

CASE REPORT

Dent. Med. Probl. 2009, 46, 2, 252–255
ISSN 1644-387X

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Using of Mineral Trioxide Aggregate (MTA) in Root Fracture Treatment – Case Report

Zastosowanie Mineral Trioxide Aggregate (MTA) w leczeniu złamania korzenia zęba – opis przypadku

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Abstract

Injuries during the developmental age are in 1% the cause of teeth loss. Healing of fractured teeth roots depends on the interaction between the pulp and periodontal tissues in the vicinity of the fracture crevice. A 16-year-old patient underwent treatment of a complex, cross fracture of the root of tooth 11 running at $1/2$ height, with displacement of fragments. Before applying endodontic treatment of the causative tooth it was stabilized with a splint by using a microscope. Under local anesthesia, the pulp from crown fragment was removed, and in the apex fragment the pulp was amputated to about 4 mm from the apex and then by using KaVo KEY laser, the pulp bleeding was stopped. Pulp cavity was filled with MTA. After 24 hours the canal in the crown section was filled with gutta-percha. The place of trepanation was closed with composite. The splint was removed after 3 months. During six-month observation the patient did not report any pain. The x-ray did not show any manifestations of bone dilution surrounding the spots adjacent to the fracture; no periapical changes were observed. There were no pathological changes of root resorption observed. The fracture crevice did not progress and tooth mobility was slight. The presented method of treatment helped to achieve satisfactory treatment results and delay a possible tooth extraction (**Dent. Med. Probl. 2009, 2, 252–255**).

Key words: dental trauma, endodontics, healing, intra-alveolar root fracture.

Streszczenie

Urazy w wieku rozwojowym w około 1% przypadków są powodem utraty zębów. Mechanizm gojenia złamań korzeni zębów jest uzależniony od wzajemnej interakcji miazgi i tkanek przyzębia w okolicy szczeliny złamania.

U 16-letniego pacjenta przeprowadzono leczenie skomplikowanego, poprzecznego złamania korzenia zęba 11 przebiegającego w $1/2$ wysokości, z przemieszczeniem odłamów. Przed przystąpieniem do leczenia endodontycznego pod kontrolą mikroskopu zabiegowego ząb przyczynowy został zaopatrzony szyną stabilizującą. W znieczuleniu miejscowym usunięto miazgę z odłamu koronowego, a w odłamie wierzchołkowym wykonano jej amputację do ok. 4 mm od wierzchołka. Następnie za pomocą lasera KaVo KEY zatamowano krwawienie miazgi. Jamę zęba wypełniono MTA. Po 24 godzinach kanał części koronowej wypełniono ostatecznie gutaperką. Miejsce trepanacji zamknięto materiałem kompozycyjnym. Szynę usunięto po 3 miesiącach. Podczas półtorarocznej obserwacji pacjent nie zgłaszał dolegliwości bólowych. W obrazie RTG nie stwierdzono objawów rozrzedzenia struktury kostnej otaczającej miejsca sąsiadujące ze złamaniem, a także występowania zmian okołowierzchołkowych. Nie zaobserwowano również objawów patologicznej resorpcji korzenia. Szczelina złamania nie powiększa się, a ruchomość zęba jest nieznaczna.

Przedstawiona metoda leczenia pozwoliła na osiągnięcie tymczasowo zadowalających rezultatów leczniczych i odroczenie ewentualnej ekstrakcji zęba (**Dent. Med. Probl. 2009, 2, 252–255**).

Słowa kluczowe: urazy zębów, endodoncja, wewnątrzzębodołowe złamanie korzenia zębów.

Injuries during the developmental age are in 1% the cause of teeth loss. They occur most often between the 11th and 20th year of age, with significantly higher occurrence in boys than in girls [1,

2] Falls, road accidents and practicing sport are among the most frequent causes of the trauma [3]. Cross root fracture concerns 2–7% of all injuries and can often be related to other traumas to hard

tissues of teeth, traumas to alveolar process bone and soft tissues [4]. Cross root fractures require radiological diagnosis, however, displacement and extrusion are often observed in clinical practice [4].

Healing of fractured teeth roots depends on the interaction between the pulp and periodontal tissues in the vicinity of the fracture crevice and modified by the possibility of bacterial infection [4]. Fracture healing can progress according to 4 models: 1. healing through calcification 2. healing through connective tissue generation, 3. healing through connective tissue and bone, 4. no healing and generation of inflammatory granulation tissue in the fracture crevice [5].

Due to the complexity and multiplicity of tissues affected by the trauma, the pulp, root cement, ligaments of periodontium, bone, complications of root fracture might be of different nature. The patient's condition before the trauma, the type of trauma, degree of root development, mobility occurrence and possible displacement of fragments, the position of the fragments and their lengths significantly affect the healing process of the tissues [4, 6].

Case Report

A 16-year-old patient reported to the clinic of Pediatric Dentistry at Poznan University of Medical Sciences in Poznan. The patient's medical history revealed that he suffered an injury to the right medical incisor during physical education class. Based on the clinical study in which the occurrence of an increased tooth 11 mobility and radiological examination, root fracture at $\frac{1}{2}$ height with displacement was diagnosed (Fig. 1). Repositioning of fragments was done and the tooth was stabilized with a splint. Due to the displacement and high risk of bacterial infection, general antibiotics therapy was applied with Dalcin C 0,3 3 times a day and it was decided to start endodontic



Ryc. 1. Stan w dniu zgłoszenia
Fig. 1. Status at the time of injury

treatment. Endodontic treatment was conducted with microscope Carl Zeiss Opmi Pico.

Under local anesthesia, the pulp from crown fragment was removed and in the apex fragment, the pulp was amputated to about 4mm from the apex and then by using KaVo KEY laser the pulp bleeding was stopped. Pulp cavity was filled with Mineral Trioxide Aggregate (MTA) (Fig. 2). After 24 hours, the canal in the crown section was filled with gutta-percha (Fig. 3). The place of trepana-



Ryc. 2. Stan po aplikacji MTA
Fig. 2. Status after MTA application



Ryc. 3. Stan po 3 miesiącach
Fig. 3. Status after 3 months



Ryc. 4. Stan po 1,5 roku. Brak przejaśnienia w okolicy szczeliny złamania
Fig. 4. Status after 1,5 year. Note radiolucency between fragments periapical part.

tion was closed with composite. The splint was removed after 3 months.

During a six-month observation, the patient did not report any pain. The x-ray did not show any manifestations of bone dilution surrounding the spots adjacent to the fracture; no periapical changes were observed. There were no pathological changes of root resorption observed. The fracture crevice did not progress and tooth mobility was slight (Fig. 4).

Discussion

According to the relevant literature, the standard approach using calcium hydroxide increases the efficiency of the performed procedures [7–9]. However, more often we hear of the possibility of changes in physical properties made to the dentin exposed to long-term effects of $\text{Ca}(\text{OH})_2$, which may lead to fractures or internal resorption that is a complication developed from, more often than not, an extended (2–3 months) using of temporary filling of roots with calcium hydroxide [10, 11]. It may be the result of changes happening in the organic matrix, since after long-term $\text{Ca}(\text{OH})_2$ exposure, it significantly lessens in force [12–15].

The most promising method that replaces the long-term therapy with calcium hydroxide is application of MTA as a material inducing apexification and creation of barrier in the periapical region of immature teeth [16–19]. When combined with the insertion of intracanal inlay supporting the hard tissues of tooth, MTA is also applicable in treating cross root fracture [20].

In the presented clinical situation, due to difficulties with the insertion of inlay, the possibility of further distancing of the fragments and subsequent risk of oxidation, it was decided to only use MTA.

From the relevant literature, it is known that using MTA in endodontic treatment brings very promising effects both in terms of biological properties of the pulp and mechanical stability of the root walls [21]. At the same time, it must be noted that insertion and adaptation of the material in the pulp cavity needs further testing and development.

The presented method of treatment helped to achieve satisfactory treatment results and delay a possible tooth extraction; in future, it will give the option to choose the reconstruction method of dental arch. The patient must be subjected to further observation. MTA application in treating cross fracture of roots might prove to be an alternative method depending on the clinical situation.

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Praca wpłynęła do Redakcji: 23.03.2009 r.
Po recenzji: 24.04.2009 r.
Zaakceptowano do druku: 24.04.2009 r.

Received: 23.03.2009
Revised: 24.04.2009
Accepted: 24.04.2009