OVERCOMING OBSTACLES: A CASE STUDY OF SUCCESSFUL ENDODONTIC TREATMENT OF A TRAUMATIZED TOOTH WITH ADVANCED ROOT RESORPTION AND PULP OBLITERATION

Samra Korac*[1], Ana Planinic[2], Irmina Tahmiscija[1], Alma Konjhodzic[1], Aida Dzankovic[1], Lajla Hasic-Brankovic[1], Naida Hadziabdic [3]

[1] Department of Restorative Dentistry with Endodontics, University of Sarajevo- Faculty of Dentistry with Dental Clinical Center, Bosnia and Herzegovina

[2] Health Center Mostar, Bosnia and Herzegovina

[3] Department of Oral Surgery and Dental Implantology, University of Sarajevo - Faculty of Dentistry with Dental Clinical Center, Bosnia and Herzegovina

***Corresponding author**

Samra Korać, DDM, MS, Ph.D, Associate Professor, University of Sarajevo-Faculty of Dentistry with Dental Clinical Center, Department of Restorative Dentistry with Endodontics, Bolnicka 4A, 71000 Sarajevo, Bosnia and Herzegovina
Phone: +38733407802, +387 33 214-249 (203)
e-mail: skorac@sf.unsa.ba
ORCID ID: orcid.org/0000-0001-7842-7299

ABSTRACT

Background: This manuscript presents an interesting case report of a successful endodontic treatment of a traumatized permanent central incisor with advanced external apical root resorption, apical periodontitis and pulp obliteration. The main objective of this study was to shed light on the challenges faced in treating late complications of dental trauma and to emphasize the significance of careful diagnosis and management in such cases.

Methods: To assess the extent of the trauma and the condition of the tooth, the patient's dental history, clinical examination and radiographic evaluation were conducted. The treatment plan involved the use of ultrasonic tips and rotary endodontic files, along with calcium hydroxide paste and non-vital tooth bleaching. Regular clinical and radiographic evaluations were performed to monitor the healing progress of the periapical lesion.

Results: The endodontic treatment proved to be highly successful in preserving the traumatized tooth, despite its shortened root and extremely narrowed endodontic space. The use of appropriate techniques and materials played a crucial role in achieving this positive outcome as evidenced by the signs of healing observed during the regular follow-up evaluations.

Conclusion: This intriguing case report highlights the successful management of a complex endodontic case involving a traumatized tooth with advanced root resorption and pulp obliteration. The careful diagnosis, treatment planning and execution of the endodontic procedures were instrumental in achieving a favorable outcome. This study underscores the importance of personalized approaches in treating late complications of dental trauma to ensure the preservation of the natural dentition.

Keywords: dental trauma, incisor, root resorption, pulpal obliteration, discoloration, bleaching

Introduction

Following the dental injury, acute and follow-up dental care should be provided. The primary post-traumatic complications reported were pulp necrosis and infection, obliteration of the pulp space, different types of root resorption, marginal gingiva and bone breakdown (1,2).

Disruption of the neurovascular supply to the dental pulp may lead to sterile pulp necrosis, followed by infection. In mature teeth with severe traumatic displacement, pulp necrosis with infection of the root canal system accompanied by apical periodontitis is a common finding (3). Pulp necrosis occurred in 1/3 of traumatized teeth and mainly manifested years after the trauma occurred (2).

External inflammatory resorption (EIR) is a common sequela following traumatic dental injury due to damage to the cementum and /or periodontal ligament during avulsion or luxation (4). Moreover, EIR may result from inflammation of the periodontal tissues or orthodontic therapy. An infection-induced resorption process known as external apical inflammatory resorption usually responds favorably to routine endodontic treatment (5).

In addition, another type of late dental trauma sequela may be a pronounced deposition of tertiary dentine along the inner walls of the root canal, resulting in rapid narrowing of the endodontic space. Although a narrow root canal space always persists histologically, it does not frequently lead to complete obliteration due to the gradual narrowing of the entire root canal (6). Pulp canal obliteration (PCO) has high rates in cases of intrusion, extrusion and luxation injuries, especially in teeth with open apices indicating the presence of viable pulp tissue (1). The prevalence of PCO after dental trauma varies, ranging from 3.7% to 40% (6).

Traumatized teeth can exhibit color changes (3). Dental traumatic injuries often result in discoloration related to pulpal damage, ranging from pink to grey, as well as tooth crowns becoming yellow or yellow-brown due to the deposition of the irregular dentine in the pulp chamber.

The present case report describes the nonsurgical endodontic treatment and intra-coronal bleaching of the maxillary central incisor with advanced external apical root resorption, pulp obliteration and coronal discoloration, secondary to dental trauma.

Case report

A 23-year-old male visited the Department of Restorative Dentistry with Endodontics at the Faculty of Dentistry with Dental Clinical Center for a routine dental examination. The patient's medical and family history were unremarkable.

The patient reported that he accidentally fell while playing when he was a little boy, resulting in a fracture of the upper central incisor. Back then, he visited a nearby dental clinic, and a dental filling was placed. Years after the traumatic tooth injury, there were no clinical manifestations of that tooth.

An intraoral clinical examination revealed discoloration of tooth no. 21 with a huge dental filling (Fig. 1). Tooth #21 was not sensitive to palpation with sensitivity to percussion, as well as without gingival sulcular bleeding on probing, along with horizontal tooth mobility Grade 1. The response to the pulp sensitivity cold test was negative. A panoramic radiograph demonstrated a periapical lesion associated with tooth #21 (Fig. 2). Moreover, a

Figure 1. The crown discoloration #21.

Figure 2.
Initial panoramic of the periapical lesion of tooth #21.

Figure 3. Initial periapical radiography demonstrates a maxillary central incisor with periapical lesion, external apical root resorption, and pulpal obliteration in a maxillary left central incisor.

radiographic examination of #21 using a periapical radiograph showed apical radiolucency associated with extensive apical root resorption and the pulp canal showed signs of obliteration (Fig. 3).

Tooth discoloration, pulp necrosis with apical periodontitis and apical inflammatory resorption were diagnosed. Following the Treatment Decision Flowchart (7), depending on the observed signs and symptoms and with consultation with an oral surgeon, it was decided to perform non-surgical root canal treatment followed by non-vital bleaching and composite filling consecutively. An informed consent for the procedure was obtained from the patient.

Case management

In order to achieve preferred moisture control, a rubber dam was applied to all maxillary incisors (1). The access cavity was accomplished with a round diamond bur and an endo-access bur rotated parallel to the long axis of the tooth (7).

Calcification that covered the orifice of the root canal was identified in the center of the tooth and carefully removed using a diamond-coated ball ultrasound tip (P 14D, Satalec Acteon, France) under the control of the dental microscope (Carl Zeiss OPMI Pico, Germany). Afterward, with the operative

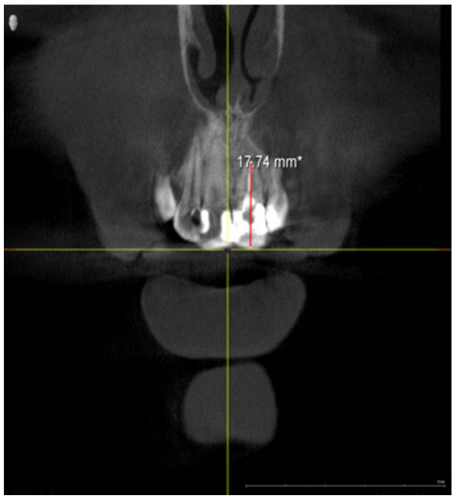

Figure 4. Working length confirmation on CBCT image

microscope's aid, a small orifice was identified. The identification of a canal orifice was based on the subtle differences in color between the tertiary dentine deposited in the pulp canal and the surrounding dentine (7). The calcified canal was negotiated by using a small hand file (0.08 K-file) (Dentsply Maillefer, Tulsa, OK) with watch-winding movements. The working length was confirmed by using an electronic apex locator Endo radar (Woodpecker Guilin) and confirmed with CBCT imaging (Figure 4). Subsequently, biomechanical instrumentation was performed using MTwo rotary endodontic files in the sequence (VDW GmbH, Munich, Germany) and copious irrigation with 1.5% sodium hypochlorite (NaOCl) combined with EDTA. In addition, the canal was dried using sterile absorbent paper points and an intracanal dressing of

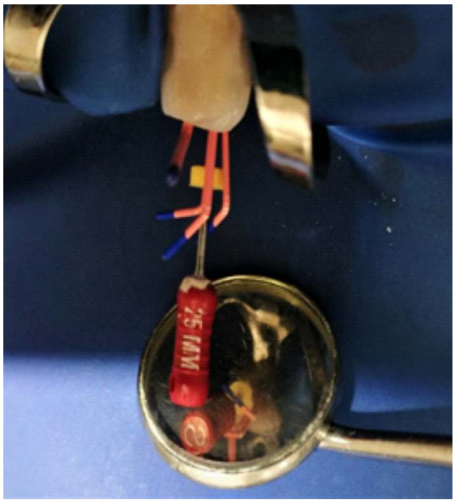

Figure 5. Endodontic filling using lateral compaction

Figure 6. Immediate post-obturation radiograph

calcium hydroxide (Calxyl, OCO-Praparate GmbH, Germany) was placed for four weeks and the access cavity was sealed using a temporary restorative cement (Cavit-G, 3M ESPE, St. Paul, MN, USA) (1).

The intracanal dressing was changed every 2 weeks. After that period, the canal was filled with gutta-percha and epoxy sealer (AH Plus, Dentsply Maillefer, Tulsa, OK, USA) using lateral compaction (Figure 5). The endodontic filling was sealed with temporary filling material (Cavit G, ESPE, Seefeld, Germany) and a postoperative radiograph was taken (Figure 6).

At the next visit, the defective composite restoration seen distally on the radiograph was replaced. At the subsequent visit, temporary materials and gutta-percha points at the orifice of the canal, 2 mm apically to the enamel-dentine junction, were removed. A thick layer of a protective glass ionomer was applied to cover the endodontic

Figure 7. Tooth #21 after restoration replacement and walking bleach therapy

Figure 8. Six-month follow-up periapical radiograph revealed periapical healing and stability of root resorption.

obturation for the walking bleach technique. The walking bleach paste was prepared as a mixture of 2g of sodium perborate tetrahydrate powder and 1g of distilled water. The mixture was applied, adapted by tamping with a cotton pellet and covered with thick temporary glass ionomer cement. The patient was evaluated five days later and the walking bleach paste was repeated. The procedure was repeated three times more until no progress in tooth shade was observed. After bleaching, we waited for one-week prior to bonded composite resin restoration application to improve the bond strength of the composite (Figure 7).

Radiographic and clinical controls of the involved tooth were performed after six months. The radiographic control suggested repairing of the periapical lesion (Figure 8); no subjective symptoms were reported.

Discussion

Trauma of teeth frequently occurs in primary and permanent dentition. The incidence of dental injuries affects no more than 5% of the world population, while the prevalence of dental trauma is high worldwide and presents a wide range from 6% to 59% (8). Approximately one-third of children and toddlers and one-fifth of adolescents and adults (permanent teeth) have sustained a traumatic dental

injury, mostly involving the maxillary central incisors, mainly from falls at home by toddlers and contact sports in adolescents (8). Dental trauma treatment is never the same and poses a challenge for the therapist.

Endodontic treatment was performed using advanced available diagnostic and therapeutic technologies, including cone beam computed tomography (CBCT), an operating microscope, endodontic ultrasonic tips and flexible rotary nickel-titanium files. An advanced 3D view using CBCT allows a detailed assessment of the extent of the periapical lesions compared to the periapical radiographs. Microscopic visualization and ultrasound instruments represent a safe and efficient combination for optimum treatment results (9). The dental operating microscope has been recognized as a useful tool in treating calcified canals and improving treatment outcomes in previous studies (7). When there is a high risk of perforation, it is crucial to use ultrasonic tips with high cutting efficiency that do not rotate (9).

Teeth with PCO provide an endodontic treatment challenge (7). Due to the partial obliteration of the canal, it was challenging to identify the remaining root canal orifice and to establish working length (3). It was decreased success endodontic treatment rate of the PCO in teeth with a preoperative lesion, as well as due to technical failures during calcified canal negotiation (3). The pulp chamber and coronal part of the canal are usually affected by partial PCO due to the corona-apical direction of obliteration, while the radicular part remains visible, albeit markedly narrowed (6). The vast majority of the root canals could be located and treated, regardless of the extent of canal obliteration visible on the radiograph (7).

The gray discoloration of the tooth crown in the traumatized teeth can be explained by the diffusion of blood disintegration products into dentinal tubules. Pulp breakdown by-products, derived from intrapulpal bleeding, as well as necrotic tissue remnants, may penetrate into tooth substance resulting in coronal discoloration (6). The tooth required post-endodontic intra-coronal bleaching to improve the appearance, and the walking bleach technique was the treatment of the choice. After three walking bleach treatments at a 1-week interval, the tooth color appeared stable. However, the clinician noticed the color was not similar to that of adjacent teeth. The patient was asked whether he was satisfied with the discoloration reversed. Whereas the patient had no complaints, the treatment was completed.

It is well known that a delayed release of the residual oxygen derived from the whitening agent affects the polymerization of resin-based materials (10). Therefore, the final restoration was placed one week after the removal of the bleaching gel.

From this case, it was considered that the patient with dental trauma must undergo a detailed examination along with regular monitoring at subsequent visits for post-traumatic complications. Providing patients with sufficient information on the importance of follow-up examinations after immediate management of traumatic injuries is essential. The success of the esthetic treatment by professional parameters may differ from subjective evaluation by the patient.

Conclusion

This case report presents a successful endodontic intervention for a permanently traumatized central incisor with advanced external apical root resorption, apical periodontitis and pulp obliteration.

The preservation of the tooth, despite having a shortened root and an extremely narrowed endodontic space, was accomplished. The successful outcome was attributed to the utilization of ultrasonic tips and rotary endodontic files, in conjunction with the application of calcium hydroxide paste and non-vital tooth bleaching. Regular clinical and radiographic assessments exhibited evidence of healing in the periapical lesion.

This case underscores the complexities confronted by dental practitioners when managing delayed complications resulting from dental trauma, thereby emphasizing the essentiality of meticulous diagnosis and treatment in such scenarios.

Declaration of Interest: Authors declare NO conflict of interest.

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