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RARE CLINICAL CASE OF TOOTH ROOT EXTERNAL RESORPTION AS A DELAYED POST-TRAUMATIC COMPLICATION

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Abstract

Presented clinical case reveals some problems concerning the detection, diagnostics and treatment of tooth root external resorption. Root resorption of permanent tooth (internal and external) is assessed as pathological process, caused by different factors both general (cardiovascular diseases, endocrine disorders, some infections, such as Hepatitis C, Hepatitis B virus, human immunodeficiency virus. etc.) and more often local (traumas, delayed complications after caries treatment, local metabolic disorders in the pulp and periodontium).

This clinical case presents the tooth root apex resorption as a delayed post-traumatic complication. The lesion of progressed resorption was revealed six years after dentoalveolar trauma. Over these years the patient didn't have any clinical manifestations. The area of resorption was revealed accidentally during the clinical X-ray examination, specifically by conical beam computed tomography that enables three-dimensional area examination and more precise assessment of pathological lesion location and distribution directions. Pathohistological study was also carried out in order to clarify the diagnosis, thus preliminary diagnosis was eventually confirmed. The color of tooth crown was changed. The choice of treatment method was conditioned by the resorption type, its etiologic factor, direction of pathological process distribution and lesion size. The treatment is often complex, long-lasting, expensive and the results are unpredictable. Tooth extraction is the only treatment in some cases. Conservative approach through endodontic intervention is possible if tooth root resorption is revealed at early stage and its sizes are permissible. In this clinical case the surgical strategy was conditioned by the large volume of tooth root resorption, thus tooth extraction was performed. After the alveolar bone healing, the space of missing tooth was restored by metal ceramic bridge, fixed on adjacent teeth after endodontic treatment.

Keywords: *tooth root external resorption, dental trauma.*

Introduction

Dental traumas can involve gum, alveolar bone, periodontal tissue, tooth root cement as well as neurovascular bundle of the pulp. The recovery is often accompanied by complications, such as pulp necrosis, root canal obliteration, root resorption and alveolar bone decay [*Chan A et al., 2001; Andreasen J et al., 2007*]. Appropriate treatment choice and long-term observation are the foremost means of complication prevention in case of traumatic lesions. Facial traumas mainly involve anterior teeth and complications occur afterwards [*Elbay Ü et al., 2014; 2015*]. Thus, pulp vitality and roentgenographic changes should be assessed over time.

The types of tooth root external resorption are differentiated as follows: superficial, inflammatory, replacement and idiopathic (primary) [*Trope M, 2000; Bakland L et al., 2004*]. Superficial resorption is a transitional process, induced by tooth dislocation and involving small portion of tooth root. Superficial resorption is more frequently observed in the teeth after orthodontic

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intervention or slight damage. This type of resorption begins on the surface of root involving cement and sometimes dentine. Resorption lesion rarely extend beyond the cement and dentine border. Superficial resorption is revealed through X-ray examination only if the defect is of an atypically big size. In practice, however, it's impossible to notice vestibular and oral surface resorption areas. Thus, it is mostly diagnosed after the tooth extraction by histological investigation. Under the favorable conditions, i.e. when the pulp is not infected, this type of resorption is reversable [*Trope M, 2000; Gutmann J, 2014*].

Inflammatory root resorption is the most aggressive and destructive among the trauma-induced resorptions, probably due to pulp or periodontium infection. The resorption more often occurs on vestibular or oral surfaces. Resorption areas are superficial or may include deeper dentine layers. Odontoclasts and section of granulation tissue are found in resorption areas. Conditioned by the changes in general state of the organism, alongside with maxillofacial and oral cavity lesions this pathological process might be revealed through cardiovascular diseases, endocrine disorders as well as impairment of other systems in patients with hepatitis C virus (HCV), Hepatitis B virus (HBV), human immunodeficiency virus controllers (HIC) and other infections [*Heboyan A, Avetisyan A, 2011*].

Inflammatory root resorption pathogenesis differentiates five factors: 1. Necrotic changes in the pulp 2. Presence of bacteria 3. Periodontal tissue lesion 4. Stagnation of bacteria and decomposed tissue remnants in decayed dentin canal tubules 5. Incomplete root formation i.e. wide dentinal canals and large pulp volume, due to which this type of resorption is often observed in children rather than in adults.

Inflammatory root resorption is generally asymptomatic. Rare clinical manifestations are similar to those of pulp lesion, so the diagnosis cannot be based on clinical picture and patient's complaints. In case the resorption results in pulp necrosis, the crown of the tooth changes its color and patients might present with aesthetic concerns.

The treatment is carried out considering the root resorption severity. Endodontic treatment is performed according to standard root canal treatment protocol if the process does not involve large area and there are enough undamaged tissues. Before the placement of permanent filling, non-hardening calcium hydroxide paste is used and properly replaced by new proportions until the resorption arrest [*Andreasen J 1970; Trope M et al., 1995; Al-Badri S et al., 2002;* Öktem *Z et al., 2009; Gutmann J et al., 2014*]. In tooth crown discoloration, internal tooth bleaching and appropriate preventive measures are performed before placing the permanent tooth filling in order to avoid further complications. Tooth extraction is required if resorption involves the most of the root.

Treatment prognosis of inflammatory root resorption in adults is more positive. The wider the dentinal canals, the bigger the probability of presence of bacteria and decomposed remnants of involved pulp, which activate odontoclasts causing cement and dentin decay.

Replacement resorption is relatively slow, chronic but not quite a benignant process, which brings to the development of ankylosis. This type of resorption occurs as a consequence of severe trauma of periodontal ligament, resulting in loss of cell vitality and considerable damage of cement. Loss of periodontal tissue occurs and accretion of osseous tissue to cement and dentine takes place. In this case, periodontal tissue between the tooth and alveolar bone is missing and the tooth occurs to be enclosed in spongiform substance and immobilized. Replacement resorption results in tooth root decay, when areas of destruction are quickly filled with osseous tissue, due to which light areas are invisible in X-ray film, unlike they are in inflammatory root resorption. Replacement resorption is mostly observed in adults, and sometimes in children either [*Andreasen J, 1970; Trope M, 2000; Al-Badri et al., 2002; Gutmann J et al., 2014*] and might result in tooth loss over time.

Some types of resorption are not possible to classify as either superficial, inflammatory or replacement ones. These types of tooth root resorption make a separate group called idiopathic, pri-

mary or cervical. It is an external resorption of root surface which occurs after dental treatment, usually beginning at the enamel-cement junction area and affecting mostly anterior teeth.

Clinical diagnosis of tooth root resorption is frequently made by accident during the roentgenographic investigation. It is conditioned by the fact that resorption remains asymptomatic until the stage of marked development. Thus, roentgenographic interpretation of resorptive process is crucial to predetermination of differential diagnosis, treatment and outcome of resorption [*Cohenca N et al., 2007a*]. Three-dimensional images allow to assess the necessary area without overlay of surrounding structures [*Cohenca N et al., 2007b*]. Unlike conventional computed tomography, conical beam computed tomography under the conditions of low-dose X-ray radiation provides an accurate information [*Loubele M et al., 2009*]. Daily usage of conical beam computed tomography for endodontic purposes is not recommended, however it is justified in dentoalveolar trauma assessment in case the conventional roentgenographic investigation methods do not provide an adequate information [*European Commission, 2012*].

Clinical case of external root resorption of maxillary central incisors as a post-traumatic complication is presented in this article.

Material and methods

The following investigations were carried out to diagnose the disease: conical beam computed tomography and pathohistological study.

Jaw scanning was performed by Planmeca Promax 3D Max conical beam computed tomography (Planmeca, Finland). The images were analyzed by Planmeca Romexis computer program (Planmeca, Finland).

After the tooth extraction, removed teeth and alveolar curettage tissues were sent for pathoanatomical investigation. Preparation was made by hematoxylin-eosin coloring and examined under the light microscope.

Clinical case

A 19-year-old male with a number of affected teeth came to the clinic with esthetic concerns. History taking was followed by clinical examination. The patient mentioned the facial trauma which he had at the age of 13. On extraoral examination of hard and soft tissues, there were no signs of injury such as edema, any changes in the color of the face skin, scars and asymmetry. Palpation of the facial bones as well as mouth opening assessment didn't reveal any anomalies.

Intraoral examination revealed first degree tooth mobility and discoloration of maxillary central incisors, that suggested pulp necrosis of the teeth, numerous teeth with partial or complete coronal destruction from dental caries as well as some missing teeth (Fig. 1).

Computed tomography revealed complete resorption of two central incisors of the upper jaw (Fig. 2). There were tissue changes around the root remnants of the maxillary central incisors (Fig. 2B) but no root and bone fracture. The roots of other teeth didn't undergo any changes.

Due to the severely marked root resorption it was not possible to save the teeth (Fig. 3), so it was decided to extract the teeth and to plan further restoration by means of fixed partial dentures.

Teeth extraction was performed under the local anesthesia. Extracted teeth and tissue mass of alveoli curettage were sent to pathohistological investigation. According to pathohistological description, there were few microcirculatory vessels and bone cells in the examined area. Osteoclasts with active plicate surface producing enzymes and integrins, directed towards the resorption area were present. Besides the osteoclasts, there were

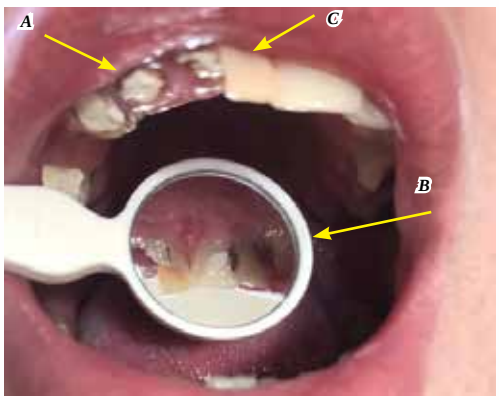

Figure 1. *Vestibular and oral images of the upper central incisors. A) Decayed tooth crowns, B) Caries affected areas, C) Discoloration*

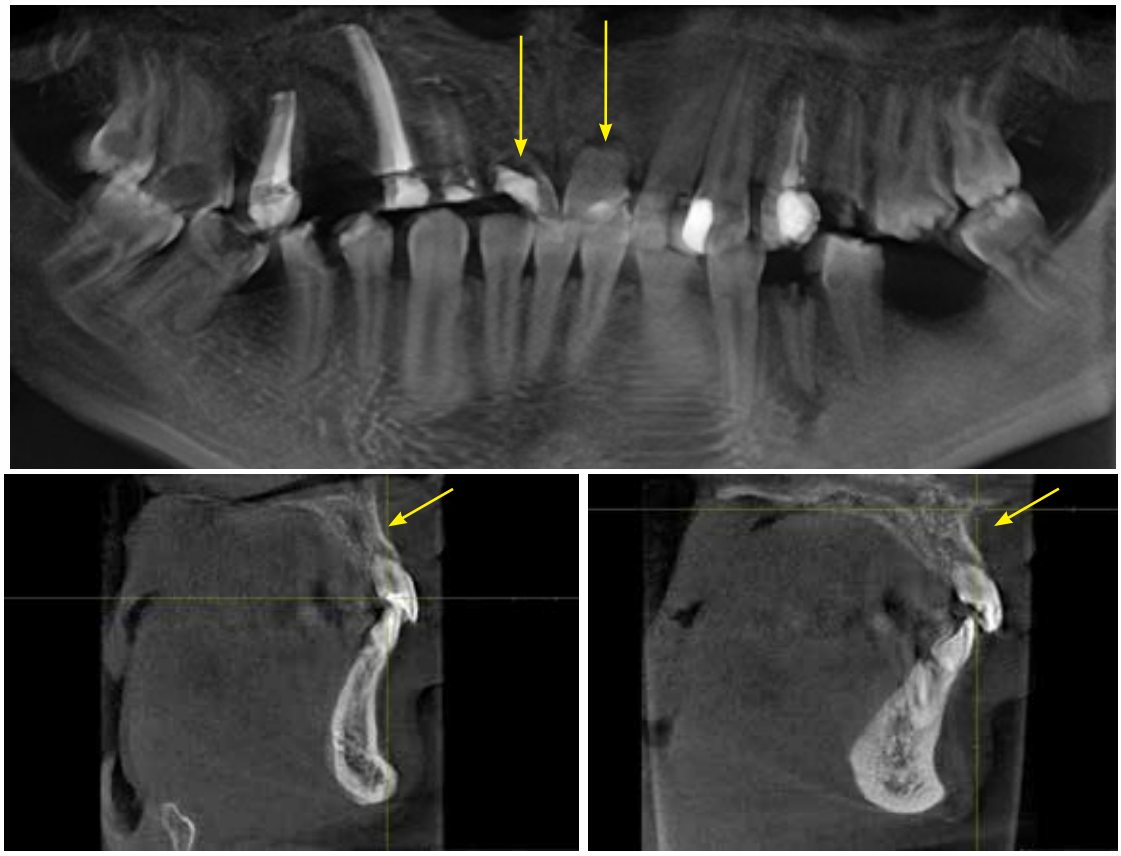

Figure 2. *Conical beam computed tomography images of the jaws. A) Complete root resorption in the maxillary central incisors, B) Tissue changes around the root remnants of the maxillary central incisors*

Figure 3. *After the extraction of maxillary central incisors: A) Hollow alveoli of maxillary central incisors, B) Tissue mass obtained by alveolus curettage, C) Extracted tooth*

monocytes (microfager, lymphocytes). Pathohistological investigation confirmed the clinical roentgenographic diagnosis.

The patient was given recommendations concerning oral hygiene. The patient underwent repeated examination the next day to plan and carry out further prosthetic treatment. As a result, the dentition defects were eliminated by means of metal ceramic fixed partial dentures (Fig. 4).

Figure 4. *The patient's teeth after the reconstruction with metal ceramic fixed partial dentures*

Discussion

Tooth root external resorption is a rare post-traumatic complication. Among the consequences of dental trauma, resorption has negative prognosis as it significantly affects periodontal ligament, pulp, alveolar bone and root cement.

Thus, roentgenographic analysis of resorption process is crucial to predetermination of differential diagnosis, treatment and outcome. In the presented case roentgenographic investigation, made about six years after the trauma revealed root resorption of maxillary central incisors. Endodontic treatment would not be effective as the main part of the roots was resorbed. From a clinical point of view, traumatized teeth challenged diagnosing, treatment planning and outcome prognosis. Recent achievements in X-ray image analysis allow to assess structural changes productively. Small- or limited-volume conical beam computed tomography provides accurate 3D images of the teeth and surrounding dentoalveolar structures. In this case conical beam computed tomography images are assessed by submillimeter-thick layers of different root portions to evaluate resorption process and to avoid overlay of anatomical structures. Daily usage of conical beam computed tomography is not recommended for children, as the dose for children is different [*Goske M et al., 2008*] and it's necessary to follow ALARA (as low as reasonably achievable) standard approach. The treatment of tooth root external resorption is frequently complex, long-lasting, expensive and the results are unpredictable. In comparison with periapical roentgenogram, new systems of extraoral X-ray examination can be advantageous in revealing complications at early stage and precise assessment of the real size, character and location of periapical injuries and resorption.

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