**Abstract**

Esthetic restoration of crown fractures at the central superior incisors level may be one of the greatest challenges a dentist can face. Generally, this type of fracture affects children and teenagers and represents the consequence of accidental injuries. The therapeutic method of restoration is determined by the patient's age and dental structure deficiency. The patient described here was a child with crown fractures in both central superior incisors. However, because one of his fractured dental fragments had been retrieved, two different restoration techniques were chosen: adhesive reattachment of the fractured dental fragment (ultraconservative technique) for tooth #9; and crown morphology reconstruction with composite resin, using a silicone putty matrix technique (minimally invasive), for tooth #8. Esthetically, both restoration techniques proved their reliability.

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**INTRODUCTION**

As the dominant element of the dento-labial composition, central superior incisors are the teeth most visible during normal functioning. They also are the teeth most susceptible to fractures caused by direct trauma, due to their size and position. Crown fractures in central superior incisors generally occur in children and teenagers, usually as a result of accidental injuries.

What determines the restoration technique selected is the patient's age: the younger the age, the more conservative the treatment should be. And, from this viewpoint, adhesive reattachment of the dental fragments involved in the fracture and crown morphology restoration by means of composite materials represent the best options. It should be noted that today's
remarkable esthetic achievements, with prolonged durability, are obtained by using composite resins.\textsuperscript{4}

**Clinical Data**

The patient was a healthy 10-year-old boy. A day before his first visit, he had fallen, resulting in crown fractures in both central superior incisors (Fig 1). The boy was accompanied by his mother, who carried a glass of milk containing one of the dental fractured fragments (she hoped it might prove useful for the restoration).

**Diagnosis and Treatment Plan**

The following findings were determined through clinical examination:

- crown fractures (Ellis Class II) in the two central superior incisors: #8 horizontal fracture with incisal angles involvement; #9 oblique fracture with mesial angle damage (Figs 2 & 3)
- plaque and chronic gingivitis (more pronounced at the interdentally papillae level, frontal area, between #7 and #8, and #9 and #10) (Figs 4a & 4b)
- presence of secondary and tertiary anatomy on both vestibular surfaces of the central incisors (Figs 4a & 4b).

Taking into account the patient’s youth and the fact that one of his fractured dental fragments had been recovered, direct techniques of esthetic restoration were determined to be the best therapeutic procedure: an ultraconservative method (adhesive attachment of the dental fragment) was chosen for #9; and a minimally invasive technique (direct composite resin restoration of crown deficit) for #8.
**Armamentarium**

- Lidocein 10% spray (Egis Pharmaceuticals Ltd.; Budapest, Hungary)
- Mepivastesin 3% local anesthetic injection solution (3M ESPE AG; Seefeld, Germany)
- Dentomin natur for professional tooth brushing (Geoprodukt KFT MAD; Szabadsag, Hungary)
- VitaPan Classical shade guide (Vident; Brea, CA)
- Gingi-Pak retraction cord, dl epinephrine HCL (Belport. Co. Inc.; Camarillo, CA)
- Kofferdam rubber dam (SDI Directa, Svenska Dental Instrument AB; Vasby, Sweden)
- flame-shaped diamond finishing burs (SS White; Lakewood, NJ)
- composite placement instruments (Ultradent Products; South Jordan, UT)
- 35% phosphoric acid etching gel (3M ESPE; St. Paul, MN)
- Adper Single Bond 2 adhesive (3M ESPE)
- RelyX adhesive resin cement system, shades A1 and A3 (3M ESPE)
- Filtek Supreme XT universal restorative composite, shades A2B and A2E (3M ESPE)
- Filtek Supreme universal restorative composite, shade Gray Translucent (3M ESPE)
- Elipar curing light (3M ESPE)
- Zetaplus high-consistency condensation-curing silicone-poly-siloxane impression material (Zhermack; Rovigo, Italy)
- clear mylar strips, finishing and polishing discs, interproximal finishing strips, composite polishing brushes (3M ESPE)
- Jiffy polishing cups (Ultradent)
- composite polishing paste (SDI Limited; Baywater, Victoria, Australia)
- EOS 300D digital camera with EFS 18-15-mm lens (Canon; Lake Success, NY)

**Treatment**

Because the child was frightened, and the teeth responded positively to vitality tests, a topical anesthesia was used, followed by a local anesthesia straight to each tooth apex. The fractured dental fragment was washed and brushed until anesthesia took effect. Once the patient was comfortable, the teeth were polished to remove any plaque; and the recovered dental fragment’s fit was checked on tooth #9 (Fig 5). The classic method was used to establish basic teeth color (it had been noted that teeth shade was closer to A2).

After operative field isolation (retractor cord, rubber dam, saliva aspirator), a long circumferential, concave bevel preparing was carried out, with irregular outline, on the dental abutment of #8. The facial level was carried 2-3 mm beyond the fracture area, with an up-and-down motion, so that the finishing line would not go straight across and would seem to “disappear” in the middle one-third more effectively (Fig 6).

The procedure was continued with adhesive substratum fulfillment of tooth #9 (acid etching, washing, drying, and adhesive application) on both remaining crown abutments and the retrieved dental fragment. During this time, the adjacent teeth were protected with celluloid strips. Bonding was done with dual-cure adhesive resin cement and proper shade material, the excess material being removed before the onset of photo-polym-
A thin resin layer was applied on both involved adhesive surfaces, maintaining the fragments closely related in their position during photo-polymerization (60 seconds from vestibular and oral). A groove was carried palatinally across the fracture line into enamel thickness (by means of a flame-shaped diamond finishing bur), in order to strengthen the bonding; the groove was filled with high-viscosity shade A2E composite resin. Once crown morphology of #9 was restored (Fig 6), it was used as a chromatic map pattern of the prospective restoration and for a mock-up for #8. The provisional restoration was done using a single composite resin shade (A2B), but the tooth surface was not etched and bonded. The goal was to restore primary morphology so that a perfect symmetry of the two central incisors related to the midline could be accomplished. The proper restoration was achieved by composite resin layering on the silicone putty matrix surface\(^1\) so that optical effects similar to those of #9 could be achieved. The first layer was shade A2E (corresponding to palatinal enamel layer); then shade A2B with greater opacity (for dentinal mammmelon reproduction [Fig 8]); then shade A2E again; and finally, a thin layer of shade Gray Translucent.

The treatment was completed with standardized finishing and polishing procedures: abrasive discs and strips with decreasing granulation; abrasive, impregnated silicone rubber cups; and composite polishing brushes with polishing paste to refine the outline form, develop texture and anatomy, and smooth the margins of the restorations (Fig 9). The use of a silicone putty matrix during the composite layering process facilitated the finishing and polishing procedures. This tool minimized the amount of lingual finishing required and developed a relatively accurate incisal edge contour.\(^12\)

It had been noted that the incisal edges of #9 (restored by adhesive reattachment of the dental fragment) were slightly unequal due to some enamel cracks (a result of the patient’s fall); these were finished by using abrasive impregnated silicone rubber cups. To achieve a symmetrical appearance, the same type of corrections were also outlined at the incisal edge of #8, restored with composite resin (Fig 9).

**RESULTS AND DISCUSSION**

The general esthetic outcome (Figs 10, 11a, & 11b) was evaluated by the patient and his mother, and by the dentist. Everyone was satisfied, especially the patient, who...
happily exclaimed, “Thank goodness no harm was done!”

The restoration’s final aspect, smile design, and full-face photography were done a week later (Figs 10, 11a, 11b, & 12). Unfortunately, the frontal photograph (Fig 9) was focused on #8 (the composite resin-restored tooth), which seems to show a better-expressed secondary anatomy as compared with #9. However, comparing the two half-section images, a similarity between secondary and tertiary morphologies of the two incisors can be noticed (Figs 11a & 11b).

**SUMMARY**

Direct techniques represent the preferred therapeutic option for the esthetic restoration of crown fractures in children and teenagers. The adhesive reattachment of fractured fragments may be considered as an ultraconservative method for esthetical rehabilitation, whereas restoration with direct composite resin is a minimally invasive one. These techniques preserve maximal tooth structure and also offer the possibility of additional adjustments if necessary. Therefore, tooth vitality is maintained; and the possible need for more sophisticated and full-sized restorations may be postponed. The high-quality materials available today make long-lasting esthetic achievements possible.

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References

Figures 11a, 11b: Left and right lateral restorations view (nonretracted view).

Figure 12: Treatment outcome a week after completion (full-face view).

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