

Treatment of a Broken Central Incisor in Children After Trauma



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INTRODUCTION

Dental trauma to the anterior maxillary teeth is common in children and is treated in a variety of ways by the general dentist. Effects of the trauma on the anterior teeth range from a simple crack to complete avulsion, depending upon the force and nature of the trauma. Reasons for the trauma can include playground accidents, physical altercations, or slipping in the shower. Anterior tooth restorations are the most challenging in the practice of modern esthetic dentistry.

Advances in modern composite formulation have provided clinicians with many different incisal and body shades to create an artistic restoration.

There are a number of different treatment options available when treating and restoring a fractured anterior tooth, depending upon the dentist's philosophy and knowledge of esthetic dentistry. Considerable progress in the esthetic and physical properties of composite resin has been made in recent years.^{1,2} These factors, along with improved techniques such as the stratification method, allow dentists to emulate the natural appearance of the dentition with direct esthetic restoration.^{3,4} A broad range of enamel shades also has been introduced, allowing dentists to control the degree of translucency as well as the opacity of these restorations with minimally invasive procedures.⁵ If the trauma causes the tooth to become fractured and the fractured fragment is retained, restoration of the tooth with the fractured fragment can be achieved with a beautiful esthetic result.⁶

Today, a dentist can restore and achieve a final esthetic result by mastering the bonding technique. When the fracture is close to the pulp and pulp is exposed, a dentist may perform endodontic treatment and follow with a post build-up and crown. Another dentist might choose to perform pulp-capping and follow up with a crown or porcelain veneer, or direct composite resin build-up to restore the fractured tooth.

Children around the ages of seven or eight, with mixed dentition, frequently exhibit large internal pulp canals with open apices because their dentition are not fully developed. At this stage, the occlusal plane and position of the teeth and soft



Figure 1: Preoperative picture.



Figure 2: Preoperative smile, fractured #9.



Figure 3: Verification of fractured fragment.



Figure 4: Bonded fractured fragment.

tissue are unstable and are in the process of maturing.⁷ It is hoped that, with mature dentition, ideal treatment will be received. Age is an important factor in determining the best restoration. When options are available, children should receive conservative treatment until they are the appropriate age.

CASE HISTORY 1

The patient, a seven-and-a-half-year-old boy, had fallen on the floor and fractured the incisal one-third of tooth #9 (Fig 1). The child's father took him to the family dentist, who presented a treatment plan that the father felt was too aggressive (as a child, the father had had a negative dental experience resulting from the

same sort of trauma). Due to his son's young age, the father believed that a more conservative approach would be best. The father and child were referred to my office for a consultation. The father brought one x-ray and the fractured fragment of #9 in a plastic bag (Fig 2).

DIAGNOSIS

Clinical exam and single peri-apical x-ray evaluation revealed no pulp exposure. Teeth #8 and #9 had a diastema, with #9 tilted buccally. Evaluation of the occlusion revealed that, due to the patient's age, there was no occlusal contact between the upper and lower anterior teeth; and that the position of the teeth and occlusal plane and soft tissue maturation were unstable. Therefore, treatment options

were limited to the most conservative, least invasive methods. The fractured fragment was evaluated, cleaned, and repositioned into place. Fit was verified and a putty stent with vinyl polysiloxane was fabricated to stabilize the fractured fragment during bonding time (Fig 3). After taking slides and photographs and considering the patient's age, the following treatment options were presented to the child's father:

- restore the fractured tooth with direct light-cured composite
- create a porcelain veneer (this was not recommended at this age, due to the unstable tooth positions and ongoing maturation of the soft tissue).⁸
- reattach the tooth fragment.



Figure 5: Finished case.

TREATMENT PLAN

Due to a symptomatic condition, treatment was started without using anesthesia. The dentin in both the tooth and tooth fragment was cleaned with pumice and washed and dried. The fractured fragment and tooth structure were disinfected using 2% chlorhexidine gluconate surgical scrub for 60 seconds and rinsed, then washed again with 5% sodium hypochlorite and rinsed. After this procedure, the operative area was isolated with cotton rolls. Total-etching technique was used to enhance bond strength and minimize microleakage. The dentin and enamel surface of fragment and tooth were etched separately for 15 seconds with Ultra-Etch® (Ultradent; South Jordan, UT) 35% with phosphoric acid (Ultradent) and rinsed, followed by the application of dentin primer and adhesive resin (ClearFil SE Bond [J. Morita; Irvine, CA]) to both surface of the tooth and fragment, thinned with gentle air syringe, and light-cured for 15 seconds. The stent was placed on the lingual surface of the tooth to stabilize the fragment and tooth during bonding. Next, the base and catalyst of dual-cured resin (Insure, Cosmedent; Chicago, IL) was mixed and a small amount applied to both surfaces. The

fragment was repositioned into place and excess resin removed with a brush and light-cured for 30 seconds. The stent was carefully removed from the lingual surface and light-cured for 30 seconds; curing continued on both the facial and the lingual for a total of 60 seconds.

Effects of the trauma on the anterior teeth range from a simple crack to complete avulsion, depending upon the force and nature of the trauma.⁹ To increase the bonding strength and longevity of teeth restored by fragment reattachment in children, it is beneficial to overlap excess composite over the fracture line.¹⁰ In this case, as previously mentioned, due to a lack of occlusal contact between the upper and lower anterior teeth, a layer of hybrid composite was applied a couple of millimeters apical to the fracture line to the lingual incisal edge and light-cured. On the facial surface, a very thin layer of translucent composite was applied over the fractured line and light-cured (Fig 4).

FINISHING AND POLISHING

To ensure the anatomy of the tooth and natural texture, translucent composite was applied to the facial surface. Polishing strips were used to establish lifelike luster on facial and lingual sur-

faces. Flexi Disks (Cosmedent) were used to polish the facial surface, followed with composite polishing paste. Football-shaped finishing diamonds (Brasseler; Savannah, GA) were used on the lingual surface to achieve lingual anatomy and followed with flexi finishing disks (Cosmedent), then followed with composite polishing paste. Occlusion was checked with different jaw movements to adjust any immature contact. The result was extremely satisfactory for the patient and his parents. The patient was recommended for a postoperative visit within a few weeks (Fig 5).

CASE HISTORY 2

This 11-year-old boy came into the office with his mother to restore the fractured incisal one-third of tooth #9 (Fig 6). The etiology of this second case was a fall in the shower. Unlike the first case, the fractured fragment of this patient's tooth #9 had been lost. The patient's mother sought high-level, conservative restorative treatment to restore the fractured tooth to its natural appearance. Advances in modern composite formulation have provided clinicians with many different incisal and body shades to create an artistic restoration.



Figure 6: Case 2, preoperative view, fractured #9 with lost fractured fragment.



Figure 7: Case 2, preoperative smile, fractured #9.



Figure 8: Repaired fractured tooth #9 with microfil composite.



Figure 9: Retracted view of final repair.

DIAGNOSIS

Clinical exam revealed no signs or symptoms of temporomandibular joint or occlusal disorder. X-ray and clinical exam revealed no pulpal pathology. Teeth #8 and #9 had diastema with minimal restoration. Tooth #8 had no evidence of fracture (Fig 7).

TREATMENT PLAN

After the complete clinical examination, an alginate impression was taken to fabricate a study model to construct the diagnostic wax-up. Due to the loss of the fractured fragment,

the patient was given the option of composite restoration. Considering the patient's age, restoring the fractured tooth with porcelain veneer was not the ideal option. The patient's parents were appreciative of the given restorative option.

Prior to preparation, the teeth were cleaned with pumice and disinfected with chlorohexadine. Then shades were selected from Renamel Microfil (Cosmedent) and hybrid composite to restore dentine and enamel. The preparation started with a round-end diamond bur (Brasseler) with a 2-mm lin-

gual reduction with deep and long bevel extended 2-3 mm around the entire facial and lingual margins. Total-etch technique was used to enhance bond strength and minimize microleakage. Labial and lingual surface were etched for 15 seconds with 37% phosphoric acid, then rinsed for 10 seconds and dried. Resin-bonding adhesive clearfil SE-BOND (Kuraray America; New York, NY) applied on facial and lingual surface, air-thinned, and light-cured per manufacturer instruction. Three-Incremental technique (Dentin-Enamel-Incisal [Cosmedent]) was



Figure 10: Postoperative portrait.



Figure 11: Postoperative portrait.

applied to restore the fractured fragment.¹¹ Renamel hybrid composite shade B1 initially was placed to build the lingual wall. A very thin layer of opaquer was applied to cover the bevel margin and resin and light-cured.

Microfil composite resin shade B1 was applied over the entire surface of composite and tooth structure and an IPC carver (Cosmedent) was used to make random bevel and groove for incisal composite, and light cure. Use bonding resin to wet groove and condense incisal composite to accentuate incisal translucency, and light cure.

Effects of the trauma on the anterior teeth range from a simple crack to complete avulsion, depending upon the force and nature of the trauma.

POLISHING AND FINISHING

The surface texture and the final form and function of restoration are achieved through careful finishing and polishing procedures. Disks, cusp, and points were used separately in this case. The final polishing was accomplished with composite polishing paste (Cosmedent). The final restoration (Fig 8) exhibited natural esthetic result (Fig 9).

CONCLUSION

A fractured maxillary anterior tooth can be bonded with excellent results as long as the fractured fragment is not lost and is in one piece. In a short amount of time, the fragment can be disinfected and bonded together using dual-cure luting resin (Case #1). If the fractured fragment is lost, as long as significant amounts of tooth structure are not compromised, conservative restorative treatment such as that offered by the direct esthetic composite treatment outlined in Case #2 is generally an ideal choice for young patients (Figs 10 & 11). *AD*

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