REPEATED ENDODONTIC TOOTH TREATMENT WITH SUSPECTED INTRA-ROOT RESORPTION. A CLINICAL CASE

Dmytro Viktorovych DOBROVOLSKYI[1], Natallia GEVKALIUK[2]

[1]Postgraduate student, "Ivan Horbachevsky" Ternopil National Medical University of the Ministry of Public Health of Ukraine, Ternopil, Ukraine
[2]Professor, PhD, "Ivan Horbachevsky" Ternopil National Medical University of the Ministry of Public Health of Ukraine, Ternopil, Ukraine
Corresponding author: Dmytro Viktorovych Dobrovolskyi; e-mail: dobrovolskyi_dv@tdmu.edu.ua

Abstract

Introduction. Intra-root resorption is one of the most poorly studied pathological conditions in modern dentistry today. According to a number of studies, the frequency of intra-root resorption detection, depending on the studied population, is 0.01-55 %. **The aim of the study** is to optimise the diagnosis and endodontic treatment of tooth 11 with suspected intra-root resorption. **Materials and methods**. Dental examination of the patient aged 15 years, determination of vitality signs of tooth 11 (cold test with Miracold plus -50°C), radiological examination (a series of targeted intraoral and extraoral X-rays of the tooth 11, orthopantomogram, cone beam computed tomography) were performed. Repeated endodontic treatment was performed using an electron microscope (Karl Kaps, Germany). **Results and disscusion**. A 15 year-old patient complained of recurrent pain in tooth 11. He received an acute injury in the area of the front teeth one year ago during boxing training. An objective examination revealed that tooth 11 was not discoloured, and there was no access to its crown. A temperature test (cold test with Miracold plus -50°C) showed no signs of vitality. Orthopantomogram of the root canal of tooth 11 showed loose filling material in the root canal, wide root apex, widening of the periodontal gap in the area of the tooth root apex. The targeted X-ray of tooth 11 shows the contours of the gutta-percha post, its apex being bent in the coronal pulp chamber, which indicates that the post was placed in retrograde position. Cone beam computed tomography showed periapical radiolucency at the apex of the causative tooth, without signs of root resorption, no intra-root resorption, and poor density of the filling material. The pulp chamber was accessed, the root canal was treated using hand instruments (K- and H-files) with constant disinfection with 5.25% sodium hypochlorite solution and solution activation using ultrasound. To clean the lubricated dentine root layer, a 2% EDTA solution was used, with subsequent neutralisation with a 5.25% sodium hypochlorite solution. The root canal apex was lined with cement (Bio MTA+) by Cerkamed, the other part – with thermoplastic gutta-percha system (DiaDent, Korea). Access to the root canal was sealed with Synergi D6 light-curing composite, colour A2. A follow-up visit within 6 months demonstrated clinical well-being, which was confirmed by a targeted radiography. **Conclusions.** The described clinical case suggests that the most optimal results of endodontic teeth treatment with intra-root resorption are observed when using an electron microscope with modern methods of root canal treatment and when filling it with biocompatible materials.

Keywords: *intra-root resorption, acute tooth trauma, endodontic treatment*.

1. INTRODUCTION

Today, among dental pathologies, there are a number of diseases that practitioners encounter much more often than it seems, and the impact of which on the treatment outcome is clearly underestimated. One of these pathologies is intra-root teeth resorption [1,2]. In most published studies, the authors describe external tooth root resorption, while internal hard tissue resorption also poses a problem for the practising dentist. According to a number of authors [3,4], the frequency of detection of intra-root resorption, depending on the population studied, ranges from 0.01% to 55%, being detected by the clinician mainly by chance during an X-ray examination. However, the authors clarify that the data obtained may be erroneous, due to the small number of observations and differences in the methods of study.

According to the American Association of Endodontists, resorption is defined as a pathological process that occurs within dentine, root cementum or bone tissue [5]. As known, intra-pulpal resorption is the destruction of intra-root dentine and dentinal tubes along the inner walls of the root canal [6-8]. One or another etiological factor (most often mechanical, chemical, thermal trauma) leads to tooth damage, which results in intra-pulpal bleeding,

accompanied by haematoma formation, which is replaced by granulation tissue [3,4]. The proliferating granulation tissue exerts pressure on the dentine walls, which leads to the destruction of the tissues, covering the inner surface of the root canal, the odontoblast layer and the predentine. As a result, odontoclasts differentiate from the connective tissue and resorption begins. However, this process is possible only if viable areas of pulp and vascularisation are preserved inside the tooth cavity, which ensures odontoclasts inflow. Resorption can be stopped only with complete elimination of the tooth pulp tissue [4,9].

In the early diagnosis of intra-root resorption, two-dimensional radiography is ineffective, as it allows detecting foci of 2-3 mm in size, with a degree of hard tissues demineralisation of about 75%. Cone beam computed tomography allows detecting resorption in the early stages of the pathological process, which significantly improves treatment prognosis [10].

In the case of an endodontic treatment, removal of organic tissue residues from resorbed areas using endodontic instruments and high-quality three-dimensional obturation due to technical difficulties is not always possible. The literature describes, as a rule, single clinical cases when the authors use different methods of cleaning and irrigation of the root canal [11,12], fill the canal with different materials and methods [13-15]. However, to date, there are no universal treatment protocols for this pathology.

The aim of the study was to optimize the diagnosis and endodontic treatment of tooth 11 with suspected intra-root resorption.

2. MATERIALS AND METHODS

Prior to the study, the patient and his representative (grandmother) were informed about the treatment measures and informed consent was obtained in writing. The study was conducted in accordance with the Declaration of Helsinki 1975, updated in 2000 (regarding the ethics of the medical community and prohibition of disclosure of patient's name, initials or hospital registration number), and the ethical standards of the Human Experimentation Committee (institutional and national), as well as with the Declaration of Ethical Principles of the Ukrainian Helsinki Human Rights Union (2016).

We conducted a dental examination of a 15 year-old patient, determined the signs of vitality of tooth 11 (cold test with Miracold plus -50°C), and performed an X-ray examination (a series of targeted intraoral and extraoral X-rays of the tooth 11, orthopantomogram, cone beam computed tomography). The working length of the root canal was determined using computed tomography, with confirmation of the apex locator. Repeated endodontic treatment was performed using an electron microscope (Karl Kaps, Germany). The apical part of the root canal was obturated with cement (Bio MTA+) of Cerkamed, which was applied using a Lee unit, cold gliders and S-Condenser, and the rest of the canal was filled with a thermoplastic gutta-percha system (DiaDent, Korea) using an injector. Access to the root canal was sealed with Synergi D6 light-curing composite, colour A2.

3. RESULTS AND DISCUSSION

The patient aged 15 years (reference) was referred to Bilyk Clinic in Ternopil by a colleague who had previously planned a comprehensive oral cavity rehabilitation. The task was to preserve tooth 11 with suspected intra-root resorption and an unformed root apex. The patient complained of recurrent pain in tooth 11 when eating and pressing on it.

The medical history revealed that the teenager was 15 years old, coming from a low-income family, was brought up with his grandmother, studied at a secondary school, and attended a boxing sports section.

The medical history also established that an acute injury in the area of the front teeth occurred one year ago during training. At the time of injury, tooth 12 was immediately lost, and tooth 11 was found and saved by the patient. Within 8 hours after the injury, the patient visited a dentist, where he was diagnosed with complete dislocation of teeth 11 and 12, without damage to the alveolar ridge. Tooth 11 was placed in the

socket after preliminary treatment, endodontic treatment and splinted in one visit.

During the objective examination, we found that tooth 11 was not discoloured, and there was no access to the tooth crown during visual inspection, which immediately raised concerns about the quality of the previous treatment, since the tooth was treated *in vitro*, with access to the pulp through the tooth root apex. Probing of the gingival sulcus was within the normal range and without inflammation. During tooth percussion, mild tenderness along the vertical tooth axis was observed. Pathological tooth mobility was not detected.

To plan the optimal treatment measures, additional research methods were performed. During the temperature test (cold test with Miracold plus -50°C), no signs of vitality were detected in tooth 11. The orthopantomogram (Fig. 1) in the anterior region of the teeth revealed the absence of the root of tooth 12 and the presence of disorders associated with an irrational approach to the treatment of tooth 11. In the root canal of the causative tooth, there is a loose filling material, a wide root apex and widening of the periodontal gap in the area of the tooth root apex.

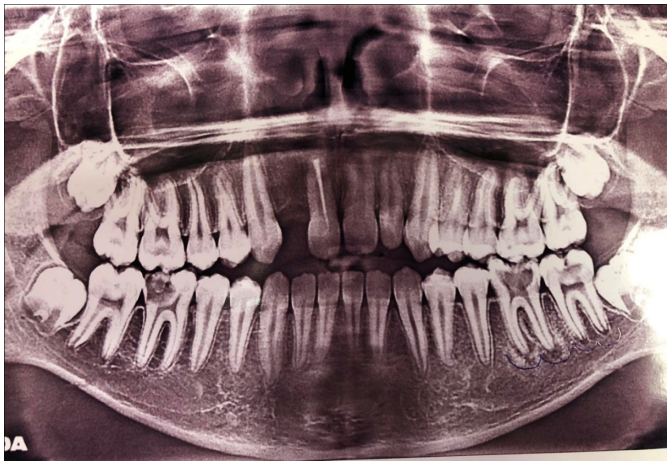

Fig. 1. Orthopantomogram of the patient at the initial visit

For a better diagnosis of the tooth periapical tissues and root canal state, a series of targeted X-rays of tooth 11 were taken (Fig. 2), which clearly visualise the contours of the gutta-percha post, which is blocked apically with a wide part, its apex being bent in the coronal part of the pulp chamber. This suggested that the post was placed retrograde to the stop and the gutta-percha was blocked in the root canal, while the excess part of the post at the top was actively cut off. After that, the tooth was obviously repaired with subsequent splinting.

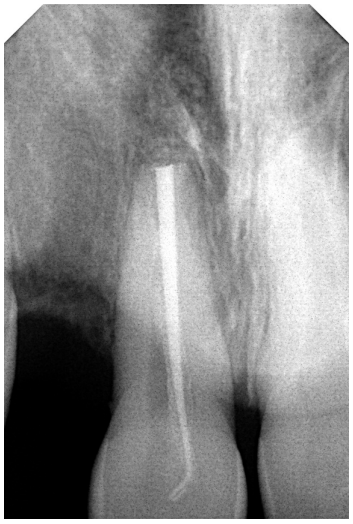

Fig. 2. Targeted X-ray of tooth 11 during the diagnostic process

Cone beam computed tomography (CBCT) was performed to verify the presence of inflammation in the root apex and to exclude the presence of root resorption (Fig. 3). The result of the study showed periapical radiolucency at the causative tooth apex, without signs of root resorption. The density of the filling material was of poor quality and did not meet the established standards. The contours of tooth 11 apex were smooth in horizontal direction, which suggested that it had been cut with boron to remove the remnants of the gutta-percha post. The results of the study confirmed the absence of intra-root resorption of tooth 11.

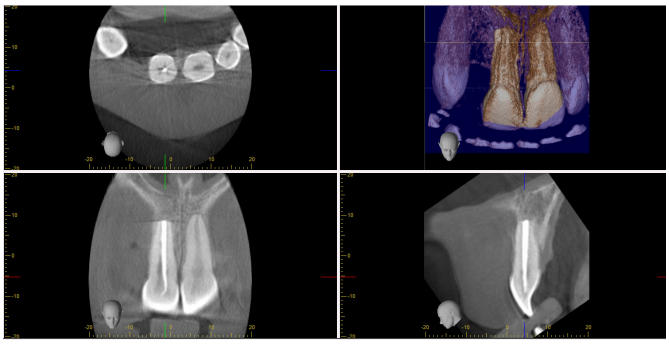

Fig.3. Cone beam computed tomography

The results obtained allowed us to determine the following tactics. All medical procedures were performed using an electron microscope (Karl Kaps, Germany). After infiltration anaesthesia ("Ubistesin Forte" 4%, 1 ml) and placement of the cofferdam system, access was made from the palatal surface of tooth 11 to the pulp chamber with spherical boron. The existing contents of the root canal were loose, filled with gutta-percha without siling. Preliminary determination of the working length of the root canal was made using computed tomography with confirmation of the apex locator. During the root canal treatment, large-sized hand instruments (K- and H-files) were used with constant disinfection with 5.25% sodium hypochlorite solution and activation of the solution using ultrasounds. The final size of the root canal apex treatment was 140 file sizes (Fig. 4). This size is a direct indication for filling with biocompatible cements based on MTA (Mineral Trioksit Agregat). The total irrigation time of the solutions was of one hour.

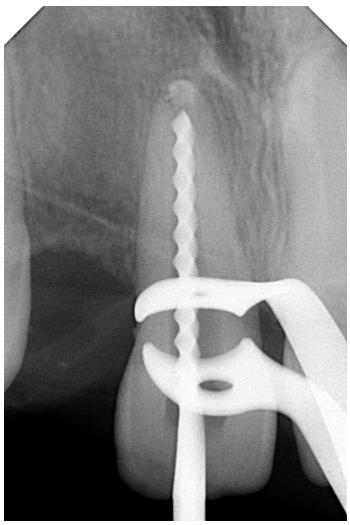

Fig.4. Targeted X-ray of tooth 11 during treatment (instrumental root canal treatment)

At the final stage, a 2% EDTA solution (exposure – 1 min) was used to clean the lubricated layer from the root dentine surface, with subsequent neutralisation with a 5.25% sodium hypochlorite solution.

After a thorough mechanical and chemical cleaning of the root canal in the absence of intra-root resorption, a decision was made regarding the root canal filling technique. The apical part (4 mm) was filled with cement (Bio MTA+) of Cerkamed (Fig. 5), which was applied using a Lee unit, cold gliders and S-Condenser.

The other part of the canal was filled with a thermoplastic gutta-percha system (DiaDent, Korea) using an injector (Fig. 6). Access to the root canal was sealed with Synergi D6 light-curing composite, colour A2. The patient received necessary recommendations regarding the chewing load on the anterior group of teeth and was notified of the next follow-up visit within 6 months.

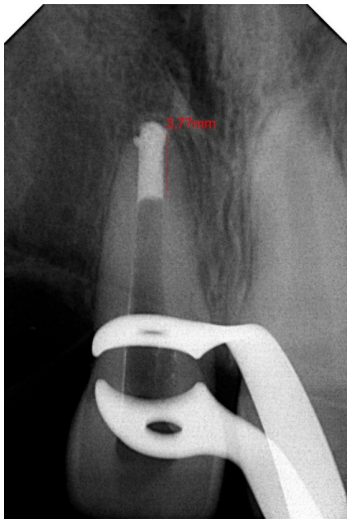

Fig. 5. Targeted X-ray of tooth 11 (root canal apex obturated with Bio MTA+)

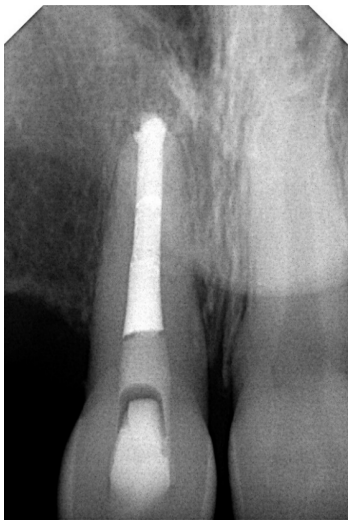

Fig. 6. Targeted X-ray of tooth 11 (root canal obturation with thermoplastic gutta-percha)

During the follow-up visit after the specified time, the patient had no complaints, no pain, and the tooth remained stable. The control radiograph

showed no periapical bone radiolucency above the root, which indicates treatment success.

5. CONCLUSIONS

Analysis of literature data and of a specific clinical case showed that dentists often do not have a sufficient level of awareness of tooth intra-root resorption problem, and underestimate the availability of material support during diagnosis and treatment. The clinical case here described allowed us to assert that optimal results of teeth endodontic treatment, in particular with intra-root resorption and wide tooth root apex, are observed when using an electron microscope with modern methods of root canal treatment and its filling with biocompatible materials. Adherence to the algorithm of the endodontic dental treatment in all its stages can ultimately increase its effectiveness and ensure teeth quality functioning.

Prospects for further research. In the future, it is planned to create a certain regulation for practicing dentists in tooth intra-root resorption treatment, to investigate and determine the most effective methods of processing and filling root canals to optimise the final treatment result.

Relationship of publication to the planned research projects. This project is part of the planned research project of the Department of Paediatric Dentistry of "Ivan Horbachevsky" Ternopil National Medical University of the Ministry of Public Health of Ukraine, entitled "Development and application of new methods of diagnostics, prevention and treatment of dental and periodontal diseases at people of different ages" (state registration number 0120 U104149).

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