with the proposed treatment.

During the first session, the tooth was isolated with rubber dam and endodontic access performed. Afterward, a chemomechanical preparation using the crown-down technique was performed. The working length was established at 21.0 mm using a #130 K-file (Dentsply/Maillefer, Ballaigues, Switzerland; Fig. 1, B). Preparation was always performed under irrigation with 2.5% sodium hypochlorite solution followed by smear layer removal with a 14.3% EDTA solution (pH 7.2) for 3 minutes. Granulation tissue was removed in the root canal using a lengthy dental excavator (#18 Dullex; SS White, Rio de Janeiro, RJ, Brazil). Calcium hydroxide solution was used to control bleeding at the perforation. A calcium hydroxide paste (Calen, SS White) was applied as a temporary dressing, and the tooth was provisionally restored with glass ionomer. After 30 days, the root canal was reopened and the calcium hydroxide paste replaced by gray MTA-Angelus. MTA was inserted into the root canal with an MTA carrier, and it was vertically condensed with Schilder pluggers (Odous, Belo Horizonte, MG, Brazil). Thus, the root canal space and the resorption defect were completely filled with MTA (Fig. 1, C). The tooth was restored with composite resin, and follow-up recalls were scheduled.

Radiographic findings at the 2-year follow-up (Fig. 2, A) and the absence of clinical signs and symptoms indicated a good outcome of the treatment. After this period, the patient did not return for further scheduled recall visits. Therefore, it was not possible to carry out new radiographic and clinical exams again until 8 years after treatment. The periapical radiograph performed at that time showed an extensive radiolucent area in the middle third of the root with separation of the apical and coronal root segments (Fig. 2, B). It was decided to carry out CBCT for better definition and visualization of the lesion. Figure 3, A and B, shows the measurements of the margins of the lesion at its greatest extent. Figure 3, C and D, shows the 3-dimensional rebuild performed from the CBCT images. During the follow-up period, no trauma was reported, and the patient remained asymptomatic. Clinically, the tooth presented without sinus tract and without periodontal pocketing (Fig. 4).

**DISCUSSION**

The available evidence in the literature suggests that traumatic dental injuries are one of the etiologic factors related to internal root resorption.1-5 The present case corroborates these findings, because the patient confirmed a history of trauma. The absence of the radiographic control after the trauma delayed a diagnosis of the pathology, which was detected in an advanced stage already reaching the lateral periodontium.

Conservative endodontic management of teeth with perforating internal root resorption historically includes root canal debridement and placement of calcium hydroxide paste. This approach seeks the formation of reparative tissue, followed by root canal filling using thermoplastized gutta-percha techniques.11,12 Surgical correction and filling of the communication with restorative materials has been suggested in cases of large defects.4,5 The development of new bioactive materials such as MTA make possible other therapeutic approaches, including the obturation of the root canal space in complex cases of iatrogenic or pathologic root perforations.6

During the endodontic therapy of pulpless teeth associated with internal resorption and a perforating de-
fect, elimination of the infection and the inflammatory granulation tissue is essential. In the present case, effort was made to assure complete elimination of granulation tissue during chemomechanical root canal preparation. Afterward, the wide perforation defect was filled with MTA by orthograde access. MTA for use in repairing lateral root perforation was first reported in 1993. This material presents satisfactory mechanical properties, biocompatibility, bacterial effects, radiopacity, and the ability to set in the presence of blood. In addition, the setting expansion improves its sealing capacity. Thus, MTA is a suitable material for the treatment of root perforations to obtain the regeneration of the periodontal attachment.

Fig. 2. Radiographic findings at the (A) 2- and (B) 8-year follow-ups. Note the separation of the apical and coronal root segments after 8 years.

Fig. 3. Images acquired with cone-beam computerized tomography. A, B, Measurement of the size of the lesion at its greatest extent. C, D, Three-dimensional rebuild.
In the present case, despite a poor prognosis, the radiographic evaluations after the first 2 years showed no signs of progression of the internal resorption associated with periodontal and periapical health tissues. These initial findings in addition to the clinical aspect indicated the success of the treatment. However, a surprising progression of the pathologic process was observed after a longer period of evaluation. This finding suggests that either: 1) the resorption was not arrested and continued affecting the normal tissue architecture adjacent to the repaired site; or 2) the root was so weak at the resorption site and fractured under normal functional load. The continuation of the resorption likely occurred owing to incomplete removal of granulation tissue despite the expended effort during chemomechanical preparation. The nonsurgical approach limits visualization of the lesion and makes granulation tissue removal difficult. It is possible that the external component of the resorption defect was not degranulated properly. Thus, a combination of nonsurgical and surgical procedures may be a better choice to repair the perforation of the root and properly remove the granulation tissue of the periradicular areas. However, some disadvantages are related to the surgical procedure. The possible formation of a physiologic gingival crevice adds to longer healing time for function regeneration, and maturation of the gingival connective tissue limits this approach.21 Regarding the root fracture under normal functional load, the separation of the coronal and apical segments suggested that it could have been caused by a horizontal fracture perpetuating the resorption defect. Additionally, coronal bacterial leakage through defective coronal restoration may have contributed to the progression of the internal resorption.4 Thus, it seems that unfavorable outcomes were not related only to MTA, even considering the possibility of inadequate seal of the defect.

Considering the limited information of a 2-dimensional image, the 2-year postoperative periapical radiograph did not show the real periradicular conditions around the repaired perforative defect. The high accuracy of CBCT images is a valuable tool for analysis of tooth structure and adjacent anatomy.22,23 Because CBCT scans provide 3-dimensional views, they present superior diagnostic performance over conventional radiographic images to determine the true extension of the resorptive process.23 CBCT images at 8 years’ follow-up showed extensive damage of the periradicular tissues observed in 3 dimensions. Despite the CBCT image’s suggesting the compromise of supportive tissues of the tooth, there was no dental mobility. Based on the clinical findings, it was decided to monitor the case without further endodontic intervention. The patient was told of the need to replace the esthetic restorations in both the treated and adjacent tooth.

Several case reports7-9 have demonstrated the effectiveness of the nonsurgical use of MTA to treat internal perforating resorption. This is a conservative approach and supported by literature. However, long-term follow-up should be conducted to examine evidence of the success of treatment. The use of more-accurate imaging techniques such as CBCT could be important to early diagnosis of unsuccessful treatment.

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Fig. 4. Clinical aspect after 8 years. A, Note the discoloration at the cervical region due to gray MTA and the gingival tissue with normal color, texture, and contouring. B, Probing of periodontal sulcus showing the absence of periodontal pocketing.

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