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Минерал триоксид агрегат у терапији екстерне ресорпције корена избијеног зуба са незавршеним растом корена – исход након десет година

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Минерал триоксид агрегат у терапији екстерне ресорпције корена избијеног зуба са незавршеним растом корена – исход након десет година

SUMMARY

Introduction Root resorption may occur as a consequence of avulsion injury and may lead to the progressive loss of tooth structure. The aim was to report the outcome of root resorption treated with mineral trioxide aggregate in a replanted immature permanent incisor after 10 years of follow-up.

Case outline This case presents external root resorption that was detected 18 months after the avulsion injury in a 9-year-old child. Apical portion of the canal was filled with mineral trioxide aggregate and the rest of the canal was filled with a canal sealer and gutta-percha. Control examinations were performed six months after completion of the endodontic treatment and afterwards yearly. The tooth was asymptomatic clinically and radiographs did not show progression of root resorption up to 4 years of follow-up. Infraposition of injured tooth was detected five years after replantation, but without significant radiographic changes up to 8-year follow-up when root resorption was detected again. However, the tooth was still hard and symptomless at the 10-year follow-up.

Conclusion Mineral trioxide aggregate may have an important role in preservation of replanted immature tooth for a long period.

Keywords: immature teeth; avulsion injury; root resorption; mineral trioxide aggregate

САЖЕТАК

Увод Ресорпција корена зуба се може јавити као последица повреде и може водити прогресивном губитку зубних структура. Циљ рада је био да се прикаже клинички исход реплантације избијеног сталног зуба са незавршеним растом корена након 10 година.

Приказ случаја Представљен је случај екстерне ресорпције корена зуба детектоване 18 месеци након авулзионе повреде код деветогодишњег детета. Апикални део канала корена зуба је напуњен минерал триоксид агрегатом, док је остатак канала оптуриран пастом и гутаперка поенима. Контролни прегледи су обављани 6 месеци након завршетка ендодонтског лечења и, након тога, једном годишње. До 4. године праћења, зуб је био без клиничких и радиографских знакова прогресије ресорпције корена. Инфрапозиција повређеног зуба уочена је 5 година након реплантације, али без значајних радиографских промена све до 8. године праћења када је уочено напредовање ресорпције корена. Ипак, након 10 година зуб је и даље био клинички без симптома.

Закључак Минерал триоксид агрегат може имати значајну улогу у дуготрајном очувању реплантираних зуба са незавршеним растом корена.

Кључне речи: незавршен раст корена; авулзија; ресорпција корена; минерал триоксид агрегат

INTRODUCTION

Traumatic injuries to permanent anterior teeth are common during childhood and 0.5–16% of the 7- to 10-year age group experience tooth avulsion [1]. Prolonged inadequate storage has been identified as a crucial factor for the survival of an avulsed tooth [2]. Ideally, tooth should be replanted within 5 minutes after the injury [2], but in clinical practice, teeth are frequently stored in unphysiological media and replantation is delayed. Therefore, loss of pulpal vitality could be considered as expected clinical finding in avulsed teeth [4]. As a further complication, root resorption may occur and may lead to the progressive loss of tooth structure.

Treatment of avulsed immature permanent teeth presents a challenge in contemporary clinical practice. Despite the fact that teeth with open apices have a potential to revascularize and continue root development, these teeth usually have worse prognosis in comparison with mature teeth, particularly due to delayed replantation after unphysiological storage [3]. Unfortunately, in the majority of clinical cases, the aim of endodontic treatment is to eliminate the infection or arrest the root resorption.

Mineral trioxide aggregate (MTA) is endodontic cement that consists of tricalcium oxide, tricalcium silicate, tricalcium aluminate, silicate oxide, bismuth oxide, and other hydrophilic particles, which set in the presence of moisture. This is a biocompatible material [4] which provides good sealing [5]. It has been reported to stimulate osteoblasts/odontoblasts [6, 7], thus inducting hard tissue formation, and its use has been recommended in complex endodontic cases. The use of MTA for endodontic treatment of immature teeth comprises formation of an apical plug that acts as an artificial barrier providing an immediate obturation of the open apex.

The purpose of this report was to describe the outcome of root resorption treated with MTA in a replanted immature permanent incisor after 10 years of follow-up.

CASE REPORT

A nine-year-old girl was referred from the public dental health service to the Clinic for Paediatric and Preventive Dentistry, School of Dental Medicine, University of Belgrade on August 2004. The night before referral, after an accident during play, she suffered an avulsion injury of a permanent left central maxillary incisor and primary left lateral maxillary incisor and uncomplicated crown fracture of a permanent right central maxillary incisor.

Replantation of the avulsed permanent tooth was performed after 3-hour dry storage at the public health service (Figure 1) and the injured tooth was stabilized at our clinic with a passive, flexible acid-etched composite splint after a total of 14 hours. Although tetracycline was recommended, the girl was placed on 250 mg of penicillin to be taken every 6 hours for 1 week. Tetanus coverage was evaluated and suitable oral hygiene and dietetic regime were recommended. Informed parental consent for the future treatment was obtained in writing and consent was also obtained from the child.

Ten days after the injury, endodontic treatment of the replanted tooth was initiated. Following pulpectomy, a non-setting calcium hydroxide paste (Kalcipast®, ICN Galenika, Belgrade, Serbia) was placed in the root canal. Splint was removed 14 days after the injury.

According to guidelines at that time [8], endodontic treatment consisted of periodical changes of calcium hydroxide dressing for apexification at the following regime: 7 days, one month, and when radiographs revealed loss of material from the root canal (Figure 2). Periapical radiographs were taken every 3 months during the first year, and every 6 months after that. Eighteen months after the injury, external root resorption was detected radiographically (Figure 3). At this point, patient and her parents were informed that initial treatment was not successful, and that progredient root resorption would eventually lead to tooth loss. They were not particularly motivated to continue with the treatment that is "temporary", especially in the situation when the complication occurred. Taking into account all clinical considerations, definitive endodontic treatment was suggested.

Calcium hydroxide was removed and the apical portion of the canal was filled with mineral trioxide aggregate (ProRoot MTA, Dentsply Tulsa Dental, Tulsa, USA; Figure 4a). The material was allowed to set into the canal and after three days the rest of canal was filled with a canal sealer (Acroseal, Septodont, Saint Maur des Fosses, France) and gutta-percha (Figure 4b). The crown of the tooth was then restored with glas-ionomer cement (Fuji IX, GC Int, Tokyo, Japan) and composite material (Gradia Direct, GC Int).

Control examinations were performed six months after the completion of the endodontic treatment and afterwards yearly. The tooth was asymptomatic clinically and radiographs did not show progression of root resorption up to 4 years of follow-up (Figures 5a-5c). Infraposition of the injured tooth was detected five years after replantation, suggesting developing replacement resorption (Figure 5d). At this point, decoronation was not considered as a treatment option since alveolar contour was still preserved. To improve aesthetic appearance, tooth was built-up with composite material. At the 6-year (Figure 5e) and 7-year (Figure 5f) follow-up, no significant resorption progression was observed clinically or radiographically. Starting from 8th year, root resorption developed again (Figures 5g-5i). However, the tooth was still hard and symptomless at the 10-year follow-up. Unfortunately, the patient was not followed longer as she moved and the tooth was extracted by another dentist.

DISCUSSION

Most avulsion injuries occur at an age which is crucial to facial growth and also psychosocial development of a child. Treatment of avulsion injury is rather demanding, considering the fact that several factors, such as mechanism of the injury, apical maturity of the root, extraalveolar storage, patient's compliance, etc. may influence therapy and prognosis of these injuries [3]. Nevertheless, maintenance of injured tooth is of outermost importance in young patients until growth reaches its full potential.

Favorable healing after an avulsion injury requires quick emergency intervention followed by evaluation and possible treatment at decisive times during the healing phase [9]. The maintenance of periodontal ligament cellular viability is essential for longevity of replanted tooth [10]. However, if excessive drying occurs before replantation, the damaged periodontal ligament cells will elicit a severe inflammatory response over a diffuse area on the root surface. Treatment strategies should always be considered in the context of limiting the extent of the peri-radicular inflammation, thus tipping the balance toward favorable (cemental) rather than unfavorable (osseous replacement or inflammatory root resorption) healing [9].

Apical maturity of the root presents an important factor that determines the outcome of a replanted tooth. Although a tooth with uncompleted root development possesses a strong reparatory potential and thicker periodontal ligament that desiccates not so fast, the postreplantation outcome is usually worse compared to the mature tooth. Andreasen et al. [2] in the study on 400 replanted teeth reported higher failure rates in teeth with open apices. According to the current guidelines [11], removal of the necrotic pulp tissue and the use of calcium hydroxide into root canal are mandatory to stimulate apical closure in a developing tooth and to prevent root resorption. However, it has been reported that prolonged treatment with calcium hydroxide exhibits high complication rate [2,3]. This approach comprises repetitive changes of calcium hydroxide dressing which may last for several months leading to the difficulties in patient follow-up. In addition, the canal is susceptible to reinfection because it is covered by a temporary coronal seal [12]. For those reasons, the use of calcium hydroxide for apexification is no longer supported [13].

Today, MTA is recommended for treatment of immature teeth with necrotic pulp [5]. Erdem and Sepet [12] performed early treatment with MTA in traumatized immature incisors and showed resolution of the periapical lesions and apexification in 4 out of 5 teeth during the two-year follow-up period. Saris et al. [14] investigated MTA as an apical barrier in 17 non-vit al immature permanent incisors and reported decrease in the size of the periapical lesion without radiographic signs of root resorption in 76.5% of cases. Moore et al. [15] evaluated 22 non-vital traumatized teeth treated with MTA and showed 95.5% clinical and 90.9% radiographical success during the minimum 18-month follow-up. Pace et al. [16] evaluated 17 immature teeth treated with MTA during 10 years and reported 94% healing rates. Cetenovic et al. [17] assessed two MTA products in both immature and mature traumatized necrotic teeth, and showed significant reduction or complete regression of chronic periapical lesions. Data on comparison between calcium hydroxide and MTA clinical efficacy in immature teeth apexification are still limited. It has been shown that both materials had similar clinical (asymptomatic tooth without pain, swelling, and luxation) and radiographical (apical barrier formation, normal periapical space, no root resorption/fracture) success rates [18–21], with apical barrier formation with MTA requiring significantly shorter time [19, 21,22].

The evidence on use of MTA for treatment of teeth with root resorption is low [5]. Correspondingly to the present case, Aggarwal and Singla [23] reported that treatment with MTA successfully discontinued external root resorption after avulsion and replantation during the 4-year follow-up. It has been shown that MTA has high pH and ability to release calcium and phosphate ions for a longer period [24] which may have deactivated the inflammatory process and retarded the odontoclastic activity [23].

To conclude, maintenance of an anterior tooth is of outermost importance in paediatric patients until growth reaches its full potential. Mineral trioxide aggregate may have an important role in the preservation of a replanted immature tooth for a long period.

Conflict of interest: None declared.

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Figure 1. Initial radiograph

Figure 2. Calcium hydroxide dressing

Figure 3. External root resorption after 18 months

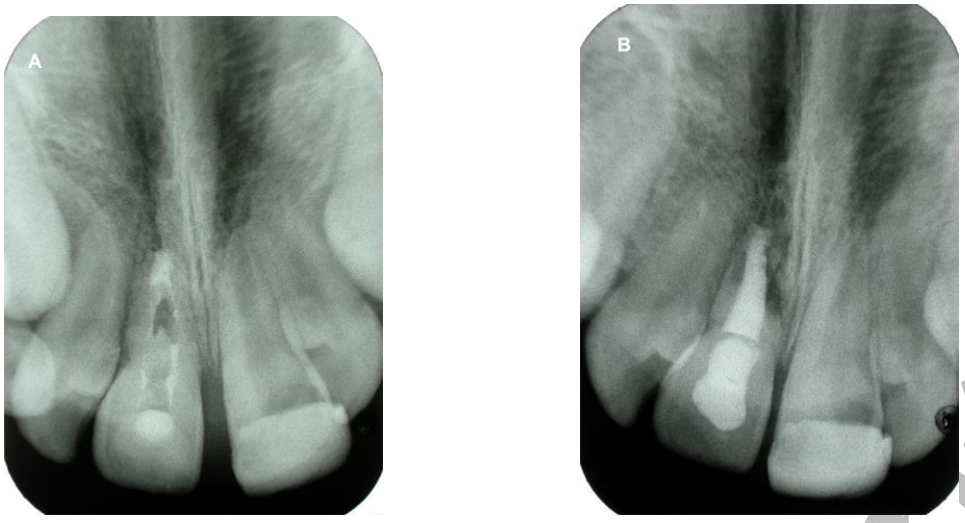

Figure 4. Definitive obturation with: (A) MTA, and (B) root canal sealer and gutta-percha

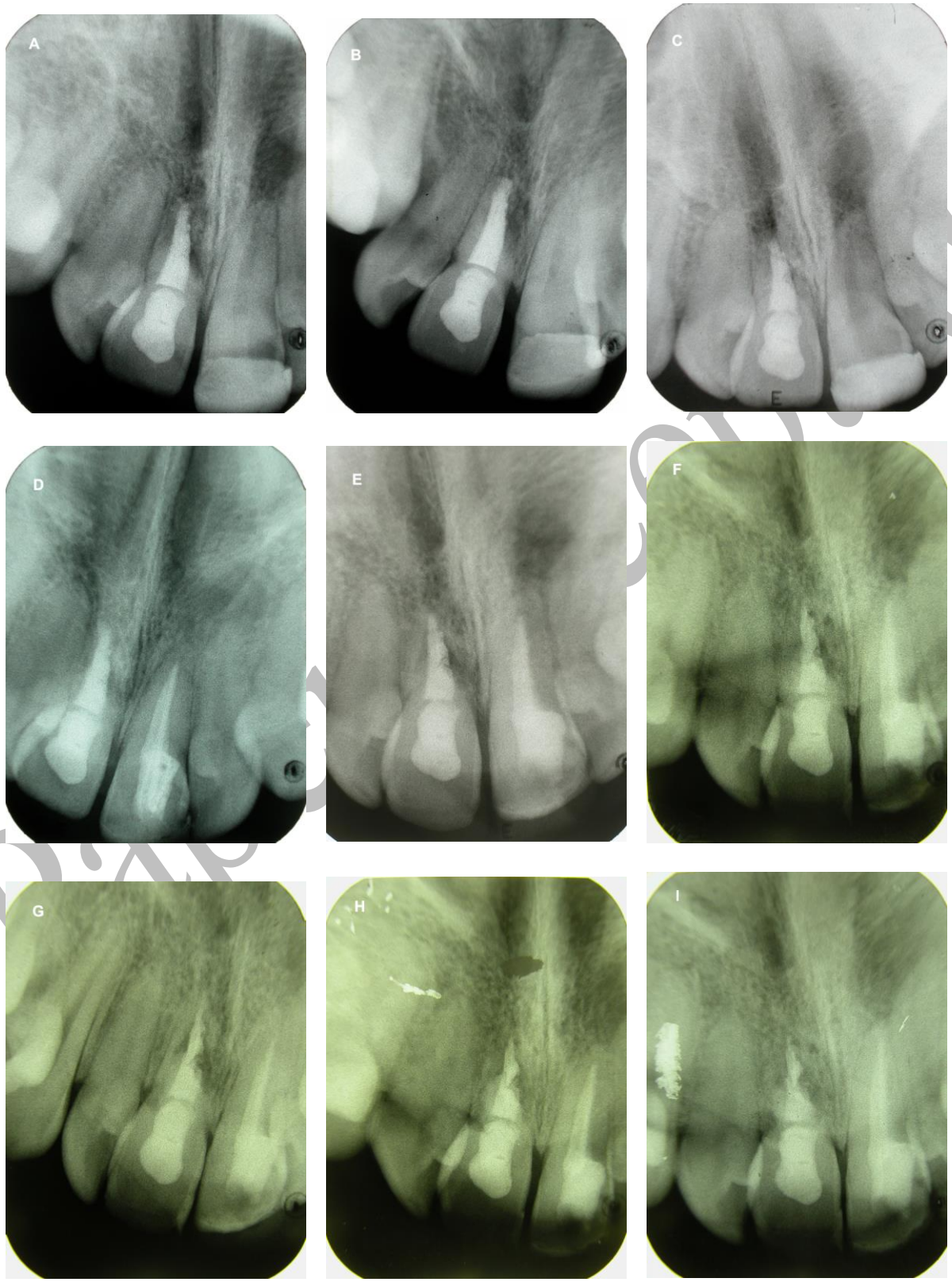

Figure 5. Radiographic follow-up after: (A) 2 years, (B) 3 years, (C) 4 years, (D) 5 years, (E) 6 years, (F) 7 years, (G) 8 years, (H) 9 years, and (I) 10 years

