

minimum intervention, **MAXIMUM SATISFACTION**

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Reconstruction Guided by a Fragment

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Introduction

Trauma during the period of mixed dentition is a frequent occurrence in children, usually involving the maxillary incisors.¹ In these circumstances, further preparation of the traumatized teeth for restorative reasons can be a case of “adding insult to injury.” The rationale for treatment should be a minimally invasive approach, including preservation and retaining as much natural remaining tooth abutment as possible.



Figures 1 & 2: The patient's fractured maxillary central incisors.



Figure 3: Radiograph showing poor adaptation of the composite fillings with the remaining tooth substrate.

Patient History and Diagnosis

A 12-year-old boy presented with fractured maxillary central incisors (**Figs 1 & 2**). He went to the emergency department of a local hospital, where tetanus inoculation was verified and composite resin was used to reattach the right central incisor fragment and build up the lost incisal fragment of the left central incisor.

A subsequent radiograph showed poor adaptation of the composite fillings with the remaining tooth substrate (**Fig 3**). The periodontal ligament was intact, with no root fractures, and a typical solid cortical bone appearance consistent with acute dental trauma. Buccal palpation elicited tenderness at the apex of the left central incisor. However, root canal treatment was deferred to allow natural regeneration of the pulpal tissues (thermal vitality tests following acute trauma are futile due to transient paraesthesia of nerve fibers).²

A week later, after prophylaxis, gingival health was evident, and the left composite filling had dislodged. The buccal tenderness associated with the left central had subsided, and the exposed dentin was sealed with a dentin-bonding agent. Notice the mamelons, incisal halo, and translucency of the reattached incisal tooth fragment on the right central incisor, which would serve as an excellent guide for characterization during the composite buildup on the left central incisor (**Figs 4 & 5**).



Figures 4 & 5: Gingival health was evident, and the left composite filling had dislodged.

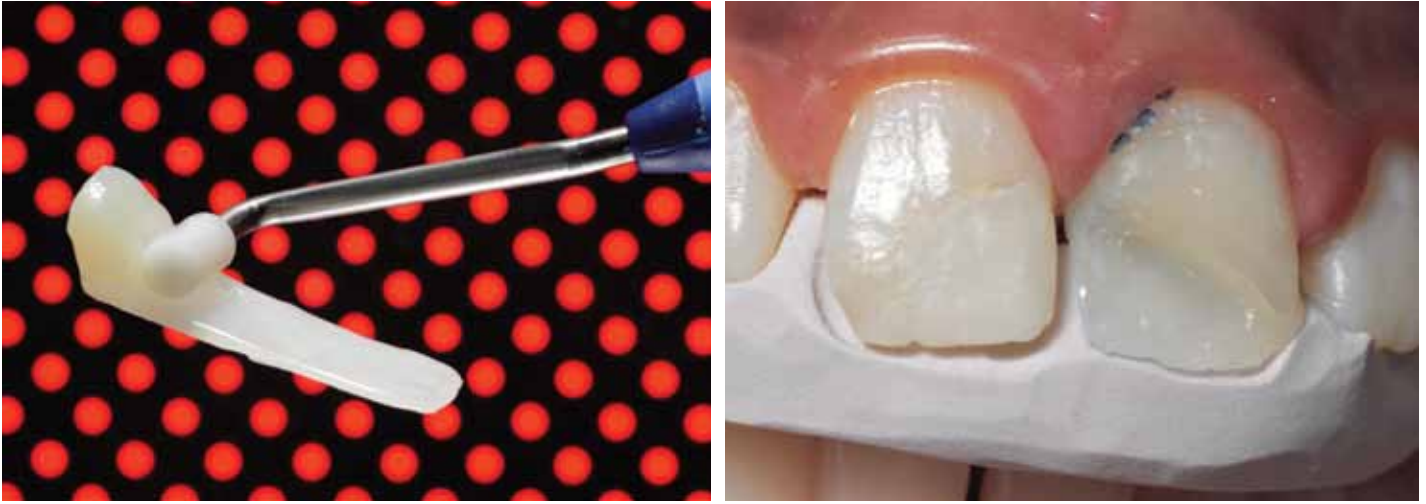


Figures 6 & 7: A maxillary median diastema was incorporated and a silicone index of the wax-up was sectioned.

Treatment

A diagnostic wax-up is invaluable in assessing esthetics. In this case, a maxillary median diastema (which was present before the accident) was incorporated. A silicone index of the wax-up was sectioned,³ ensuring that a ledge was present at the incisal edge to support the intraoral composite buildup (Figs 6 & 7).

A nanohybrid composite (Herculite Ultra, Kerr; Orange, CA) was chosen for its superior esthetic⁴ and mechanical properties.⁵ It allows excellent surface gloss after polishing, as well as advantageous optical properties such as translucency, opalescence, and fluorescence.⁴ Using a rubber dam when building up anterior teeth, where esthetics are a paramount concern, can be disadvantageous due to excessive dehydration of teeth, making accurate shade assessment during incremental layering a challenge. Therefore, in this instance, isolation was limited to dry gingival retraction cord and judicious aspiration.⁶ To preserve the maximum amount of remaining tooth substrate, preparation was minimal, limited to roughening of the fractured edge with a diamond bur. After application of the dentin-bonding agent, the silicone index was used as a template for the initial layer of incisal shade. The thickness of the initial layer depends upon the total buccal-palatal thickness of the tooth being treated and the anticipated thickness of the subsequent layers of composite. In this instance, the initial layer was rolled to a thickness of approximately 1 mm using a CompoRoller (Kerr) to build up the palatal aspect of the left central incisor (Figs 8 & 9).



Figures 8 & 9: A CompoRoller was used to build up the palatal aspect of the left central incisor.

A thin layer of composite (dentin shade A1) was placed at the incisal edge, incorporating the mesial and distal aspects to emulate the incisal halo effect (Fig 10).

A suitably shaped instrument was used to place dentin shade A2 for the mamelon effect within the coronal reconstruction of the left central incisor (Fig 11).

The final covering layers, enamel A1 and incisal shades, were sculpted with conical and cylindrical CompoRoller tips (Fig 12). The final contouring and finishing/polishing of the left central incisor buildup was postponed for one week, allowing evaluation of the shade and characterizations.

Salvaged useable fragments of fractured teeth (Fig 13) are ideal for reconstructing teeth to their former morphology and esthetics and, of course, preserving natural tooth substrate. However, if the remaining intraoral tooth substrate has discolored due to breakdown of the pulpal blood vessels, there may be a color transition between the tooth and the reattached fragment. Depending on the amount of remaining tooth, this is usually not a concern since the cervical aspects of teeth are darker than the incisal parts. To improve fracture resistance, reattached fragments should be rehydrated in saline for 30 minutes prior to bonding with the remaining intraoral tooth substrate.⁷ In this case, the silicone index was used to verify location, and the fragment was “linked” to the remaining tooth abutment with an incisal shade composite on the palatal aspect.



Figure 10: A thin layer of dentin composite was placed at the incisal edge.



Figure 11: Dentin composite was placed for the mamelon effect.



Figure 12: Sculpting of final covering layers.



Figure 13: Salvaged useable fragments of fractured teeth are ideal for reconstructing teeth to their former morphology.



Figure 14: The chasm between the remaining tooth and reattached fragment was filled with a combination of dentin and enamel shades to create an undetectable color transition.

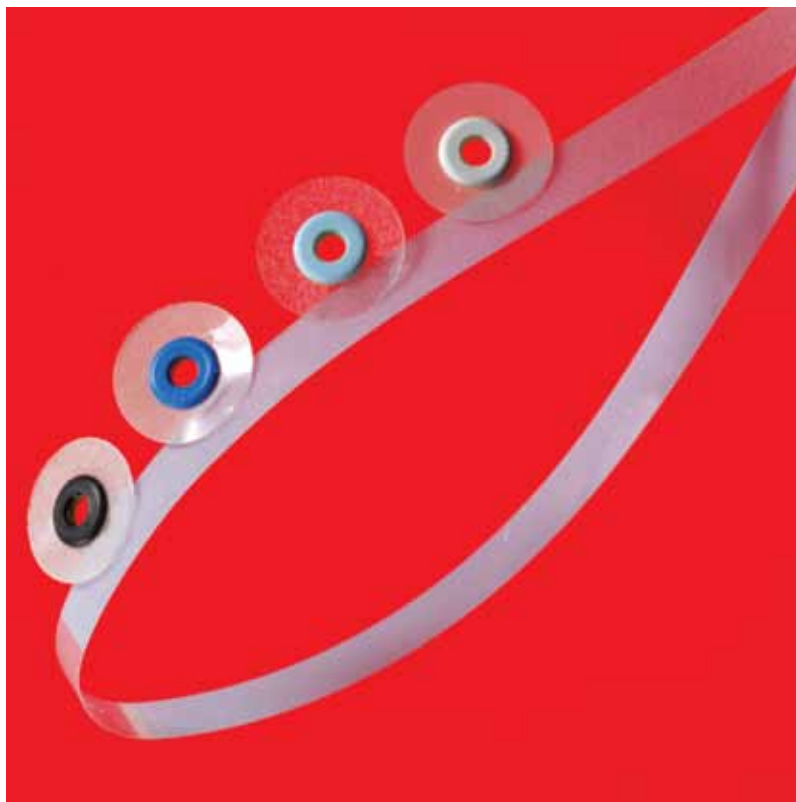


Figure 15: Aluminum oxide abrasive discs.

The chasm between the remaining tooth and reattached fragment was filled with a combination of dentin A2 and enamel A2 shades to create an undetectable color transition (Fig 14).

Finishing and polishing should achieve a high gloss and smooth surface roughness (Ra)⁸ of less than Ra = 0.2 mm (critical threshold for bacterial adhesion and biofilm formation)⁹ for good marginal adaptation, reduced microleakage, and retaining morphology and occlusal contacts for improved wear resistance. Clinically, this is accomplished with aluminum oxide abrasive discs (Fig 15); diamond-coated interproximal strips, silicone tips, and polishing paste, using slow hand-piece speeds (< 10,000 min⁻¹) to avoid melting the surface layer of the composite resin.

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Results

The postoperative result, two weeks later, shows impeccable gingival health, correct anatomical form of the composite buildup on the left central incisor, seamless transition between the composite and natural tooth substrate, dentin mamelons, together with an incisal halo, opalescence, and incisal edge translucency, which mimics the reattached natural tooth fragment on the right central incisor (Figs 16 & 17).

It is worth noting that the composite buildup on the left central incisor is similar, but not identical, to the morphology of the right central incisor. The reasoning for this is two-fold. First, it is clinically difficult to produce a facsimile by direct free-hand composite buildups. Second, it is unusual to find identical teeth in any one individual dentition, and slavishly copying an existing tooth appears contrived and artificial. Nature is creative, rather than perfect. Finally, any artificial prostheses or restoration should broadly conform to the existing dentition by blending with the surrounding teeth.

The pre- and postoperative full-face images (Figs 18 & 19) show restitution of dental esthetics that are in harmony with the surrounding lips, achieved by minimum intervention and yielding maximum satisfaction.



Figures 16 & 17: Two weeks postoperative.





Figures 18 & 19: Pre- and postoperative full-face images.

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