

CASE REPORT

Dent. Med. Probl. 2009, 46, 2, 256–259
ISSN 1644-387X

© Copyright by Wrocław Medical University
and Polish Stomatological Association

MARIA MIELNIK-BŁASZCZAK, ARTUR MICHAŁOWSKI

Posttraumatic External Apical Root Resorption – Case and Treatment Report

Pourazowa resorpcja zewnętrzna korzenia zęba – opis przypadku i metody leczenia

Chair and Department of Paediatric Dentistry University Medicine in Lublin

Streszczenie

Urazy zębów w wieku rozwojowym są drugą co do częstości przyczyną zgłaszania się pacjentów do lekarza stomatologa. Urazy w postaci całkowitego zwichnięcia zęba według danych z piśmiennictwa występują u 0,5–16% dzieci z uzębieniem stałym i dotyczą znacznie częściej chłopców. Wybite zostają najczęściej siekacze przyśrodkowe w szczęcie, znacznie rzadziej w żuchwie. Resorpcja zewnętrzna korzenia jest powikłaniem występującym w przypadku urazów zębów prowadzących do uszkodzenia tkanek przyzębia. Najczęściej występuje w zębach całkowicie zwichniętych, wtórnie replantowanych. Proces jest uzależniony od zachowania żywotności miazgi. Etiologia i patogenеза resorpcji zewnętrznej nie jest do końca wyjaśniona. Opisano przypadek 10-letniego pacjenta, u którego w wyniku urazu w 2005 r. doszło do całkowitego zwichnięcia zęba 21. Ząb replantowano bez jednoczesnego leczenia endodontycznego. Podczas badań kontrolnych w okresie 3 lat od urazu została zachowana żywotność miazgi. W 2008 r., po 3 latach od urazu, stwierdzono początki powikłania w postaci przewlekłego ropnego stanu zapalnego tkanek okołowierzchołkowych – rozpoznano i opisano radiologicznie m.in. resorpcję zewnętrzną korzenia zęba. Praca przedstawia kliniczne możliwości zahamowania wyżej opisanego procesu patologicznego z wykorzystaniem preparatów wodorotlenkowo-wapniowych i leczniczych właściwości ozonu (**Dent. Med. Probl. 2009, 2, 256–259**).

Słowa kluczowe: stomatologia dziecięca, resorpcja, ozon.

Abstract

Teeth trauma in the developmental age is the second reason as for the frequency of patients' reporting to the stomatology doctor. The traumas in the form of the complete tooth dislocation are frequent with the 0.5–16% children with permanent teeth and are more often common with boys. The dislocated teeth are most usually the medial incisor in the jaw and more rarely – in the mandible. External tooth root resorption is a complication occurring with tooth trauma which, in consequence, leads to the damage of the periodontal tissues. The problem prevails in teeth which are completely dislocated, secondarily implanted. The process depends on the preservation of pulp vitality. Etiology and pathogenesis of the external resorption is not fully explained. In this study, the authors described a case of a 10 year-old patient, who in the consequence of the trauma in 2005, experienced complete dislocation of tooth 21. The tooth was replanted without a parallel endodontic treatment. In the course of the control study, in the period of 3 years from the trauma, the vitality of the pulp was certified. In 2008, after 3 years from the trauma – the beginnings of complications in the form of the chronic purulent inflammation of periapical tissues – the external resorption of the tooth root was recognized and described radiologically. The study presents clinical possibilities of inhibiting of the above described pathological process with the use of hydroxide-calcium preparations and curative powers of ozone therapy (**Dent. Med. Probl. 2009, 2, 256–259**).

Key words: paediatric dentistry, resorption, ozone.

The conduct in post-trauma cases of teeth treatment of patients in developmental age is quite a serious problem in developmental age stomatology.

Such problems involve the treatment of young teeth which are immature following their dislocation and replantation. Frequent complications in the form of pulp necrosis, gangrenous pulp

decomposition, chronic purulent inflammation of periapical tissues or the resorption of hard tissues of the tooth make completion of treatment more difficult or even impossible and the rehabilitation of the mastication organ – barely possible [1–6].

Teeth trauma in the developmental age is the second reason as for the frequency of patients' reporting to the stomatology doctor. The traumas in the form of the complete tooth dislocation are frequent with the 0, 5–16% children with permanent teeth and are more often common with boys. The dislocated teeth are most usually the medial incisor in the jaw and more rarely – in the mandible [1–5].

In the treatment of the consequences and post-trauma complications of teeth, among others, in the external resorption of the root, one should take advantage of all available methods of treatment as the retain as many teeth in the oral cavity as possible, with regard to the young age of the patients and to the growth processes in the organism [7].

Resorption is a damage done to the tooth structure by osteoclasts. One can differentiate external and internal resorption depending on the fact which surface is resorbed [8].

External, inflammatory resorption of the root, such as in the case described, is a consequence of the traumatic dislocation of the tooth [9]. In this type of resorption, odontoblasts resorb external surface of the tooth – which mainly affects the tooth root. The process excited by the inflammatory condition may have a rapturous course. Resorption also affects the tooth socket bone adhering directly to the focus in the root cementum. This may lead to a complete damage of the tooth in just a few months. External resorption is not usually recognized, as its course is usually asymptomatic. Even when the structure of the tooth is completely damaged, the tooth will remain stable in the dental arch. In cases of the advanced resorption, one may encounter imprecise pain problems [10, 11].

In treatment of children after mechanical traumas, in the result of which the tooth dislocation occurred, one should take advantage of all the possibilities as for the methods of treatment to retain teeth in the oral cavity.

The condition for the arrival at a full effect in the endodontic treatment is the removal of the infected tissue from the canal system by its mechanical-chemical elaboration and tight filling of the canals. There are no known methods of complete canal sterilization. The search for new methods of elaboration of tooth canals which would completely sterilize the root system is still going on. Great hopes are ascribed to the use of hydroxide-calcium preparations or ozone in the endodontic treatment [12].

The condition for proper endodontic treatment is both mechanical and chemical elaboration of the tooth canals. Mechanical elaboration is not sufficient for a complete removal of microorganisms. One recommends the use of chemical means whose aim is the disinfection of the canals. Such preparations should not only have a wide spectrum of antibiotic action but they can't be toxic for the host tissues. The solution of sodium hypochlorite is one of the most popular disinfecting means regarding its strong antibacterial action; however it triggers toxic action towards the periapical periodontium. A substantial alternative is presented in the form of ozone therapy. Clinical application of ozone aids the conducting of the endodontic procedure. Ozone deeply infiltrates the canal system, causing its almost complete disinfection and dryness. [12].

Ozone, the allotropic variety of oxygen, is finding more and more common application in stomatology due to its antiseptic action activating the immunological response and die to its advantageous effect on the metabolism of the inflamed tissues.

The use of ozone in stomatology results from the following physicochemical properties [13, 14]:

- It improves the metabolism of the inflamed tissues, increasing their oxygenation;
- It activates systems of the immune system response – in great concentrations it exhibits immune-suppressive action and in lower doses immune-stimulating action;
- It influences the oxidation balance of the organism;
- It destroys bacteria, fungi and viruses.

As a very strong oxidizing agent, it connects with biomolecules, which build among others, bacterial cells membranes [14, 15] The studies showed that a few-second action of ozone leads to the complete inhibition of vital functions of bacteria both Gram positive ones (+), and Gram negative ones (–), ozone also destroys *Candida albicans* [14, 16]. The authors described a case of a 10 year-old patient, who as a result of a mechanical trauma experienced a complete dislocation of tooth 21. The possibilities of taking advantage of hydroxide preparations and ozone therapy in the treatment of the complication in the form of external root resorption were presented.

Case and Treatment Report

The patient – S.L. – a 10 year-old boy, reported to the Developmental Age Department of Medical University of Lublin in September 2005 with the diagnosed tooth 21 dislocation. Due to the

unfinished development of the root apex, the preservation of the periodontal tissue, and the short time which elapsed from the trauma till the moment of reporting, the procedure of replantation was decided. The immobilization was left for the period of 3 weeks. During consecutive control studies in the period from replantation till 2008, the tooth showed a preserved vitality. In August 2008 in the clinical examination, the gangrenous decomposition of the tooth pulp was ascertained. Chronic purulent inflammation of periapical tissues with an active purulent fistula in the region of the tooth root apex. Under the x-ray picture, the symptoms of chronic inflammation of the periapical tissues of tooth 21 were confirmed (Fig. 1). The image of the tooth crown remained right and its mobility was physiological. Endodontic treatment was initiated. Classical scheme of a mechanical-chemical character was applied, using 2% of



Ryc. 1. Stan początkowy. Przewlekły stan zapalny tkanek okołowierzchołkowych zęba 21

Fig. 1. Pre-operative view. The symptoms of chronic inflammation of the periapical tissues of tooth 21



Ryc. 2. Stan po 3 miesiącach. Kanał wypełniony tymczasowo preparatem wodorotlenkowo-wapniowym (Biopulp®)

Fig. 2. View at 3 months recall. The canal is filled temporarily with the calcium-hydroxide material (Biopulp®)

the sodium hypochlorite and 0.9% of NaCl solution. 24 second application of ozone was effected each time with the use of Ozotop® (W&H Poland) apparatus. The canal was filled temporarily with the calcium-hydroxide preparation-Biopulp® exchanged every weeks. In the course of the so conducted endodontic treatment, the complete closure of the purulent fistula was achieved, however due to the negligent radiological symptoms of the inflammatory condition in the form of bone tissue rarefaction, the canal has not been finally filled so far (Fig. 2). The tooth fulfills its functional and esthetic role in 100%. The mucous membrane in the region of the apex has a proper structuring. Excessive instability of the tooth is not confirmed.

Discussion

Unlike bone, which undergoes resorption and apposition as part of a continual remodeling process, the roots of permanent teeth are not normally resorbed. Only the resorption of deciduous teeth before they are shed can be considered physiologic. Avulsion injuries pose a greater and serious assault to the gingiva, the periodontal ligament and the pulp. Andreasen has shown that resorption defects occur on the root surface adjacent to the areas of damage to the periodontal ligament during avulsion or extended drying before replantation. Inflammatory resorption is a mechanism of eliminating infected calcified tissue from the body; osteoclasts acting as specialized macrophages actively participate in the healing process to repair traumatized tooth and bone [17]. Calcium hydroxide is one of the most effective materials for the treatment of external root resorption because of mainly two properties high calcium ion concentration and alkaline pH [18]. The specific mechanism of action of calcium hydroxide is still debated. Several theories have been postulated to explain its biological activity.

The most important step in case of avulsion injuries is the maintenance of viable periodontal ligament cells which could be achieved with an early replantation of the tooth with minimum extra oral dry time. It is equally important to store the tooth in suitable storage medium. Physiologic splinting and early endodontic intervention has also got an effective role to play. Thus as the degree of trauma cannot be controlled it is the preventive measures that enhance the prognosis of a replanted tooth. External inflammatory root resorption involving more than 20% of root structure will usually go for a replacement resorption. However, an effort should always be made to slow

down the resorption process because replantation can restore the patient's esthetic appearance and occlusal function and the replanted incisor can remain functional for some years.

The patient remained for 4 years under the care of Developmental Age Department of Medical University of Lublin. Patient requires further systematic treatment and observation due to the possibility of complications occurrence. The therapeutic success would be the survival of the

tooth in the oral cavity to the moment of adolescence, when the combined surgical-implant-prosthetic treatment would be effective. One should consider the need for specialist treatment of patients in the developmental age after teeth trauma using modern therapeutic ways. It increases the chances of success in treatment and by the same time – it offers the possibility of further treatment of the stomatognathic system of the patient [7].

References

- [1] KRASNER P.: Management of sports – related tooth displacements and avulsion. *Dent. Clin. North AM.* 2000, 44, 111–133.
- [2] WĄSEK A., BUBIĘK-BOGACZ A.: Pourazowe uszkodzenia zębów i wyrostka zębodołowego u dzieci i młodzieży w świetle obserwacji własnych. *Stomat. Wspól.* 2002, 9, 46–50.
- [3] PIOTROWSKA M.: Replantacja zębów stałych – postępowanie. *Czas. Stomat.* 2002, 55, 668–676.
- [4] WIECZOREK P.: Replantacja całkowicie zwichniętych zębów – przegląd piśmiennictwa. *Nowa Stomat.* 1997, 2, 3, 13–16.
- [5] JANDA-WASILUK L.: Replantacje i autotransplantacje zębów z zastosowaniem preparatu węglanu wapnia w materiale doświadczalnym i klinicznym. Praca doktorska, WAM, Łódź 1996, 4–9.
- [6] MILEWSKA R., ŁUCZAJ-CEPOWICZ E.: Odległa ocena leczenia endodontycznego zębów stałych z niezakończonym rozwojem korzenia u dzieci po urazach mechanicznych. *Nowa Stomat.* 2003, 8, 1, 12–15.
- [7] SOB CZAK M., REMISZEWSKI A., WACIŃSKA-DRABIŃSKA M., CZERNIUK M., GÓRSKA R.: Postępowanie zachowawcze i chirurgiczne w leczeniu trudnego przypadku po urazie zęba niedojrzałego – opis przypadku. *Dent. Med. Probl.* 2003, 40, 2, 445–449.
- [8] WHITE S. C., PHAROAH M. J.: Radiologia stomatologiczna. red. Różyło T. K., wyd. Czelej, wyd I, 2002, 342–345.
- [9] NEWMAN W.G.: Possible etiologic factors in external root resorption. *Am. J. Orthod.* 1975, 67, 522–525.
- [10] TRONSTAD L.: Root resorption—etiology, terminology and clinical manifestations. *Endod. Dent. Traumatol.* 1988, 4, 241–252.
- [11] ANDREASEN J.O., BORUM M.K., JACOBSEN H.L., ANDREASEN F.M.: Replantation of 400 avulsed permanent incisors. 4. Factors related to periodontal ligament healing. *Endod. Dent. Traumatol.* 1995, 11, 76–89.
- [12] KLEPACZ J., ŁĘSKI M.: Możliwości wykorzystania ozonu w endodoncji. *Dent. Med. Probl.* 2008, 45, 194–198.
- [13] HUTH K.C., SAUGEL B., JAKOB F.M., CAPELLO C.: Effect of aqueous ozone on the nf-[kappa] b system. *J. Dent. Res.* 2007, 86, 451–456.
- [14] BACHANEK T., ORŁOWSKI M., WOLAŃSKA E., CIESZKO-BUK M.: Ozon w stomatologii – uwagi praktyczne. *Medicus.* 2005, 6, 7, 15–17.
- [15] HOLMES J.: Clinical reversal of root caries using ozone, double-blind, randomized, controled 18-month trial. *Gerodontol.* 2003, 20, 106–114.
- [16] NAGAYOSHI M., KITAMURA C., FUKUIZUMI T., NISHIHARA T., TERASHITA M.: Antimicrobial effect of ozonated water on bacteria invading dentinal tubules. *J. Endodont.* 2004, 30, 778–781.
- [17] ANDREASEN J.O.: External root resorption: its implications in dental traumatology, pedodontics, periodontics, orthodontics and endodontics. *Int. Endo. J.* 1985, 18, 109–118.
- [18] SADD Y.: Calcium hydroxide in treatment of external root resorption. *J. Am. Dent. Assoc.* 1989, 118, 579–581.

Address for correspondence:

Artur Michałowski
Department of Paediatric Dentistry University Medicine in Lublin
Staszica 11
20-081 Lublin
tel./fax: (+48) 081 532 06 19
e-mail: sekretariat.ped@um.lublin.pl

Praca wpłynęła do Redakcji: 2.04.2009 r.
Po recenzji: 15.04.2009 r.
Zaakceptowano do druku: 5.05.2009 r.

Received: 2.04.2009
Revised: 15.04.2009
Accepted: 5.05.2009