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Clinical Technique/Case Report

A Posterior Composite Case Utilizing the Incremental and Stratified Layering Technique

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Clinical Relevance

This paper illustrates a technique for placing posterior composites.

SUMMARY

Composite restorations should bring out the artist in the dentist. Today's composites are made to produce highly aesthetic, functioning restorations. There are several systems from which practitioners can choose, and the techniques for each system can be daunting. Composite restorations are conservative and a viable alternative, if proper protocol is followed. Each manufacturer has its own steps for applying its composites; however, by following the sound basic principles for bonded restorations, the practitioner can apply these procedures to every composite system. Thus, by utilizing proper techniques and understanding the material, one can both achieve a predictable outcome and desired aesthetics. The case study presented here illustrates the necessary steps required to achieve an anatomical, functional and aesthetic restoration.

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INTRODUCTION

By utilizing both the incremental and the stratified technique, an anatomical and color correct restoration can be accomplished. With the incremental technique, a predictable outcome can be achieved through controlling shrinkage, enhancing the adaptation and controlling depth of cure and overcontouring of the restoration. While with the stratified technique, the desired esthetic outcome can be reached and the color built into the restoration with depth.

Potential Problems

As with all composite restorations, leakage and shrinkage are major issues with these restorations. This can lead to sensitivity, bacterial infiltration and decay.

Advantages and Disadvantages

Advantages would include a natural looking restoration. Disadvantages include the amount of time the practitioner will need to place this type of restoration, and the fact that the longevity of these restorations is much shorter when compared to other types of restorations.

TECHNIQUE

A 26-year old female presented with two chief concerns: temperature sensitivity on the lower right area and wanting a tooth-colored filling. Upon examination, an existing occlusobuccal amalgam with biologically unacceptable leaking and open margins on tooth #31 were found, with no noted fractures on the tooth structure. Tooth #30 had a large, deep mesio-occlusal and separate buccal amalgam (Figure 1).

Radiographically, there was a small radiolucent area on the pulpal floor underneath the restoration on tooth #31. Periodontally, the tissues were in good health, with a sulcar depth ranging from 2 to 3 mm with 0 mobility.

The treatment plan called for replacing the amalgam on tooth #31 with a composite restoration, and the composite of choice was the Vit-l-escence system (Ultradent, South Jordan, UT, USA). This particular composite is a Bis-GMA microhybrid with a particle size around 0.7 µm with fluorescence and opalescence properties. The planned treatment for tooth #30 was a buildup and crown.

After anesthesia and prior to placement of the dental dam, a shade was chosen, using the Vit-l-escence shade guide (Ultradent); shade A2 was the shade of choice for the enamel layer. Next, an occlusal analysis was done with Accufilm II (Parkell, Farmingdale, NY, USA) to determine the patient's centric stops and to note if there were any working or non-working interferences (Figure 2). Any lateral interference should be removed and none should be created with the new restoration.

A dental dam (Henry Schein, Inc, Melville, NY, USA) was placed to isolate the lower right quadrant area. The existing amalgam and caries were removed (Figure 3) using a carbide bur, not a diamond bur (Brassler USA, Savannah, GE, USA). Research has shown that the bond strength to dentin is actually decreased when using diamond burs for preparation.[1] The Sable Seek caries indicator (Ultradent) was used to determine if any caries remained. The preparation was refined and modified for composite restorations where there were rounded internal line angles, and a beveled cavosurface was employed to expose the maximum amount of enamel rods for bond strength.[2]

A combination of the incremental[3-12] and stratified layering technique[5] was used to fill the tooth. In the incremental technique, each layer was placed in a wedge formation no more than 2-mm thick. The initial layer was placed, then subsequent layers were placed, but they did not touch more than 2 surfaces, such as the pulpal floor and an axial wall. By utilizing the technique of placing a small amount of composite, a low C factor can be achieved.[13] The advantage to having a low C factor is a reduction of the amount of shrinkage in the composite while it is being polymerized. Before light curing, the practitioner will want as much surface area of the composite as free as possible to allow for the composite to flow, thus decreasing the amount of shrinkage.[5]

The stratified technique allows the practitioner to achieve a restoration that has a color depth that matches the original tooth. This was accomplished by placing darker chroma composite in the deeper portion of the preparation, then each restoration had an additional layer lighter in shade, so as to emulate the construction of natural tooth structure.[5] For example, the enamel layer for this tooth was an A2 shade. To find the shade that you will need in the deeper layers, go 2 to 3 shades darker. Thus, for the deeper dentin composite, shade A4 was used. Next, the subsequent layers were placed one shade lighter than the previous shade. In this case, each layer of composite that was placed was light cured for 10 seconds using the Optilux 501 halogen curing light (Kerr, Orange, CA, USA). The traditional protocol of uniform, continuous light curing was utilized, with no need for light curing through stepped, ramped or the pulse-delayed technique[14-15] because of the small incremental layers being placed with the lowest C factor possible.

Next, the preparation was etched with a total etch technique[16] using Ultra-Etch (Ultradent), a 35% phosphoric acid etchant. An etchant layer was first placed around the enamel layer at the cavosurface for 5 seconds (Figure 4) prior to the remaining portion of the preparation being filled with phosphoric acid for another 10 seconds (Figure 5). A total of 15 seconds was utilized for the amount of etching time. This was rinsed with a copious amount of water, then blot dried with a cotton pellet. The remaining liquid was removed with a microbrush (Kerr). The microbrush was taken to a paper towel or bib to dry. As this is repeated, you will see fewer wet spots, eventually ending with no spots (Figure 6). The tooth is now ready for the next step.

PQ1 bonding agent (Ultradent) was used for the next step. PQ1 is an ethyl alcohol based, single step bonding agent, 40% filled, fluoride releasing and radiopaque. A thin layer was applied to the preparation with an agitating technique and air thinned until no rippling was seen on the bonging agent. Once the rippling was gone, the bonding agent was ready for curing (Figure 7). The preparation was light cured for 10 seconds.

The first layer of the A4 dentin composite was placed into the preparation and light cured for 10 seconds (Figure 8). The next layer of dentin composite added was the A3 shade and was light cured for 10 seconds. The second-to-last layer was the A2 shade enamel layer of the composite (Figure 9). The preparation was filled until the composite material was short of the 1-mm cavosurface. The final layer will be the microfilled composite. Once the enamel shade of the composite is placed (Figure 10), it is light cured for 10 seconds. The

Figures 1-22.

final layer of composite (Figure 11) to be placed is Amelogen (Ultradent), a microfilled composite. Amelogen is a Bis-GMA composite with a particle size of 1.0 µm for polishability and wear. Enamel shade PF-A was used in this case. This final layer was light cured for 40 seconds. The inherent strength of the restoration comes from the microhybrid composite placed earlier. The final layer should be placed only on one side of the cavosurface, not touching the other margins; this will decrease the amount of cross marginal stress on the composite, which can lead to microcracks and leakage of the margins.[5]

When placing the composite layers, the goal is to place the composite in such a way as to emulate the anatomy of the tooth structure, so that a minimal amount of contouring is done with the handpiece.

When contouring with a handpiece, fine diamond burs (Brassler & Axis, Irving, TX, USA) are used for finishing the composite restoration (Figures 12 and 13), and fluted burs are contraindicated for the finishing of composites. Research has found that fluted burs produce microfracturers in composites, while fine diamond burs produce a smoother finish.[2] Once the contouring is accomplished, the rubber dam is removed and the occlusion checked (Figure 14). The patient's centric stops, made prior to replacing the restoration with no lateral interferences, are the goals. Adjustments are made accordingly until the patient's original occlusion is achieved.

Jiffy Polishing cups and points (Ultradent) are used from coarse to fine for polishing the restoration (Figures 15, 16 and 17). After each use of the polishing cup, the debris is rinsed off the tooth before the next polishing cup is used. The final step in polishing uses Jiffy Composite Polishing Brush (Ultradent), a silicon carbide particle brush (Figure 18). A fine polished surface should be achieved at this point (Figure 19).

A surface glazing is the final stage after polishing.[2] A layer of Ultra-Etch etchant (Ultradent) is placed on the margin of the restoration for 10 seconds (Figure 20). It is rinsed with a copious amount of water and air-dried. PermaSeal, an unfilled resin (Ultradent) added to the restoration using a microbrush for better control (Figure 21), is air thinned until there is no rippling and light cured for 40 seconds. The purpose for this step is to ensure a sealed margin that lasts longer and is less prone to staining over time. This step is not for a final polish (Figure 22).

CONCLUSIONS

By taking the time to learn to use composites properly, an anatomically and color correct restoration can be achieved. Placing composite restorations not only meets the patient's needs, but it also gives the practitioner an opportunity to use his or her artistic abilities. In order to accomplish this, the practitioner should utilize both the incremental technique and the stratified technique. With the incremental technique, one can achieve a predictable outcome, with control over shrinkage, enhance adaptation, depth of cure and control overcontouring of the restoration. With the stratified technique, the desired aesthetic outcome can be reached and the color built into the restoration with depth. Composites are a viable adjunct in our armentarium of restoring teeth. They can provide some fun for the dentist and produce a very rewarding outcome.

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