Case Report

Esthetic and Functional Treatment of a Poorly Prognosed Traumatized Tooth

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Abstract

A correct diagnosis and appropriate emergency management of the avulsion injuries are crucial factors for the repair and healing of tooth and dentoalveolar tissues. Despite the treatment provided, replanted teeth may be eventually lost and demonstrate the poor outcome. An appropriate treatment option may be fiber-reinforced composite bridges. This report presents a clinical case that involves the endodontic, surgical, and restorative management of a traumatized permanent lower central incisor with a large chronic apical periodontitis.

Keywords: Actinomycosis, avulsion, dental trauma, fiber-reinforced composite bridges

Introduction

Traumatic injuries of dentoalveolar tissues are common serious oral health problems among children and adolescents. Avulsion injury occurs most commonly in the permanent dentition of 7–9 years old[1] with a 16.6% rate.[2] The loosely structured periodontal ligament, surrounding the erupting teeth with short and incompletely formed roots, facilitates a total displacement from the socket.[3]

An updated referenced-based flowchart was published in 2009 for the clinical management of avulsed permanent incisors with an open apex.[3] Following the replantation, avulsed teeth possibly survive.[4] However, successful replantation depends on success during the management of damaged dentoalveolar tissues. Despite the treatment provided, 21%–89% of replanted teeth are eventually lost and demonstrate the poorest outcome among all traumatic dental injuries.[4-7]

Several treatment options, ranging from Maryland bridges to implants, are available for the replacement of traumatically missing permanent anterior teeth.[8] Prosthesis like porcelain fused metal and dental implants are not recommended before the completion of the growth period.[9,10]

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An appropriate alternative to conventional metal bridges or removable partial dentures is a fiber-reinforced composite bridge (FRCB).[11] FRCB is applied directly or indirectly using the avulsed tooth or artificial plastic tooth or by a direct build-up composite resin tooth.[12-15]

This report presents a clinical case that involves the endodontic, surgical, and restorative management of a traumatized permanent lower central incisor with a large chronic apical periodontitis.

Case Report

A 13-year-old female patient was referred from a private practitioner to the Faculty of Dentistry, Department of Endodontics, with an asymptomatic large periapical lesion associated with the mandibular right central tooth. A detailed history was taken from the patient's family, and no significant medical history was recorded. According to the patient's history, the related tooth was avulsed at the age of 7 and was replaced by her family. Then, the patient was referred to a

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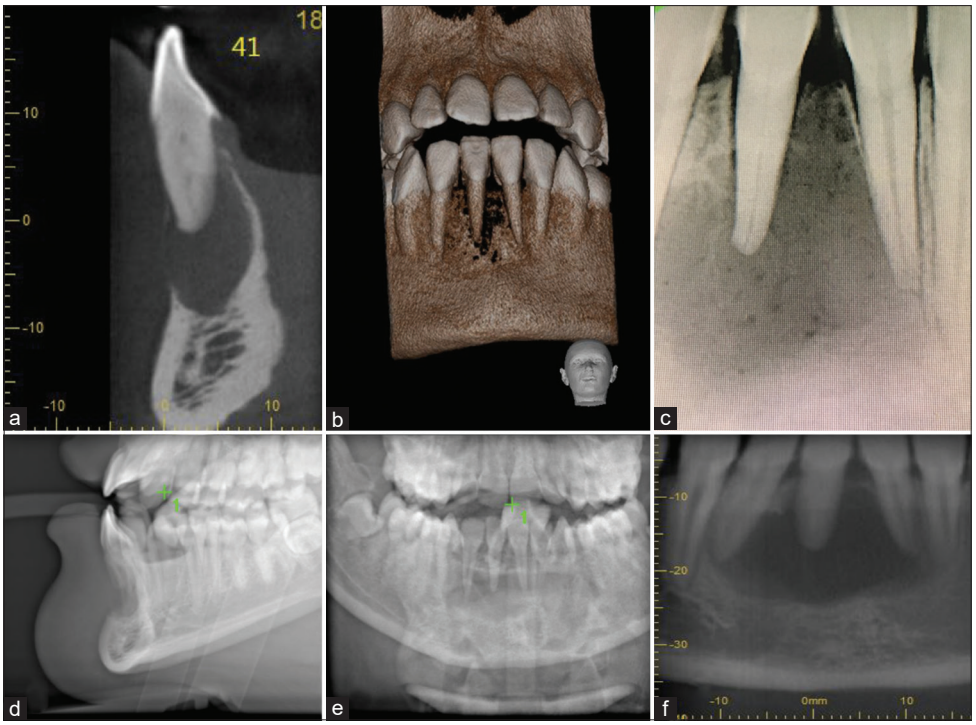

Figure 1: Diagnostic radiographic presentation (a) The cross-sectional CBCT image showed that the root canal was seemingly obliterated, and a large periapical lesion was observed. (b) CBCT 3D reconstruction. (c) The periapical radiograph of the related tooth. (d) Buccal fenestration and, (e), (f) large periapical lession including teeth 31, 41 and 42.

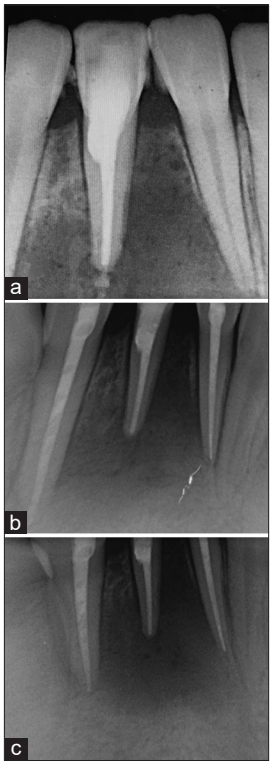

Figure 2: Endodontic management and follow-up: (a) Postoperative radiograph, (b) 12-month follow-up, (c) 24-month follow-up.

private clinic. The tooth had been followed up for a year in terms of vitality and was decided as it was vital. The patient's parents stated that they did not go to further follow-up for the related tooth since then. There was no clear information about the storage conditions, the time between trauma and replantation, and the duration of splinting.

Extraoral examination revealed no signs or symptoms. The intraoral evaluation revealed discoloration of the mandibular right central tooth. The teeth were not tender to percussion and were not mobile. The extraoral and intraoral radiographs were taken [Figure 1]. The radiographs revealed a large periapical lesion associated with teeth 31, 41, and 42, and all teeth had closed apex. Partial obliteration was observed in tooth 41. Tooth 41 demonstrated no response to the electric pulp test, while prolonged response was recorded for teeth 31 and 42. The treatment plan included root canal treatment and follow-up of the necrotic tooth. The treatment plan was proposed to the patient's family and accepted. Written informed consent was obtained from the patient's family.

Endodontic treatment

As the electric pulp test response was negative, local anesthesia was not administered. The access cavity was prepared and the working length was determined using an electronic apex locator (Root ZX Mini, J. Morita, Tokyo, Japan) and confirmed radiographically. The canal was instrumented with ProTaper Next (Dentsply Maillefer, Ballaigues, Switzerland) file system to a size X4 to obtain a master apical diameter of size 40. During cleaning and shaping procedures, the root canal was irrigated with 2.5% sodium hypochlorite. The canal was dried with paper points

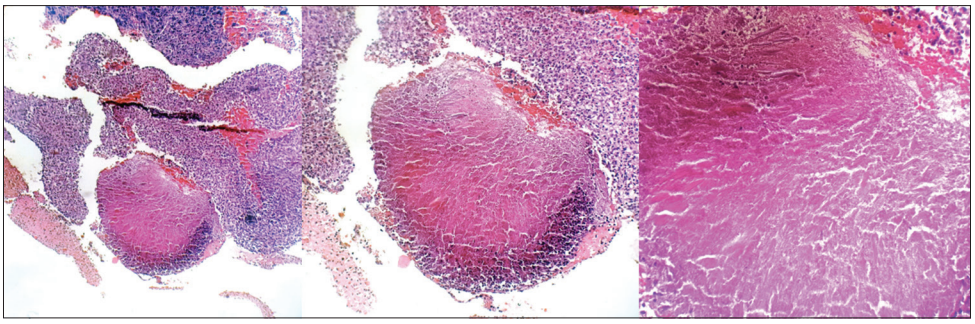

Figure 3: Histopathological images – actinomycosis.

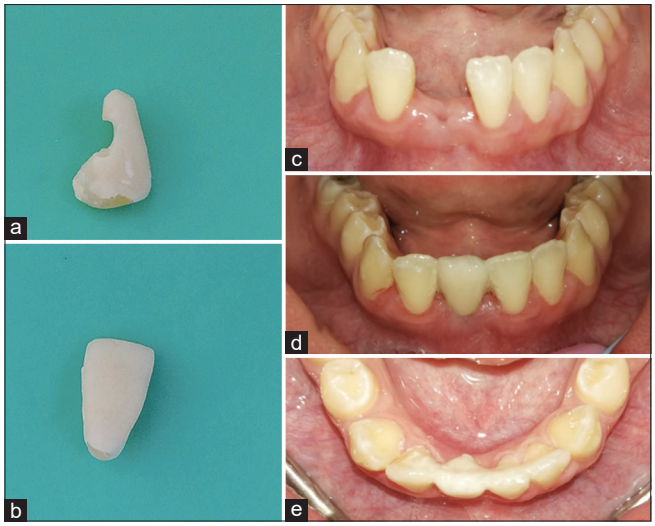

Figure 4: Fiber-reinforced composite bridge management: (a) Proximal view of pontic, (b) Labial view of pontic, (c) Missing tooth area, (d) Labial view of fiber-reinforced composite bridge, (e) Occlusal view of fiber-reinforced composite bridge.

Figure 5: Fiber-reinforced composite bridge 2-year follow-up.

and dressed with calcium hydroxide (Metapaste; Meta Biomed Co., Ltd., Chungbuk, Korea). The access cavity was sealed with temporary filling material (Cavit, 3M ESPE, Germany), and a second appointment was scheduled for 10 days later. At the next visit, calcium hydroxide was removed. The final irrigation was performed with 2.5% sodium hypochlorite with manual dynamic activation and 17% ethylenediaminetetraacetic acid for 1 min to remove the smear layer, and the canal was rinsed with distilled water and irrigated with 2% chlorhexidine gluconate. The root canal was obturated with gutta-percha and resin-based root canal sealer (Adseal; Meta Biomed Co., Korea) using the cold lateral compaction technique. Postoperative periapical radiographs were taken to evaluate the quality of obturation. The pulp chamber was cleaned to remove the excess of gutta-percha and sealer and was restored with composite resin (Point 4'; Kerr, Orange, CA, USA) [Figure 2a]. At the 6-month and 12-month follow ups, the patient was asymptomatic. The radiographic examination revealed no periapical changes. Teeth 31 and 42 were tested for pulpal vitality again using the same electrical pulp test, and they suggested no response. Root canal treatment was decided for both teeth, and similar procedures were applied [Figure 2b]. Twenty-four-month follow-up, the examination revealed no periapical changes, and mobility was observed in tooth 41 [Figure 2c]. Surgical periodontal curettage was planned since the pathology affected not only the apical part but also the large area on the root surface.

Despite all the interventions, the extraction decision was taken because of the mobility and precarious prognosis of the tooth. A tissue sample was sent for histopathological investigation. Based on histopathological examination, the diagnosis was actinomycosis [Figure 3].

Restorative treatment

After removal of tooth 41, a direct FRCB was chosen as a treatment option and patient consent was obtained. The remaining soft tissue and calculus were scaled from the tooth, and it was immersed in saline solution.

A follow-up visit was planned 2 weeks later for the socket healing. To mark the gingiva level, a black dot was created on the labial and lingual surfaces of the tooth. The tooth was

decoronated, root canal filling material was removed, and the apical end of the tooth was formed into an ovate pontic design with finishing diamond burs [Figure 4a and b]. The pulp chamber space was restored with light-cured composite. The adaptation of the pontic to the missing tooth area was controlled [Figure 4c]. A space for fiber was prepared across the lingual side of the tooth from one proximal side to another with appropriate burs, and it was rinsed to remove debris and dried [Figure 4a]. Proximal box cavity preparations for supporting the fiber bridge were prepared to tooth number 42 and 31. After the application of 37% phosphoric acid gel to the enamel for 30 s, it was rinsed and gently air-dried for 5 s. The self-etch adhesive resin was applied to the enamel and dentin according to the manufacturer's instructions (OptiBond™ All-In-One; Kerr Corp., Orange, CA, USA), and the adhesive resin material was polymerized for 20 s using light-emitting diode-curing light (Elipar S10; 3M ESPE, St. Paul, MN, USA). Flowable composite resin (Nova Compo HF; Imicryl, Konya, Turkey) was applied on the preparation site, and the premeasured fiber stick (Everstick C and B; GC Corporation, Tokyo, Japan) was inserted using hand instruments and then light-cured for 20 s. The prepared tooth structure was placed into the proper position, and the fibers were covered through the light-curing resin composite. During occlusal adjustment, areas of premature or lateral excursion contact on the FRCB were removed using articulating paper and diamond finishing burs [Figure 4d and e]. After this procedure, the surfaces were polished with rubber polishing points and discs (Sof-Lex™ Finishing and Polishing System; 3M ESPE, St Paul, MN, USA).

The FRCB and abutment teeth were in good condition at a 1-year follow-up examination. Over a 2-year follow-up, no serious complications were found regarding the treatment process [Figure 5]. Specific discomfort was not reported, although there was some calculus on the mandibular anterior tooth lingual surface. The patient was recommended to pay more attention to oral hygiene. At a 3-year follow-up examination, FRCB was mobile and partially debonded. It was repaired and rebonded in a single visit and polished. The patient was recalled for further follow-ups.

Discussion

Avulsion injuries may lead to necrosis, incomplete root development, pulp canal obliteration, inflammatory resorption, replacement resorption/ankyloses.[16,17]

A correct diagnosis and appropriate emergency management of the avulsion injuries are crucial factors for the repair and healing of tooth and dentoalveolar tissues. Past studies and case reports showed that traumatized teeth with open apex generally demonstrate a lower rate of pulp necrosis than teeth having closed apex.[18] On the other hand, recovery of avulsion cases depends on many factors that concern not only dental conditions but also dentoalveolar tissues. It was reported that the overall survival rate of avulsed/replanted permanent teeth was 50% after 5.5 years.[19]

In this case report, the tooth was considered to be immature when the trauma occurred at the age of 7, as her family stated. The patient was referred to our clinic at the age of 13. Root development continued for 6 years after the injury, and the apex was closed. However, obliteration had occurred according to the radiograph taken at the first examination at our clinic.

It may be claimed that the tooth remained vital for a while. However, the expected improvement in the periodontium was not observed, and the tooth became necrotic. Interestingly, the root resorption that often appears in cases of avulsion did not occur despite all the inflammatory reactions in this case. The endodontic, periodontal, and surgical interventions were not enough to save the tooth; finally, the tooth was extracted. The reason for unhealed periodontium may be related to a possible replantation of the tooth in a contaminated condition. The histopathological examination revealed actinomycosis which may explain this unfair prognosis. Actinomycosis is a chronic, granulomatous, infectious disease that causes persistent extraradicular infection.[20]

The patient's bone structure and age were considered, and due to the contraindication of implant treatment and fixed bridge prosthesis, FRCB was chosen as the treatment option. This technique is a reversible, minimally invasive technique that can be applied in a single visit. Furthermore, using an extracted natural tooth, a natural feeling and favorable esthetics can be achieved, resulting in good patient outcomes.[21]

A systematic review showed that the FRCB survival rate was 94.4% after 4.8 years.[22] Debonding and delamination of pontic were claimed to be the majority of failures.[23] In most cases, these failures could be repaired and the repairability of FRCB could prolong the durability of the restoration.[21]

Valittu and Sevelius reported that 97% of recemented restorations maintained their function.[24] It may be concluded that FRCBs are a good alternative to other options in terms of appropriate case selection, design, and material use.[25]

In this case, esthetic and functional problems due to the missing anterior teeth were solved in one visit at minimal cost with preservation of natural tooth structures with high patient satisfaction. As a result of 3 years, FRCB was debonded one time and repaired immediately.

The reason for debonding may be due to poor oral hygiene or secretion/formation of saliva because in all follow-up visits, calculus was observed in the anterior teeth area, and the patient was referred to for calculus removal consistently. As the patient was over 18 years old, in case of a possible failure, she will be directed for a permanent prosthesis.

As a result, appropriate treatment and follow-ups are very important after avulsion injury. Although the tooth may be revascularized, healing of the periodontium is also critical for the prognosis of the tooth. FRCB may be a treatment option that satisfies the patient in many ways. Poor oral hygiene can affect the longevity of the treatment.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understands that her name and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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