Single-visit apexification with MTA following ozone disinfection
A case report

Abstract

Introduction

Immature teeth with necrotic pulp and large periapical lesions are difficult to treat using conventional endodontic therapy. Materials such as mineral trioxide aggregate (MTA) are indispensable. However, disinfection is still problematic and alternatives such as ozone are under consideration. This case report demonstrates successful healing after single-visit apexification using MTA following ozone disinfection.

Methods

The case report presents a case of traumatised a maxillary anterior tooth. The radiographic evaluation revealed an open apex with a very wide canal. The canal was cleaned using intra-canal instrumentation and 0.5% NaOCl and final irrigation with 15% EDTA. In order to ensure sufficient canal disinfection, the canal was treated with ozone for 72 seconds. Subsequently, a 4mm apical barrier (plug) was created with MTA and allowed to set. The root canal was then obturated with thermo-plasticised gutta-percha. The access cavity was sealed with a composite resin restoration.

Results

A one-year follow-up demonstrated a clinically asymptomatic and adequately functional tooth with radiological signs of healing. The positive clinical resolution of this case is encouraging for the use of ozone and white MTA as an apical plug in immature teeth with open apices.

Conclusion

The combination of ozone disinfection and MTA appears to be a valid option for single-visit apexification, with its main advantage being the speed at which the treatment can be completed. Apexification in one visit using ozone and an apical plug of MTA can be considered a predictable treatment and may be an alternative to long-term calcium hydroxide apexification.
tract and moderate discomfort during mastication. Recently, the crown involved had become markedly discoloured, owing to which the patient's facial appearance had become highly unaesthetic. The radiographic examination of the tooth showed a wide canal with an open apex and periapical lesion (Fig. 2). Electric pulp testing was performed on teeth in the area of trauma, that is, from the maxillary left canine to the maxillary right canine. All the teeth gave a positive pulpal response, indicating their vitality, except the involved maxillary left central incisor.

**Treatment protocol**

Regarding the current clinical guidelines, it was decided to treat the case non-surgically by placing an MTA apical barrier. Adequate isolation was achieved with the use of cofferdam. Once the working length had been determined, the canal was cleaned using a size 80 H-file and gentle but copious irrigation with 0.5% sodium hypochlorite and 15% EDTA as final irrigation. After final drying of the canal prior to obturation, ozone gas produced by the Prozone generator (W & H) was introduced directly into the root canal to within 3 mm of the apex using a slow in-and-out movement of the flexible cannula for 72 seconds, as recommended by the manufacturer (Fig. 3). We used ozone to eliminate any residual bacteria in inaccessible anatomical areas or within the dentinal tubules. White MTA (ProRoot MTA, DENTSPLY Tulsa Dental Specialties) was mixed to a paste consistency with sterile water and delivered to the canal using a Dovgan carrier. An endodontic plugger of a suitable size was used to condense the MTA at the apex to about 4 mm in thickness (Fig. 4). A radiograph was taken to confirm its position (Fig. 5). A moist cotton pellet was sealed inside for setting of the MTA. The patient was recalled the next day and the hard set of the MTA was verified with an endodontic file. The remaining portion of the root canals was then closed with thermoplastic gutta-percha and a radiograph was taken (Fig. 6). Intracoronal bleaching was also performed. The sinus tract disappeared two weeks after the treatment (Fig. 7). The 12-month follow-up found an asymptomatic and adequately functioning tooth with radiological signs of healing (Fig. 8).

**Discussion**

Until a relatively short time ago, calcium hydroxide has been used to establish an apical hard-tissue barrier in immature open apices. The time interval for calcium hydroxide apexification has been reported to vary from 12 to 24 months. This presents possible problems regarding patient compliance and the risk of reinfection if the temporary restoration fails, and predisposes the tooth to fracture. Moreover, calcium hydroxide is a strong alkali and could irritate periodontal tissue. The barrier produced by calcium hydroxide apexification has been reported to be more porous and weak, and can allow apical micro-leakage.

MTA has been widely recommended for closure of open apices. It demonstrates good apical seal, biocompatibility, and pulpal and periodontal regeneration capabilities. White MTA was preferred over the grey MTA, as it has shown significantly less micro-leakage.

When single-visit apexification with MTA is the preferred treatment protocol, the major problem is ensuring sufficient canal disinfection with respect to the exposed periapical tissue. A low-concentra-
A hypoactive pulp of the maxillary 25 tooth was identified. The tooth was asymptomatic and exhibited a periapical radiolucency. The tooth demonstrated a fair degree of clinical soundness. The tooth had been asymptomatic since the last recall visit, 4 months prior. A sinus tract emanated from the clinical lesion and extended into the soft tissue. The sinus tract was resolved two weeks post-surgery. The sinus tract was excised under local anesthesia. This was followed by copious irrigation, obturation, and coronal sealant placement.

The sinus tract was monitored weekly for a period of 12 weeks. A positive clinical healing was observed in the 12th week post-surgery. The healing process was further confirmed by the absence of clinical signs of infection and radiographic signs of healing. The sinus tract was excised two weeks after the treatment. The 12-month follow-up found an asymptomatic and adequately functioning tooth with radiological signs of healing.

The above-mentioned technique saves a great deal of time compared with calcium hydroxide apexification and achieves a predictable apical barrier in a single visit. Long-term follow-up is however necessary to ensure success.

Editorial note: A complete list of references is available from the publisher.