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Restorative Technique Selection in Class IV Direct Composite Restorations: A Simplified Method

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Clinical Relevance

Esthetic resin composite anterior restorations using the so-called multilayer technique may be accomplished when a detailed selection of the shade and an accurate reproduction of the tooth morphology are available.

SUMMARY

Use of the techniques presented here will yield highly esthetic resin composite restorations in minimal time. Although more elaborate composite layering techniques exist and may be used in complex esthetic scenarios, a simplified approach combining two body shades and implementing basic dental anatomy concepts often will deliver highly acceptable esthetic results.

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INTRODUCTION

Reproducing esthetically pleasant anterior restorations requires that clinicians combine artistic skills with fundamental knowledge of tooth morphology, along with selection and use of appropriate composite resin materials.[1] According to Fahl, "This involves comprehensive understanding of tooth shape, color and function and the teeth's natural optical properties in order to select the most appropriate replacement materials."[2]

Today's composite resin systems offer the clinician various enamel and dentin shades to mimic the variations of tooth opacities and translucencies.[3,4] Their main objective is to allow replication of the combined optical properties of dentin and enamel. For small anterior class III or V restorations, only one shade may be necessary, because composite resin is relatively translucent, allowing the adjacent and underlying tooth structure to reflect or show through the restoration.[5] However, for larger through-and-through class III and IV restorations, which have no backing tooth structure, a relatively translucent composite may not be able to mask the dark background of the oral cavity.[6] Therefore, the multilayer technique is recommended, in which an opaque material is placed beneath a translucent

Figure 1. *Inadequate layering technique with compromised results.*

composite resin in an effort to create depth from within the restoration and to mask the dark background.[7] The decision of when to use this technique involves three considerations. According to Vargas,[8] if the adjacent teeth or the tooth to be restored in a through-and-through preparation is polychromatic in nature and no incisal halo or translucency is evident, the tooth may be restored with two shades of composite resin; otherwise, translucent and white opaque shades are indicated to restore the incisal translucency or halo effect. Once the decision is made to use more than one shade, the clinician needs to know the level of translucency of the composite resins being used, because in certain brands, a 2-mm thickness of the body shade (referred to as Universal) of composite resin may be enough to mask the dark background of the oral cavity.[9]

Finally, it is important before restoration to evaluate the tooth morphology (line angles, developmental grooves, and superficial texture) and how to reproduce those details by sculpting the composite and contouring with finishing burs and disks.

The purpose of this article is to describe in detail how one patient's maxillary central incisors were restored using a direct composite resin technique. The previously placed layered class IV resin composite restorations on both central incisors were removed, and the patient's smile was enhanced using a two-shade simplified buildup technique.

CLINICAL CASE

Diagnosis

A caries-free 25-year-old male patient expressed dissatisfaction with the appearance of his smile after recently performed direct composite resin restorations. During the examination, it was determined that the class IV composite resin restorations on both central incisors did not match in color, contour, or texture. A composite veneer was also placed on the left lateral incisor in order to "align the tooth" with the central incisors. All the restorations contained opaque white and translucent resin composite used in an attempt to simulate the natural appearance of dental tissues. The layering technique used was inadequate, and the final result was compromised (Figure 1). After discussion of alternative treatments, the patient decided on a direct bonding procedure because of fewer visits and affordable cost.

Shade Selection

The right lateral incisor was used for shade selection since it had not been restored. A mild color gradient and translucency in the incisal third was found. A decision was made to replace the existing restorations using a two-shade technique based on Vargas's classification on both central incisors, focusing mainly on establishing ideal contours and texture. Shade A2 body was selected for the dentin aspect of the restoration by placing the shade tab in a horizontal position and matching the middle third of the tab to the middle unrestored third of the left central incisor. The facial enamel shade should generally be one shade lighter, so A1 body was selected for the facial aspect of the restoration. It was not considered necessary to use any opaque or dentin-shaded composite resin. Kalore composite resin (GC America, Inc., Alsip, IL, USA) was chosen for this case due to its optical properties.

In order to assess the needed thickness of the lingual layer using the selected body shade to mask the darkness of the oral cavity, two disks 1 and 2 mm thick were fabricated of shade A2 composite resin and then placed on a white background with a black stripe. This allowed the clinician to see that a 2-mm lingual layer thickness was necessary to create the necessary masking effect (Figure 2).

CLINICAL STEPS

Lingual Putty Matrix

A polyvinylsiloxane impression putty material (Reprosil, Dentsply International, York, PA, USA) lingual matrix was fabricated directly in the patient's mouth using the lingual surface of the remaining tooth structure and existing restorations as guides. After local anesthesia was established via infiltration with 2% Lidocaine with 1:100,000 epinephrine (Xylestesin-A 2%, 3M ESPE, St Paul MN, USA), cotton roll isolation was done.

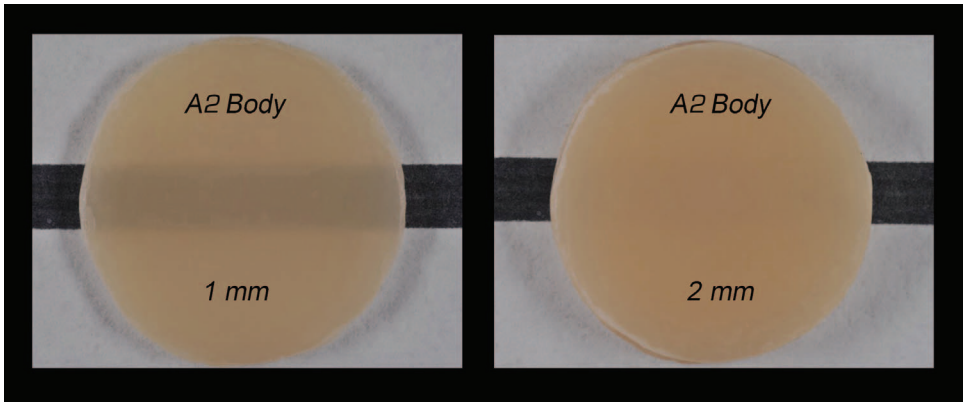

Figure 2. *Masking effect of the selected resin composite product: (Left) 1 mm; (Right) 2 mm.*

Preparation Design

The existing restoration on the right central incisor was removed. A 1.5-mm 75° functional-esthetic enamel bevel was prepared using an 8888 diamond bur (Brasseler, Savannah, GA, USA) on the facial. The lingual bevel was a 45° functional bevel.[10] A coarse disc (Sof-lex, 3M ESPE) was then used to extend the facial bevel interproximally and toward the gingival third of the facial surface to create a so-called "infinite bevel," with which the composite resin margin will be indistinguishable after restoration (Figure 3).[11]

Composite Resin Layering

Teflon tape was placed on the adjacent teeth to prevent their being etched. This was followed by the application of 32% phosphoric acid (Uni-Etch, Bisco, Schaumburg, IL, USA) to enamel and dentin for 15 seconds. The acid etchant was then rinsed for 30 seconds, excess water was eliminated, and a dental adhesive (Optibond FL, Kerr, Orange, CA, USA) was applied. This adhesive was considered to provide a more reliable enamel bond than the supplied self-etching adhesive.[12] The lingual PVS matrix was then seated (Figure 3), followed by application of the lingual layer of A2 body shade composite resin to form a lingual shell (Figure 4). After light curing the first increment, the PVS matrix and Teflon tape were removed, and a Mylar strip (Crosstex, Hauppauge, NY, USA) was placed to restore the interproximal walls and contacts. At the same time, thickness was added to the lingual shell (Figure 5). A final 1-mm A1 shade composite resin layer was applied, extending from the facial bevel toward the incisal edge and onto the mesial and distal contact areas to restore the line angles. After polymerization (Valo, Ultradent, South Jordan, UT, USA) of this layer, a thin lead mechanical pencil was used to establish the positions of transitional line angles according to the tooth planes (Figure 6). The main objective was to establish correct lengths and contours (Figure 7). After removal of the composite restoration on the left central incisor (Figure 8), esthetic and functional bevels were prepared, and restoration was completed following the same protocol described above.

Finishing and Polishing

The finishing process was initiated with coarse and medium-coarse discs (Sof-lex, 3M ESPE) following the contours of the contralateral tooth, followed by the use of the 8888 fine diamond and ET6 extra fine diamond bur (Brasseler) for texture and microanatomy. Finishing strips (Sof-lex, 3M ESPE) were used interproximally to eliminate flash and coarse, and medium and fine rubber polishing points were used on the lingual surface (Jiffy Polishers, Ultradent) after occlusal adjustment (Figure 9). Final esthetic evaluation of shade and texture of the restoration was done 15 days postoperatively (Figure 10).

DISCUSSION

The existing restorations with which the patient presented to the dental office are an example of how lack of planning and understanding of the way that different opacities and translucencies of composite resin behave will compromise restorations.[13] During the shade selection process, the main goal was to select a dentin shade that matched the area of the tooth that is less affected by extrinsic or intrinsic factors.[3] The cervical third of a tooth is affected by the surrounding gingival tissue (extrinsic), which adds red or pink to the existing dental shade. On the other hand, the incisal third of the tooth is affected by the presence of different intrinsic opacities and translucencies, leaving the middle third of the tooth as the area least affected by these factors. Another important factor to consider is the

Figure 3. *Facial esthetic (infinite) bevel and PVS matrix and protection of neighboring teeth.*
Figure 4. *A2 lingual shell.*
Figure 5. *Proximal contacts and final lingual thickness established.*

type of shade tab that was used. This was fabricated to reproduce the natural color gradient of teeth, and only the middle third of the tab represents the actual composite shade, so matching these areas will give the dentin shade that, if used for a two-shade technique, will represent approximately 80% of the restoration.[10]

Figure 6. *Facial layer placed and transitional line angles marked.*
Figure 7. *Correct length and contours established on tooth 8.*
Figure 8. *Removal of previous restoration from tooth 9.*

The length and size of the central incisors of this patient when he presented were adequate for making an intraoral putty matrix. Otherwise, it would have been necessary to complete a diagnostic wax-up. Minor adjustments of the existing restorations' lingual contours were performed with a football shape carbide bur (OS1, Brasseler), and lingual embrasures were rectified with a coarse disc (Sof-lex, 3M ESPE) prior to fabricating the lingual matrix. The eventual thickness of the lingual layer of these restorations was approximately 2 mm, which is enough to create the needed opacity to hide the

Figure 9. *Final contours and polished surface.*
Figure 10. *Final evaluation done 15 days postoperatively.*

interface of tooth and restoration and to mask any possible shadows. This layer also matched the dentin shade of the underlying tooth structure while leaving space for the final composite layer that replaced the enamel (Figure 5).[9]

Development of natural contours in the final composite layer using three separate increments is recommended.[10] The first and second increments should recreate the mesial and distal line angles. Placement of the composite resin for these should begin at the cervical extension of the esthetic bevel and continue toward the incisal edge against the Mylar strip. This should be followed by slowly pulling the Mylar strip to the lingual. This will result in well-defined line angles prior to light curing.[14] The final increment should be a flatter layer of resin composite filling the area between the line angles, where developmental grooves may be sculpted as needed. The finishing and polishing process can be challenging as we need to recognize when to go from one disk or bur to another. Our recommendation is to follow a five-step sequence. Step 1 can be accomplished by using a coarse Sof-lex disk (3M ESPE) facing down (facing toward the head of the hand piece) or a medium 8888 diamond bur (Brasseler). This should achieve an adequate emergence profile (right central incisor) or blend the resin to tooth interface (left central incisor). Step 2 should establish the correct length using a coarse Sof-lex disc (3M ESPE) facing up (facing away from the head of the hand piece) and incisal embrasures using a medium Sof-lex disc (3M ESPE) facing down. Using discs for this step will give better control of the reduction. Step 3 can be accomplished with medium and fine Sof-lex discs (3M ESPE) facing down and should recreate facial and lingual embrasures. Step 4 should reproduce any secondary anatomy in the incisal third using a medium 8888 diamond bur (Brasseler), whereas step 5 should create a polished surface that resembles the texture present in neighboring teeth by using fine and super fine Sof-lex discs (3M ESPE) facing down.

Although different manufacturers' resin composite and adhesive systems were combined to treat this patient, it has been demonstrated that etch-and-rinse adhesive systems can be safely used with composites from different manufacturers without compromising bond strength.[15] The three-step etch-and-rinse adhesive system was used instead of the self-etching adhesive system supplied by the resin composite manufacturer because it provides a more reliable enamel bond and has been demonstrated in many clinical trials to be very effective.[12,16] In addition, both manufacturers claim that the products used in this case are compatible.

Conflict of Interest

The authors of this manuscript certify that they have no proprietary, financial, or other personal interest of any nature or kind in any product, service, and/or company that is presented in this article.

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