

Accidents Happen



One of the most challenging tasks for the aesthetic clinician is creating predictably aesthetic and durable restorations to restore the single central incisor, whether it is caused by a tooth fracture or a presenting definitive restoration. Our goal is to create a aesthetic restoration that is indistinguishable from the natural counterparts surrounding it. This involves matching color, shape, and contours in relation to the adjacent teeth and surrounding soft tissues. Advances in materials, techniques, and technology have allowed us to create more aesthetic and durable restorations that blend in with the neighboring natural dentition.¹

THE TOOTH

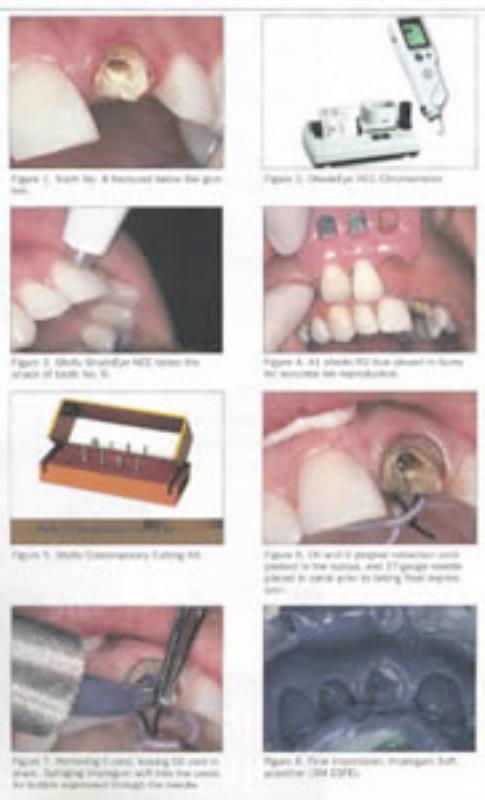
Quite frequently, the immediate placement of an anterior restoration is because of an emergency tooth fracture. In the case presented, this active patient flew in from a ski trip with

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the crown of tooth No. 8 broken off about 1 mm from the gingiva, with no compromise of sensitivity (Figure 1). He needed an immediate temporary, and requested treatment that would restore the tooth at the next appointment while still giving uncompromised aesthetics, function, and prognosis. As for the history of the tooth, an minor accident had left the patient with an endodontically treated tooth, a metal post, and a PFM crown. This crown had been made wider than tooth No. 8 to close the diastema space that existed before the accident. We discussed different treatment options, including an all-porcelain crown for tooth No. 8 and bonding or veneering tooth No. 8 to close the space, yet maintain midline symmetry.²

When treatment planning, the patient's desires are as important, if not more important, than the clinician's preference for technique and choice of restoration. This planning

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Figure 17. Super etch on tooth No. 8.



Figure 18. Super buff with Ultra Polish X on tooth No. 8.



Figure 19. Final restoration seated and polished and adjacent teeth treated.

After the canal was filled with impression material, my assistant removed the extraction core using cotton pliers as I followed her around the margins with my serrated tip filled with impression material (Figure 1). The patient then closed down on the Impregum-loaded triple try for 6 minutes. By using this hydrophilic polymer impression material, I achieved a highly accurate and stable impression that captured the preparation, and the entire length of the canal (Figure 2). From this one impression, the laboratory could fabricate a highly accurate-fitting post and core structure and the final restoration (Figures 3 through 11).

TEMPORIZATION

For temporization, I did a composite buildup on the seated model of the patient's maxillary arch. A vacuum former was used to form a thin clear splint over the seated-up model. The splint and canal were isolated prior to placing a short, medium-thickness fil to provide a temporary post. The template was filled with Tempflow Core P (Kerr), an anterior temporary crown and bridge material, and placed over the tooth and allowed to set. After removing it from the mouth, the preparation was removed from the template and trimmed and polished using an acrylic base and rubber points, and powder. The acrylic-filled provisional was seated and held firmly with finger pressure and fully set. Articulating paper revealed the heavy occlusal contact points. The impre-

ssion was removed for marginal trimming, occlusal adjustment, and polish. To achieve a stain-resistant luster, Optiguard (Kerr) was applied to the external surfaces and cured. The provisionals were then cemented using Tempflow Core (Kerr). Occlusion was checked and adjusted, and the entire provisional was polished.

DIRECT BONDING

The appropriate impressions and lab work were sent to the laboratory. After the model work was completed, the model of tooth No. 8 was seated up, and a full-contour wax-up of tooth No. 8 was completed in order to determine the balanced tooth width that would ultimately be achieved in the mouth. An incisal edge matrix was made of the wax-up to guide in the fabrication of the post and core for tooth No. 8. The wax-up of tooth No. 8 was removed, leaving the wax on the model of tooth No. 8.

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CEMENTATION

At the seating appointment, the provisional was removed. An explorer and scalpel checked for any residual composite on the interproximal surfaces of the adjacent teeth. The residual temporary cement was removed using air abrasion (Air Dent, Air Techniques) and the post-and-core structure was tried in for evaluation of margins and fit (Figure 12). Geristore (Den-Mat) was chosen for cementation. Super E (Kerr) was carefully applied to the gingival margins to control hemorrhaging and thoroughly rinsed. The post and interdental surface of the porcelain restoration were etched with 30% hydrochloric acid and rinsed. Bonding agent was painted on and air-dried.

In preparation for cementation, the margins and gingival areas were etched using 30% hydrochloric acid and thoroughly rinsed and dried. Tissue A and B (Den-Mat) were brushed onto the canal and around the preparation using a micro brush until glossy. This was gently dry-spun just to match the length, width, and facial plane. Occlusion was adjusted for very light contact. This would remove stress from the restoration. After staining and glazing, the fil was pulled and the margins verified. The crown was fit to a solid model to refine gingival contours and verify interproximal contacts. The whole crown was then polished with diamond paste and a cotton ball. Finally, the inside was etched with 30% hydrochloric acid for 2 minutes and rinsed, and the crown was ready for cementation.³

After fabricating the all-

ceramic post, platinum foil was adapted over the post and die. To mask the die neck and the junction between the post and the cast, opaque RI was applied over the entire crown portion except for the last 2 mm at the facial margin; here, a solder lock was desired to blend the crown to the gingiva. This was baked and readapted to the die. Porcelain margins material for dentin shade RI was placed at the facial margin, and thereby covered the entire opaque foil. After baking, the crown was baked and layered in the shade provided by the Shofu Shadefix NCC. The crown was shaped and contoured with special emphasis on:

(1) gingival emergence pins to block gingival tissue;

(2) labio-interproximal emergence development;

(3) incisal embrasure opening;

(4) facial anatomy and balance.

All four of these points had to match tooth No. 8 exactly; it was not enough just to match the length, width, and facial plane. Occlusion was adjusted for very light contact. This would remove stress from the restoration. After staining and glazing, the fil was pulled and the margins verified. The crown was fit to a solid model to refine gingival contours and verify interproximal contacts. The whole crown was then polished with diamond paste and a cotton ball. Finally, the inside was etched with 30% hydrochloric acid for 2 minutes and rinsed, and the crown was ready for cementation.³

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Figure 20. Lab fabricated denture base, anterior, pre-occluded area.



Figure 21. Preparation done on the right.



Figure 22. Post and core try-in.



Figure 23. Anterior preparation with check contours on adjacent teeth.



Figure 24. Final crown seated on tooth No. 8.

ment take into consideration the number of patient visits, factors, and preparation choices. The patient can demand his desire for a strong closure, but also to not force the "overclosure" or width between teeth Nos. 8 and 9 that his original PFM restoration exhibited. He also did not want to remove any tooth structure from tooth No. 8 for veneer preparation. Despite the urgency for a final restoration to be placed, aesthetics, symmetry, and major color match were

extremely important to him.⁴

New bonding agents and ceramic materials allow us to offer aesthetic all-ceramic restorations that are still strong and durable. In addition, composite can bond to the tooth in ways that are now almost undetectable. Especially in anterior cases, I choose all-ceramic restorations for their ability to maintain the clarity and translucency of natural dentition. Compared with the improved bonding materials available, ceramic materials exhibit the

strength and fit needed for clinical success. The final treatment decision for this patient was a laboratory fabricated post and core and an all-ceramic crown for tooth No. 8. The clinician spaces would be closed by easily igniting the difference in space between the No. 9 crown and bonding on the mesial of No. 8.⁵

TREATMENT

We got started immediately. No anesthesia was needed. No sensitivity was noted.

First task on digitize impressions of the upper arch and placed it up to Speed Stone (Dentsply) to fabricate a template for the provisional. The next step is the often challenging but always critical initial match. Once this is in, we usually switch back when designing a natural restoration that is indistinguishable from the natural counterparts surrounding it. This involves matching color, shape, and contours in relation to the adjacent teeth and surrounding soft tissues. Advances in materials, techniques, and technology have allowed us to create more aesthetic and durable restorations that blend in with the neighboring natural dentition.¹

MATCHING COLOR

The human eye is highly adaptive in its visual color. However, color is a very subjective property artificially defined by high value/lightness, and chromaticity. This color can be quantified and expressed numerically. Tooth shade is a measure of how much colored abalone, or reducing the variation in the perception of these attributes is essential when you desire accurate and predictable shade reproduction in your restorations. The Shadefix NCC colorimeter uses sensors to detect the exact color of teeth and express it in numerical form. At the point of a button, it records the Shadefix NCC prints out the shade, value, and hue of the teeth, along with a precise "recipe" based on Shofu's Vintage Blue Porcelain System. The color information can be used for porcelain colors, and base regeneration in our impressions. Because the line extended below the gingiva, gingival retraction cord size 00 (Vivadent) was packed subgingivally around the entire periphery of the tooth, and size 0 was packed on top. The ends of the cords were left exposed to allow any residual impression to be taken before the impression was to be taken.

In order to allow air to escape from the canal and ensure that no air bubbles were trapped in the canal during the impression-taking procedure, a shortened 25-gauge needle was placed in the canal (Figure 6). Impregum Soft (3M ESPE) was dispensed by a dual-nozzle syringe into the canal and around the preparation. The Shadefix NCC is

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Figure 25. Super etch on tooth No. 8.



Figure 26. Super buff with Ultra Polish X on tooth No. 8.

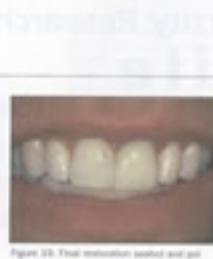


Figure 27. Final restoration seated and polished and adjacent teeth treated.

After the canal was filled with impression material, my assistant removed the extraction core using cotton pliers as I followed her around the margins with my serrated tip filled with impression material (Figure 1). The patient then closed down on the Impregum-loaded triple try for 6 minutes. By using this hydrophilic polymer impression material, I achieved a highly accurate and stable impression that captured the preparation, and the entire length of the canal (Figure 2). From this one impression, the laboratory could fabricate a highly accurate-fitting post and core structure and the final restoration (Figures 3 through 11).

DIRECT BONDING

The next step was to completely close the diastema space. A thin metal strip (Dead Fail Matrix, Den-Mat) was placed interproximally to protect tooth No. 8 from the bonding material. The mesial surface of tooth No. 8 was microtomed using the Air Dent air abrasion unit from Air Techniques and 34% phosphoric acid (Figure 14), and thoroughly rinsed and air-dried. Tissue Quick (Den-Mat) bonding agent was brushed on and cured. A B-1 microfill (Vivadent, Den-Mat) was placed on the lingual and cured. Lingual microfill composite (Vivadent, Den-Mat) was placed on the facial and cured (Figure 15). After removing the metal strip, final polishing and finishing were done with the Shofu Contemporary Polishing Kit, which includes six shapes of fine and superfine T and F diamonds and via Ceramic mill points and caps, from prepophilic to polish to ultra polish (Figure 16). The diamonds were used to smooth the lingual, mesial, margins and interproximals of tooth No. 8.

The composite was cured, and then smoothed and polished using the Shofu magnate polishing discs, super buff, and Ultra II polishing paste. The physical properties, translucent quality, and polishing characteristics of the composite allowed me to complete this lifelike restoration.

Additional smoothing of the interproximals was done using the Shofu finishing strips, and the contacts were verified with them. After polishing the composite with Shofu magnate discs, a final polish was performed using the super buff with diamond polishing paste (Figures 17 and 18).

CONCLUSION

Whether you are restoring a single unit or multiple units, it is always important that the patient is fitted with a habit appliance to protect the dentition if needed, such as a bruxing splint or mouthguard. In this case, the final step was to take a full upper arch alginate impressions to fabricate an aesthetic mouth-