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Case Report

Multidisciplinary approach to the rehabilitation of a crown-root fracture with original fragment for immediate esthetics: a case report with 4-year follow-up

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Abstract – Dental practitioners frequently encounter dentoalveolar traumas. According to the severity of the trauma, a large spectrum of complications such as isolated tooth fracture, dentoalveolar fracture or fracture at maxillofacial region may occur. If the isolated tooth fracture occurs particularly at anterior region, the rehabilitation should satisfy both esthetic and functional problems. An unrestorable tooth should be extracted and this leads to more complex treatments such as implant or conventional prosthetic rehabilitations, which will restore the function, but impair the esthetics. Recently, powerful new generation dual-cured resin composites have been produced for reattachment of original fractured fragments. In this case, we presented treatment of oblique crown-root fracture of a maxillary central tooth from enamel-cement junction by the reattachment technique. We used dual cured resin composite (Panavia F®) and a self-tapping screw-post (Dentatus®) for reattaching the crown fragment. Orthodontic treatment was applied for intruding and leveling the tooth. Four years after treatment, the tooth exhibited good esthetics, good periodontal health and normal function. However, minimal relapse occurred in spite of orthodontic treatment. In conclusion, the reattachment technique is an alternative method, which offers satisfactory esthetic and functional rehabilitation of the fractured teeth.

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Key words: dentoalveolar trauma; crown fracture; original fragment; bonding agent; resin composite; screw-post; reattachment technique; orthodontics

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Dentoalveolar traumas are commonly caused by injuries such as; falling, fighting and vehicle accidents in children and adolescents, and as a result of sports accidents in adults (1, 2). Fractures because of trauma usually occur in the maxillary anterior teeth (3, 4), and these fractures subsequently lead to esthetic, functional and phonetic problems. The conventional approaches for the rehabilitation of the fractured anterior teeth include composite restorations, and post-core supported prosthetic restorations (5–7). If the fracture extends the biologic width, which is described as the gap

between crestal bone and gingival sulcus, flap surgery combined with osteoplasty/osteotomy procedures is required (2, 8, 9). Recently, it has become possible to preserve the fractured segment of the tooth by the use of reattachment technique which presents advantages over resin composite restorations (2, 10) by offering good short-term (2) and medium-term results (11). This technique can be applied both to the fractures, which include simple enamel-dentin portions, and to the more complex situations in which pulp (12) and periodontium are involved (2). Conservation of the fractured original crown fragment is the important aspect for reattachment. In this case report, the reattachment technique, which is used in the management of a fractured maxillary central incisor and the treatment outcomes of a 4-year follow-up, are presented.

Case report

A 38-year-old male patient was referred to the Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, of Çukurova University on July 2000, with the complaint of a fractured right maxillary incisor tooth because of a trauma during tennis training. The patient had no systemic disease. He did not have hemorrhage or swelling in the related area. The clinical and radiographic maxillofacial examination revealed that there was no fracture of the maxilla, mandible or any other facial bones. Intraorally, the coronal fracture in the right maxillary central tooth involved the enamel–dentin junction and extended from buccal to the palatal aspect subgingivally. Although radiographs could not detect the fracture line clearly, clinical observation showed that the crown fragment was mobile but still in place (Fig. 1). Pulpal exposure was observed and the tooth was diagnosed as non-vital by electrical pulp test. As the periodontium was possibly damaged by trauma, the endodontic treatment was postponed for 2 weeks. In this period, the mobile crown fragment was stabilized in its original place and splinted to the teeth 21, 12, 13 by vestibular acid-etch composite and arch wire. The patient received antibiotic coverage, analgesic and 0.2% chlorhexidine gluconate oral rinse for 1 week in order to prevent a probable infection. After 1 week, the endodontic treatment was completed. The splint and the fractured crown fragment were removed (Fig. 2). The fracture extending subgingivally on the palatal aspect was noticeable. Flap surgery was not performed, because the biologic width was not involved with the fracture on the buccal aspect. So, all debris on the root surface was scaled and the hemostasis was achieved by locally placed 1/4 adrenaline embedded cotton pellets. A tapered, self-tapping screw-post (Dentatus, NY, USA) of 20-mm length and 2-mm width was inserted into 1/3 section of the root canal for retention (Figs 3 and 4). A hole was drilled in the middle part of the crown fragment (Fig. 5). Panavia F (Panavia F, Kuraray Medical Inc., Japan) self-etching primer was applied to the entire tooth surfaces (enamel and dentin) of the adherent surfaces (root surface, inner side of the crown fragment and hole). Excess primer was removed by a paper point to prevent the formation of a pool of the primer in the root canal or at the corners of the cavity. The primer was dried completely with gentle air flow. Panavia F paste A and B was mixed and then was applied to the adherent surfaces within

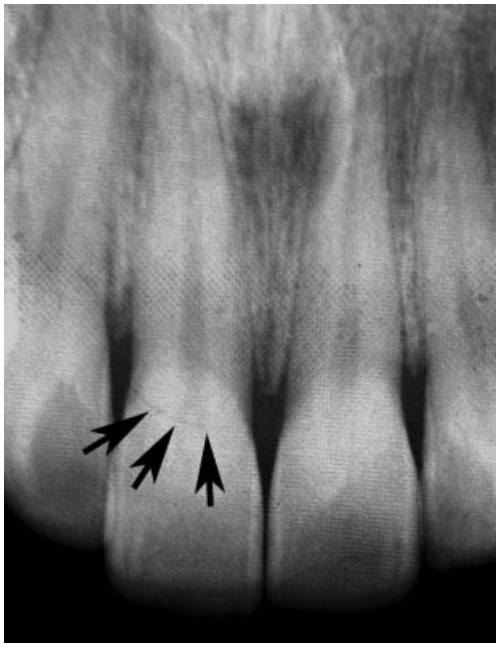

Fig. 1. The fracture line was clearly detected radiographically.

Fig. 2. The composite resin-wire splint and the fractured crown were removed.

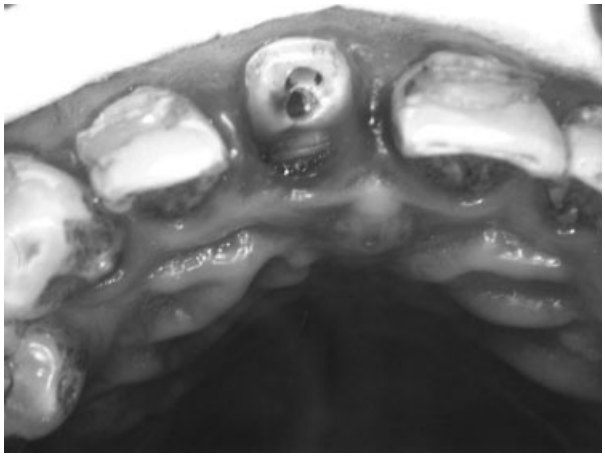

Fig. 3. Root channel was drilled for screw-post insertion.

Fig. 4. A twenty millimeter length and 2 mm width of a tapered, self-tapping, screw-post (Dentatus®) was inserted into 1/3 section of the root canal for retention.

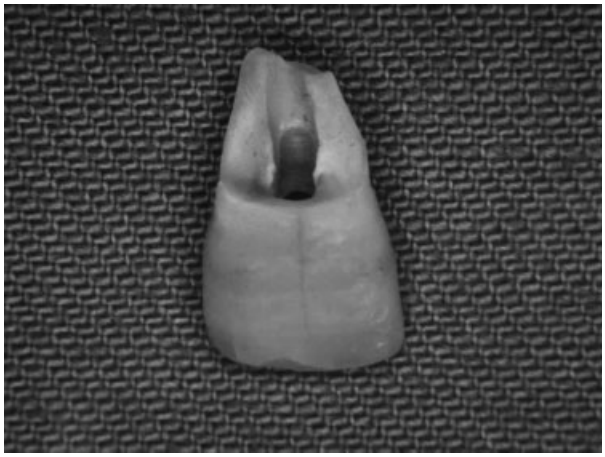

Fig. 5. A hole was drilled in the middle part of the crown fragment.

3 min. The crown fragment was reattached to the root surface, placed under pressure for 40 s and cured with light for 20 s. The remnants of the resin were removed from the pocket and the tooth surfaces. Finishing and polishing of the restoration were carried out, and the occlusion was checked to assure no contact (Figs 6 and 7).

Fig. 6. Immediate postoperative presentation.

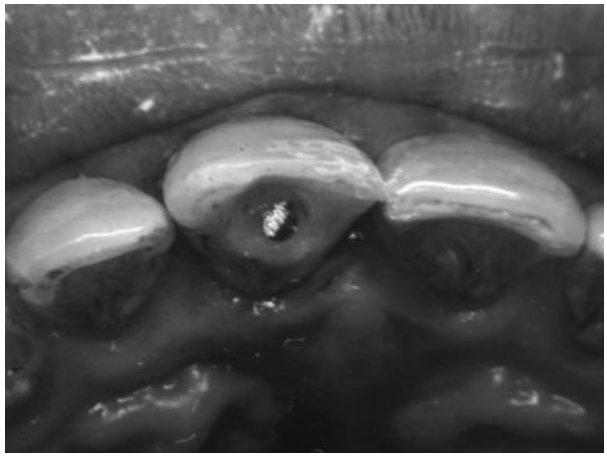

Fig. 7. The occlusion was checked for no contact.

One month later the clinical and radiographical examinations revealed a stable reattachment of the crown fragment with no color change. However, the tooth extruded labially about 2 mm. Periodontal probing revealed a depth of 4 mm on the mesial side, 2.5 mm on the buccal side, 3 mm on the distal side and 1.5 mm on the palatinal side. The maxillary central incisor was intruded and leveled by using 2×4 segmented arch orthodontic technique (Fig. 8). Leveling was achieved at the end of 3 months. For stabilization of the teeth, a wire was attached onto the palatal surfaces of the anterior teeth including canines. After 6 months the palatinal wire splint was removed. At this time periodontal probing revealed a depth of 2 mm on the mesial side, 2 mm on the buccal side, 2.5 mm on the distal side and 1 mm on the palatinal side. The patient was

Fig. 8. 2 × 4 segmented arch orthodontic technique.

Fig. 9. The tooth presented good periodontal health with no periradicular pathosis radiographically.

then scheduled on recall visits at each 6 months and the periodontal measurements were repeated at each visit. After 4 years, the clinical and radiographic findings presented no color change, no mobility and no periradicular pathosis and the tooth had a healthy periodontium with no pocket formation or gingival recession. However, minimal relapse was occurred despite the orthodontic treatment (Figs 9 and 10).

Discussion

It is well known that restoration of the fractured teeth by using the original fragments is advantageous to resin composite restorations or

Fig. 10. Minimal relapse occurred in spite of the orthodontic treatment.

prosthetic rehabilitations (2, 8–12). The good short-term (2) and medium term (11) results of this technique, which is named as reattachment technique, are present but long-term results are unknown. This report presents good immediate esthetics and functional outcomes of this technique over a 4-year period. The advantages of the reattachment technique can be summarized as:

1 Once the original fractured fragment is reattached; the natural appearance will instantly be gained again. Resin composite, which is applied to the fractured surfaces, may remain resistant for a long time when compared with conventional composite restorations. Using the fractured fragment will minimize the amount of the required restoration.

2 In this case, the orthodontic treatment was performed for 3 months. Retention was continued for 6 months. In this manner, reattachment technique allows performing orthodontic treatment and seems to be advantageous and reliable as reported by Simonsen (13).

3 As the dehydration results in color change; the fractured fragment should be preserved in sterile saline or water (2, 11). We saved the fractured fragment in the mouth by splinting at least for 2 weeks. Simonsen (13) reported that the dehydrated fractured fragment might be rehydrated for several months. We recommend keeping the fractured fragment preferably in its original place, in the mouth, as long as possible. During this time, the endodontic treatment should be performed. This healing period is also needed for the recovery of the periodontium, which is possibly affected by the trauma.

4 According to the amount of the restoration; screw-posts, cast-posts or dentine pins could be used for supporting the fragment. In the presented case, a tapered screw-post with a self-cutting thread was

preferred and has an active fit in order to increase stabilization.

In this case, excellent stabilization of the fractured crown fragment, excellent natural appearance with no color change, good periodontal health with no periradicular pathosis were maintained during 4-year follow-up. However, a tolerable little movement labially occurred in spite of the orthodontic treatment.

Conclusion

Compared with alternative techniques, such as a dental implant or crown-bridge restoration, reattachment technique offers several advantages. It provides immediate esthetics and functional rehabilitation of the fractured teeth. The cooperation required from the patient is low, and the treatment requires little time, thus easily accepted by the patient. Additionally, this technique allows further treatments like orthodontics with good prognosis.

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