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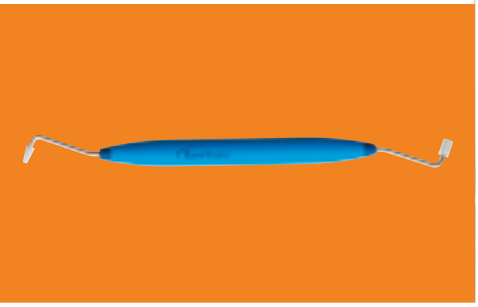

Artistry and methodology

Restoring anterior teeth with direct composite resin

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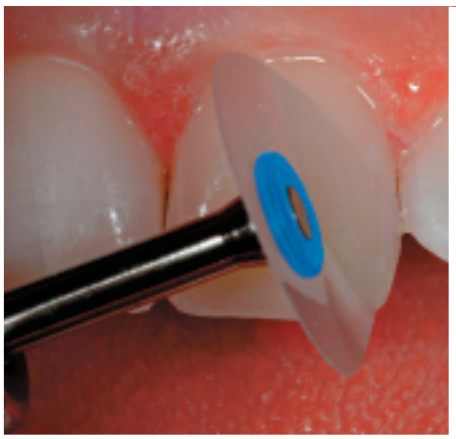

A SUPPLEMENT TO DENTAL PRODUCTS REPORT

SPONSORED BY KERR CORPORATION

Simplifying direct anterior restorations

Mastering the artistry and methodology

ABSTRACT

One of the many challenges facing restorative dentists in today's esthetic-conscious practice is the artistic use of direct composite restorative materials to rebuild natural-looking tooth structure. Advances in materials and technology, combined with greater expectations and increased esthetic demands by patients, has created an environment in the dental practice where patients may not accept a single-shade composite restoration in an esthetic area. Artistic ability also becomes more important for the clinician, because the subtleties of anterior tooth morphology and color are sometimes difficult to visualize, much less reproduce clinically. This article discusses and defines techniques that the author feels provide a "happy medium" between the single-shade buildup and the more complex multi-shaded buildup, which may not be realistic for some practitioners to attempt.

By Robert A. Lowe, DDS

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Many restorative dentists are struggling with the artistic use of direct composite restorative materials to restore tooth structure. While improvements in materials and technology have enabled today's practitioner to approach most restorations with a variety of treatments, improving esthetics has become more important for the clinician and the patient. Successful, esthetic clinical reproduction of tooth morphology requires a solid knowledge base of materials science along with artistic ability. Not all dentists are capable of or interested in tackling complex multi-shaded composite buildups, and simpler alternatives are becoming available. This article focuses on a technique referred to as an "additive" buildup technique: The restoration is built up in layers to final contour in a fashion similar to the way a ceramist builds a porcelain restoration, rather than overbuilding and cutting back to contour using rotary instrumentation. To master this technique, it is necessary to review and understand anterior tooth morphology, including proper contour and surface texture. Employing the additive buildup technique will allow the creation of anterior direct composite restorations that blend harmoniously with the patient's oral environment.

Maxillary anterior tooth morphology

Maxillary anterior teeth, the heart of the "esthetic zone," have three distinct planes from the facial and proximal aspects. Proximal facial line angles are positioned so that portions of the mesial and distal surfaces are visible from the straight-on facial perspective. These line angles and lobal concavities (the most prominent being the largest middle lobe) on the facial surface are what make the facial anatomy of the maxillary central and lateral incisors come alive.

Three distinct proximal planes are seen in a facial view of the maxillary central incisor: (1) from the periodontium to the apical boundary of the "contact zone"; (2) from the apical boundary of the contact zone to the apical extent of the incisal embrasure; and (3) from the apical extent of the incisal embrasure to the incisal edge. The contact zone is the area between adjacent teeth where they appear to touch. The actual proximal contact is only a small portion of the contact zone, located toward its incisal boundary. The proximal view of a maxillary central incisor shows the three distinct planes of the facial surface: (1) from the periodontium to the height of contour—about 1 mm; (2) from the height of contour to the junction of the middle and incisal thirds; and (3) from the junction of the middle and incisal thirds to the incisal edge. The creation of the third plane (the incisal plane) toward the palatal aspect is crucial for both function and esthetics.[1]

Histology and esthetics

To duplicate the esthetics of natural teeth using composite materials, the restorative dentist must understand the histologic vitality that causes differences in the clinical appearance of enamel and dentin. In most situations, it is clinically difficult to simply choose one body shade of composite that matches all areas of a tooth to be restored, even taking into consideration the so-called chameleon effect. The inherent opacities of dentin and enamel require different opacities of composite material to replace each specific tissue type. A more opacious material is required for dentin replacement, whereas a more translucent material is needed to replace enamel. The goal is that some of the dentin layer will be visible through the transparent enamel, thereby creating a depth of color in the restoration.

Many composite material lines, such as the one used in this clinical case (Premise, Kerr Corp.), give dentists opacity options for the various Vita shades (Vident) as well as transparent enamels for creating incisal effects. Mopper has described a technique for designing "invisible" Class III and Class IV composite restorations by creating a long bevel and feathering the composite material out to a knife-edge to make the margins disappear.[2] This technique takes advantage of the translucent nature of composite as its thickness decreases, thereby allowing the natural tooth color underneath to blend as the material reaches the preparation margin. The secondary benefit of the long bevel (2 to 3 mm or more) is the increased micromechanical retention of the material itself. When restoring an anterior incisal edge, functional stress requires a preparation with more surface area to retain the material successfully without fracture. The question is where to place the restorative margins so they will blend or disappear.

For a moment, let's think about how plastic surgeons hide incisions (scars) when performing facial

AS WE REVIEW

the articles in various dental publications, many of them focus on complete rehabilitation or complex cosmetic treatment plans. While these treatments are certainly a reality in today's dental practice, they are the exception rather than the rule for many general practitioners. Most dental treatment is accomplished in increments—restoring one to four teeth at a time, providing excellent service, and enjoying the relationships we have created with our patients.

In this issue, sponsored by Kerr Corp., Dr. Robert Lowe illustrates that high-quality dentistry begins with understanding the anatomy, morphology, and histology of the dentition. There is no better place to start when learning how to create optimal esthetics and functional harmony through the proper use of direct resin. Advancements in materials allow us to build teeth intraorally much as a dental ceramist would, factoring in the effects of the dentin, enamel, contour, and surface texture. The esthetic dentist's goal should be to provide a restoration that disappears within the smile, is relatively simple to create, and will provide a long lifespan. Dr. Lowe presents a technique sequence that is logical and easy to follow, with results that speak for themselves.

Another issue addressed in the article is the ever-evolving challenge of choosing an adhesive system that will fit into your practice best. Dental manufacturers are continually creating new materials as they react to the needs of today's clinician. We need a bonding agent that is simple to use, is not technique sensitive, eliminates post-operative sensitivity, and provides an optimal bond to both enamel and dentin. While fourth-generation systems (etch, primer, and bonding resin) are viewed by some clinicians as the Gold Standard with regard to bond strengths, they are very technique sensitive. This article demonstrates the use of a new seventh-generation material that will have its place in our restorative practices. It is wise for us all to be aware of the bond strength differences between the various generations available from dental manufacturers and to be sure that we are choosing the correct material for any restorative procedure.

As I read this article and review its excellent photography, I am again reminded that we are practicing dentistry at an amazing time. We are indeed fortunate to have materials at our fingertips that allow us to conservatively recreate tooth structure with an amazing degree of accuracy. Dr. Lowe has shown us how this can be incorporated as a routine, predictable component of our nuts and bolts general dentistry.

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FIG 1: Pre-operative full-smile view of fractured facial-incisal composite on tooth No. 9.

FIG 2: This 1:1 view shows the fractured composite on the facial-incisal aspect. The original composite is too opaque compared with the adjacent central incisor, which has a more transparent white-washed enamel.

FIG 3: A body or dentin shade is chosen. Placing a clear or lightly tinted translucent enamel shade over the body shade influences the value (warmth, or lack of) and how much of the dentin layer will show through the enamel layer.

procedures. They place incisions parallel to the natural folds or contours of the skin so that they are camouflaged and blend with the patient's natural facial contours. Now, let's consider that the restorative margin of a composite restoration is actually a scar on the surface of the tooth. Where, then, is the best place, anatomically, to hide that scar? The answer is the facial proximal line angles of the tooth—where the facial plane meets the proximal surfaces. So, borrowing methodology from the plastic surgeon, we can now begin to form parameters for margin placement based on maximum esthetics, which also will create better microretentive form for the restoration. The transverse restorative margin, which joins the mesioproximal to the distoproximal and crosses the facial surface of the tooth, can be difficult to hide. Remembering the three-plane nature of the facial surface, it is best to place the margin at the intersection of these planes when possible. Also, remember that straight-line margins are more difficult to hide than slightly curved or tortuous (wavy) ones, so try to avoid connecting the proximal line angles with a straight line across the facial surface whenever possible.[3]

Tooth preparation

A patient presented with a fractured composite resin on the facial incisal aspect of tooth No. 9 (Figures 1 and 2). A pre-operative shade is chosen using a shade guide (Figure 3). The operative plan (Figure 4) is outlined on the facial surfaces of tooth No. 9 using a sharp, sterilized No. 2 pencil. Note the positions of the facial proximal line angles and the margin placement planned to join the mesioproximal to the distoproximal margins. A coarse, pointed diamond is used to create the bevels around the preparation and extend them to the outlined parameters.

It is important to note that in the incisal portion of the preparation, creation of the bevel also means removal of tooth structure in the anteroposterior dimension. Creating enough space for the application of both dentin and enamel replacement is critical to esthetic success. If this area of the tooth is not reduced enough in the palatal direction, the result will be removal of the enamel layer during the finishing and contouring processes. It is important to anticipate the amount of space (about 1 mm) needed to enable adding the replacement layers on top of one another in a way that predictably creates the proper optical effect without producing an overcontoured restoration.

It is easier to choose the appropriate shade for the dentin replacement after completing the preparation, because the surface hypocalicification has been prepared away. Using a shade guide is helpful for narrowing the color-match possibilities; however, it is a good idea to place some of the actual composite material on the tooth surface after preparation to verify color selection.

Treating enamel and dentin surfaces

After shade selection, the restorative process can commence. The preparation was thoroughly rinsed, dried, and then rewetted with an antimicrobial/densensitizer (such as AcQuaSeal G, AcQuaMed Technologies). Next, high-volume suction was placed within 1 mm of the prepared surfaces for 2 seconds, and

then removed. This created a perfectly moist surface for placing a hydrophilic primer (not too desiccated, which collapses the collagen, and not too moist).[4]

A new seventh-generation dentin bonding adhesive (OptiBond All-In-One®, Kerr Corp.) was copiously placed with a microapplicator and agitated into the prepared surface. A second layer of adhesive was applied in the same fashion (Figure 5). Air thinning and light curing followed according to the manufacturer's instructions.[5]

Seventh-generation bonding systems

The total-etch technique with fourth- and fifth-generation bonding systems for placing direct composite restorations has been very popular for some time. However, the total-etch approach can be technique sensitive and, if not used properly, can lead to post-operative sensitivity for some patients.

These types of dentin adhesives generally require three steps for completion of the bonding process: (1) application of phosphoric acid for a specified amount of time— usually 15 seconds or less; (2) application of an adhesion-promoting agent, or primer; and (3) application of a bonding agent, or adhesive. Between the first and second steps, water rinsing and drying are generally required. Between the second and third steps, drying or solvent evaporation is necessary. After completion of all these steps, light curing is required to polymerize and harden the adhesive.

Efforts directed toward developing new systems to simplify the dentin adhesion process[6] and single-bottle systems that contain acidic, polymerizable monomers have resulted in a variety of self-etching, self-priming dentin adhesive systems (Table 1 lists materials available in this category along with others mentioned in this case).[7] These self-etching, self-priming dentin adhesive systems can be easier to use because they require fewer clinical steps. Also, self-etching, self-priming systems have shown a decrease in post-operative sensitivity because their use does not involve removal of the smear plugs and opening of the dentinal tubules, which is what occurs when utilizing a total-etch technique with 37% phosphoric acid.[8] Among the many properties of a self-etch adhesive, the one that clinicians should be concerned with most is its ability to effectively etch enamel and achieve high bond strength to enamel.[9] The new seventh-generation bonding material used in this case, OptiBond All-

LEARNING OBJECTIVES

After reading this article, the reader should be able to:

1. Discuss proper maxillary anterior tooth contour and morphology.

2. Describe an "addition" buildup technique using composite resin to re-create natural contour that also limits the amount of rotary instrumentation necessary for finishing.

3. Describe in "histologic" terms the various opacities of composite resin materials and their appropriate use for replacing dentin and enamel.

4. Discuss how to vary natural surface texture by using different types of finishing and polishing instrumentation.

5. Describe seventh-generation self-etch bonding systems and their use in direct composite restorations.

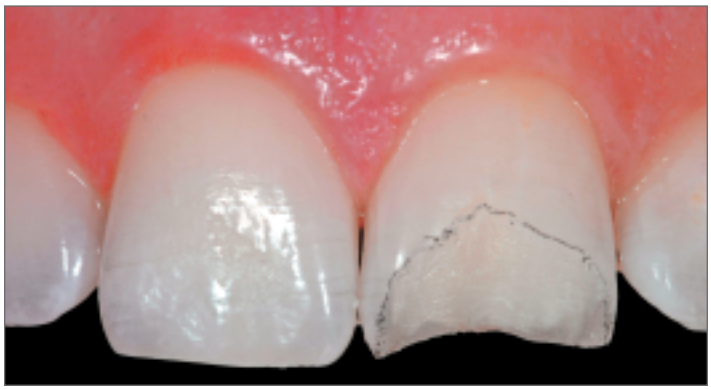

FIG 4: Facial view of prepared tooth No. 9. The form was outlined with a sterile pencil, showing the extent of the beveled surfaces.

FIG 5: A self-etching dentin bonding agent (OptiBond All-In-One) was applied to the prepared tooth surface in a brushing motion.

FIG 6: The first increment of composite, a flowable resin (Premise Flowable) was placed and cured to create a sticky surface on which to place the next increments of composite. Flowable resin can block discolored tooth structure before the actual dentin buildup.

FIG 7: An artist's brush was used to smooth the flowable layer before curing. This layer should be no more than 0.5 mm thick.

FIG 8: B1 body shade composite (Premise) was placed and shaped using the cone tip of the CompoRoller, which can be used to evenly spread and contour the composite horizontally and vertically.

In-One, has been reported by the manufacturer to demonstrate high bond strength on dentin as well as effective enamel etching, which should result clinically in strong and durable bonds between restorative materials and tooth structure.[5]

Restorative sequence and material placement

The first step in the restorative process is to place a thin (less than 0.5 mm) layer of flowable composite, shade A3 or A3.5 (Premise Flowable, Kerr Corp.), on the surface of the entire preparation (Figure 6). (Note that the shade is not critical to this step because of the thinness of this layer.) After curing, the flowable resin creates a sticky surface on which to place additional increments of microhybrid composite. A sable artist's brush (#2 Keystone brush, Patterson Dental) can be used to thin out the flowable composite layer before curing (Figure 7). In some cases, the flowable layer can be used to opaque out any undesirable color on the remaining dentin and create a common color to the understructure before further composite application.

After curing the flowable layer, the chosen shade of dentin replacement, in this case B1 (Premise, Kerr Corp.), was syringed to place on the facial surface. One of the challenges with direct composite placement has always been the creation of layers with uniform thickness, contour, and homogeneity. Traditionally, this was difficult to perform using a bulk-fill technique and a composite spatula. The CompoRoller™ composite-placing instrument (Kerr Corp.) can be used for the incremental placement of composite materials (Figure 8). In my practice, the CompoRoller has provided a clinically reliable method for developing these layers quickly with the correct contours and has greatly reduced the amount of contouring and finishing necessary post-placement. The disposable cone tip of the CompoRoller is used to flatten and spread the dentin increment in the mesiodistal and cervicoincisal directions. (Good analogies for the proper use of this instrument are applying paint to a wall with a paint roller or rolling a piece of dough into a thin pie crust.) Changing the direction of the instrument slightly while rolling the composite will spread the material evenly and uniformly over the prepared surface.

After shaping the dentin increment during placement with the CompoRoller, a sable brush was used to blend the increment of composite at the marginal interface. A plastic filling instrument (such as the Goldstein FlexiThin Mini 4, HuFriedy) was used to simulate lobes and depressions in the restorative material before curing (Figure 9). When the enamel layer is placed over this sculpted surface, the varying thicknesses of translucent material create an internal optical effect similar to that seen in natural teeth. Keep in mind at this point that the facial contour of the dentin increment is still palatal to the intended final facial position of the completed restoration. This leaves space for the enamel increment in the facial-lingual (palatal) dimension that will bring the completed restoration to full contour.

With the dentin increment cured, composite tints can be placed and cured before the placement of the

FIG 9: Using a composite plastic filling instrument, the lobes of the dentin layer were sculpted to simulate mammelon development. Note that the facial plane of the dentin increment should be about 1 mm to 1.5 mm palatal to the facial surface of the adjacent unprepared tooth so there will be sufficient space for the enamel increment without overcontouring in the facial dimension.

FIG 10: White composite tint (Kolar+Plus) was added to the cured dentin increment to simulate an incisal halo and cured before addition of the enamel layer.

transparent enamel layer to create internal effects similar to those that would be created by a ceramist. Because there is a degree of what the author terms an "enamel white wash" appearance to the patient's natural teeth, a thin layer of white composite tint (Kerr Kolor+Plus, Kerr Corp.) was interposed between the dentin and enamel layers to duplicate this effect. Concentrating a small amount of the white colorant at the tips of the lobes simulated a halo effect (Figure 10). The white composite tint was spread with the artist's brush and then light cured for 10 seconds.

Because of the high value in the incisal third of this tooth, a small amount of XL1 (Premise, Kerr Corp.) was placed between the vertical depressions between the facial lobes and blended with the No. 2 artist's brush (Figure 11). After light curing this increment, the enamel layer—transparent Amber (Premise, Kerr Corp.)—was dispensed and then contoured using the cylinder and cone ends of the CompoRoller (Figure 12). The cone end was used to help create line angles (Figure 13) and texture as the material was uniformly spread across the facial surface.

When the contours were completed, the surface was uniformly smoothed using the artist's brush (Figure 14). The final increment was light cured according to the manufacturer's specifications. An eight-fluted composite finishing bur (ET9, Brasseler USA, or TDF 9, Axis Dental) can be used to smooth any marginal discrepancies and perform minor contouring (Figure 15); however, the author has found that the use of the CompoRoller greatly reduces the need for gross rotary contouring.

Finishing and polishing

It is important at this point to emphasize that the beautiful contours that can be created using the addition buildup technique must not be destroyed by overzealous finishing and polishing. The first thing to consider before undertaking this procedure is the surface texture of the patient's natural teeth. Not all teeth are highly polished (or "smooth like glass"). In fact, most are not. Natural anatomic phenomena, such as perikymata and mammelons, create a texture on the tooth surface. The patient's surrounding teeth should be examined carefully before the restoration is finished and polished. The process of polishing a restorative material consists of a series of steps using varying grits of abrasive materials (progressing from rough to smooth), the most common being sandpaper discs and rubber points, discs, and cups.

FIG 11: A small amount of XL1 composite (Premise) was added and blended with a brush on the dentin increment apical to the incisal edge and between the facial lobes to raise the value slightly and to simulate a white-washed enamel appearance.

TABLE 1

Product Guide

7th-generation bonding
Clearfil S3 Bond/Kuraray
G-Bond/GC America
iBond/Hereaus Kulzer
OptiBond All-In-One/Kerr
Xeno IV/Dentsply Caulk

Composites
4 Seasons/Ivoclar Vivadent
Esthet-X/Dentsply Caulk
Gradia Direct/GC America
Premise/Kerr
Venus/Heraeus Kulzer

Finishing & polishing
ComposiPro and EP Polishers/Brasseler USA
Gloss polishers/Kerr
Occlubrush/Kerr
OptiDisc/Kerr
Sof-Lex/3M ESPE

Surface sealants
BisCover/Bisco, Inc.
Luxaglaze/Zenith/DMG
OptiGuard/Kerr

Resources

Brasseler USA
www.brasselerUSA.com
800-841-4522

Dentsply Caulk
www.caulk.com
800-532-2855

GC America
www.gcamerica.com
800-323-7063

Hereaus Kulzer
www.heraeus-kulzer-us.com
800-431-1785

Ivoclar Vivadent
www.ivoclarvivadent.us.com
800-533-6825

Kerr Corporation
www.kerrdental.com
800-537-7123

Kuraray Dental
www.kuraraydental.com
800-879-1676

3M ESPE Dental Products
www.3MESPE.com
800-634-2249

Ultradent Products Inc.
www.ultradent.com
800-496-8337

Zenith Dental
www.zenithdental.com
800-662-6383

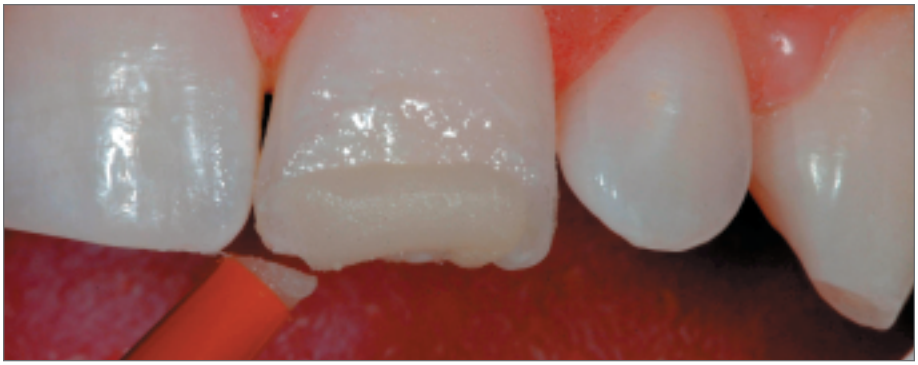

FIG 12: The incisal shade (Premise Amber) was added to the incisal third of the tooth.

FIG 13: The CompoRoller was used to sculpt and evenly distribute the enamel increment, blending it with the previously cured body increment at the junction of the middle and incisal third of the facial aspect.

FIG 14: Before blending the incisal composite increment, the brush was moistened with bonding agent and then wiped thoroughly with a 2x2 sponge to remove any excess. The bristles should be only slightly moistened so they are pliable.

FIG 15: An 8-fluted composite finishing bur was used to smooth margins and accentuate lobes and surface texture as needed.

The sequence recommended by the author for finishing direct anterior composite restorations is: (1) carbide finishing burs (sparingly!); (2) flexible discs; (3) rubber abrasives; and, finally, (4) polishing brushes. Pointed carbide burs can be used to create initial surface texture, starting with an 8-fluted bur and ending with a 30-fluted bur. The 30-fluted bur should be used only if an extra-smooth texture is desired.

Next, coarse/medium grit polishing discs (OptiDisc™, Kerr Corp.) were used to polish accessible proximal surfaces and help accentuate the proximal-facial line angles of the tooth. It is important to note that the abrasive portion of the disc faces inward (toward the handpiece) so that the disc can be flexed, which enables the clinician to create a fine stroke-like movement in which the instrument will contact only the proximal surface while rotating. The abrasive side of the disc is easily distinguished by the green color-coded center. Extreme care should be taken when using the disc on the facial aspect so the facial profile is not flattened. If it is desirable to use the disc on the facial aspect, it should be done lightly in a "touch-and-go" fashion to avoid excessive removal of restorative contours (Figure 16).

When finishing near the margins, the disc should be rotated in the proper direction—from the restorative material toward the tooth surface. This will help prevent ditching and the occurrence of white lines. Turning the disc around so that the abrasive surface faces away from the handpiece allows access while shaping the incisal edge. Note that the incisal edge should not be too flat or unidirectional. The polishing process is repeated on all surfaces with fine discs, followed by extra-fine discs.

Next, the rubber abrasives are used. It is the opinion of the author that coarse rubber abrasives are too aggressive and should be used very sparingly, if at all. Starting with a medium-grit rubber abrasive (HiLuster^{PLUS}, Kerr Corp.), the touch-and-go or paint-stroke movement was used across the planes of the restorative surface. Rubber discs can be used with the edge oriented vertically to polish and accentuate the depres-

sions between the lobes on the facial surface (Figure 17). The rubber disc can be used in a horizontal direction as long as the edge of the disc, not the flat portion, is used for polishing. Using the flat portion of the disc will make the restoration too flat, or one-dimensional, and destroy the lobed surface. Rubber abrasive points also can be used to polish the facial surface, the depressions between the lobes (Figure 18), and at the cervical margins. When polishing the cervical contours, the entire circumference of the rubber abrasive cup should contact the tooth surface. In other areas, it is better to use the cup like a disc—that is, point of contact is one edge only. After medium-grit polishing, the process was repeated on all restorative surfaces using a high-gloss, fine polisher (such as Gloss^{PLUS} Polishers, Kerr Corp.).

After polishing with the series of rubber abrasives was completed, using a polishing brush was the final step in the process. Some clinicians prefer to use a diamond paste in this step, but some polishing brushes are available with polishing mediums incorporated into them, eliminating the need to use pastes. One such brush, the Occlubrush®, (Kerr Corp.), is available in either a cup or point. The author uses the Occlubrush dry, but it can be used in conjunction with water spray. Using light, downward pressure to expand the cup as it rotates, the Occlubrush quickly creates a high degree of luster and reflectivity on the restoration surface (Figure 19).

Surface sealants

The role of a surface sealant is to fill any microscopic imperfections left from the finishing and polishing processes. It is a common misconception that this is a "glazing" step, which it is not. Compare the application of a surface sealant to the application of wax to a car. After wax is applied, most of it is buffed away, but some wax remains in the microscopic scratches and acts as a protective agent against rust. This action is similar for composite restorations. Most of the surface sealant placed on smooth, polished areas will eventually wear away; however, the microscopic imperfections that remain from the polishing process will be covered and protected.[10] Surface sealants, such as OptiGuard®, (Kerr Corp.) are clear, filled resins. They are applied after a 5-second etch with 37% phosphoric acid to clean the surface of the restoration (Figure 20) and are then air thinned and light cured. Surface sealants can be reapplied periodically if necessary.

Figure 21 shows a full-smile view of the completed

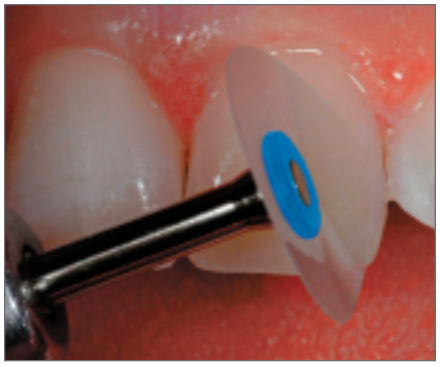

FIG 16: The polishing disc was used to polish the distal aspect of the facial surface and highlight the proximal facial line angle. The abrasive portion of the disc faces the handpiece so that it can be flexed to create the appropriate contour.

FIG 17: Using the edge of the rubber polishing disc (HiLuster^{PLUS}) in a vertical orientation, the facial surface can be well polished yet maintain the sculpted lobed appearance without overflattening the facial plane.

FIG 18: A rubber Gloss^{PLUS} Polisher was used to further polish the facial aspect, creating a highly reflective, smooth surface.

FIG 19: An Occlubrush was used to give the surface of the composite a final high luster while retaining surface texture, essential to a natural-looking restoration.

FIG 20: A surface sealant was applied with an artist's brush, then light cured to complete the restorative process.

FIG 21: A full-smile view of the completed restoration on tooth No. 9.

FIG 22: A 1:1 view of the completed restoration shows the internal effects and translucency created by using the additive buildup technique. Note how the restoration disappears among the maxillary lateral incisors and cuspids.

Disclosure

Dr. Lowe occasionally lectures on behalf of Kerr Corp. and is a product evaluator for the company.

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restoration on tooth No. 9. The 1:1 view of the completed restoration in Figure 22, taken with a black background to show the internal effects and translucency created by following this step-by-step process, demonstrates the overall esthetic appearance of the restoration. The goal with the additive buildup technique is "imperfect perfection" or "perfect imperfection," however you choose to look at it. We do not aim to create a mirror image of tooth No. 8, but to develop a natural blending that allows the restored tooth No. 9 to disappear among the maxillary lateral incisors and cuspids. The natural lateral incisors are not mirror images either; they demonstrate natural, subtle differences in shape and internal characterization. The restoration should be undetectable to the observer. In this case, the restorative goal was accomplished using a reliable, reproducible technique.

Conclusion

Any direct restoration carries the dentist's personal "signature." Successful placement requires a combination of knowledge of material science and artistic endeavor. Human dentate form is polychromatic, with many subtle intrinsic effects. To create restorative excellence that resembles natural teeth, it is imperative to understand the steps of proper material placement while releasing the artist within. Equally important are a thorough understanding of proper tooth contours and a sound systematic approach that reproduces those contours with direct restorative materials and finishing armamentaria. It is within the capability of every dentist to follow this basic histologic approach to dentin and enamel replacement. With the appropriate shades and opacities of composite material available, creating a dental restoration that defies detection can be predictable and rewarding for you, as well as satisfying for the patient.

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1. Successful, esthetic clinical reproduction of tooth morphology requires:

a. an advanced degree in restorative dentistry and the newest materials and instruments.
b. a solid knowledge base of materials science along with artistic ability.
c. a thorough understanding of complex multi-shaded composite buildups.
d. complete knowledge of single-shade composite restorations.

2. The additive buildup technique:

a. refers to building up layers to final contour.
b. building layers in a fasion similar to the way a ceramist builds porcelain restorations.
c. avoids overbuilding and cutting back to contour using rotary instrumentation.
d. all of the above

3. Which proximal planes are seen in the facial view of the maxillary central incisor?

a. from the periodontium to the apical boundary of the contact zone.
b. from the apical boundary of the contact zone to the apical extent of the incisal embrasure.
c. from the apical extent of the incisal embrasure to the incisal edge.
d. all of the above

4. Creating which plane is crucial for both function and esthetics?

a. the proximal plane
b. the tertiary plane
c. the incisal plane
d. the palatal plane

5. To duplicate the esthetics of natural teeth, the dentist must:

a. understand the histologic vitality that causes differences in the clinical appearance of enamel and dentin.
b. choose different opacities of composite material to replace dentin and enamel.
c. ensure that some of the dentin layer is visible through the transparent enamel.
d. all of the above

6. "Invisible" Class III and IV composite restorations require:

a. creating a long bevel and feathering the composite material out to a knife-edge to make the margin disappear.
b. choosing at least six different composite colors and opacities.
c. light curing every other layer to increase depth of color.
d. none of the above

7. When restoring an anterior incisal edge:

a. avoiding creating the chameleon effect is the most important aspect of the restoration.
b. artistic ability is more important than the materials chosen.
c. functional stress requires a preparation with more surface area to retain the material successfully without fracture.
d. all of the above

8. Where is the best place to hide the restorative margin in a maxillary central incisor?

a. At the intersections of the facial proximal line angles of the tooth.
b. Just shy of the mesioproximal facial surface of the tooth.
c. Opposing the distoproximal facial surface of the tooth.
d. In a place that allows creating a straight line across the facial surface whenever possible.

9. It is important in the incisal portion of the preparation to:

a. allow for removal of 1 mm of the enamel layer during finishing.
b. create enough space for application of both dentin and enamel replacement layers.
c. allow for extensive contouring when adding the replacement layers.
d. all of the above

10. Things to consider before polishing and finishing are:

a. the surface texture of the patient's surrounding natural teeth.
b. natural anatomic phenomena, such as perikymata and mammelons.
c. avoiding flattening the facial profile of the restoration.
d. all of the above

CE QUIZ

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