Steps for Successful Direct Resin Veneers

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One of the most challenging cases that presents to the dental office is the single, discolored central incisor. The dentist has to make the difficult decision on how to effectively and esthetically restore the tooth back to its natural color and original form. There are many different restorative techniques and materials to choose from. Should a feldspathic porcelain be used? A pressable ceramic? How much tooth structure should be removed? Should a composite resin be used as the final restorative? All of the questions are legitimate. And, the answer depends on several factors. What material does your laboratory make look the best? How talented are you with composite resins? How much are you willing to pay a laboratory technician to match the tooth?

When deciding on what material to use as the restorative, the pros and cons of porcelain and composite should first be reviewed. Porcelain restorations are stronger than composite. But, they are also more expensive. Porcelain may require more tooth preparation, and may be more difficult to match to a single central incisor. Conversely, composite resin is not quite as strong as porcelain, requires more clinical skill, and, in some cases, may not have the longevity of porcelain. This article reviews composite resin as the material of choice when restoring the single discolored central incisor.

Resin bonding is a skill that is acquired through practice. When restoring anterior teeth, composite resins are essential as a restorative material. They provide excellent esthetics and allow for augmentation versus amputation of the tooth structure. Composite resins can mimic the appearance of natural tooth structure and allow light transmission similar to nature. The esthetics of a restoration depends on its resemblance to a natural tooth. The perfect reproduction of the natural characteristics of the tooth was difficult with early composites because of their lack of available shades, light transmission, dimensional stability, and other features. Since that time, various esthetic composite resin materials have been introduced. These new composites possess exceptional color characteristics, improved formulation, and excellent handling. All of the color characteristics necessary to simulate nature can now be incorporated into a restoration. These color characteristics include hue, chroma, value, opacity, translucency, and special effects.

**OPTICAL PROPERTIES OF COMPOSITE RESIN**

Knowledge of color characteristics, including light transmission, is essential to achieve natural results with composite restorations. Because light can be reflected, transmitted, or absorbed by the dentinal structure, the use of different translucencies and opacities is important for re-creating the varying degrees of light transmission that occur naturally in the tooth. Hue, the "name of color," constitutes the first dimension of the polychromatic effect and corresponds to the wavelength of light reflected by the teeth. On the VITA® shade guide (Vident, Brea, CA), the hue is listed as A1, A2, B1, etc. The second dimension, chroma, can be defined as the intensity of the color or degree of hue saturation. The chromatic dimension only compares colors of equal hue. The "brightness" of color is represented by value, which is the third dimension of the polychromatic effect. Of these three characteristics, value is the most important. If a tooth has the right hue, but the value is low, the restoration will not match. Translucency remains one of the most difficult effects to create. The translucency is determined by the amount of light that is able to penetrate the tooth (or the restoration) before being reflected.

Contemporary composite resins possess many optical properties that render a polychromatic result, such as a variety of hues, opacity, translucency, and fluorescence. Color modifiers and opaquing resins can also be layered to create an infinite number of color combinations. To achieve the desired outcome, different layers of composite resin are necessary. Since composite materials are monochromatic and cannot duplicate the complex color seen in the natural dentition, a variety of resin shades must be selected to provide natural-looking esthetics.

The color of the tooth usually comes from the thicker underlying dentin. Therefore, the composite material must be opaque enough to block out any undesirable shades. The enamel layer is virtually colorless; therefore, enamel shades of composite resin exhibit high translucency, are fluorescent, and opalescent. The final layer must be able to be highly polished. Opaquers and tints are an integral part of the composite system. They allow the darker underlying surfaces to be concealed and can be used to adjust the value and chroma. Tints increase the chroma and lower the value. Opaquers work in the opposite way (by increasing value).

Proper contouring and finishing are the final steps necessary to create the life-like effect of the direct composite veneer. A series of steps using finishing burs and discs will allow the final desired outcome to be achieved.
CLINICAL CASE

The patient presented to the dental office with a discolored right central incisor (tooth No. 9) (Figure 1). The tooth had a history of trauma, but it remained vital. Composite resin had been previously placed on the tooth several times, but it never matched the adjacent tooth. The patient did not like the color or the contour of the restoration (Figure 2). It was decided that a direct composite veneer would be placed using a hybrid material, microfill opaques, and tints.

Before beginning the case, the tooth was color-mapped and the corresponding materials were placed in a ResinKeeper (Cosmedent, Inc, Chicago, IL) to expedite the procedure (Figure 3). The old composite restoration was removed using ET®9 carbide burs (Brasseler USA, Savannah, GA) until the tooth structure was exposed. A chamfer diamond bur (Brasseler USA) was then used to prepare the tooth structure for the resin. Approximately 0.7 mm of enamel was removed to provide the necessary room for multiple layers of material. Care was taken to maintain as much enamel as possible, which would enhance the bond strength of the restoration. The preparation followed the contour of the gingival tissue and the margins were placed equigingivally. No incisal wrap was created (Figure 4). To keep the restoration from being bulky and provide seamless margins, it is necessary to remove some tooth structure when placing direct composite veneers.

Clear matrix strips were placed interproximally before etching to prevent bonding to the adjacent teeth. The tooth was etched for 20 seconds (Figure 5) with Ultra-Etch® (Ultradent Products, Inc, South Jordan, UT), rinsed, and air-dried. If dentin was exposed, the tooth would not have been air-dried. Because of the minimal preparation design, no dentin was exposed, which allowed to total enamel bonding substrate (Figure 6). One-Step® Plus (Bisco, Inc, Schaumburg IL) was placed on the tooth in multiple coats (Figure 7) for approximately 20 seconds. This was lightly air-thinned to remove the solvent. Because no dentin was exposed, a conventional unfilled resin (D/E Resin, Bisco) could have been used.

The initial layer of A1 hybrid Renamel® (Cosmedent, Inc) was applied and contoured with a long-bladed composite instrument (Figure 8). The layer was then smoothed with a #3 Cosmedent brush (Cosmedent, Inc) and light-cured for 20 seconds. Care was taken to ensure the material was as thin as possible to block the underlying dark color. It is very important to constantly monitor the thickness of the composite material from the incisal aspect. Overbuilding would not allow sufficient space for the microfill layers. This could make the tooth appear too bulky. This layer should be fairly smooth (Figure 9).

The opaque nature of the hybrid does an excellent job of blocking dark substrates. If the value of the tooth needs to be raised, an opaquer can be used. In this case, the Creative Color A1 opaquer (Cosmedent, Inc) was placed in a very thin layer to increase the overall value. This was placed with a #1 Cosmedent brush (Cosmedent, Inc) (Figure 10) and light-cured for 20 seconds.

Two different shades of microfill were used to replicate the adjacent tooth color. A1 Renamel microfill (Cosmedent, Inc) was placed at the cervical area and sculpted down with a long-bladed composite instrument to the incisal edge. This was then thinned to make room for the second shade (Figure 11). Because the adjacent tooth exhibited more chroma at the cervical edge, one shade darker A1 microfill was used there. Because of the higher value at the incisal half, the next increment of microfill (B-1) was placed at the incisal area and blended into the cervical portion. Brushes and a long-bladed instrument were used to form some irregularities for the dentinal lobes (Figure 12). To highlight the dentinal lobes and recreate the natural effect of the adjacent tooth, a violet tint was applied in a very thin wash vertically at the incisal edges of the composite and in between the projected lobes in accordance with the color mapping (Figure 13). White opaquer (Cosmedent, Inc) was placed at the line angles to aid in further creating a mirror image of the left central incisor (Figure 14).

Figure 15 shows the final cured tints before placement of the incisal shade. Tints cannot be placed on the surface and polished. They must be covered with an incisal shade of composite. This was accomplished by placing a final layer of Light Incisal microfill (Cosmedent, Inc), which allowed the underlying previously placed colors to shine through (Figure 15). The final layer was slightly overcontoured to allow sufficient thickness for finishing and polishing (Figure 16).

To replicate natural form and texture, the initial contouring was performed with a series of finishing burs and discs. Line angles are clearly defined by the light reflective surface. To make a tooth appear wider, the line angles can be moved more to the interproximal edge. To give the appearance of a narrower tooth, the line angles are moved more toward the center of the tooth. Before finishing, the heights of contour of the line angles were drawn on the two centrals (Figure 17). The right central appeared wider; therefore, the line angles were moved more toward the body of the restoration, not interproximally. If a disc is used, there is a tendency to make the tooth wider and flatter as a result of the nature of the finishing. An ET®9 carbide bur (Brasseler USA) was used initially to flatten the facial surface and move the line angles (Figure 18). The final position of the line angles should be

Figure 7 One-Step® Plus was placed on the tooth.
Figure 8 Placement of the Renamel® hybrid with a long-bladed instrument.
Figure 9 Appearance of the tooth after placement of hybrid.
Figure 10 Creative Color opaquer was placed to increase the value.
Figure 11 Placement of the A1 microfill.
Figure 12 Placement of the B1 microfill and slight development of dentinal lobes.
Figure 13 A violet tint was applied to tooth.
Figure 14 White opaquer was placed at line angles.
Figure 15 Application of the Light Incisal microfill.
Figure 16 The restoration after layering (before finishing).
Figure 17 The height of contour was drawn on the central incisors.
Figure 18 An ET®9 bur was used for the initial contour.
a mirror image of the left central incisor. Polishing discs were used at low speed without irrigation or polishing pastes to smooth the surface and keep the interproximal clear (Figure 19).

Surface texture and final polishing were accomplished with a 7404 carbide bur (Brasseler USA) at low speed using a back-and-forth motion along the entire tooth structure (Figure 20).

Development of a high luster depends on the particle size of the composite. Microfill composites have a smaller particle size; therefore, they polish much better and hold the polish over time. Hybrid composites with a larger particle size are more difficult to polish and do not maintain the polish over time. The newer nanofilled composites are easier to polish, but are not quite as polishable as microfills. A FlexiBuff (Cosmedent, Inc) with Enamelize™ polishing paste (Cosmedent, Inc) was used for the final polishing step to develop the high-gloss surface polish (Figure 21). A high gloss allows the restorations to last longer without staining. Figure 22 shows the immediate postoperative restoration.

The final restoration at the 6-month recall is shown in Figures 23 and 24.

CONCLUSION

Several steps must be followed to achieve a successful outcome for an anterior direct composite veneer. Proper layering is critical to the outcome. Each layer must be closely watched from the incisal view to prevent overbulking, which can lead to finishing into the hybrid layer. Tints and opaquers must be used sparingly and in the correct areas. Without the proper anatomy and surface characterization, the restoration will not match the adjacent tooth. The final polish is essential to improving the longevity of the restoration. When following these steps, the direct composite veneer is a viable and conservative technique used for achieving excellent results.

REFERENCES