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Treatment for a complicated crown-root fracture with intentional replantation: a case report with a 3.5-year follow up

CASE REPORT

Lin-Tian Yuan*, Duo-Mo Duan*, Ling Tan, Xiao-Jing Wang, Li-An Wu

Department of Pediatric Dentistry, School of Stomatology, The Fourth Military Medical University, Xi'an, China

Abstract – Crown-root fractures are always challenging for pediatric dentists because of their complicated treatments and uncertain prognosis. The purpose of this case report was to describe a severe crown-root fracture successfully treated by multidisciplinary approaches including intentional replantation. After a 3.5-year follow up, the patient felt comfortable and satisfied with her tooth, and the prosthesis was functionally and esthetically acceptable. It is recommended that multidisciplinary treatment with intentional replantation is effective and necessary for similar cases to be conservatively managed.

Key words: Crown-root fracture; child; permanent tooth; prognosis

Correspondence to: Li-An Wu and Xiao-Jing Wang, Department of Pediatric Dentistry, School of Stomatology, The Fourth Military Medical University, Xi'an 710032, China
Tel.: +86 29 84776087
Fax: +86 29 83223047
e-mails: ailingcun@yahoo.com.cn; babydentsit@163.com
*These authors contributed equally to this paper.

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A crown-root fracture is defined as a fracture involving enamel, dentin, and cementum. The fracture may be grouped according to pulpal involvement into uncomplicated and complicated. Crown-root fracture is a relatively common trauma in maxillary anterior teeth in children, comprising 5% of injuries affecting the permanent dentition and 2% in the primary dentition (1, 2).

The treatment strategies are complex and depend on the fracture line's position and the amount of remaining root (2–4). Crown-root fractures that extend below both the gingival margin and the alveolar crest level can be challenging. The extraction of the tooth is often indicated (2). Early loss of a tooth in a child's anterior region may not only lead to esthetic and psychological problems, but also bring detrimental effect on the development of occlusion and the alveolar bone (5–7). Therefore, prevention from injury and conservation of severely traumatized teeth are extremely significant whenever possible.

The purpose of this case report was to present the multidisciplinary treatment for a complicated crown-root fracture and its satisfactory prognosis with a 3.5-year follow up.

Case report

An 11-year-old girl fractured her permanent maxillary left central incisor following an accident. One day after the accident, she paid a visit with her parents to the Department of Pediatric Dentistry, School of Stomatology, the Fourth Military Medical University, Xi'an, China. Her medical history and extraoral examination were noncontributory. The intraoral examination revealed a complicated crown-root fracture in the maxillary left central incisor with a smashed crown, and the fracture line extended to about 4 mm subgingivally. Radiographic examination demonstrated that the vertical fracture line was stopped at the cervical third of the root, and the root was fully developed (Fig. 1). There was no apparent periapical pathosis or displacement.

The girl and her parents were informed of the benefits, risks, and costs of preserving and restoring the maxillary left central incisor using surgical extrusion and fiber post. They were also informed of the advantages and disadvantages of extracting the fragment or leaving it in its advisable place. The patient and her guardian consented to the preserving treatment.

Fig. 1. Radiographic demonstration of vertical complicated crown-root fractures affecting the left central incisor.

Primacaine was administered as a nasopalatine nerve block and buccal infiltration. After removal of the smashed crown and the coronal segment, the apical fragment was luxated with a thin periosteal elevator, which was about 10 mm left, long enough for holding a crown. The extracted root was then inspected and confirmed of no extra fracture. The root was replanted immediately to a more coronal position with the fracture line at 1 mm supragingivally and stabilized in the new position with wire and composite splint (Fig. 2a,b). The pulp tissue was extirpated, and the root canal was filled with antibiotics paste and sealed with zinc oxide–eugenol cement. Two weeks later, a routine root canal preparation was made after removing the splint, and intracanal dressing with Vitapex paste was given. Two months later, periradicular radiograph showed that low-density area was reduced, new bone formed, and the periodontal membrane space became normal. The root canal was then obturated with gutta-percha and sealer. One week after the root canal treatment, the tooth was temporarily restored with fiber post and resin composite (Fig. 3a,b).

The patient was recalled after 6 and 12 months. She complained of no discomfort with her tooth. Clinical and radiographical examination revealed no sinus, mobility, root resorption, or periradicular pathosis. Twenty six months later, the patient came back for consultation of the discolored crown. Clinical examination revealed that the tooth had healthy periodontium, with no sinus, gingival color change, or abnormal mobility, except some pigmentation on the tooth surfaces, especially on the lingual side (Figs 4 and 5a,b). Radiographical examination showed normal periodontal membrane space with no root resorption. Considering the patient's age and the esthetic request, an all-ceramic crown was recommended and performed with a resin core built up.

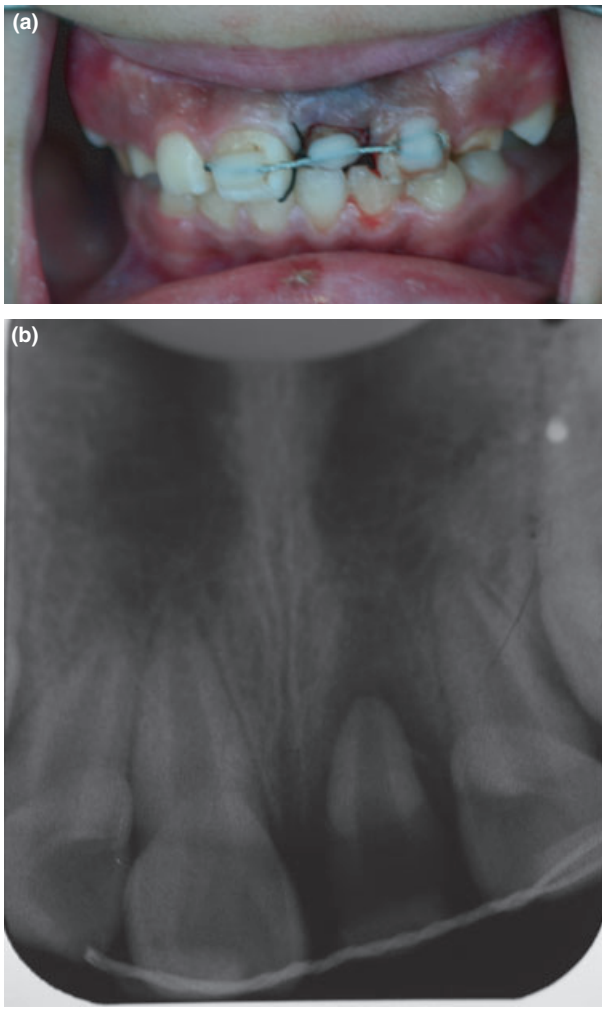

Fig. 2. Intentional replantation and fixation by a steel wire and composite splint. (a) Clinical aspect. (b) Radiographic aspect.

At the 3.5-year follow up, the patient felt comfortable and satisfied with her tooth, and the prosthesis was functionally and esthetically acceptable (Fig. 6a,b).

Discussion

Crown-root fractures typically present a fracture line that originates in the dental crown and extends apically in an oblique direction, frequently with pulp exposure (8). The fracture line is usually single, but multiple fractures can occasionally be seen. Vertical fracture running along the long axis of the tooth or deviating in a mesial or distal direction is rare (9). Communication with the oral cavity to the pulp and periodontal ligament in these fractures permits bacterial invasion and subsequent inflammation (1, 10). For this reason, repair of the fracture by the deposition of osteodentin along the fracture line is exceptionally rare, and fracture healing cannot be expected (1, 11). Thus, in contrast to root fractures, the suggested treatment protocols for crown-root fractures focus mainly on the possibility of using the remaining apical fragments after removing the coronal part.

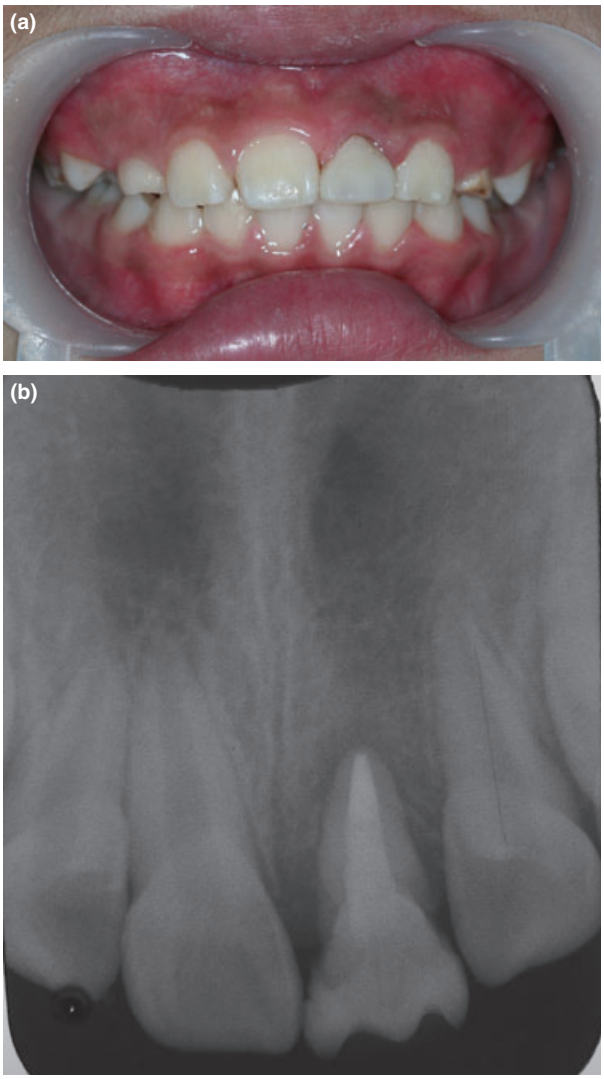

Fig. 3. One week after the RCT, temporary crown restoration with fiber post and resin composite. (a) Clinical aspect. (b) Radiographic aspect.

Fig. 4. Radiographic aspect after 26 months of replantation, the periodontal membrane space was normal with no periapical pathosis.

Fig. 5. Tooth at 26-month recall with severe pigmentation on the crown. (a) Labial view. (b) Lingual view.

The level of fracture determines the type of therapy. When the apical fragment is too short to support a coronal restoration, it may be submerged *in situ* to preserve alveolar bone until the patient is old enough to have an implant or fixed partial denture (12). If it is long enough to support the subsequent restoration, the treatment option could be the removal of the coronal fragment and subsequently crown lengthening, and orthodontic or surgical extrusion of the remaining apical fragment (1, 4, 13–15).

Surgical extrusion or intentional replantation is considered a viable alternative for the management of crown-root fractures when the fracture extends subgingivally and periodontal surgery is not recommended owing to esthetic reasons (8, 15). Compared with orthodontic extrusion, this treatment option allows the detection of additional fractures at the root (6) and exact measurement of the remaining root length, usually takes only 3–6 months, and needs fewer scheduled visits with lower cost. Moreover, studies show that surgical extrusion has a good prognosis; approximately 80% of the teeth treated are still in working condition after 5 years (16). As a result, it is comparatively easier to get the patient's cooperation and keep long-term contact, especially for patients in remote areas.

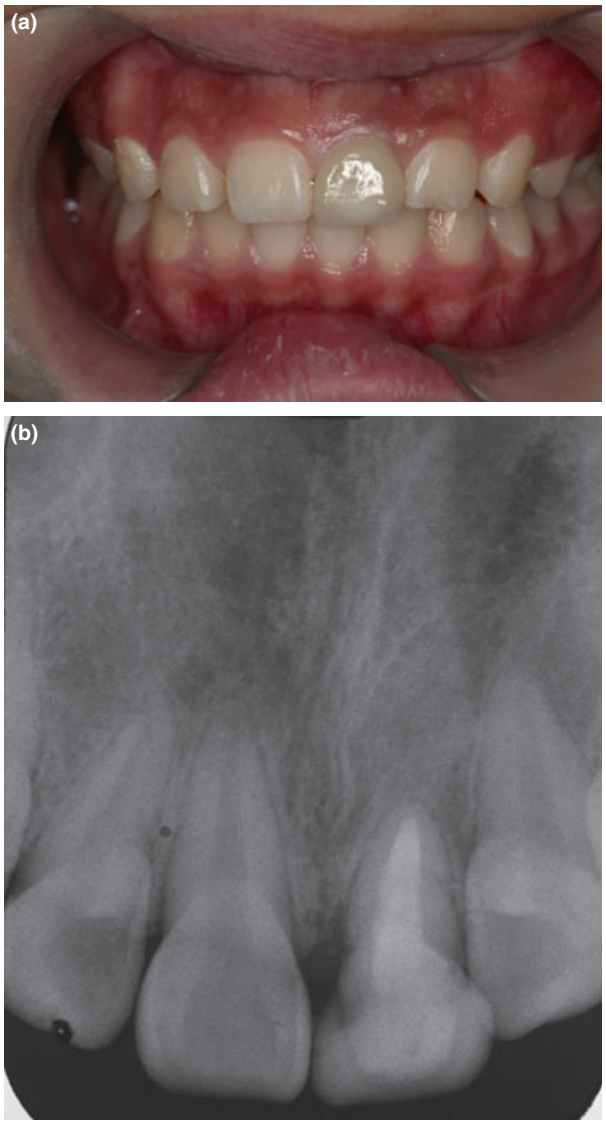

Fig. 6. Tooth at 3.5-year recall. (a) Functionally and esthetically acceptable ceramic crown. (b) Radiographic view.

In the case reported, no root resorption or ankylosis was noticed after 3.5 years, mainly because the young patient had a strong ability of self-repairing; the intentional replantation procedure was carefully performed and avoided severe damage to the periodontal ligament or contamination during the surgery. Furthermore, healing of periodontal ligament tissues is facilitated owing to the effective control of infections and resorption complications, by means of systematic medication, intracanal dressing of calcium hydroxide (17–19), and instruction and maintenance of good oral hygiene.

In this case, because the patient's dentition had not reached full maturity at the time of injury, we chose composite resin restoration first and planned to make a permanent cosmetic restoration after her grown-up. However, the patient came back after 26 months complaining the discolored crown. At the examination, the success of the treatment was confirmed. Considering the patient's age (nearly 14 years old) and her thirst for beauty, an all-ceramic crown, owing to its optimal functional and esthetic characteristics (15, 20), was proposed. As the periodontal maturity of the tooth might have not fully been achieved, it is possible that the esthetic outcome of the restoration would change over time. As with any dental trauma, long-term follow up is important; in this case, a young child has been able to keep a tooth with a complex injury for several years, maintaining the space and allowing continued alveolar development. Possibly, later in life, the tooth may need to be replaced with an implant or a bridge, but in the meantime, she has a well-functioning and esthetic tooth.

In conclusion, this case confirms that a multidisciplinary approach including intentional replantation is an effective attempt to treat complicated crown-root fractures, and it has certain reference value for the clinicians.

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