



Reattachment of Fractured Tooth Fragments Using Modified Over Contour Technique: 2- Case Report

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Case Report

History

Received: 29/12/2021

Accepted: 24/01/2022

ABSTRACT

Crown fractures of the teeth especially in anterior region are common forms of dental trauma. If the fractured tooth fragment is available after dental trauma, reattachment of the fragment to the remaining tooth substrate may provide maintenance of the optical properties and shape of the natural tooth conservatively, as well as psychological benefits to the patients, relatively short chair-time, predictable treatment outcome and low-cost. This case report summarizes coronal fractures of two upper central incisors that was successfully reattached using resin composite and modified over contour technique.

Keywords: Reattachment, Fractured Tooth, Over Contour Technique, Case Report.

Modifiye Over Kontur Tekniği ile Kırık Diş Parçalarının Yeniden Dişe Yapıştırılması: 2- Olgu Sunumu

Süreç

Geliş: 29/12/2021

Kabul: 24/01/2022

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Öz

Özellikle ön bölgede yer alan dişlerin kırım kırıkları dental travmalardan sonra sık karşılaşılan bir durumdur. Dental travma sonrası kırık diş parçası mevcutsa, parçanın kalan dişe yeniden yapıştırılması, doğal dişin optik özelliklerinin ve şeklinin korunmasının yanı sıra, hastayı psikolojik olarak rahatlatan, nispeten kısa tedavi süresi, öngörülebilir tedavi sonucu ve düşük maliyeti ile konservatif bir tedavi seçeneğidir. Bu vaka raporunda, travma sonucu kırılmış iki üst santral dişin kırık parçalarının rezin kompozit ve modifiye edilmiş over-kontur tekniği kullanılarak başarılı bir şekilde yeniden yapıştırılması özetlenmiştir.

Anahtar Kelimeler: Yeniden Yapıştırma, Kırık Diş, Over-Kontur Tekniği, Vaka Raporu

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How to Cite: Koç Vural U.(2022) Reattachment of Fractured Tooth Fragments Using Modified Over Contour Technique: 2- Case Report, Cumhuriyet Dental Journal, 25(1): 79-82.

Introduction

Dental trauma in the mouth effects aesthetic, mastication and phonation and cause psychological and physiological impairment due to the traumatic aspect in the facial area and changing the patient's lifestyle.¹ Crown fractures of the anterior teeth mostly seen in children and/or adolescents, and the upper incisor teeth are the most often injured in accidents due to their vulnerable position in the mouth²⁻⁴, whereas the lower central incisor and the upper lateral incisors are less frequently affected.⁵ Although a single tooth is usually affected after traumatic dental injuries, multiple tooth injuries are not rare. However, in many countries, treatment of traumatized teeth has not been a priority for many peoples, unfortunately. It should be kept in mind that, treatment of a traumatized tooth is extremely important in terms of quality of life and for the prevention of undesirable challenges at long-term.^{2,6}

The treatment and prognosis of traumatized and fractured teeth depend on a series of factors, such as the degree, location, level and type of fracture, the condition of soft and periodontal tissues, and the requirement of root-canal treatment.⁷ Another important factor in the success of the reattachment therapy is storage time and storage media of the fractured tooth fragment out of the oral cavity. Since these factors, mentioned above, can cause changes in the color of enamel and dentin, there may be a color mismatch between the reattached tooth fragment and the remained tooth substrate. The lack of an aesthetically satisfying appearance may impair the social interactions of school children and affect the self-confidence of young people.^{8,9}

When the tooth fragment is available, a conservative treatment option for fractured anterior teeth is reattachment, which offers some advantages over

conventional prosthetic indirect restorations or composite layering techniques.⁹⁻¹² In reattachments cases, the fracture line is crucial for the reattachment of the fragment; if it is continuous and regular, it will be easier to adapt¹³ otherwise, reattachment of the tooth fragments can be more complicated in the presence of irregular fracture line with or without multiple fragments.

These 2-case reports aimed to present clinical application steps of reattachment therapy of upper central incisors after coronal fractures as well as the interventions done for functional and aesthetic adjustments using modified over contour technique.

Materials and Methods

Case Descriptions

A female patient at the age of 15, acquired a horizontal fracture in the upper right central incisor tooth in the cervical third, and another horizontal fracture in the middle third vestibule-palatine in the upper left central incisor tooth. Both fractures were in vestibule-palatine direction. The etiology of the tooth fracture was direct frontal trauma due to the fall, at home. The patient has no medical history. On extra- and intra- oral examination, no bruises or abrasions on the soft tissues were detected. The patient's admission time to the clinic after trauma is 24 hours. Periapical radiograph observations indicated no signs of any root fracture and periapical pathology. The two tooth fragments were found at the accident site, and kept in milk.

Clinical Examination

Case 1. The horizontal fracture was localized at the cervical third of the right upper central incisor tooth. The patient was diagnosed as a horizontal vestibule-palatine fracture including two-thirds of the clinical crown, and the tooth fragments were completely detached (Figure 1a). Clinical observations indicated the pinkish color of the dental pulp was reflected from the incisal edge of the tooth, but there was no visible bleeding (Figure 1b). The patient reported to have severe hypersensitivity. At pre-op time, electric pulp testing (Kerr Vitality Scanner 2006, SybronEndo, Orange, CA, USA), thermal testing (air-water syringe), tactile tests (palpation and percussion), as well as the predictors of inflammation and self-reported patient history was taken. Periapical radiography was obtained to assess the level of the dental fracture and the need for root-canal therapy. The radiography indicated no periapical pathology at the beginning. The insertion of the both tooth fragments were not presented good positional stability indicating missed tooth fragments (Figure 2a).

Case 2. The horizontal fracture was localized at the almost middle of the left upper central incisor tooth. The diagnosis was a horizontal vestibule-palatine fracture covering half of the clinical crown, and the tooth fragments were completely detached. The patient

reported to have hypersensitivity but not severe. Radiography observations and the insertion of the fragment were similar to the Case 1. Clinical check-ups were done after one week and 3- months.

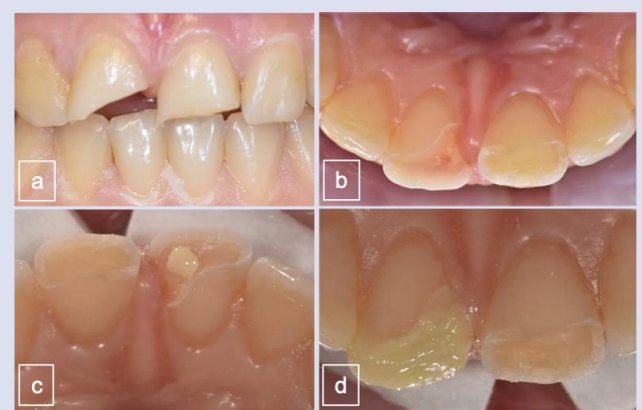


Figure 1. Indirect pulp capping
a. pre-operative view (buccal), b. pre-operative view (palatal), c. calcium hydroxide, d. glass ionomer cement

Treatment Plan

Case 1. For indirect pulp-capping, the area was irrigated with sterile saline solution and dried gently with sterile cotton pellets for indirect pulp capping. The reflected pinkish area was covered by calcium-hydroxide (Dycal; Dentsply Caulk, Milford, ME, USA) (Figure 1c). Then, a conventional glass ionomer cement (Figure 1d) was inserted throughout the incisal edge. The tooth was left undisturbed for 1 month then, the patient re-visited the dental clinic. After tooth vitality and physiologic mobility were guaranteed, the teeth were isolated with a rubber-dam (Optradam, Ivoclar Vivadent, Schaan, Lichtenstein). Since reattachment of the fragments to the tooth substrates confirmed missed tooth fragments, color of resin composite to be used was detected under ambient lighting conditions. The removal of the glass ionomer cement was started from peripheral area under water cooling. Previously inserted calcium hydroxide cement and a thin layer of glass ionomer cement were left. Enamel surfaces were totally exposed but the dentin surfaces were not. The disinfected fractured tooth fragment and remained tooth structures were selectively acid-etched by 37% orthophosphoric acid for 30 s on the enamel margins¹⁴, rinsed and gently dried with cotton pellets. A universal adhesive system (Solare, GC, Tokyo, Japan) was applied according to the manufacturer's recommendations onto the substrate and tooth fragment. No additional groove or bevel preparation was done due to the missing tooth fragments. Approximately a 1mm thick resin composite (A2 and AO2) (G'aenial A'chord, GC, Tokyo, Japan) was placed on the palatal side of the substrate and un-cured. Subsequently, the tooth fragment was reattached, positioned and light-irradiated with a light-curing unit (Elipar Freelight 2, 3M ESPE, St. Paul, MN, USA, 1000 mW/cm²) for 20 s. Then the gap between substrate and tooth fragment was filled incrementally. After the restoration, the preparation

extended 2.5 mm coronally and apically from the fracture line, with a depth of 1 mm (Over contour technique, Figure 2d-j) by round-ended diamond finishing bur and then beveled. This created a slightly over contoured tooth surface. After etching and bonding as mentioned previously, the resin composite was placed by layering technique (G'aenial AO2, Gaenial A'chord A2, GC, Tokyo, Japan). The re-attachment and restoration steps were summarized in Figure 2a-j.

The polishing was done with polishing discs (Sof-Lex, 3M, St. Paul, MN, USA) in a decreasing order.

Case 2. It was decided to reattach of tooth fragments of left upper central incisor tooth immediately. The same protocol was followed mentioned above for re-attachment, except indirect pulp capping step. Photographs were obtained during the clinical application steps, after obtaining written consent from the patient.

Patient was instructed to prevent heavy loading of the anterior teeth. Post-operative period was uneventful.¹⁵

Discussion

Traumatic injuries of permanent anterior teeth are a common problem especially seen in the first and second decades of life because of increased physical activities of this age-group.^{4,16}

A proper dental restorative treatment after traumatic dental injuries is crucial for preventing biological and sociopsychological impacts.⁸ A series of treatment options can be preferred for the restoration of traumatized teeth, varying from biological restorations to indirect prosthetic approaches. As the treatment and prognosis for each case is unique, treatment (chipping / bulk) and its level, availability for reattachment and conditions of the dentin tubules. In the literature, different reattachment methods present a perfect alternative treatment option for anterior fractured teeth since their natural anatomic form, contour, color, surface texture, translucency, incisal coverage, function and contribution to phonation are maintained.^{4,17}

Although Demarco *et al.*¹⁸ stated that the degree of bevel and the used material for the reattachment were not sufficient enough to catch the natural fracture resistance of the intact tooth, some alternative techniques were reported in the literature. Additionally, some authors advocate preparation of the tooth surfaces before and/or after bonding.^{11, 17, 19} Reis *et al.*²⁰ indicated that a simple reattachment without any additional preparation of the neither fragment nor tooth can improve approximately one third (37.1%) of the fracture resistance of intact tooth while over contour 97.2%. Similarly, Abdulkhayum *et al.*¹⁹ reported excellent fracture strength recoveries after over contour and/or internal groove techniques were employed. In light of the current literature, it was decided to use a slightly modified over contour technique in the present cases. The modification, employed in these cases, aimed first to promote the fracture strength of the reattached tooth and secondly to improve color match among substrate, resin composite and tooth fragment since the esthetic aspects of the restoration are equally important due to the high psychosocial and emotional impact on individuals' quality of life. After 3- month, reattachment interventions were clinically successful in line with the current literature, in these two cases. Exact color match was maintained and fragments were stayed reattached. This may be due to the reattachment technique and adhesive system, employed. However; there were some factors contributed to render reattachment procedures difficult. The main difficulty during reattachment was that there was a gap between the substrate and the fractured tooth fragment due to the missing pieces. This gap made it difficult both reattaching of the fractured tooth fragment exactly and maintaining the color harmony among fractured tooth fragment, remained tooth structures and resin composite. Although Andreasan *et al.*²¹ recommended when the fragment is missed or inappropriate for reattachment, composite resin restoration should be preferred instead. However, it was decided that the master piece should be kept in

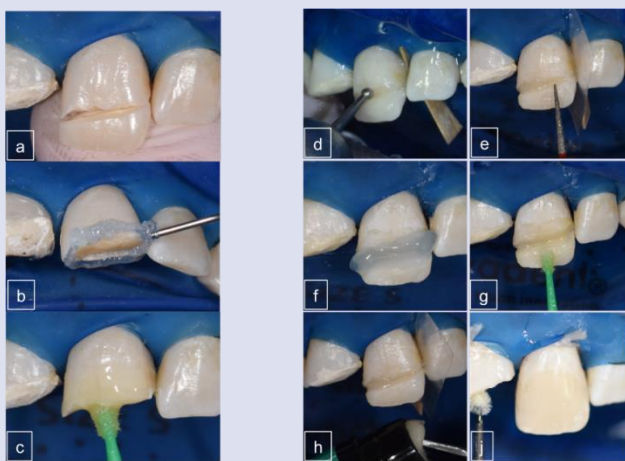


Figure 2. Reattachment steps of fractured tooth fragment and clinical application of over contouring technique

a. clinical view of the gap between the tooth and the fractured tooth fragment, b,f. acid-etching, c,g. bonding, d,e. over contouring, h. incremental composite layering, j. polishing



Figure 3. Clinical view of reattachment therapies at recalls

a. pre-operative stage, b. reattachment of left upper central incisor tooth, c. reattachment of right upper central incisor tooth, d. 3- month post-operative stage

the mouth in the present two cases, considering the patient's age, aesthetic need, and long-term sustainability of the aesthetics.

However, it should be noted that reattachment of tooth fragment(s) doesn't finalize the process since aesthetic, biological or functional adjustments/interventions can be required over time. A wide variety of factors are effective on the survival of a reattached tooth in the oral cavity. Patient collaboration and awareness of the limitations of the applied treatment are extremely important for maintaining long lasting restorations.²²

Conclusions

After 3- month, reattachment of fractured tooth fragments using modified over contour technique were clinically successful.

Acknowledgements

None

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