

inside ESTHETICS

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Enhancing the Polychromatic Effect of Direct Composite Anterior Restorations Using Coloring Resins

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Albert Einstein said that after a certain high level of technical skill is achieved, science and art tend to coalesce in esthetics, plasticity, and form.¹ He concluded the premise by saying that the greatest scientists are always artists as well. Today, dentists can acknowledge this phenomenon when they realize that improved composite resin materials and adhesive techniques have made it possible for them to predictably implement a conservative, practical, and esthetic approach to direct restorations.² Once the clinical and functional parameters of a case have been identified, dentists can determine the techniques, materials, and tools that should be incorporated into the treatment plan in order to achieve the patient's desired esthetic results, and do so in the most conservative manner possible.³ This type of systematic, evaluative process ensures that the case will be completed to the satisfaction of the patient's esthetic needs, as well as in terms of minimizing the amount of otherwise healthy tooth structure that would be sacrificed during the restorative process.⁴

A variety of functionally supportive and esthetic alterations can be achieved using a category of direct composites called small-particle hybrids (Vit-I-escence™, Ultradent Products, Inc, South Jordan, UT; Point 4, Kerr/Sybron, Orange, CA; Venus™, Heraeus Kulzer, Armonk, NY; Esthet-X®, Dentsply Caulk, Milford, DE), which has been cited in the literature as demonstrating better mechanical, physical (eg, strength, wear, and handling), and optical properties than previously available composites.^{5,6} This Bis-GMA-based fluorescent

and opalescent composite system incorporates fillers with a size of 0.07 μm, according to the manufacturer, and it provides the necessary low-translucency, fluorescent dentin composites and high-translucency, opalescent/transparent enamel composites that lend themselves to a durable and natural-looking restoration.

In many instances, a natural layering concept can be used to create restorations with only dentin and enamel composites that optically mimic natural tooth structure.⁷ However, there are occasions when the most natural effect (ie, matching restorations to the natural characterizations observed in adjacent teeth and/or the same tooth) requires the application of tints and stains to create the intricate refinement of hue, chroma, and value necessary to produce an imperceptible restoration.⁸

This article presents a case in which a 49% filled, light-cured, Bis-GMA composite coloring resin (Vit-I-escence Colors, Ultradent) was used to facilitate color matching and enhancement of the anatomical and morphological nuances when creating two Class IV direct composite restorations for a 20-year-old beauty pageant contestant. The pink, yellow, blue, light/dark brown, white, orange, clear, and ochre colors enabled these restorations to be completed with even polychromatic customization that ultimately contributed to a highly esthetic result.

CASE PRESENTATION

On presentation, the patient's maxillary central incisors—teeth No. 8 and No. 9—were visibly detracting from the es-

thetics of her smile because the composite restorations that had been previously placed to repair Class IV fractures had become worn and discolored (Figure 1). The patient indicated that she was not interested in porcelain veneers or any treatment that would require additional removal of her remaining tooth structure. Rather, she wanted conservative yet artistically created composite restorations.

A thorough examination was performed that included radiographs and intraoral and extraoral photographs. The patient's periodontal health and occlusion were inspected and, overall, the patient was found to be in excellent oral health. No pathologies were found that would contraindicate re-restoration and esthetic enhancement with direct composite placement.

Preoperative Treatment Planning

The patient's maxillary central and lateral incisors were thoroughly analyzed to determine the most appropriate composite shades necessary to affect the desired overall esthetic results. A combination of spectrophotometry (Figure 2) and visual



Figure 1 Close-up, 1:1 view of the patient's maxillary central incisors. The previously placed and discolored restorations are obviously visible.

assessment were used to record details of the appearance of the affected dentition. These details included variations in the hue, chroma, and value of the tooth structure, as well as the condition of the dentin and enamel, tooth shape, characterizations, and texture.

Initially, composite shades A1, B1, and Pearl Frost were identified as the shades for the dentin and enamel replacement composites. To ensure the esthetic success of the proposed direct composite placement treatment, an understanding of the optical characteristics of the patient's natural teeth—and, subsequently, the optical properties of the selected restorative material—was imperative.⁹

A putty stent of the patient's maxillary arch was fabricated for use as a dimensional guide during composite placement and previewed in the patient's mouth (Figure 3).¹⁰ Class IV fractures have been successfully treated with direct resin-based composites,¹¹ but such restorations require the development of proper and functional lingual contours, as well as an understanding of natural tooth anatomy, tooth color, and the role tooth structure plays in both.¹¹

Composite Placement

The selected composite shades were previewed on the patient's maxillary central incisors before tooth preparation (Figure 4). Before starting the preparation process, the patient was anesthetized; the lips and cheeks were properly retracted; and cotton rolls were placed for intraoral fluid control. The preexisting composite restorations were removed, and the prepara-



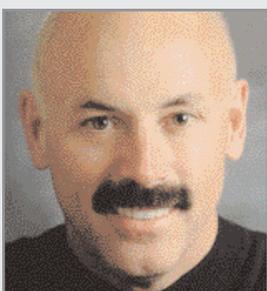
Figure 2 The composite shades were selected digitally with the use of a spectrophotometer (Easyshade, Vident, Brea, CA).



Figure 3 The putty stent was tried in the patient's mouth before tooth preparation.



Figure 4 The Vit-I-escence composite materials in shades A1, B1, and Pearl Frost were previewed on the patient's unprepared teeth.



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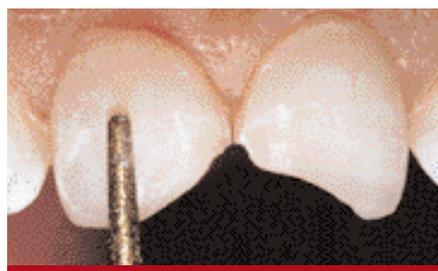


Figure 5 The preparations were refined after removal of the old restorations.



Figure 6 Incisal view of the completed preparation.

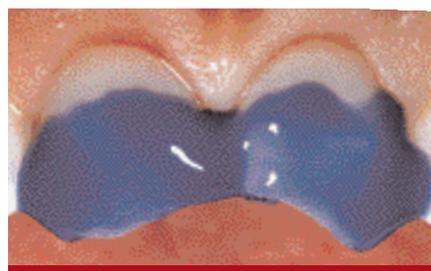


Figure 7 The teeth were etched.



Figure 8 The PQ1 adhesive was applied to both preparations.



Figure 9 An initial lingual layer of Opaque Snow composite was applied to teeth No. 8 and No. 9 and served as a zone of neutrality onto which the hue, chroma, and value of the teeth could be built.

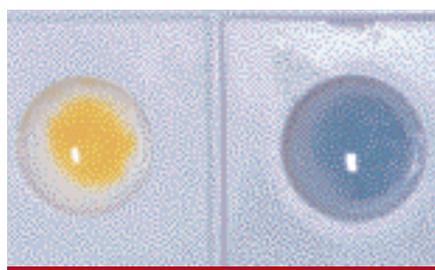


Figure 10 The Vit-I-escence Color Resins were placed in respective wells for use.



Figure 11 The yellow tint was mixed with clear in a 50/50 ratio to add warmth (chroma) to the Opaque Snow layer.



Figure 12 Blue and clear tints were placed to create the illusion of natural translucency along the incisal third, between the mamelons (ie, 30% blue; 70% clear).



Figure 13 A high-value incisal halo was created by adding a 50/50 mixture of white and clear tints.



Figure 14 Initial polishing was completed using a series of green polishers.



Figure 15 Subsequent refinement was accomplished using blue Jiffy polishing points.



Figure 16 A green stone was used to create tertiary anatomy.



Figure 17 A goat-hair wheel and 0.5-µm diamond polishing paste were used for final polishing.



Figure 18 The putty stent was returned to the patient's mouth to verify the final contours of the maxillary central incisor restorations.



Figure 19 Postoperative 1:1 close-up of the polychromatic, invisible, and highly esthetic Class IV restorations on teeth No. 8 and No. 9.



Figure 20 Final postoperative view of the patient in natural smile.

tions were refined (Figure 5 and Figure 6). The preparations were then thoroughly cleansed and scrubbed using an antibacterial agent.

The preparations for teeth No. 8 and No. 9 were etched for 20 seconds using 37% phosphoric acid (Figure 7), rinsed for 15 seconds with an air/water spray, and lightly air-dried, as was the uncut enamel of teeth No. 7 and No. 10. A single-component adhesive bonding agent (PQ1®, Ultradent) was applied to the etched enamel for 15 seconds (Figure 8), lightly air-dried for 5 seconds, and then cured with an LED curing light for 20 seconds per tooth.

Then, the first lingual/proximal layer of composite in Opaque Snow was placed on both teeth No. 8 and No. 9 to control opacity, prevent show-through, and serve as a zone of neutrality onto which the in-

herent hue, chroma, and value of the teeth could be built (Figure 9). Color blending using composite translucency, as well as mixing color tints to modify composite color, can produce natural-looking restorative effects.¹² The material was carefully manipulated and shaped, using the putty stent as a guide to help facilitate subsequent finishing endeavors.¹³ This layer was cured for 10 seconds per tooth.

Then, before building up the dentin replacement layer, a combination of colored/tinted resins (Vit-I-escence Colors) (Figure 10) was applied to add warmth (chroma) to the neutral Opaque Snow layer. Specifically, a 50/50 mixture of yellow and clear-colored resin was applied (Figure 11), after which the resin was light-cured for 10 seconds per tooth. It has been suggested in the literature that opaques, tints, and color modifiers may be extreme-

ly useful in altering the chromatic appearance of restorative substrates, contributing to predictable esthetic results.¹⁴

The dentin replacement layer composite in shade B1 was then applied to teeth No. 8 and No. 9 for mamelon development and cured for 10 seconds per tooth. To construct the incisal edge, enamel composite in Pearl Neutral was placed on both teeth and cured for 10 seconds, after which a combination of tints (30% blue, 70% clear) was applied to create the illusion of translucency along the incisal third, between the mamelons (Figure 12). This resin enhancement was also cured for 10 seconds per tooth.

Because the patient's adjacent natural dentition also exhibited a "high-value halo" in the incisal area, this illusion was created with the application of another combination of colors—50% white and

50% clear—to both teeth No. 8 and No. 9 (Figure 13). Appropriate curing was then performed.

To complete the restorations, a final enamel layer of Pearl Frost composite was placed on each tooth, shaped, and sculpted. Each restoration was then fully light-cured for 60 seconds from multiple directions.

It is important to note that on teeth No. 7 and No. 10, incisal augmentation was completed using the Opaque Snow and Pearl Frost composites to improve the incisal silhouette.

Finishing and Polishing

Ultrafine finishing and polishing discs (VisionFlex, Brasseler USA, Savannah, GA) were used for incisal edge adjustments, as well as for opening the incisal embrasures. Initial surface texturization was completed using a green Brasseler stone.

A lifelike luster was achieved using a series of high-shine polishing cups and points (Jiffy®, Ultradent) (Figure 14 and Figure 15). Tertiary anatomy (ie, surface texture and morphology) was created using the green stone (Figure 16), while final finishing was completed using burs contained in a specially designed finishing kit (New Horizon Composite Finishing System, Frank J. Milnar, DDS; #K0097, Brasseler USA).

The restorations were complete after final polishing with a goat-hair wheel and 0.5- μ m diamond polishing paste (Figure 17). At that time, the final restorations on teeth No. 8 and No. 9 were verified using the putty stent (Figure 18).

CONCLUSION

More and more patients are choosing to enhance their smiles or to restore defects such as Class IV fractures in conservative ways. This is now possible in esthetic ways when today's direct composites are skillfully and artistically applied after thoughtful consideration of the tooth's appearance and characteristics (Figure 19 and Figure 20). Using an appropriately selected direct composite system that preserves and conserves the tooth restoration complex can help dentists deliver the patient's desired esthetic results with minimal sacrifice of otherwise healthy natural tooth structures.^{3,15}

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DISCLOSURE

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