Case Report

Reattachment of subgingivally fractured central incisor with an open apex

Eden E, Yanar SÇ, Sönmez Ş. Reattachment of subgingivally fractured central incisor with an open apex.

Abstract – A case report of a 6-year-old girl with a fractured maxillary left central incisor with an open apex is presented. The procedure used to repair the fracture included flap surgery with an intrasulcular incision and endodontic treatment. The patient was called for 3 months regular follow-up to check the root formation. At the end of 32 months just before the root was obturated by guttaperka, she fractured the same tooth. Flap surgery was repeated and the tooth was restored. The root canal was obturated with a root filling paste and guttaperka as the apex was closed. Examination 10 months after treatment revealed good periodontal health, aesthetics and normal function.

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Fracture of the crown and the root with pulp exposure in a permanent tooth is a relatively uncommon injury. Andreasen (1) found that such fractures constitute between 5% and 8% of all traumatic injures. When they do occur, they present both endodontic and restorative problems. After a complex injury a pulpotomy or apexification is needed as treatment for an open apex. Pulpectomy is the most preferred endodontic treatment where the pulp is affected and, furthermore, the pulp canal could be used by a dowel for better retention of the restoration (2). Tooth fractures occur more often amongst young patients with immature apex and cause further treatment complications. For extensive pulpal involvement, a pulpotomy has been reported to be successful in allowing completion of root formation. In cases with subgingival fractures, apexification followed by root canal therapy is necessary as coronal restoration is not possible.

Over time, numerous techniques have been developed for the reconstruction of injured teeth: resin crowns, orthodontic bands, ceramic crowns and resin composite restoration with and without pins (3). The use of composites, which have already been widely used for the reconstruction of anterior teeth, has enabled development of a technique to reattach the fractured dental fragment. This technique was introduced at the end of the 1970s (4, 5). It involved the application of an adhesive on the fractured surfaces, which had been suitably chamfered and etched, and then the interposition of resin composite between the fragment and tooth. Reattachment of the dental fragment has only become possible with the improvement of adhesive and restorative materials. The possibility of dentin hybridization allows successful performance of dentinal treatments previously impossible by means of conventional techniques (6–9).

Using the original tooth fragment to restore a fractured tooth, it is possible to achieve very good aesthetics with original tooth contours, texture and radiolucency and function (10–13). Several case reports show that even subgingival tooth fractures could be restored successfully (12–17). Reattachment of the original tooth fragment in subgingival fractures provides a better biological surface for periodontal attachment.

The following case report describes a young patient with a subgingival tooth fracture of a permanent tooth with an open apex and the results of the treatment.

Case report

A 6-year-old girl fractured her maxillary left incisor with an open apex while diving into a swimming

pool and the pulp was seen out of the fracture line (July 2001). Because the accident occurred on a weekend and no proper dental facilities were available, the patient could attend the clinic only 3 days after the trauma. The patient reported having provoked pain due to thermal stimulus. Nothing abnormal was found in the patient's medical history.

The oral examination revealed that the tooth had a vertical fracture extending to the subgingival one-third at the root and the pulp was exposed (Fig. 1).

A periapical radiograph showed that the root formation was not complete and there was no root fracture (Fig. 2).

The patient's parents were informed about the risk of tooth loss. However, considering the age of the patient, they accepted the limitations and risks

Fig. 1. Initial appearance of maxillary first permanent incisor after trauma.

Fig. 2. Initial periapical radiography before the treatment.

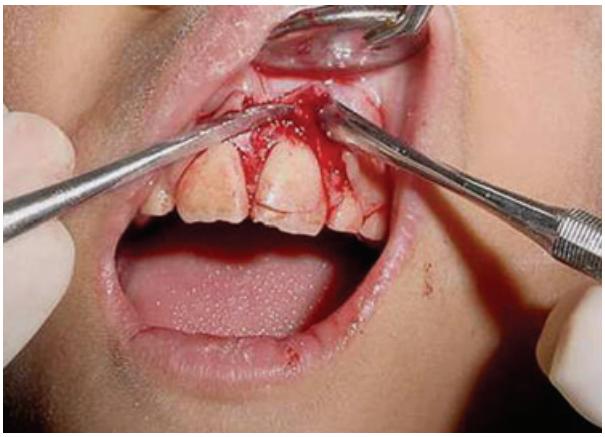

Fig. 3. First flap surgery.

Fig. 4. Tooth fragment.

Fig. 5. Tooth fragments.

associated with an attempt to save the tooth by the fragment reattachment technique. After taking their consent, full thickness buccolingual mucoperiostal flap was raised with an intrasulcular incision (Fig. 3).

The tooth remnant and the fragment were etched for 15 s with a 35% phosphoric acid gel, washed

away with an air-water spray and dried (Figs 4 and 5) (18). The bonding agent (Single Bond, 3M Espe, Seefeld, Germany) was brushed over the fragment and the tooth and light cured for 20 s (12). Before the fragment was reattached by the resin composite a cotton pellet was placed in the chamber of the pulp to avoid the obstruction of the pulp chamber with the resin composite that was used for reattachment The fragments were reattached with a hybrid resin composite (Z-100, 3M Espe), light cured after the excess was removed and polished. Following stabilization of the tooth fragment, the flaps were sutured (Figs 6 and 7).

One week later, the suture was removed and clinical examination revealed proper healing. At the same time, an entrance cavity to the pulp was opened from the palatinal surface of the tooth. The root canal was medicated with calcium hydroxide paste as an apexification treatment and the incisal fracture on the crown of the tooth was restored with a hybrid resin composite (Z-100, 3M Dental). The patient was called for 3 months of regular follow-up

Fig. 8. The root canal remedicated with calcium hydroxide paste in the follow-up examination.

Fig. 6. Intraoral view after the first flap surgery.

to check the root formation. In these follow-up examinations the root canal was remedicated with calcium hydroxide paste and the entrance of the pulp was restored by glassionomer cement. The patient was followed regularly for 2 years (Fig. 8).

However, before the root canal filling was placed, she fractured the same tooth in three pieces on palatinal surface (February 2004). The patient reported that it happened when she was eating a hard cake (Fig. 9). The mobile fragments were removed and the root canal was filled with gutta-perka and a root canal filling paste (Diaket) (Fig. 10). Then, full thickness buccolingual mucoperiostal flap was raised, with an intrasulcular incision for the

Fig. 7. Intraoral view after the first flap surgery.

Fig. 9. Intraoral view of maxillary first permanent incisor after the second trauma.

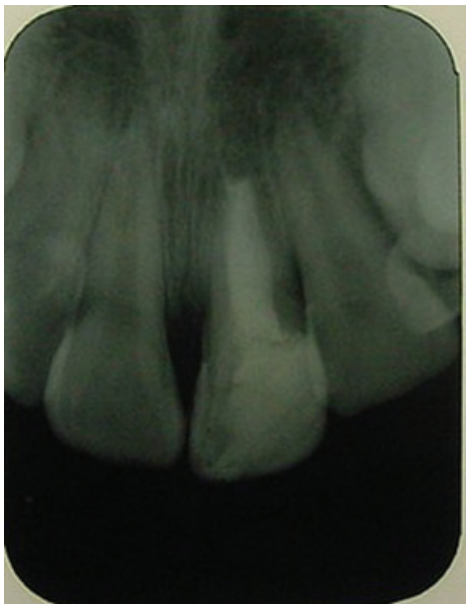

Fig. 10. The periapical radiograph of the root canal filled with guttaperka and a root canal filling paste.

Fig. 11. Second flap surgery.

Fig. 12. Second flap surgery.

Fig. 13. Final restoration with composite at the end of the treatment.

Fig. 14. Final restoration with composite at the end of the treatment.

second time (Figs 11 and 12). The tooth remnant and the vestibule and distal fragments were etched for 15 s with a 35% phosphoric acid gel, washed away with an air-water spray and dried (18). The bonding agent (Single Bond, 3M Dental) was brushed over the fragments and the tooth and light cured for 20 s (12). After this the fragments were reattached with a resin composite (Z-100, 3M Dental). As there was much structure loss a composite was used to rebuild the crown over the gingival margin on the palatinal surface. Following stabilization of the tooth fragments and composite restoration, the flaps were sutured. Final restoration with composite was completed in a subsequent visit (Figs 13 and 14).

Clinical and radiographic examinations after 10 months (February, 2005) revealed a stable re-attachment of the fragments, good aesthetics and periodontal health with no bleeding on probing or periodontal pocket (Figs 15 and 16).

Fig. 15. Clinical examination after 10 months.

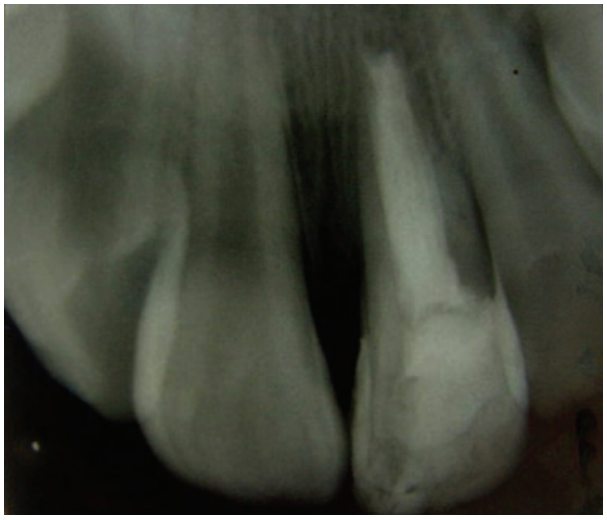

Fig. 16. Radiographic examination after 10 months.

Discussion

The present case report described that fragment reattachment is an alternative to resin composite build-up for restoring aesthetics and function of traumatized teeth. The dental reattachment technique has been widely accepted with the development of acid conditioning and dentin adhesives (12, 13, 19). Moreover, it is advantageous because it is a simple and fast technique that produces good aesthetic and functional results that are long-lasting. This technique requires only a thin layer of a resin composite and restores the original form and colour of the tooth (20). In addition, positive emotional effects result from fragment bonding and increases the patient's self-esteem. Original tooth reattachment provides better fragment adaptation to the remaining tooth, good stability and colour fidelity so that patient satisfaction increases as the natural appearance of the original tooth is achieved. Furthermore, there is an advantage of biocompatibility of the natural tooth surface with gingiva.

Improvement of biomaterials has increased the number of possibilities for the treatment of fractured teeth. Van Dijken et al. (21) reported that a resin composite has a favourable subgingival reaction. Dragoo (22) showed the formation of junctional epithelium and connective tissue adjacent to subgingival restorative materials in humans. It is also important to consider the fit and contour of the margin of subgingival restorative materials in humans. In the present case, the favourable clinical outcome may have been a result of the good adaptation of the fragment, associated with the sealing effect of the restorative material used and the proper fit and contour of the margin. A long junctional epithelium might have been established in the area.

In cases with an open apex, the apexification treatment needs a long time without a final restoration. Because of the entrance cavity to the pulp and immediate restoration the remaining tooth structures are weakened and are prone to fracture with less force. In the present case force produced even by a hard cake caused a multiple fracture that caused further complications.

In this case, clinical and radiograph follow-up revealed good performance of the autogenous reattachment technique. The aesthetics was successfully re-established, and periodontal prognosis was satisfactory.

As the autogenous reattachment technique is not a common technique and is not well known, it is important to advise and educate patients to keep tooth fragments following trauma so that reattachment can be attempted.

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