

POST-ORTHODONTIC RESTORATIVE SOLUTION:

Conservative Techniques with Direct Composite Bonding

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Abstract

With the popularity and success of clear aligner therapy, more adults are electing to improve their smiles with orthodontic treatments. Yet even after their teeth are straight, many of these patients remain unsatisfied with their smiles, which still exhibit worn or chipped incisal edges or residual spacing. Influenced by social media “success stories” and orthodontist recommendations, many adult patients are consulting with restorative dentists on conservative and affordable treatment options for their post-orthodontic smile enhancement needs and wishes. As a result, restorative dentists are seeing direct composite bonding in the anterior segment as an increasingly popular treatment choice to improve the smiles of their patients, especially adults completing orthodontic treatment. Although it might be more challenging technically, the direct deposit bonding procedure—when performed utilizing sound principles and the proper esthetic materials—allows for predictable results in a noninvasive, conservative, and economical manner that often does not require anesthesia. Equally important, it produces happy, satisfied, and grateful patients with beautiful smiles.

Key Words: composite bonding, composite layering, diagnostic wax-up, Class IV fracture, post-orthodontic, anterior teeth



Learning Objectives



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

1. Understand how different direct composite materials are used to create polychromatic layered restorations and the value these materials bring in producing beautiful end results.
2. Efficiently perform each step in the sequence of polychromatic layering to deliver predictable and reliable results.
3. Recognize how being able to give the patient options for post-orthodontic cosmetic enhancements that are less invasive and sometimes more cost-effective will gain patient confidence and potentially bring more patients to your practice.

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Introduction

With the advent of clear aligner orthodontic therapy, a growing number of people, especially adults, are choosing to straighten their teeth.¹ Yet even after their teeth are straight, many of these adult patients remain unsatisfied with their smiles, which still exhibit residual spacing or uneven, worn, or chipped incisal edges resulting from years of wear due to previous malocclusion, destructive habits, or sleep bruxism (a possible side effect of obstructive sleep apnea).²

Consequently, many dental practices are seeing these patients for post-orthodontic consultations to discuss options to correct worn incisal edges, residual spaces, diastemas, or undersized teeth. Increasingly aware of current dental materials and techniques as a result of education from their orthodontists and social media posts from others sharing their own smile-enhancing treatments, these adult patients come prepared with a list of demands and expectations.

In such instances, restorative treatment options consist of direct, indirect, or a combination of the two methods. Some patients choose treatment with indirect porcelain restorations, but not all. Many other patients—seeking a conservative, non-invasive alternative that is also economical, especially after just having paid for costly orthodontics—are opting for direct composite bonding.

Advantages and Disadvantages of Direct Composite Bonding Versus Indirect Porcelain Restorations

From a patient's perspective, the two biggest advantages of direct composite are affordability and tooth structure preservation. Modern composite bonding can serve as a more economical alternative for patients unable to afford costly indirect restoration treatment for multiple teeth.³ And even when a patient's ability to afford porcelain veneers is not a consideration, the ultra-conservative nature of direct composite bonding—whether it involves one tooth or several—appeals to many since it does not involve drilling.

The main disadvantage of direct composite bonding is expected longevity. Considering the many individual variables that may affect longevity, restorative dentists should present

patients with a broad range of predictability; any direct anterior restoration can last between five to approximately 15 years.⁴ However, this concern is somewhat offset by patients' realization that with composite bonding they have the option of eventually transitioning into the more durable porcelain in the future, if needed or desired.

From a dentist's perspective, it often is a matter of familiarity and skill level. Some restorative dentists may lean toward the indirect method simply because they do not feel as confident doing a direct resin restoration. While this hesitance is understandable and justifiable, it is the author's opinion that the polychromatic layering of dental composites can be mastered by anyone who devotes the time and effort to practice the technique.

Clinical Recommendations for Restorative Success with Direct Composite Bonding

Whether it involves one tooth or several, the likelihood of success using the direct composite bonding technique in the anterior region increases when dentists follow some general principles and practices. These include the following:

1. Always preplan treatment. Study models made for diagnostic wax-ups are key in tooth preparation to ensure for optimal bond strength, color blending, and marginal masking. It also helps if immediate postoperative photographs are taken at the initial texturizing and polishing appointment so the dentist can later review and evaluate the initial polish in order to have a clear understanding of what details will require fine-tuning at the final polish appointment.
2. When it comes to finishing and polishing—no matter the composite discs, burs, and polishers used—the first step should always be to establish the overall primary outline form, which includes the facial line angles, incisal and facial embrasures, and three facial planes. Once this framework is established, secondary and tertiary facial anatomy and textures can be created. There is no one single bur or polisher that is perfect for every situation; the choice of instruments is up to clinician preference.
3. Lighting is a key factor when creating reflective and deflective zones and making the surface texture visible on the natural tooth that is to be replicated. Available in either silver or gold, a reflective powder, such as Hi-Light (American Dental Supply; Allentown, PA), serves as a useful tool in revealing a tooth's tiniest details. Coating the powder on the natural tooth/teeth that are to be matched will greatly enhance visualization. Clinicians should also reapply it to the tooth/teeth they are working on as they progress through the polishing sequence to ensure they are proceeding well. If they notice any imperfections at this time, they can backtrack a step or two to correct them before progressing to the next stage.
4. Texturing should always be completed with a slow-speed, high-torque handpiece. Electric handpieces work well

Lighting is a key factor when creating reflective and deflective zones and making the surface texture visible on the natural tooth that is to be replicated.



Figures 1 & 2: Preoperative views showing uneven incisal edges after orthodontic treatment. Knowing the incisal edges would be restored, the orthodontist did an excellent job of balancing the gingival zeniths.



Figure 3: Lateral view showing the 1.5- to 2-mm incisofacial bevel to help with color blending.

since their settings can be adjusted to the desired revolutions per minute (rpm) and torque. If you do not have an electric handpiece, an air-driven, slow-speed friction grip handpiece, such as Star Dental Titan 3 (Dental EZ; Lancaster, PA) works equally well. (This handpiece was used to complete all three cases discussed in this article.)

5. Particularly when many anterior teeth are to be restored, the appointments should be broken up. Final texturizing and polishing on this many teeth can take about an hour; the lengthy and tiring aspects can take its toll on both patient and dentist. To alleviate the impact, at the first appointment the composites should just be given a quick general shaping, polish, and occlusal verification before the patient is sent home. By giving the patient time to “test-drive” the new smile and the dentist a break, both parties can regroup at a subsequent visit with collaborative feedback to finalize the detail work from a fresh perspective.

Case Presentations

The three cases described in this article illustrate common complaints of patients presenting for post-orthodontic smile enhancements (e.g., uneven incisal edges, old or inferior composite work on anterior teeth, and moderate to severe wear on the maxillary/mandibular anterior teeth). They demonstrate,

step by step, how to correct these issues using layered direct composite bonding in an efficient manner that delivers predictable and reliable results. In each of the three case examples, the composite and shades used were Estelite Omega (Tokuyama Dental America; Encinitas, CA). However, it should be noted that there are many composite brands that can provide excellent results; the choice is up to clinicians' individual preferences.



Case 1: Uneven Incisal Edges

Referred by his orthodontist after finishing clear aligner treatment (Invisalign, Align Technology; San Jose, CA), a patient presented to discuss restorative options for the four upper incisors (Figs 1 & 2). These teeth exhibited a common occurrence for adults who undergo orthodontic treatment. For decades these patients functioned with crowding and malocclusion, which created wear patterns on the incisal edges. Once they are in proper alignment, those worn edges do not line up, the smile is not attractive, and the patient is left wanting those imperfections corrected.

The patient was presented with various restorative options and materials, with the choice essentially coming down to porcelain versus composite. Despite the ultraconservative porcelain veneer preparation techniques used with modern ceramics, the patient did not like the prospect of having his teeth drilled for such small adjustments. Instead, he opted for bonding. Although the primary concern when choosing a composite restoration is potential longevity issues due to functional stresses, he reasoned that if he were to have any chipping issues over time, he could eventually transition into porcelain. He also knew he would be wearing retainers (Invisalign Vivera) at night for life, and that these would help protect the restorations.

Therefore, with the treatment choice decided, tooth whitening was performed, and study models made for a diagnostic wax-up. For small incisal additions, tooth preparation is important to help ensure optimal bond strength, color blending, and marginal masking. First, a pumice slurry and a prophyl cup were used to preclean the surface of any plaque. Second, a conservative incisal edge bevel was placed with a medium-grit diamond bur (#6844, Komet USA; Rock Hill, SC) (Fig 3).⁵⁻⁷ While



Figure 4: Silicone putty index from diagnostic wax-up used to establish the lingual shelf with an achromatic milky-white (MW) composite.



Figure 5: Dentin shade DA1 composite was used to create the dentin layer. This was feathered about halfway onto the incisofacial bevel. Creating vertical striations helps scatter the light and block the hard incisal edge.



Figure 6: View of internal calcification effects placed with the BL1 composite.



Figure 7: View of the final thin layer of MW composite over the incisal one-third.



Figure 8: Postoperative view of the final restorations.



Figure 9: Lateral view of final restorations with angled lighting showing seamless marginal blending on the facial surface.

this step is not always necessary, it is extremely helpful when trying to hide a hard incisal edge on such a small addition. Finally, an air abrasion unit (MicroEtcher II, Zest Dental Solutions; Carlsbad, CA) was used to micro etch the facial and incisal surfaces to help increase micromechanical bond strength.⁸

Using the diagnostic wax-up to fabricate a silicone putty index, the lingual shelf was first established on teeth #7-#10 with an achromatic milky-white composite (MW) (Fig 4). It is extremely important to keep this layer thin and not let any of the MW shade feather onto the facial surface. If it does, then the hard incisal edge will be visible in the final restoration. Next,

a dentin shade (DA1) was sculpted along the incisal third, just onto the facial bevel (Fig 5). As this patient's other teeth did not have much incisal translucency, the incisal mamelons were kept subtle. Creating vertical lines within this layer helps scatter the light, which aids in hiding the hard incisal edge while also replicating the natural dentinal surface.⁹ Taking care to avoid over application, a small amount of incisal (TRANS) was placed. The body enamel (EB1) was then placed just short of the final facial contour, leaving room to add subtle internal white calcification effects (Fig 6).



Figure 10: Full-smile preoperative view showing old composite restoration on #8.



Figure 11: A 1:1 view showing color difference and poor marginal blending of existing composite on #8.

There are several techniques to create internal calcification effects. In this case an opaque bleach white composite (BL1) was used rather than a liquid resin.¹⁰ A final thin layer of MW was then placed to just beyond the final facial contour to leave room for finishing and polishing (Fig 7). A layer of glycerin gel (K-Y, Reckitt Benckiser; Parsippany, NJ) was used during the final photopolymerization to ensure a full cure of the oxygen inhibition layer.¹¹

Finishing and polishing were completed with a series of discs (Sof-Lex, 3M; St. Paul, MN), carbide and diamond burs (#6844 and #H379, Komet), composite polishers (PDQ, Kavokerr; Brea, CA), and diamond polishing paste (Porcelize, Cosmedent; Chicago, IL).¹²⁻¹⁴ The patient was quite pleased with the final results (Figs 8 & 9) and grateful for the conservative, noninvasive, and cost-effective treatment, as well as the fact that no anesthesia was necessary.

Case 2: Old Bonding Replacement

A female patient presented with an old, extremely unsightly composite on a maxillary central incisor (#8) (Figs 10 & 11). Fortunately, anticipating the placement of new composite after clear aligner treatment (Invisalign), her orthodontist had skillfully positioned the affected tooth by leveling the gingival zenith with #9 instead of leveling the incisal edges, which would have left the gingival zeniths uneven. Treatment options offered at other dental offices included a single porcelain crown/veneer or porcelain crowns/veneers on #8 and #9 and even #7-#10 to facilitate color matching. The patient, averse to the idea of more tooth grinding, preferred the most conservative option of a direct composite veneer, which in her case required no drilling on natural tooth structure.

Alginate impressions were taken to fabricate bleaching trays and a diagnostic wax-up. The patient's anterior teeth did not have much incisal translucency, but there were some areas of chromaticity that needed to be replicated. A palate of six shades of composite (MW, DA2, EA1/EB1, BL1, TRANS) and two shades of colored resins (Blue and High Chroma Opaque) were used (Fig 12). Often a single shade of A1 or B1 is not quite right for the dentin or enamel, but if the two are mixed in the proper proportions, it is possible to create a more desirable

shade. The same formula was followed for establishing a lingual shelf and incrementally layering from back to front (Figs 13 & 14). To help with the incisal chromatic effects, a combination of liquid resins was applied after the body enamel, and then a final thin layer of MW allowed those effects to show in the final restoration (Figs 15 & 16).

For the finishing and polishing stages, the first step was to establish the overall primary outline form, which includes the facial line angles, incisal and facial embrasures, and three facial planes (Fig 17). Once this framework was established, secondary and tertiary facial anatomy and textures were created. There is no one single bur or polisher that is indicated; it is the clinician's choice.

This case was selected for illustrative purposes because the natural surface texture of #9 was quite visible and more challenging to match compared to a smooth glossy finish. Accordingly, a silver reflective powder (Hi-Light) was used to greatly enhance visualization of the minutest details of the surface anatomy and texture of #9's natural enamel (Fig 18). The powder was reapplied during the polishing sequence to ensure that work was progressing on the right track; when minor imperfections were spotted, the dentist backtracked to correct these before proceeding to the texturing stage. Texturing was completed with an air-driven, slow-speed friction handpiece (Star Dental Titan 3) (Figs 19-23). The patient and her orthodontist were pleased with the result (Figs 24 & 25).

“From a patient’s perspective, the two biggest advantages of direct composite are affordability and tooth structure preservation.”



Figure 12: View of the composite shades (MW, DA2, EA1/EB1, BL1, TRANS) and liquid resin colors (Blue and High Chroma Opaque) used for this restoration.



Figure 13: With the aid of the silicone putty index, the lingual shelf was established with MW composite.



Figure 14: Dentin shade DA2 was used to create the dentin layer.



Figure 15: Using a gloved finger, equal amounts of EA1 and EB1 were mixed together on the composite pad to get a better color match, and then layered into place. Next, High Chroma Opaque and Blue liquid resins, along with BL1 composite, were used to better replicate and complement the chromatic and calcification effects seen on #9.



Figure 16: A final thin layer of MW was placed on the incisal one-third to allow the effects to show through.



Figure 17: A disc was used to establish initial facial outline form.



Figure 18: A silver reflective powder was used to enhance visualization of the surface anatomy and texture of #9's natural enamel.



Figure 19: A medium- or fine-grit diamond bur was used in a slow-speed, high-torque handpiece to define three facial planes and initiate facial grooves/lobes and tertiary anatomy.



Figure 20: A football/egg-shaped carbide bur was used to refine what was just developed by the diamond bur and to mimic the surface texture of #9 with subtle stippling.



Figure 21: A medium-grit diamond bur was used to create a fine perikymata effect.



Figure 22: A rubber polishing disc was used to erase and blend the texture to the desired results.



Figure 23: A silicone polishing brush was used to shine and polish without removing surface texture.

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Figure 24: A 1:1 view of final restoration on #8 showing how the surface texture and characterization closely matches those of #9.



Figure 25: Full-smile postoperative view of the final direct composite veneer restoration on #8.

Case 3: Worn Maxillary/Mandibular Anterior Teeth

A male patient presented with moderate to severe wear on the maxillary and mandibular anterior teeth (Figs 26-29). His posterior teeth were in good shape with almost no wear.¹⁵ Having just finished orthodontic treatment, his occlusion was in a new, more ideal position so it was not known whether his protrusive parafunction would continue. The stressful nature of his work had also changed for the better. These factors were considered when the patient was presented with the restorative treatment and material options, as well as the risks of potential material failure over time.

In this particular case, the advantages of current affordability and tooth structure preservation outweighed the less-immediate disadvantage of durability issues. The patient chose to start with composite, knowing he could transition into the costlier, longer-lasting porcelain if he needed or wanted to in the future.

Once orthodontic treatment was completed, alginate impressions were taken to fabricate bleach trays and a diagnostic wax-up. The wax-up was evaluated on an articulator for excursive pathway movements to reproduce the best possible palatal contours of the upper incisors and incisofacial contours of the lower interiors.

Tooth preparation was completed with a prophyl cup and pumice/water slurry to remove any plaque. A slight 1.5- to 2-mm incisofacial bevel was made at 45 degrees with a medium-grit diamond bur (#6844) to help with color blending. Finally, air abrasion (PrepStart, Zest Dental) was used to micro etch the surfaces. A total-etch technique was used and a bonding agent (OptiBond Solo Plus, Kerr Dental; Orange, CA) was applied and light-cured.

Using the silicone putty index, MW composite was used to establish the lingual shelf for teeth #6-#11 (Fig 30). A serrated nonabrasive metal strip (Smart Strips, KaVo Kerr) was used to open the interproximal contacts from the bonding agent. In some cases, it is better to restore one or two teeth at a time; in other cases, such as the one described here, it is helpful to restore them all at once as it is easier to visualize the overall

smile line, incisal edge positions, height-to-width ratios, and emergence profiles. It also speeds the process, thus reducing the time patients have to stay openmouthed. Since most of these procedures are done with no anesthetic and employ a lip retractor (e.g., OptraGate, Ivoclar Vivadent; Amherst, NY), wearing such a device for an extended period of time can be quite uncomfortable for some patients.

A sectional matrix (Composi-Tight 3D, Garrison Dental; Spring Lake, MI) normally used for posterior restorations was employed to further establish the incisal embrasures (Figs 31 & 32). With this framework established, it was much easier to visualize where and how thin/thick the subsequent layers needed to be. An equal-parts mix of DA1 and DA2 was used to replicate the dentin morphology (Fig 33). Before light-curing, a photograph was taken with cross-polarized filters (polar_eyes, PhotoMed; Van Nuys, CA) to ensure correct shade matching. (Cross-polarized photography removes all reflective light interference, making it easier to evaluate the actual color of the teeth and composite before and during the procedure.¹⁶) The next layer used was a translucent composite (TRANS) along the incisal edge to provide subtle light transmission to replicate natural opalescence and translucency. A body enamel of shade B1 was then sculpted to full contour in the middle one-third and feathered incisally to leave room for a final thin layer of MW along the incisal one-third. The same procedure was completed for the six lower anteriors (Fig 34).

In consideration of the appointment's lengthy and tiring aspects for both patient and dentist, the composites were just given a quick general shaping, polish, and occlusal verification. At this time immediate postoperative photographs were also taken so the dentist could evaluate the initial polish and have a clear understanding of what details would require fine-tuning at the final polish appointment (Fig 35). The patient was sent home to try out his new smile. At the final polish appointment, the dentist—having reviewed postoperative photographs and in collaboration with patient feedback—finalized the detail work to achieve seamless integration between the restorations and natural teeth.



Figures 26-29: Preoperative views of maxillary and mandibular anterior teeth showing post-orthodontic tooth positioning and worn incisal edges.



Figure 30: View of lingual shelf established with MW composite using the silicone putty index.



Figure 31: A metal sectional matrix was used to further develop the incisal embrasures with MW composite.



Figure 32: Lateral view of lingual shelf showing how this layer was kept thin, allowing room for the dentin shade that follows to be thick enough to block out the hard incisal edge.



Figure 33: A mixture of DA1/DA2 composite was sculpted to replicate the dentin morphology.



Figure 34: View of lower anteriors with lingual shelf established with MW composite using the silicone putty index as a guide.



Figure 35: Basic shaping and polishing was done at the end of the first appointment.

TIPS

Using Composite Resin to Restore Four or More Anterior Teeth

BEGINNER

- In preparation for working on composite, first learn anterior tooth morphology and how to wax anterior teeth.
- Work on one tooth at a time. This will take longer, but will minimize the chance of bonding interproximal contacts together.
- When working on a single tooth, isolate the adjacent teeth with polytetrafluoroethylene (PTFE) tape. Some prefer to first isolate with Mylar strips to do the etch and bond, and then place the tape so that it is free of any bonding resin.

INTERMEDIATE

- For greater time efficiency, layer the central incisors and canines concurrently. However, create each lingual shelf one at a time to prevent the adjacent lingual shelves from connecting and bonding together.
- Isolate the lateral incisors with PTFE tape and layer the central incisors and canines at the same time. For the central incisors, after curing the bonding resin, use a nonabrasive serrated interproximal reduction (IPR) strip to maintain the interproximal contact and repeat after each subsequent layer, as needed.
- Create each lingual shelf one at a time. After all the lingual shelves are established, use a medium- or fine-grit disc to refine the incisal edge and embrasure form. This should prevent creating any dust that interferes with subsequent layers. If dust is noticed, however, remove it using a small amount of wetting resin on a sable brush before continuing to layer. When placing the final layer, use the “Mylar pull” technique (i.e., using a Mylar strip as an instrument, rather than a matrix) one at a time to get a smooth transition of composite from facial to lingual.

ADVANCED

- Layer all teeth at the same time. Doing so provides an overall view of incisal length, smile line flow, and symmetry of tooth size and ratios, allowing clinicians to notice and resolve any minor adjustments as they are encountered during the actual layering process.
- The lingual shelf can be created singly or all at once. If doing all at once, position the silicone putty index orally and bring the composite to the putty rather than placing the composite in the putty and then adapting into position. The former technique allows for more sculpting control, thereby minimizing overflow; with the latter technique there is a higher risk of composite overflow from the lingual side going unnoticed into the interproximal contact area.
- If excess composite from the lingual shelves happens to connect the embrasure and contact area, use a thin IPR diamond disc to carefully shape and reopen the contact and then refine with medium- and fine-grit discs. Being able to layer all teeth at once is also helpful because you can see in real time how each layer matches in hue, chroma, value, translucency, and characterization. A Mylar strip can then be used to shape the final layer interproximally one tooth at a time beginning on one end.
- Another technique for managing interproximal contacts is to use a posterior sectional matrix to help shape the composite interproximally. Once the lingual shelf is established, use a serrated IPR strip to open the contact area from any bonding resin. Place the sectional matrix longitudinally and use a small amount of MW composite to create a thin layer that connects the lingual self to the facial interproximal line angle. Instead of feathering the MW composite onto the facial surface, adapt it up against the matrix and remove excess until the desired shape is created. Once this is done on adjacent teeth, the interproximal contact is established and facial layering is all that is needed for finalization.



Figures 36-44: Postoperative views of maxillary and mandibular anterior direct composite restorations showing seamless integration and harmony with the natural teeth.

The new smile “reveal” at the completion of treatment is always a rewarding moment, and this case was no exception. Even at the basic polish stage at the end of the long appointment, the patient was extremely grateful for his enhanced smile. The following week when he returned to complete the detailed texturizing and polishing, he marveled at how well the composite material blended into his existing teeth to produce such natural-looking results (**Figs 36-44**). He was also very thankful for the treatment’s conservative nature.

Additional Recommendations

As in each of the three examples described in this article, clinicians treating cases involving a direct composite bonding post-orthodontic restorative solution should do the following:

1. Instruct patients who have just finished with clear aligner orthodontic treatment to wear a provisional retainer until the new restorative work is completed.
2. Advise patients that when they schedule their restorative appointment, they also should schedule their final orthodontic retainer impression appointment for the next day in order to minimize any tooth shifting.
3. Whenever possible, schedule these longer, more challenging restorative appointments for the typically less busy end of the day; this allows clinicians greater focus to do their best work without feeling rushed or distracted.

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Figures 45 & 46: Case 1, two-year postoperative view.



Figures 47 & 48: Case 2, two-year postoperative view.



Figures 49 & 50: Case 3, two-year postoperative view.

Summary

Patient awareness and understanding of modern dental materials and procedures is greater than ever as a result of social media and people sharing their own smile-enhancing dental treatment experiences. Many of these treatments are being done with indirect porcelain restorations, but not all. More people are seeing beautiful examples of direct composite bonding to repair chipped or worn incisal edges, or excess spacing, and

are seeking practitioners who are proficient at this type of dentistry. Orthodontists are also educating their patients about this minimally invasive option. Although the polychromatic layering technique is the ultimate in direct composite artistry, newer single-shade composite systems are making it easier to obtain acceptable results with one shade.¹⁷ Even with a single-shade system, the layering principles are applicable with the use of a silicone putty index, lingual shelf for establishing the back-drop, and facial contour shaping.

As dental materials continue to evolve and allow for more conservative procedures, restorative dentists would do well to consider and become proficient at direct anterior composite bonding as a more economical and noninvasive alternative to costly porcelain veneers for their adult patients requiring post-orthodontic smile enhancements.

It is the author's opinion that the polychromatic layering of dental composites can be mastered by anyone who devotes the time and effort to practice the technique. The benefits are well worth it: Patients appreciate the minimally invasive approach, and dentists can not only derive the satisfaction of creating conservative and esthetic restorations, but also can attract and serve a new adult patient segment, affording them the opportunity to grow their practices and areas of expertise. The restorations are still doing well after two and a half years (Figs 45-50).

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3 Hours Credit

This Continuing Education (CE) self-instruction examination is based on the article *Post-Orthodontic Restorative Solution: Conservative Techniques with Direct Composite Bonding* by Kevin M. Brown, DDS, AAACD. This article appears on pages 84-97.

The exam is free of charge and available to AACD members only. AACD members must log onto www.aacd.com/jcdce to take the exam. Note that only Questions 1 through 5 appear in the printed and digital versions of the jCD; they are for readers' information only. This exercise was developed by members of the AACD's Written Examination Committee and jCD's Contributing Editors.

1. What is an advantage of direct composite restorations compared to indirect porcelain restorations?

- a. Less clinician skill is required.
- b. Composite material stains less.
- c. It is more affordable.
- d. There is usually more tooth preparation involved.

2. What is the main disadvantage of direct composite bonding over bonded porcelain restorations?

- a. staining
- b. longevity
- c. polish
- d. shading

3. What is the benefit of using an air abrasion unit on the tooth preparation?

- a. It helps with color blending.
- b. It increases micromechanical bond strength.
- c. It helps in concealing a hard incisal edge.
- d. It helps with the final contouring.

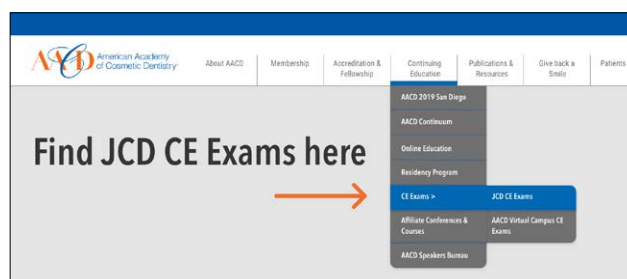
4. What is the key factor in creating reflective and deflective zones in direct composite restorations?

- a. shade of the composite
- b. lighting
- c. postoperative photographs
- d. addition of tints and stains

5. What is required for successful restorations with direct composite?

- a. The use of a single bur and polisher for proper anatomic detail.
- b. All imperfections can be corrected at the end of final polishing.
- c. Using a high-speed handpiece to produce a better texture and polish.
- d. Study models for a diagnostic wax-up to ensure optimal bond strength of the composite.

To take the complete exam, log onto www.aacd.com/jcdce



AACD Self-Instruction Continuing Education Information

Exams will be available for 3 years from publication date for dentists, and 1 year from publication date for laboratory technicians.

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