Alternative Treatment Procedure in the Case of Fractured Abutment of Adhesive Bridge: A Clinical Report

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ABSTRACT

In this case report, an alternative approach was presented for treatment of coronal fracture including pulp of maxillary central incisor, one of the abutments of an adhesive bridge, by using fiber post and tooth's own fractured component. The patient was referred to our clinic with the complaint of pain from the upper right central incisor and mobility of the adhesive bridge in maxillary anterior segment. It was realized that, the upper right central incisor, one of the abutments of the adhesive bridge, had been fractured at middle thirds of the crown including the pulp chamber. After dismounting the adhesive bridge and completion of the root canal treatment, a fiber post was placed into the fractured tooth. The fractured component, adherent to adhesive bridge retainer, was concorded to the fiber post. The whole structure was cemented with adhesive resin. A 1-mm-wide groove was made along the fracture line and restored with composite resin. The patient was evaluated clinically and radiographically at 12 and 30 months after the treatment.

CLINICAL SIGNIFICANCE

Adhesive cementation of fractured component by supporting the remaining tooth structure with a fiber post is an inexpensive and conservative treatment alternative when the fractured component is compatible with the remaining tooth structure in cases of tooth fractures including the pulp chamber at anterior segment.

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INTRODUCTION

Injuries to primary and permanent dentition are among the most common types of trauma to occur in the maxillofacial region. The rate of traumatic injury is significantly higher for maxillary incisors than for other teeth.[1]

Maryland bridge is a composite resin-bonded metal retainer.[2] The resin bonded fixed partial denture (FPD) is a treatment alternative for replacement of missing teeth when conservation of tooth structure is needed.[3] The success of this technique depends upon the ability to etch specific high modulus,

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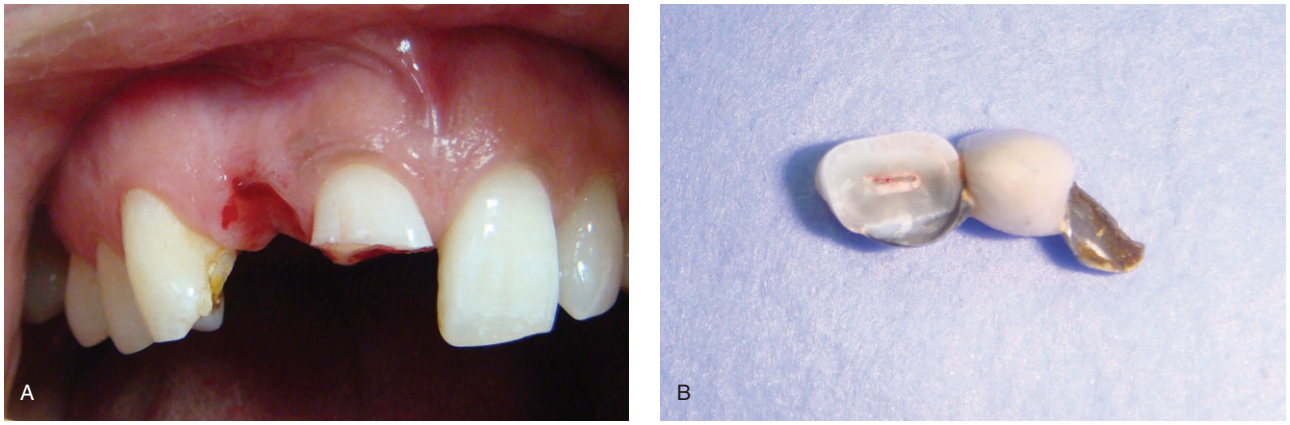

Figure 1. A, *Clinical appearance of one of the abutments of adhesive bridge, which had been fractured at middle thirds of the crown including pulp chamber.* B, *Recovered fragment of fractured incisor adherent to adhesive bridge.*

nonprecious alloys.[2] These restorations are adhesively cemented to tooth structure. Recently, adhesive technology developed faster. So, it is possible to fracture the abutment teeth in the case of trauma to the Maryland bridge.

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.[4,5]

In the last three decades, many authors have proposed a valid alternative to conservative treatment of these fractures represented by the re-bonding of the fractured fragment.[4,6–9] If a broken fragment is available, the restoration of teeth with its own fragment has been suggested as an alternative treatment.[1,5,10–15]

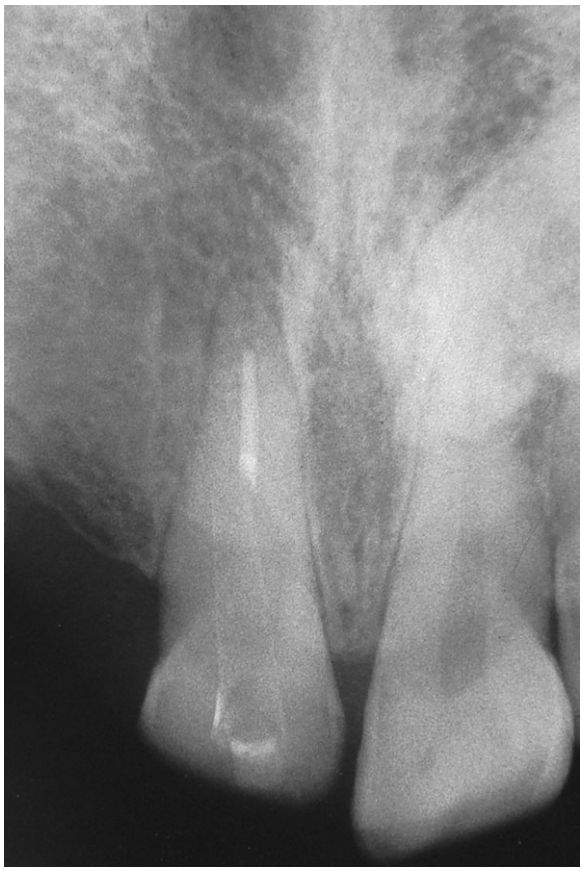

Figure 2. A fiber post at adequate dimension with the last drill used was placed into the fractured tooth. A periapical radiograph was taken for controlling.

Figure 3. The fiber post was adhesively cemented to the prepared root canal.

Figure 4. Intraoral view of the patient after the restoration.

Figure 5. Intraoral view of the patient 12 months after the restoration.

The retention of restorations on an endodontically treated tooth with significant loss of tooth structure is often achieved using a post and core.[16] A growing interest in esthetic dental restorations and adhesive dentistry has led to the development of innovative post materials and techniques for esthetic restoration of endodontically treated teeth. These newer systems have focused on physical properties—such as the modulus of elasticity—that are more closely matched to dentin to decrease stress concentrations within the root canal and reduce the incidence of fractures.[1,16]

In this case report, an alternative approach was presented for treatment of coronal fracture including pulp of maxillary central incisor, one of the abutments of the adhesive bridge, by using fiber post and the tooth's own fractured component.

CLINICAL REPORT

A 36-year-old female patient was referred to our clinic with the complaint of pain from the upper right central incisor and mobility of the adhesive bridge in the maxillary anterior segment. The patient was informed about the procedures, and then signed informed consent was obtained. Clinical and radiological examination revealed that the upper right central incisor, one of the abutments of the adhesive bridge, had been fractured at middle thirds of the crown including the pulp chamber (Figure 1). After dismounting the adhesive bridge, the fracture line and fragments were examined. Because the

Figure 6. Radiographic examination of the reattached tooth 12 months after the treatment.

fractured fragments were concordant with each other, reattachment of the fractured fragments was chosen as an appropriate treatment option. Pulp remnants in the coronal component, adherent to the adhesive bridge retainer, were cleaned with a diamond burr (Brasseler, Lemgo, Germany) and kept in a sterile saline solution.

After local anesthesia, access cavity was prepared and the canal was located with a size #15 K-File (Dentsply Maillefer, Ballaigues, Switzerland). Then the canal was irrigated with 5.25% sodium hypochlorite, and the working length was determined using the apex locator function of VDW Gold device (VDW, Munich, Germany). Root canal preparation was accomplished with ProTaper rotary nickel-titanium system by WDV Gold to size F5. The root canal was filled by lateral condensation of gutta-percha and AH Plus (Dentsply DeTrey, Konstanz, Germany). Three days after the root canal treatment, the root canal was prepared using drills (Cytec Blanco, Hannerkratt, Germany) at the dimensions of $1.2 \times 1.5 \times 1.8$ mm. A fiber post (Cytec Blanco) at adequate dimension with the last drill used was placed into the fractured tooth. A periapical radiograph was taken for controlling (Figure 2). The prepared root canal was rinsed with NaOCl, dried with paper point, etched with 37% orthophosphoric acid gel (Scotbond, 3M ESPE, St. Paul, MN, USA), rinsed, and dried gently. Subsequently, a bonding agent (Edgeprimer, Kuraray Dental, Okayama, Japan) and dual-cure adhesive cement (Edgeprimer, Kuraray Dental) were applied to the etched surface. After excess cement was removed, an oxygen blocking agent (Oksyguard II, Kuraray Dental) was applied, and polymerization was carried out using halogen light cure (Hilux Ledmax 550, Benlioğlu, Ankara, Turkey) for 40 seconds on both buccal and palatal sides (Figure 3).

The fractured component, adherent to the adhesive bridge retainer, was concorded to the fiber post. After the canine retainer of the adhesive bridge was air-abraded with 50 μm Al_2O_3, the whole structure was etched with 37% orthophosphoric acid gel (Scotbond, 3M ESPE),

Figure 7. Intraoral view of the patient 30 months after the restoration.

rinsed, and dried gently. Subsequently, a bonding agent (Edgeprimer, Kuraray Dental) and dual-cure adhesive cement (Edgeprimer, Kuraray Dental) were applied to the etched surface. After excess cement was removed, an oxygen blocking agent (Oksyguard II, Kuraray Dental) was applied, and polymerization was carried out using halogen light cure (Hilux Ledmax 550, Benlioğlu) for 40 seconds on both buccal and palatal sides.

After reattaching the fragment, a 1-mm groove in the fracture site was prepared. The groove and the fracture site was etched with 37% orthophosphoric acid (Scotbond, 3M ESPE) for 15 seconds, rinsed thoroughly with water, and dried gently. A bonding agent (Singlebond 2, 3M ESPE) was applied to the etched surfaces and light cured for 20 seconds. After choosing a well-matching composite color, the composite (Filtek 250, 3M ESPE) was light cured for 40 seconds. The tooth repair site was finished using polishing disks (Opti Disc, Kerrhave, Broggio, Switzerland) (Figure 4).

The patient was evaluated clinically and radiographically 12 and 30 months after the treatment (Figures 5–8). Nothing was encountered that indicated signs of periapical tissue damage. There was no change in the color of the tooth. The patient had no complaints. If a fractured component is compatible with the remaining tooth structure in cases of tooth fractures including the pulp chamber at anterior segment, adhesive cementation of the fractured component by supporting the remaining tooth structure with a fiber post is an inexpensive and conservative treatment alternative.

DISCUSSION

Reattachment of the fractured fragment offers a lot of advantages, such as excellent esthetics, natural brightness and texture, color match to remaining crown portion, maintenance of original tooth contours, preservation of identical occlusal contacts, incisal margin wear match to that adjacent tooth, positive psychological response, conservative, and inexpensive technique.[4,15,17–20]

Successful reattachment is dependent upon rapid retrieval of the fragment.[21] The fragment should be preserved in physiological solution, sterile saline, or water to prevent any color changes caused by dehydration.[1,22] Hydration maintains vitality and original appearance of the tooth while ensuring adequate bond strength because of the hydrophilic characteristic of adhesive systems.[23] Some authors suggest using sterile saline solution,[24] whereas others consider water or saliva to be adequate storage media for fragment preservation.[25] In this case, the fragment was stored in a sterile saline solution during the treatment and no discoloration was observed during follow-up examinations. This result is in agreement with the results of Toshihiro and Rintaro[21] who explained that the incisal fragment may regain some original color because of water absorption in the mouth.

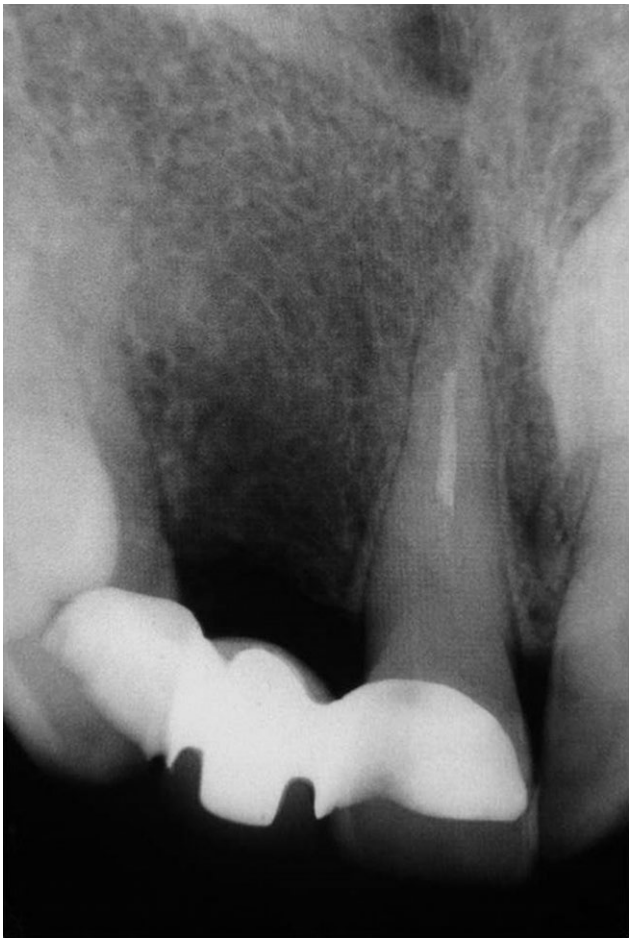

Figure 8. Radiographic examination of the reattached tooth 30 months after the treatment.

Many techniques have been proposed for reattaching the fragment to the remaining tooth such as placement of a circumferential bevel before reattaching the fragment,[4,5,11] placement of an external chamfer at the fracture line after bonding,[4,5,11] use of a V-shaped enamel notch,[4,5,11,26] placement of an internal groove,[4,5,11,23] leaving a superficial overcontour of restorative material over the fracture line,[4,5,26] when endodontic therapy is required, using the pulp chamber as an inner reinforcement[26] or using fiber posts.[1] Reis and colleagues[27] suggest that use of additional preparation (bevel, chamfer, and overcontour) is needed to enhance the resistance to fracture of the reattached fragment. In this case report, fiber post and pulp chamber were used as inner reinforcement because root canal treatment was performed, after reattaching the fragment, and a bevel was prepared on the buccal surface.

Demarco and colleagues.[28] observed that both the used materials and the preparation technique could influence fracture resistance of reattached teeth. According to their results, dual-cure cement produced lower failure loads compared with a chemically cured composite and a light-cured composite. In this case report, a dual-cure cement was used for attaching fragments.

In this case, the bonding of a fiber post to the tooth structure is supposed to increase both durability and survival. Bonding of a post to the tooth structure should improve the prognosis of tooth by increasing post retention[29] and reinforcing tooth structure.[1]

CONCLUSION

The patient was evaluated clinically and radiographically at 1 and 2 years after the treatment. No symptoms were encountered that indicated signs of periapical tissue damage. There was no change in the color of the tooth. The patient had no complaints. If the fractured component is compatible with the remaining tooth structure in cases of tooth fractures including pulp chamber at anterior segment, adhesive

cementation of the fractured component by supporting the remaining tooth structure with a fiber post is an inexpensive and conservative treatment alternative.

DISCLOSURE

The authors do not have any financial interest in any of the companies whose products are discussed in this paper.

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