Management of a non-vital central incisor with an open apex
Using a novel MTA-based repair material in a young patient

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The treatment of immature necrotic teeth with non-vital pulps and open apices often presents a challenge to the clinician. Cleaning and shaping the thin canal walls, controlling the infection, and performing satisfactory sealing of the apex are sometimes not possible. In most cases, the treatment involves the induction of apical closure by apexitification procedures to allow more favourable conditions for the conventional treatment.

Traditionally, calcium hydroxide has been the material of choice used to induce the formation of an apical hard tissue barrier before placing the permanent filling. Although many studies have reported favourable outcomes when this treatment is used, disadvantages have also been reported. The use of calcium hydroxide apical barriers has been associated with some problems, such as unpredictability of apical filling, risk of re-infection due to leakage of the provisional filling, and risk of root fracture as a result of the long-term application of calcium hydroxide. Furthermore, poor patient compliance has a negative influence on the prognosis of conventional apexitification procedures.

With the advent of the mineral trioxide aggregate (MTA), a cementum-like hard tissue, all of the cases sealed with MTA healed, whereas in the calcium hydroxide cases, two out of 10 did not heal. However, MTA has some disadvantages too. Because of its consistency, its manipulation and placement in the site of repair can be challenging. Additionally, its use can cause discoloration of the tooth, and it should be used with caution in aesthetic zones. A novel material, MTA REPAIR HP (high plasticity), was recently introduced with the intention of improving some of those characteristics.

Several studies show that apexitification with MTA has a high success rate with fewer visits and less time to completion. Also, in a study that compared clinical and radiographic results of apexitification with MTA or calcium hydroxide, all of the cases sealed with MTA healed, whereas in the calcium hydroxide cases, two out of 10 did not heal. However, MTA has some disadvantages too. Because of its consistency, its manipulation and placement in the site of repair can be challenging. Additionally, its use can cause discoloration of the tooth, and it should be used with caution in aesthetic zones. A novel material, MTA REPAIR HP (high plasticity), was recently introduced with the intention of improving some of those characteristics.

This new formula retains all the chemical and biological properties of the original MTA, however, it changes its physical properties of manipulation, resulting in greater plasticity, thereby facilitating handling and insertion. Additionally, its formula uses a different radiopacifier (calcium tungstate), which does not cause staining of the root or dental crown, according to the manufacturer. This case report, we present the clinical identification, diagnosis and management of a non-vital central incisor with an open apex, treated using MTA REPAIR HP.

Case report
A 12-year-old male patient with a non-contributory medical history presented for examination with the chief complaint of pain in tooth #11. Clinical examination found that the tooth had been re-stored with a temporary filling and responded with pain to percussion and palpation and presented with a discrete oedema in the area. There was no probing defect or sinus tract stoma. According to the patient, root canal therapy had been started in the tooth approximately 12 months before. In the radiographic examination, a radiopaque material inside the canal a few millimetres short of the apex could be observed. Also, on the radiograph, it could be seen that the apex was not completely formed and presented with a periapical lesion. In this case report, we present the clinical identification, diagnosis and management of a non-vital central incisor with an open apex, treated using MTA REPAIR HP.

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Figs. 4a & b: CBCT images. (a) Axial view just after MTA REPAIR HP placement. (b) Axial view at the nine-month follow-up. The bone formation, including the cortical plates, can be observed.
and gutta-percha cones with the aid of pluggers (B&L Biotech) in the last 3 mm of the canal was manipulated according to the manufacturer’s instructions and confirmed with a radiograph. Instrumentation proceeded using stainless-steel K-type hand files in a crown-down technique until a #80 hand file achieved the working length. Between each file change, copious irrigation with 2.5% sodium hypochlorite solution was performed (approximately 100 ml throughout the entire treatment).

During the procedure, passive ultrasonic irrigation was performed for 1 minute several times to ensure complete removal of the old material and to maximise the irrigation technique. After the completion of instrumentation, the canal was irrigated with 5 ml of 17% EDTA (Fórmula & Ação) for 3 minutes and a final rinse with 5 ml of saline solution. A calcium hydroxide-based paste was placed in the canal as an inter-appointment dressing, and the tooth was temporarily restored (Fig. 2). After ten days, the patient came to the clinic for conclusion of treatment. The tooth was asymptomatic, and the area did not have any signs of inflammation. After nine months, another CBCT examination was conducted. Comparison of the CBCT images was performed, and bone healing and apical closure of the open apex could be observed (Figs. 4a & 4b).

The patient presented for recall one month later without any symptoms. Postoperative radiographic and clinical evaluations were performed at three, six and nine months. The tooth was asymptomatic, and the area did not have any signs of inflammation. After nine months, another CBCT examination was conducted. Comparison of the CBCT images was performed, and bone healing and apical closure of the open apex could be observed (Figs. 5a & 5b).
Discussion

Previous clinical studies in humans have demonstrated that an apical barrier of MTA can be used with success in the technique of apexification of teeth with open apices. El-Meligy and Avery ran a clinical trial comparing the use of calcium hydroxide and MTA in 30 teeth of 15 patients who had lost pulp vitality through caries or trauma. The conventional technique of apexification with calcium hydroxide failed, while none of the teeth filled with MTA showed clinical or radiographic signs of pathology. Simon et al. carried out a prospective clinical trial in 57 teeth of 50 patients with open apices treated with MTA plugs and definitive filling of the canal and observed success in 81% of the cases.

In this case report, the use of a modified MTA (MTA-bioceramic-based high-plasticity reparative cement) achieved a good clinical result over the short follow-up period. Comparison of CBCT images just after placement of the MTA barrier and after a nine-month period demonstrated bone formation and apical closure by hard tissue. It should be noted that a radiolucent area could be seen at this time. Such a healing pattern could be classified as incomplete healing, according to Molven et al.

From a clinical perspective, the handling and placement of the MTA REPAIR HP was easier than with the conventional MTA. According to the manufacturer, the difference between MTA REPAIR HP and the original Angelus MTA is the replacement of distilled water with a liquid that contains water and another organic plasticiser that gives the new product high plasticity (Fig. 6). The manufacturer claim that the new MTA does not promote dental discoloration could not be studied in this case, since the material was placed in the apical portion of the canal.

The importance of case reports is the demonstration of what is possible in our patients using scientific clinical treatment protocols. Reports from clinical practitioners have played important roles in the field of dentistry, but should be validated through proper laboratory and clinical research studies. In conclusion, the clinical protocol using the new MTA REPAIR HP, as described in this case report, enabled the successful apexification of a central incisor in a young patient.

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