Mineral trioxide aggregate in treatment of permanent teeth with open apex and endo-perio lesions. A case report

**ABSTRACT**

**Background** Mineral trioxide aggregate (MTA), one of the latest materials applied in dentistry, has a variety of potential uses. Numerous studies emphasise its biocompatibility with periodontal and hard tissues, as well as excellent sealing and regeneration abilities.

**Case report** This article describes the successful therapy of immature mandibular premolars with large open apex, resorption, and endo-perio lesions. In the presented case, the canal was filled with the MTA material. At present, the treated tooth is asymptomatic, and a three-year follow-up radiographic examination demonstrated the dramatic regeneration of periradicular tissues and the new hard tissue formation in the area of the affected teeth.

**Keywords** Endo-perio diseases; Mineral trioxide aggregate; Open apex.

**Introduction**

Endodontic treatment of permanent teeth with incomplete root apex development, apical periodontitis and bone loss poses a challenge to the dentist [Andreasen et al., 2002; Felippe et al., 2005]. For many years, multi-appointment therapy has been performed using calcium hydroxide dressings. Such a treatment is however long-term and associated with the risk of root weakening and tooth fracture. Additionally, there is a fear that the patient will not see the dentist regularly to change temporary dressings [Andreasen et al., 2002]. In this situation, the application of mineral trioxide aggregate (MTA) seems to be a better treatment [Parirokh and Torabinejad, 2010]. MTA was developed in the early 90ties at the Loma Linda University in the USA, and in 1998 was introduced in the dental market as ProRoot MTA® (Dentsply Tulsa Dental Specialties, Tulsa, USA) [Torabinejad et al., 1994; Torabinejad et al., 1995]. Since that time, it has been successfully used in different clinical cases such as apexification of teeth with incomplete root development, direct pulp capping, pulpotomy and pulpectomy, repair of perforations of root and pulp chamber floor, treatment of tooth resorption, and retrograde canal filling during root resection [Roberts et al., 2008]. Numerous reports emphasise that MTA may improve the outcome of not only endodontic treatment but periodontal as well [Katsamakis et al., 2013; Srinivasan et al., 2009].

**Report**

A 12-year-old female patient was referred to the Endodontic Clinic of the Medical University of Lodz (Poland) to continue root canal treatment that had been started two years earlier at a private dental office. A medical history revealed that the girl suffered from asthma and received inhaled corticosteroids. On the basis of earlier treatment records it was found that after trephination of tooth #35, the calcium hydroxide dressing was inserted into the canal. Since then (1.5 year), no endodontic procedures were performed. On admission to the Endodontic Clinic, an extensive cavity within the tooth crown filled with a temporary dressing and a deep pathological pocket were visible. The dental radiograph showed the incompletely developed root apex with a very wide apical foramen, thin root wall, a bony pocket and chronic periradicular periodontitis around tooth #35 indicating an endo-perio lesion (Fig. 1). Due to a very bad condition of the tooth and a concomitant malocclusion, the patient was referred to the orthodontist for consultation whether tooth #35 should be treated or extracted for orthodontic reasons. The specialist diagnosed severe retrognathia and tooth...
abnormalities (crowding of upper teeth), and advised the endodontist to treat and retain tooth #35 as long as possible. The involved tooth was treated at the Endodontic Clinic using a dental operating microscope and a rubber dam for tooth isolation. After the removal of the dressing, a hemorrhagic exudate from the canal was observed. Approximate working length was established with an electronic apical locator and radiographs. The root canal was cleaned with 2.5% NaOCl and NaCl. Next, the canal was delicately dried with paper points and the calcium hydroxide dressing (Calxyl®, OCO Präparate), was placed for two weeks. At the first appointment, instructions on oral hygiene were given to the patient and rinsing of the oral cavity was recommended after each application of inhaled corticosteroids. The patient had in fact many teeth with fillings and carious lesions.

After two weeks, the calcium hydroxide dressing was removed by instrumentation and irrigation with 2.5% NaOCl and 17% EDTA. Additionally, ultrasonic activation of a #25 K-file passively placed in the canal was carried out to improve canal debridement and Calxyl®. The canal was finally filled. At first, the periapical region of the canal was filled with small pieces of resorbable collagen sponge (Biokol®, Stalmed). Next, small portions of the MTA material were inserted into the canal and condensed vertically using pluggers. In this way, the entire canal was filled with MTA. In the region of the periconoral canal orifice, a sterile cotton pellet saturated with physiological saline was placed on MTA (Fig. 2). A tight dressing (GC Fuji Triage®) was inserted into the crown. After two days, the cotton pellet was removed and the permanent filling (Tetric Evo Ceram®, Ivoclar Vivadent®) was placed. Root canal retreatment of tooth #36 was also carried out. The patient visited the endodontist again after the following one and three years, despite the recommended earlier follow-ups. Clinical examination did not present any pathological changes in the tooth and the periodontal ligament. On the basis of the radiograph, bone regeneration and healing of apical periodontitis were observed (Fig. 3, 4).

Discussion

Modern endodontics offers different treatment possibilities, even in very complicated endo-perio lesions of immature teeth [Felippe et al., 2006; Kottoor and Velmurugan, 2013; Parirokh and Torabinejad, 2010]. In the presented case report, the incompletely developed root apex with a large open apical foramen, external root resorption, endo-perio lesions, extensive apical periodontitis involving the mesial side of the alveolar process along with the bony pocket were diagnosed. Additionally, a long time that had passed from the trephination to the final root canal filling was considered a poor prognostic factor. After preparing an access cavity to the tooth at the private dental office, a calcium hydroxide dressing was inserted into the canal and was left in the tooth for a period of 1.5 year. Long-term calcium hydroxide dressings weaken the root structure, possibly by naturalizing, denaturing, or dissolving the acidic components of dentine [Andreasen et al., 2002]. Moreover, the inadequate dressing within the tooth root and the crown undoubtedly contributed to ongoing bacterial infection. Despite such an unfavourable situation, the treatment was successful. Both, the root canal and periodontal treatment as well as canal filling with the MTA material were the factors which determined the success of therapy. Numerous studies emphasise very good biocompatibility, and antibacterial and antifungal activity of this material [Ferk et al., 2011; Al-Kahtani et al., 2005; Srinivasan et al., 2009]. MTA also possesses excellent sealing properties and the ability to harden in the presence of fluids including blood [Tang et al., 2002; Torabinajed et al., 1994]. MTA has low solubility in tissue fluids (less than 3%), therefore it does not undergo resorption [DaSilva et
References