Dental Traumatology

*Dental Traumatology* 2008; **24**: e61–e66; doi: 10.1111/j.1600-9657.2008.00709.x

# Multidiciplinary treatment of complicated subgingivally fractured permanent central incisors: two case reports

## CASE REPORT

**Fahinur Ertugrul, Ece Eden, Tunç İlgenli**

Department of Pedodontics, Ege University School of Dentistry, İzmir, Turkey

Correspondence to: Assoc. Prof. Dr Fahinur Ertugrul, Department of Pedodontics, Ege University School of Dentistry, İzmir, Turkey
Tel.: +90 232 388 64 31
Fax: +90 232 388 03 25
e-mail: fahinur@yahoo.com

Accepted 22 February, 2008

**Abstract** – Subgingival crown fractures with pulp exposure in permanent teeth present both endodontic and restorative problems with unfavorable prognosis. Numerous restorative techniques such as resin composite restorations with and without pins, crowns and reattachment of the fractured dental fragment could be listed as the treatment options. There are several successful cases in the literature where advantages of less microleakage and proper gingival biocompatibility in cases with reattachment of the tooth fragment were reported. Two cases of palatinal subgingival crown fractures are reported. Both had been restored by reattachment of the fragment and composite with the help of the flap surgery. Follow up visits (Case 1 for 4 years and Case 2 for 1 year) revealed satisfactory esthetics and function.

Dentoalveolar traumas are very common in children and adolescents mostly caused by falling, fighting and vehicle accidents, and as a result of sports (1). Dental fractures because of trauma usually occur in the maxillary anterior teeth and these fractures subsequently lead to esthetic, functional and phonetic problems (2, 3).

The traditional conservative treatment of crown fractures has been restorations with composite resin and dental bonding systems (4, 5). Complicated crown fractures or extention of the fracture line subgingivally lead to problems in treatment. Complicated crown fracture is a fracture involving enamel, dentin, and exposing the pulp and therefore require the treatment of the pulp by pulp capping, pulpotomy, or pulpectomy. If the fracture extends further subgingivally, flap surgery combined with osteoplasty/osteotomy procedures is required (6, 7).

Recently, it has become possible to preserve the fractured segment of the tooth by the use of reattachment technique with the availability of the adhesive systems. This presents advantages over resin composite restorations by offering good esthetic and function (6, 8). This technique can be applied both to the fractures, which include simple enamel-dentin portions, and to the more complex situations in which pulp and periodontium are involved (9–13). Conservation of the fractured original crown fragment is the important aspect for reattachment.

In this paper, two case reports where the reattachment technique was used will be presented.

### Case 1

A 12-year old boy with traumatized permanent maxillary right central incisor attended to the clinic with complicated palatinal subgingival crown fracture.

The medical history of the patient revealed no systemic disease. The patient reported that he had a bicycle accident 1 month ago and had injured his tooth and that no treatment had been performed.

Clinic examination revealed no hemorrhage, lacerations or swelling in the related area but a complicated crown fracture of maxillary right central incisor was present. There was no alveolar bone fractures detected on radiographs. Radiographic investigation revealed that the root formation of the affected tooth was complete, the periodontal ligament has enlarged and the subgingival fracture was extending to the coronal third of the root. The tooth was diagnosed as non-vital by electrical pulp test.

At the first visit, a rubber dam was placed and the necrotic pulp was extirpated without removing the fractured tooth fragment. After necessary irrigation and shaping procedures, the canal was dressed with a calcium hydroxide paste and the access cavity was restored with glass-ionomer cement. The root canal was obturated by gutta-percha and root canal paste (Diaket, 3M Espe, Seefeld, Germany) 1 week later (Fig. 1).

The fracture surface was opened by flap surgery and the fractured tooth fragment was removed a week after

 

*Fig. 1.* The periapical radiograph of the root canal filled with gutta percha and a root canal filling paste.

*Fig. 2.* Flap surgery.

the root canal treatment (Figs 2 and 3). The fragment and the fractured tooth were etched with 32% phosphoric acid gel for 20 s. The bonding agent (Single Bond, 3M Espe, Seefeld, Germany) was applied to the etched surfaces and reattached by composite (Z-100, 3M Espe, Seefeld, Germany) (Fig. 4). Tetracycline hydrochloride was applied on the root surfaces and the flap was sutured (Fig. 5). A week later the sutures were removed and the remaining restoration of the tooth was performed by composite (Z-100, 3M) (Fig. 6).

The patient was recalled every 6 months and the 4th year evaluation revealed satisfactory esthetics and function (Fig. 7).

### Case 2

A 10-year old girl with traumatized permanent maxillary left central incisor attended to the clinic with complicated

*Fig. 3.* Tooth fragment.

*Fig. 4.* The reattachment of the tooth fragment during the flap surgery.

*Fig. 5.* Intraoral views after the flap surgery.

*Fig. 6.* Final coronal restoration with composite at the end of the treatment.

*Fig. 7.* Intraoral view of the patient 4 years after the treatment.

palatinal subgingival crown fracture (Fig. 8). The medical history of the patient revealed no systemic disease. The patient reported that she had fallen 18 days ago and had injured her tooth and that no treatment had been performed. She had complains of pain because of moving fractured fragment on the palatinal side of the affected tooth.

Clinic examination revealed irritation on the gingiva because of the moving fragment (Figs 9 and 10). There was no alveolar bone fractures detected on radiographs. Radiographic investigation revealed that the root

*Fig. 8.* Frontal view of the complicated crown fracture at the initial visit (18 day after the injury).

*Fig. 9.* Frontal view of the complicated crown fracture and moving fragment.

*Fig. 10.* Palatal appearance of the tooth.

*Fig. 11.* Initial periapical radiograph of the fractured maxillary incisor.

*Fig. 12.* Flap surgery.

*Fig. 13.* Tooth fragment.

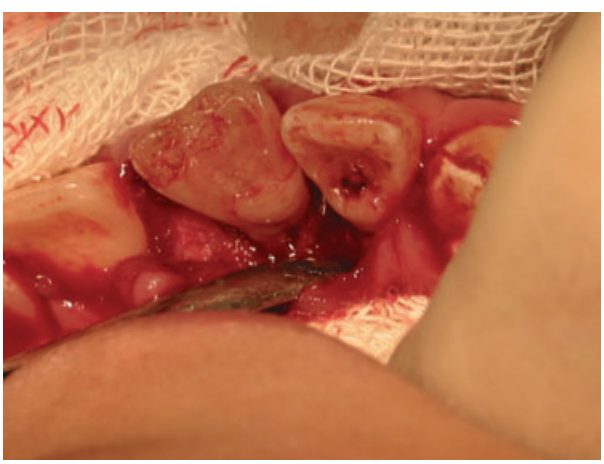

*Fig. 14.* The reattachment of the tooth fragment during a flap surgery.

formation of the affected tooth was complete and the subgingival fracture was extending to the coronal third of the root (Fig. 11). The vitality of the tooth could not be diagnosed clearly by electrical pulp test.

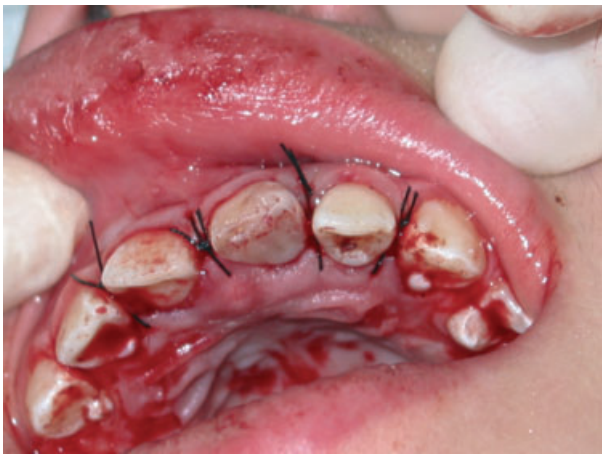

*Fig. 15.* Intraoral views after the flap surgery.

*Fig. 16.* The periapical radiograph of the root canal filled with ProTaper-gutta percha and a root canal filling paste.

*Fig. 17.* Final coronal restoration with composite at the end of the treatment.

*Fig. 18*. Intraoral view of the patient 12 months after the treatment.

After delivering the local anesthesia, the fragment was removed and intrasulcular incision, full thickness buccolingual mucoperiostal flap was elevated (Figs 12 and 13). The fragment and the fractured tooth were etched with 32% phosphoric acid gel for 20 s. The bonding agent (Single Bond, 3M) was applied to the etched surfaces and reattached by composite (Z-100, 3M) (Fig. 14). Tetracycline hydrochloride was applied on the root surfaces and the flap was sutured (Fig. 15). A week later the sutures were removed and the pulp was extirpated. The root canal treatment was performed by rotary root canal instruments (ProTaper Rotary File, Dentisply, Tulsa, Oklahoma, USA) and obturated by gutta percha (ProTaper Gutta-Percha Points, Dentisply, Tulsa, Oklahoma, USA) and diaket (3M) (Fig. 16). After the completion of the root canal treatment, remaining restoration of the tooth was performed by composite (Z-100, 3M) (Fig. 17).

The patient was recalled every 6 months and the first year evaluation revealed satisfactory esthetics and function (Fig. 18).

## Discussion

The treatment of tooth fractures that are extending below the gingival margin has been the center of debate for a long time. The alternative treatment modalities of such crown-root fractures are composite resin restoration, fragment reattachment, full crown coverage or extraction (14). It is advised to extrude the tooth ortodontically or surgically so that the fracture line is above the gingival margin but this shortens the root length and create further problems (14–17).

It has been reported that a resin composite has a favorable subgingival reaction and the formation of junctional epithelium and connective tissue adjacent to subgingival restorative materials in humans (18, 19). However, it is very important to consider the fit and contour of the margin of subgingival restoration as well. Therefore, reattachment of the fractured tooth fragment is preferable with possibility of good adaptation because of the original tooth contour (20). This technique requires only a thin layer of a resin composite and restores the tooth by original form and color of the tooth (21). This is the most outstanding advantage of the technique for the fractures related with the gingival margin.

Many articles reported such cases with different follow-up periods (7, 10–13, 20, 21). These showed the success in good adaptation of the fragment, associated with the sealing effect of the restorative material used and the proper fit and contour of the margin.

The fracture depths in both cases represented were almost similar. We might assume that palatine avoids deeper fractures and we may accept better healing on the gingival margin. Long and short time follow-ups of both cases represented here revealed good performance both in esthetics and in periodontal health.

In conclusion, with the improvements in bonding agents and restorative resins better and long lasting results may be obtained in reattachment technique.

## References

1. Ellis E, Moos KF, El-Attar A. Ten years of mandibular fractures: an analysis of 2137 cases. Oral Surg Oral Med Oral Pathol 1985;59:120.
2. Ripa LW, Finn SB. Clinical Pedodontics. In: Finn SB, editor. The care of injuries to the anterior teeth of children. Philadelphia, London and Toronto: W.B. Saunders Company; 1973. p. 24–270.
3. Resmond-Richard BuF, Allanche C, Perin M, Michel JF, Le Bere A. Dental injuries among school children aged from 6 to 15, in Rennes (France). Endod Dent Traumatol 1994; 11:186–8.
4. Buonocore MG, Davilla J. Restoration of fractured anterior teeth with ultraviolet-light-polimarized bonding materials: a new technique. J Am Dent Assoc 1973;86:1349–54.
5. Simonsen RJ. Traumatic fracture restoration: an alternative use the acid etch technique. Quintessence Int 1979;2:15–22.
6. Baratieri LN, Monteiro S, De Andrada MAC. Tooth fracture reattachment: case reports. Quintessence Int 1990;21:261–70.
7. Baratieri LN, Monteiro S, Cardoso CA, Filho JCM. Coronal fracture with invasion of the biologic width: a case report. Quintessence Int 1993;24:85–91.
8. Baratieri LN, Monteiro S, De Andrada MAC. The "sandwich" technique as a bas efor reattachment of dental fragments. Quintessence Int 1991;22:81–85.
9. Liew VP. Reattachment of original tooth fragment to a fractured crown. Case report. Aust Dent J 1988;33:47–50.
10. Eden E, Yanar SÇ, Sönmez Ş. Reattachment of subgingivally fractured central incisor with an open apex. Dent Traumotol 2005;21:1–6.
11. Turgut MD, Gönül N, Altay N. Multiple complicated crown-root fracture of a permanent incisor. Dent Traumotol 2004;20:288–292.
12. Toshihoro K, Rintaro T. Rehydration of crown fragment 1 year after reattachment: a case report. Dent Traumotol 2005;21:297–300.
13. Andreasen JO, Andreasen FM (editors). Crown-root fractures. Textbook and color atlas of traumatic injuries to the teeth. Copenhagen: Munksgaard; 1994. p. 257–77.
14. Olsburg S, Jacoby T, Krejci I. Crown fractures in the permanent dentition: pulpal and restorative considerations. Dent Traumotol 2002;18:103–15.
15. Çalışkan MK, Türkün M, Gomel M. Surgical extrusion of crown-root-fractured teeth: a clinical review. Int endod J 1999;32:146–51.

16. Kocadereli İ, Taşman F, Güner SB. Combined endodontic-orthodontic and prosthodontic treatment of fractured teeth. Case report.. Aust Dent J 1998;43:28–31.
17. Van Dijken JW, Sjöström S, Wing K. The effect of different types of composite resin fillings on marginal gingivae. J Clin Periodontol 1987;14:185–9.
18. Dragoo MR. Resin-ionomer and hybrid-ionomer cements. 2. Human clinical and histologic wound healing responses in specific periodontal lesions. Int J Periodontics Restorative Dent 1997;17:75–87.
19. Martens LC, Beyls HMF, De Craene LG. Reattachment of the original fragment after vertical crown fracture of a permanent central incisor. J Pedod 1988;13:53–62.
20. Andreasen JO, Andreasen FM. Essentials of traumatic injures to the teeth, 1st edn. Copenhagen: Blackwell Munsksgaard; 1994. p. 28–35.
21. Koparal E, Ilgenli T. Reattachment of a subgingivally fractured central incisor tooth fragment: report of a case. J Clin Pediatr Dent 1999;23:113–116.