

## Adhesive tooth fragment reattachment with intentional replantation: 36-month follow-up

### CASE REPORT

Muharrem Cem Dogan<sup>1</sup>, Erkan Onur Akgun<sup>1</sup>, Hamdi Oguz Yoldas<sup>2</sup>

<sup>1</sup>Department of Pediatric Dentistry; <sup>2</sup>Department of Endodontics, Faculty of Dentistry, Cukurova University, Adana, Turkey

Correspondence to: Erkan Onur Akgun, Cukurova Universitesi Dis Hekimligi Fakultesi, Cocuk Dis Hekimligi Anabilim Dalı, 01330, Sarcam, Adana, Turkey  
Tel.: +90 322 3387330  
Fax: +90 322 3387331  
e-mail: erkanonur@yahoo.com

Accepted 17 March, 2012

**Abstract** – Crown-root fracture is one of the most challenging fracture types in dental traumatology literature. Aesthetic and functional rehabilitation is the primary goal of the treatment of crown-root-fractured tooth. For this purpose, reattachment of the fragment to its original position is a good choice. This paper reports a case of an adhesive fragment reattachment of a complicated crown-root fracture with intentional replantation in a 9-year-old girl patient and 36-month follow-up.

Crown-root fracture is one of the most challenging fracture types in dental traumatology literature. There are several treatment techniques defined in the literature such as removal of the fragment and supragingival restoration, removal of the fragment followed by gingivectomy and osteotomy for the exposure of the fracture surface, orthodontic or surgical extrusion of the remaining tooth for the exposure of the fracture surface, intentional replantation with or without 180° rotation and extraction of the tooth remnant and placement of an implant (1–8).

Aesthetic and functional rehabilitation is the primary goal of the treatment of crown-root-fractured tooth. For this purpose, reattachment of the fragment to its original position is a good choice. The development of adhesive technologies has made it possible to reattach the fragment if it is available (8–10). This could be a more conservative approach and have several advantages, such as a better aesthetic result that became an important criterion for patients and also dentists in recent years, incisal margin wear that matches that of adjacent teeth, patient acceptance and a faster and cheaper procedure (9, 11, 12). However, in cases of deep located fractures, the presence of gingival suppuration and bleeding compromises the success of the endodontic and adhesive procedures.

Intentional replantation is considered a viable alternative for the management of the crown-root fractures when the fracture line is well below the gingival margin and periodontal surgery is not recommended owing to aesthetic reasons (2, 7). This paper reports a case of a fragment reattachment of a complicated crown-root fracture with intentional replantation in a 9-year-old girl patient and 3-year follow-up.

### Case report

A 9-year-old girl was referred to Paediatric Dentistry Clinic at Cukurova University for treatment of her broken tooth 22 h after her fall from a bicycle. Initial examination was completed at an emergency service of a local community hospital and followed-up for probable injuries. After a follow-up for a night, she was discharged from the hospital with no symptoms of neurologic damage or other injuries of the body.

Medical history and extra-oral examination were normal. At intra-oral examination, an oblique crown fracture at tooth no 21 with a fracture line extends to gingiva and bleeding from the gingiva were found (Fig. 1). Tooth was sensitive to palpation and cold testing. Distal fragment of the tooth had class II mobility and being held in position by the periodontal ligament.



Fig. 1. Clinical view of the fracture line.

Radiologic examination revealed a complicated crown-root fracture at tooth no 21(Fig. 2).

Informed consent was taken including the clinical situation, treatment techniques and prognosis of the tooth and complications can occur during and after the treatment. Parents filled and signed the form and reported that they choose fragment reattachment with intentional replantation because of the fastness and cheapness of the method and if it is not possible the extraction of the tooth.

Treatment was carried out under local anaesthesia. Distal fragment was extracted with a periosteal elevator and kept on moistened gauze (Fig. 3). Tooth remnant luxation was performed with rotational movements and as much as atraumatically. To avoid the periodontal ligament cell loss-related root resorption, tooth remnant was held with a forceps and additional saline was sprayed during extra-oral procedures (Fig. 4). Root canal treatment of the remnant completed with gutta-percha points and epoxy resin-based root canal sealer AH-plus (Dentsply DeTrey, Konstanz, Germany) extra-orally (Fig. 5).

Prior to cementation, fragment was tried on the tooth remnant to ensure accuracy of fit. Then each of the fractured surfaces of the tooth remnant and the distal fragment was etched with 35% phosphoric acid gel (Ultra-Etch; Ultradent Products Inc, South Jordan, UT, USA) for 30s followed by delicate rinsing and drying. The fragment was reattached with dual cure resin-based cement Panavia F (Kuraray Medical Inc., Osaka, Japan) following the manufacturer's instruction. The pulp chamber was filled with the cement properly. Resin-based cement was used carefully to avoid the overflow from the margins. Excess cement was removed with an excavator before polymerization. Light curing was performed for 30s. After the resin setting was



Fig. 3. Fragment kept on moistened gauze.



Fig. 4. Extracted tooth was held with forceps during endodontic procedure.



Fig. 5. Fracture surface was cleaned with sterile saline.



Fig. 2. Radiographic examination of the fracture line.

completed, tooth was replanted to its original position at the alveolar socket. A non-rigid splint material, 0, 0215-inch multistrand wire (Masel Orthodontics, Bristol, PA, USA) was bent extra-orally and applied to stabilize the tooth (Fig. 6). A postoperative radiograph was taken (Fig. 7). The total extra-oral time was

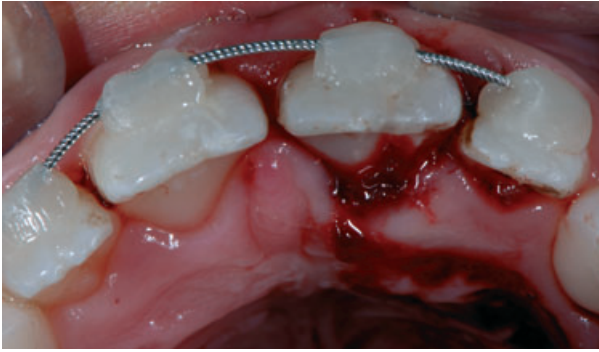


Fig. 6. Replanted tooth was stabilized with multistrand wire splint.



Fig. 8. Fracture line preparation.



Fig. 7. Postoperative radiographic view.



Fig. 9. Prepared cavity was filled with composite resin.

28 min. Postoperative instructions were given as a soft diet for a week and carefully brushing after every meal. Doxycycline 100 mg BID prescribed for 7 days.

One week after the operation, the splint was removed. There was no evidence of periapical infection, and gingiva was healed. Patient reviewed a complaint of the fracture line appearance at the front side of the tooth. Fracture line was prepared with a carbide bur (SS White Burs Inc., Lakewood, NJ, USA) and a composite resin (Clearfil APX; Kuraray Medical Inc.) was applied to the cavity following the manufacturer's instructions (Figs 8–10).

Patient scheduled for routine controls. Third-year follow-up revealed no signs of root resorption and gingival pocket development (Figs 11–13).

#### Discussion

Various treatment strategies such as removal of the fragment and restoring the tooth with resin composites or full crown restorations, orthodontic or surgical

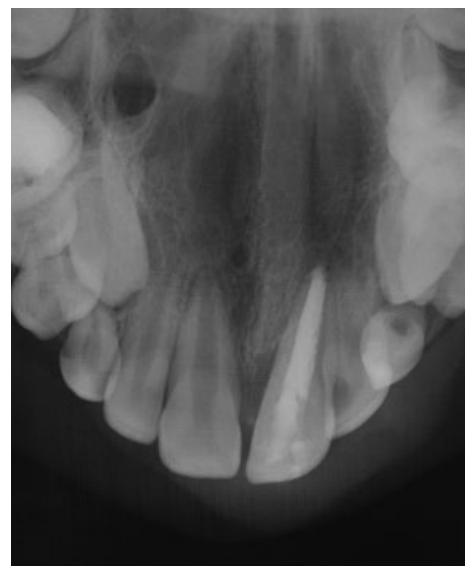


Fig. 10. Radiographic view of the tooth 2 weeks after operation.



Fig. 11. Clinical view after 36-month follow-up.



Fig. 12. Radiographic examination after 36 months.



Fig. 13. Three-year follow-up: there was no sign of gingival pocket development.

extrusion of the fragment and restoration of the tooth were described in the literature including intentional replantation of the crown-root-fractured tooth which we preferred in this case (2–8, 12). Intentional replantation must be accurately planned to avoid the periodontal ligament cell loss. The time from extraction to

replantation and the preservation and handling methods of the tooth are probably of crucial importance for maintaining the vitality of periodontal ligament (13). In our case report, extra-oral time was 28 min, tooth was handled with forceps and additional saline was sprayed to avoid the dehydration.

Some operators were performed intentional replantation with 180° rotation. This technique has been used to treat localized periodontally comprised teeth, such that remaining healthy periodontal ligament contacts the localized lesion area of the socket while the denuded root surface contacts the previously healthy socket areas (3). In treatment of crown-root fractures, rotation was used to expose the fracture line towards facial side of tooth for biological space maintenance. In our case report, tooth was not rotated because there was still intact periodontal ligament and cementum on root surface of the fragment. This approach helps us to achieve a good aesthetic result.

Splint material used for fixation in this case report was 0, 0215-inch multistrand wire that was widely used for canine-to-canine retainer after orthodontic treatment. Becker and Goultschin reported that slightly elastic properties of the material allow the physiological movement of tooth, and material is non-invasive of dental tissue and reversible (14).

Yilmaz et al. (15), in a clinical follow-up study, reported success for 2 years of using flowable resin composite for the reattachment with a V-shaped external double chamfer on both of the fragments. In the present case, a dual cure resin cement Panavia F was used for the reattachment of the fragments because the root surface of the tooth was covered with blood and this may alter the light curing procedure. And also, Panavia F is a self-etching and self-adhesive system that does not need rinsing with water, which may affect root surface and periodontal ligament.

Advantages of using a tooth fragment were discussed in different publications. Among these advantages, the most prominent ones are achieved aesthetics in the anterior region and also function which cannot be provided by any other type of restoration. Original colour match and contour and incisal translucency and contacts can be preserved by reattaching the fragment.

An external chamfer was prepared after the reattachment and replantation contrary to the method described by Yilmaz et al. because an extra preparation before the reattachment would extend the extra-oral time in this case. Furthermore, studies about fracture resistance of reattached tooth fragments have shown that additional pre or postreattachment preparations have favourable effects on regaining the fracture strength (9, 10, 15–20).

In a laboratory study, Pusman et al. (10) stated that internal dentinal groove preparation before the reattachment protocol increases the fracture resistance recovery. In the present case, internal dentinal groove was not prepared but the pulp chamber of the tooth and the fragment should act as an internal dentinal groove.

Early loss of a tooth usually results with poor quality and quantity of bone which needs extra procedures

like bone grafting for future prosthetic and surgical managements. Closing the gap with orthodontic tooth movements is another treatment option in tooth loss. Also, all these procedures need long time to maintain and are expensive. Removing the coronal fragment and orthodontic extrusion of the apical fragment and restoring the tooth with resin composites or full crowns could be a treatment choice. But because of the depth of fracture line, gingival margin width after extrusion treatment would not be the same when compared with the adjacent tooth.

Surgical exposure of the fracture line with gingivectomy and osteotomy could be another option for treatment. However, it is not indicated in aesthetically sensitive regions (1, 21).

Compared with other possible techniques, fragment reattachment before tooth replantation is a practical, low-cost and an aesthetic approach that was practised in this case report. The treatment plan of this case was based on to maintain the alveolar ridge thickness and height until the patient's growth and development ends.

## References

- Andreasen JO, Andreasen FM, Andersson L. Textbook and color atlas of traumatic injuries to the teeth, 3th edn. Copenhagen: Munksgaard; 1994. 320 pp.
- Fariniuk LF, Ferreira EL, Soaresini GC, Cavali AE, Baratto FF. Intentional Replantation with 180 degrees rotation of a crownroot fracture: a case report. *Dent Traumatol* 2003;19:321–5.
- Wang J, Li M. Multidisciplinary treatment of a complicated crown-root fracture. *Pediatr Dent* 2010;32:250–4.
- Saito CT, Guskuma MH, Gulinelli JL, Sonoda CK, Garcia-Júnior IR, Filho OM et al. Management of a complicated crown-root fracture using adhesive fragment reattachment and orthodontic extrusion. *Dent Traumatol* 2009;25:541–4.
- Kirzioğlu Z, Karayılmaz H. Surgical extrusion of a crown-root fractured immature permanent incisor: 36 month follow-up. *Dent Traumatol* 2007;23:380–5.
- Wang Z, Heffernan M, Vann WF Jr. Management of a complicated crown-root fracture in a young permanent incisor using intentional replantation. *Dent Traumatol* 2008;24:100–3.
- Bindo TZ, de Moraes EC, de Campos EA, Gonzaga CC, Correr GM, Baratto-Filho F. Multidisciplinary approach of a crown-root fracture using intentional replantation: a case report. *Pediatr Dent* 2010;32:428–32.
- Rappelli G, Massaccesi C, Putignano A. Clinical procedures for the immediate reattachment of a tooth fragment. *Dent Traumatol* 2002;18:281–4.
- Chazine M, Sedda M, Ounsi HF, Paragliola R, Ferrari M, Grandini S. Evaluation of the fracture resistance of reattached incisal fragments using different materials and techniques. *Dent Traumatol* 2011;27:15–8.
- Pusman E, Cehreli ZC, Altay N, Unver B, Saracbası O, Ozgun G. Fracture resistance of tooth fragment reattachment: effects of different preparation techniques and adhesive materials. *Dent Traumatol* 2010;26:9–15.
- Yılmaz Y, Guler C, Sahin H, Eyuboglu O. Evaluation of tooth-fragment reattachment: a clinical and laboratory study. *Dent Traumatol* 2010;26:308–14.
- DePasquale S, Gatt G, Azzopardi A. Tooth fragment reattachment following crown root fracture: a case report. *Dent Update* 2008;35:696–9.
- Andreasen JO, Borum MK, Jacobsen HL, Andreasen FM. Replantation of 400 avulsed permanent incisors. Part 1. Diagnosis of healing complications. *Endod Dent Traumatol* 1995;11:51–8.
- Becker A, Goultshin J. The multistrand retainer and splint. *Am J Orthod* 1984;85:470–4.
- Yılmaz Y, Zehir C, Eyuboglu O, Belduz N. Evaluation of success in the reattachment of coronal fractures. *Dent Traumatol* 2008;24:151–8.
- Bruschi-Alonso RC, Alonso RC, Correr GM, Alves MC, Lewgoy HR, Sinhoreti MA et al. Reattachment of anterior fractured teeth: effect of materials and techniques on impact strength. *Dent Traumatol* 2010;26:315–22.
- Stellini E, Stomaci D, Stomaci M, Petrone N, Favero L. Fracture strength of tooth fragment reattachments with post-pone bevel and overcontour reconstruction. *Dent Traumatol* 2008;24:283–8.
- Reis A, Francci C, Loquercio AD, Carrilho MR, Rodrigues Filho LE. Reattachment of anterior fractured teeth: fracture strength using different techniques. *Oper Dent* 2001;26:287–94.
- Demarco FF, Fay R-M, Pinzon LM, Powers JM. Fracture resistance of re-attached coronal fragments: influence of different adhesive materials and bevel preparation. *Dent Traumatol* 2004;20:157–63.
- Bhargava M, Pandit IK, Srivastava N, Gugrani N, Gupta M. An evaluation of various materials and tooth preparation designs used for reattachment of fractured incisors. *Dent Traumatol* 2010;26:409–12.
- Olsburg S, Jacoby T, Krejci I. Crown fractures in the permanent dentition: pulpal and restorative considerations. *Dent Traumatol* 2002;18:103–15.

This document is a scanned copy of a printed document. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material.