Case Report

Re-attachment of a fractured tooth: a case report

Arhun N, Ungor M. Re-attachment of a fractured tooth: a case report.

Abstract – A 16-year-old patient who fractured her maxillary central incisors is presented. One of the original tooth fragments was available. The fracture was clean and there was no pulpal exposure. Juxtaposition of the fragment to the tooth showed that the margins of each fitted well against each other and no interfragmentary space was present. The fragment was re-attached with an adhesive bonding agent and the other tooth was restored with a resin composite. The esthetic result achieved in a single appointment was excellent. The tooth was vital and there was no change in the color of the tooth in 1-year recall.

Neslihan Arhun[1], Mete Ungor[2]

[1]Department of Conservative Dentistry, Faculty of Dentistry, Baskent University; [2]Department of Endodontics, Baskent University, Ankara, Turkey

Key words: crown fracture; dentin bonding; dental trauma; re-attachment

Neslihan Arhun DDS, MSc, PhD, Baskent University, Dis Hekimligi Fakultesi, Dis Hastalıkları ve Tedavisi A. B. D., 11. sokak no. 26, 06490 Bahçelievler, Ankara, Turkey
Tel.: 90 312 215 13 26 147
Fax: 90 312 215 29 62
e-mail: neslihan@baskent.edu.tr

Accepted 18 October, 2005

It has been estimated that about one quarter of the population under the age of 18 sustain traumatic injury in the form of anterior crown fracture (1, 2). Ninety-six percent of these traumatic injuries involve maxillary incisors (80% central incisors and 16% lateral incisors) (3).

In the dental literature, numerous treatment modalities have been introduced for the reconstruction of fractured teeth such as resin or ceramic crowns and resin composite restorations with or without pins (4). However, the progressive development of adhesive dentistry technology enables clinicians to re-attach the original fragment to the tooth mechanically and chemically.

Re-attachment of a tooth fragment should be preferable to restoring fractured teeth when the fragment is available. Several advantages in this treatment are responsible for its widespread use. It is a conservative procedure; it maintains the original tooth contours and translucence as the patient's own incisal enamel appears more natural than any other composite, the color match of the remaining crown portion and its color stability over time and incisal edge will wear in harmony with the adjacent teeth, as a composite restoration tends to wear faster than enamel (5). Total chairside time for re-attachment of incisal edge is less than constructing a composite resin incisal edge (6, 7). The method is much more economical.

A patient with a fractured anterior tooth is usually emotionally upset about his or her appearance, and also suffers some discomfort like sensitivity to cold stimuli. Quick restoration of the esthetic appereance and relief of discomfort for these patients within a single appointment by preserving the natural tooth structure may lead to a positive emotional and social response from the patient (8).

Many techniques have been proposed for re-attaching the fragment to the remaining tooth: using a circumferential bevel before reattaching (6, 9–11), placing a chamfer at the fracture line after bonding (12, 13), using a V-shaped enamel notch (14), placing an internal groove (11, 15) or a superficial overcontour over the fracture line (16). Some authors have also indicated bonding with no additional preparation (17, 18).

Other sources of variation found among published articles related to this subject were the materials used to re-attach the fragment. Using bonding agents only (15, 19–22), associating bonding agents with flowable resins (23–26), dual or self-cured luting cements (16, 18) or light-cured luting cemets (27) have been extensively reported. Associating bonding agents with hybrid or microfill

resin composites have also been used (6, 14, 15, 28, 29).

Munksgaard et al. (19) published the first *in vitro* report about shear bond strengths of dentin bonding agents for incisal re-attachment. Shear bond strength estimations of dentin bonding agents used for incisal re-attachments were initially published using sheep and bovine incisors *in vitro* (30). It was found that, whichever dentin bonding agent was used, the fracture strength did not vary significantly and was about 50–75% of that of an intact incisor (30).

Reis et al. (16) compared the fracture strength of different re-attachment techniques. It was shown that using a superficial overcontour over the fracture line, placing an internal groove and the resin composite restoration provided fracture strength as high as the ones observed in sound teeth. However, simple attachment with no additional preparation or using a buccal chamfer over the fracture line only recovered 37% and 60% of the intact tooth fracture strength, respectively, when a dual cure luting cement was used (16).

Worthington et al. (31) showed that placement of any kind of preparation did not improve the fracture strength of fragment bonded teeth compared with preparations less attachment. They observed that incisal edge re-attachment restored approximately half the fracture resistance of sound teeth.

Reis et al. (32) found that chamfer technique could provide a better strength recovery than simple re-attachment and both were inferior to the resin composite restoration that is able to restore the original tooth fracture.

The present case report describes the re-attachment of an original tooth fragment using dentin bonding technique.

Case

The patient was a 16-year-old girl presenting on an emergency basis. Her maxillary central incisors were fractured in an outdoor activity accident 11 h before the treatment (Fig. 1). The fragment of tooth number 11 had been brought to the office in a paper tissue (Fig. 2). The fractured fragment was disinfected with NaOH and rinsed thoroughly with water. Examination of the fragment revealed a very clean break. The pulp chamber may be seen but there was no sign of pulpal exposure or blood (Fig. 3). There was no fracture of the root (Fig. 4). Juxtaposition of the fragment with the tooth showed that the margins of each fitted well against each other and no interfragmentary space was present. The pieces fit together so well that the use of a resin composite would have prevented the best apposition of the tooth fragments and might have added to tooth length. After administration of local anesthesia, a rubber dam was placed to isolate the fractured tooth.

Fig. 1. Fractured maxillary central incisors.

Fig. 2. Fractured fragment.

Fig. 3. Pulp chamber may be seen but there was no sign of pulpal exposure.

The fracture site and the fragment were treated with self-etching primer (Clearfil Liner Bond SE Primer; Kuraray, Osaka, Japan) (Fig. 5). The primer was allowed to remain undisturbed for 20 s, the surfaces were air dried gently and the adhesive was applied to both surfaces (Clearfil Liner Bond SE) (Fig. 6). The fragment was positioned in

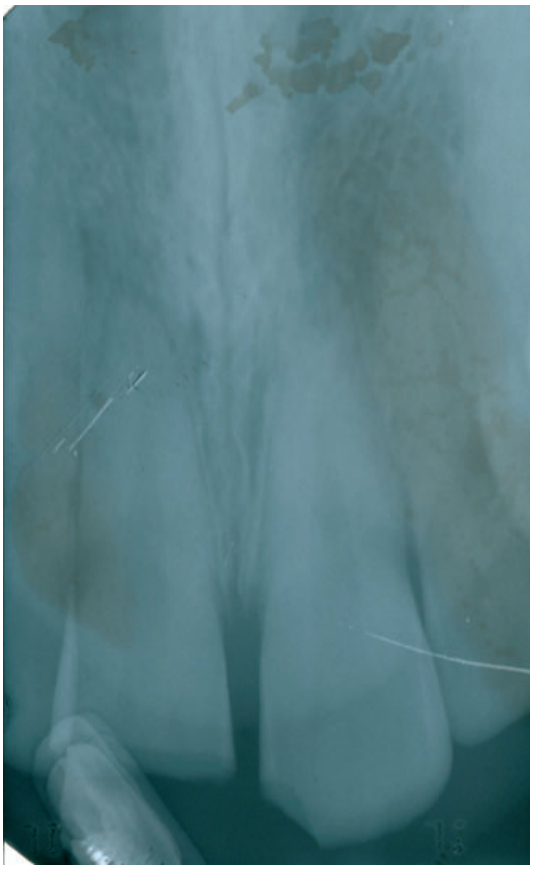

Fig. 4. There was no fracture in the root.

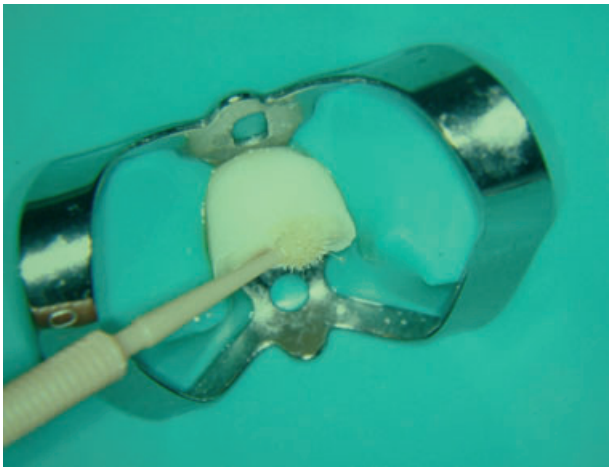

Fig. 5. Self-etch primer was applied.

its original place and light cured for 10 s from various directions.

After re-attaching the fragment, a groove in the fracture site was prepared. The groove and the fracture site of tooth number 21 were acid etched with 37% phosphoric acid for 20 s and rinsed thoroughly with water but not dried (Fig. 7). A single

Fig. 6. Adhesive was applied.

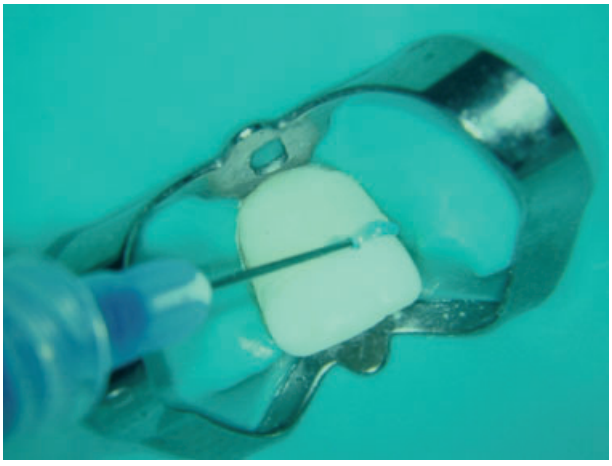

Fig. 7. Acid-etching of the groove.

Fig. 8. Completed immediate repair.

step adhesive (Single Bond, 3M, St. Paul, MN, USA) was applied to the surfaces and light cured for 20 s. The groove and the tooth were restored with a hybrid resin composite (Z250, 3M). The tooth repair site and the restored central tooth was finished and polished with finishing disks (Sof-Lex, 3M) (Fig. 8).

The esthetic result was excellent and the repair was barely visible. A week later, the patient was called for a follow-up appointment. The patient

Fig. 9. Tooth at 1-year recall.

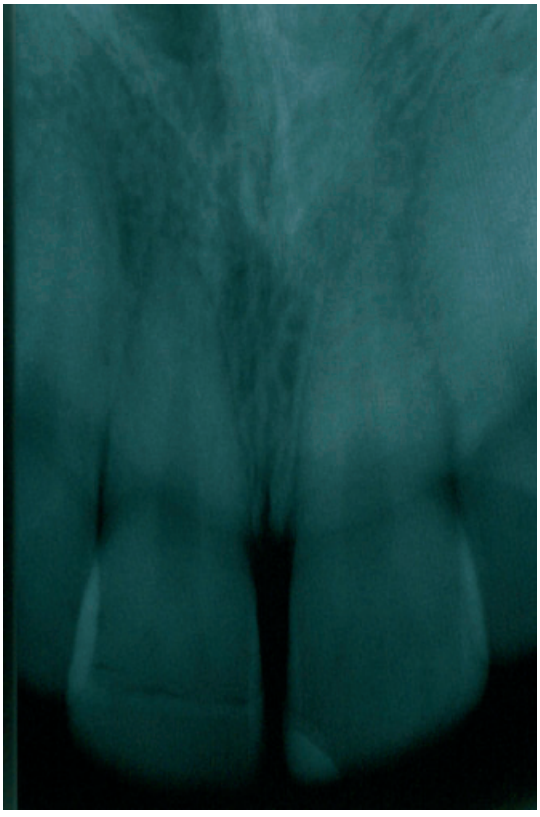

Fig. 10. Tooth at 1-year recall.

reported that she had a little sensitivity to cold for about 12 h after the treatment which disappeared after that. The family was satisfied with the treatment.

One year after the treatment, the patient was called to check the vitality of the tooth. The tooth was vital (Figs 9 and 10).

Conclusion

Re-attaching fragments with dentin bonding adhesives can be used to restore fractured teeth, presumably with sufficient strength but long-term follow up is essential to predict the durability of the tooth-adhesive-fragment complex and the vitality of the tooth.

References

1. Murchison DF, Burke FJ, Worthington RB. Incisal edge reattachment: indications for use and clinical technique. Br Dent J 1999;186:614–9.
2. Petti S, Tarsitani G. Traumatic injuries to anterior teeth in Italian schoolchildren: prevalence and risk factors. Endod Dent Traumatol 1996;12:294–7.
3. Andreasen JO, Ravn JJ. Epidemiology of traumatic dental injury to primary and permanent teeth in a Danish population sample. Int J Oral Surg 1972;1:235–9.
4. Buonocore MG, Davila J. Restoration of fractured anterior teeth with ultraviolet-light-polymerized bonding materials: a new technique. J Am Dent Assoc 1973;86:1349–54.
5. Busato AL, Loguercio AD, Barbosa AN, Sanseverino MdoC, Macedo RP, Baldissere RA. Biological restorations using tooth fragments. Am J Dent 1998;11:46–49.
6. Burke FJ. Reattachment of a fractured central incisor tooth fragment. Br Dent J 1991;170:223–5.
7. Cavalleri G, Zerman N. Traumatic crown fractures in permanent incisors with immature roots: a follow-up study. Endod Dental Traumatol 1995;11:294–6.
8. Mader C. Restoration of a fractured anterior tooth. J Am Dent Assoc 1978;96:113–5.
9. Simonsen RJ. Traumatic fracture restoration: an alternative use of the acid etch technique. Quintessence Int 1979;10:15–22.
10. Amir E, Bar-Gil B, Sarnat H. Restoration of fractured immature maxillary central incisors using the crown fragments. Pediatr Dent 1986;8:285–8.
11. Walker M. Fractured-tooth fragment reattachment. Gen Dent 1996;44:434–6.
12. Davis MJ, Roth J, Levi M. Marginal integrity of adhesive fracture restorations: chamfer vs bevel. Quintessence Int 1983;14:1135–46.
13. Franco EB, Coradazzi JL, Ishikiriama A. Reattachment of a fractured fragment to a tooth: using the acid etch technique. A case report. Estomatologia e Cultura 1985;15:47–50.
14. Simonsen RJ. Restoration of a fractured central incisor using original tooth fragment. J Am Dent Assoc 1982;105:646–8.
15. Baratieri LN, Montiero S Jr, de Albuqueuque FM, Vieira LC, de Andrada MA, de Melo Filho JC. Reattachment of a tooth fragment with a 'new' adhesive system: a case report. Quintessence Int 1994;25:91–6.
16. Reis A, Francci C, Loguercio AD, Carrilho MR, Rodriguez Filho LE. Re-attachment of anterior teeth: fracture strength using different techniques. Oper Dent 2001;26:287–94.
17. Osborne JW, Lambert RL. Reattachment of fractured incisal tooth segment. Gen Dent 1985;33:516–7.
18. Dickerson WG. Conservative reattachment of a pulpally exposed, fractured incisor. Dent Econ 1994;84:90–1.
19. Munksgaard EC, Hojtved L, Jorgensen EH, Andreasen JO, Andreasen FM. Enamel-dentin crown fractures bonded with various bonding agents. Endod Dent Traumatol 1991;7:73–7.
20. Andreasen FM, Steinhardt U, Bille M, Munkgaard EC. Bonding of enamel-dentin crown fragments after crown fracture. An experimental study using bonding agents. Endod Dent Traumatol 1993;9:111–4.
21. Kanca J. 3rd. Replacement of a fractured incisor fragment over pulpal exposure: a long-term case report. Quintessence Int 1996;27:829–32.

22. Pagliarini A, Rubini R, Rea M, Campese M. Crown fractures: effectiveness of current enamel-dentin adhesives in reattachment of fractured fragments. Quintessence Int 2000;31:133–6.
23. Small BW. Emergency reattachment of fractured tooth. Using dentin bonding agent and flowable composite. Oral Health 1996;86:33.
24. Farik B, Munksgaard EC. Fracture strength of intact and fragment-bonded teeth at different velocities of the applied force. Eur J Oral Sci 1999;107:70–3.
25. Farik B, Munkgaard EC, Andreasen JO, Kreiborg S. Drying and wetting anterior crown fragments prior to bonding. Endod Dent Traumatol 1999;15:113–6.
26. Farik B, Munksgaard EC, Andreasen JO. Impact strength of teeth restored by fragment-bonding. Endod Dent Traumatol 2000;16:151–3.
27. Dean JA, Avery DR, Swartz ML. Attachment of anterior tooth fragments. Pediatr Dent 1986;8:139–43.
28. Martens LC, Beyls HM, de Craene LG, D'Hauwers RF. Reattachment of the original fragment after vertical crown fracture of a permanent central incisor. J Pedod 1988;13:53–62.
29. Diangelis AJ, Jungbluth M. Reattaching fractured tooth segments: an esthetic alternative. J Am Dent Assoc 1992;123:58–63.
30. Badami AA, Dunne SM, Scheer B. An *in vitro* investigation into the shear bond strengths of two dentin bonding agents used in the reattachment of incisal edge fragments. Endod Dent Traumatol 1995;11:129–35.
31. Worthington RB, Murchison DF, Vandewalle KS. Incisal edge reattachment: the effect of preparation utilization and design. Quintessence Int 1999;30:637–43.
32. Reis A, Kraul A, Francci C, de Assis TG, Crivelli DD, Oda M et al. Re-attachment of anterior fractured teeth. Fracture strength using different materials. Oper Dent 2002;27:621–7.