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Clinical Technique/Case Report

Utilization of Occlusal Index and Layering Technique in Class I Silorane-based Composite Restorations

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PURPOSE

This article describes a technique that uses an occlusal index to restore teeth back to their original contour and anatomy with minimal finishing. A new type of ring-opening silorane composite reported to have less than 1% volumetric shrinkage was used in the restoration. For the silorane-based composite, there is no oxygen-inhibited layer to be polished away. The final composite layer is cured under pressure and further minimizes voids and gap formation. The technique can also be used on multiple posterior restorations under rubber dam isolation. Overall, if used properly, this technique helps the clinician produce superb anatomy and reduces time for posterior composite restorations.

INTRODUCTION

Patients' demand for tooth-colored restorations has increased dramatically and dentists' utilization of posterior composite has been steadily on the rise. Careful case selection, improvement in materials and refinement of placement techniques have made it possible to produce superbly esthetic and long-lasting restorations. Yet, the techniques used by experts often require considerably longer time than is feasible in private practice situations.

In addition to the difficulty in obtaining proximal contacts, extensive finishing and polishing time has been cited as one of the obstacles.[1] Several authors have proposed methods to reduce finishing and polishing time. Recent techniques involve employing the bite-form or functionally generated occlusion.[2-3] Both proposed techniques require not using the rubber dam or its removal at a critical stage of the restoration process.

Other techniques that do not require removal of the rubber dam have been suggested. Thermoplastic resin, transparent impression materials and clear plastic wrap have been proposed as a custom matrix material to substitute bite-form or functionally generated occlusion.[4-6] Similar techniques have been proposed for Class III and V restorations.[7-8] The most promising technique utilized a clear custom occlusal matrix to place posterior composite restorations. This custom occlusal matrix technique significantly reduced placement and finishing time and improved surface smoothness of mesio-occlusal posterior composite restorations placed *in vitro*.[4-5] However, due to the time needed to prepare the matrix band prior to construction of the custom occlusal matrix, there was no significant difference in total mean time of the procedures with and without the custom matrix. This article describes a technique that uses

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an occlusal index to restore teeth back to their original contour and anatomy with minimal finishing.

DESCRIPTION OF MATERIALS AND TECHNIQUES

Silorane Composite

A new type of composite, based on silorane chemistry, Filtek P90 Silorane Low Shrink Posterior Restorative, was used with the adhesive Self-Etch Primer and Bond (3M ESPE, St Paul, MN, USA). The composite was chosen because of its reported ease of handling and non-stick qualities. It is also reported to have no slumping and the filling holds its shape, which lends itself well to the layering technique.

Occlusal Custom Matrix

A clear silicone bite registration impression material is used is this demonstration (Clear Oasis, Oasis Sands Dental Products Inc, Chicago, IL, USA). The material is designed to be used as a matrix for the fabrication of temporaries, in particular, multiple veneers. This transparent material, used in conjunction with a flowable material, makes temporization fast and highly esthetic. Other kinds of bite registration material may be used, as long as they are not too rigid and set within a reasonable amount of time.

The material is injected onto the occlusal surface of the tooth prior to operating on the tooth. Immediately after setting, the bite registration is trimmed to include at least one tooth posterior and anterior to the area of interest. Make sure that the trimmed area corresponds to the area exposed by rubber dam. One can easily finish the occlusal index procedure while waiting for the anesthesia to take effect. If a study model is available before treatment time, the same index can be produced on the study model. If one is to fabricate the index on a model, another material, Transil (Ivoclar Vivadent, Schaan, Liechtenstein), an addition reaction poly vinyl siloxane bite registration material, can also be used. Be aware that this material is not indicated for use intraorally, since it takes about 15 minutes to set.

The technique is demonstrated by restoring moderate size Class I occlusal caries on #19 (Figures 1-2). Cavity preparation followed conservative removal to gain access to underlying caries (Figures 4-7). The silorane composite material was inserted using the layering technique (Figures 8-11). After the last increment, the occlusal index was applied under digital pressure and light-curing was initiated (Figures 12-13).

After the layers, a characterization step can be completed for groves and fissures with the help of colored tint (Tetric Color, Ivoclar Vivadent) (Figure 14). This step is optional, especially with flat occlusal surfaces, since subsequent polishing can remove the tint. Moreover, additional steps require more time and may not be practical for modern practice.

Figure 1. *Pre-operative image of the occlusal caries on tooth #19.*

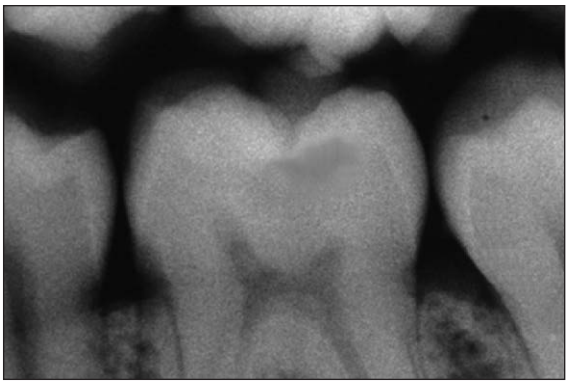

Figure 2. *Radiographic image of the extent of occlusal caries.*

Figure 3. *A clear silicone bite registration impression material is used.*

The major advantage of the index technique is the minimal finishing and polishing time. Gross discrepancy can best be removed by carbide finishing burs. However, if the index is placed properly, often times, one only needs to touch-up with abrasive impregnated points and brushes Astropol and Astrobrush (Ivoclar Vivadent) (Figure 15). Minimal occlusal adjustment is

Figure 4. *Conservative removal of occlusal fissure to gain access to underlying caries.*

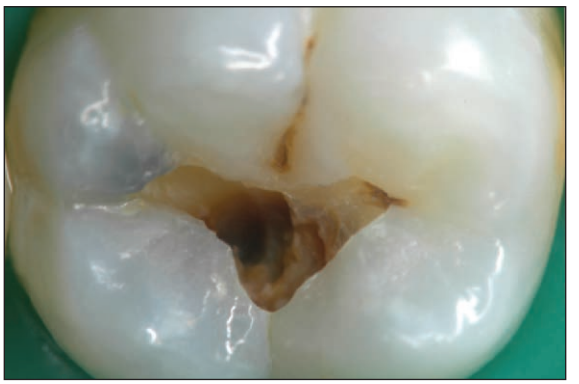

Figure 5. *Initial conservative outline to visualize the extent of caries.*

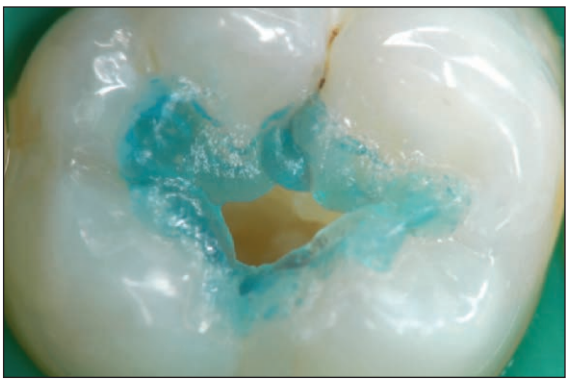

Figure 6. *Application of the Silorane System Adhesive Self-Etch Primer and Bond to ensure optimal bonding.*

Figure 7. *Final outline after caries removal. The cavity preparation has received the adhesive system and is ready to be restored.*

Figure 8. *First increment of silorane-based composite shaded A3.*

Figure 9. *Diagrammatic representation of the first increment minimizing connection between the buccal and lingual cusps.*

needed, thus greatly diminishing chair time (Figure 16).

VARIATIONS OF THE TECHNIQUE

TFE Tape Technique

If one is using colored bite registration material (Figure 18), which does not allow curing light to shine through, one can utilize a TFE tape (TFE Threaded Seal Tape, Oatey Cleveland, OH, USA) to act as a substitute. Before the final increment, slight excess is injected into the cavity. After molding with instruments to cover all cavosurface margins, a strip of TFE tape is stretched slight and placed over the occlusal surface, covering the tooth (Figure 19). TFE tape has been utilized in other dental situations, as in protecting adjacent teeth while etching and seating laminates. Use finger pressure to adapt the TFE on the buccal and lingual surface

Figure 10. *First increment of silorane-based composite shaded A2.*

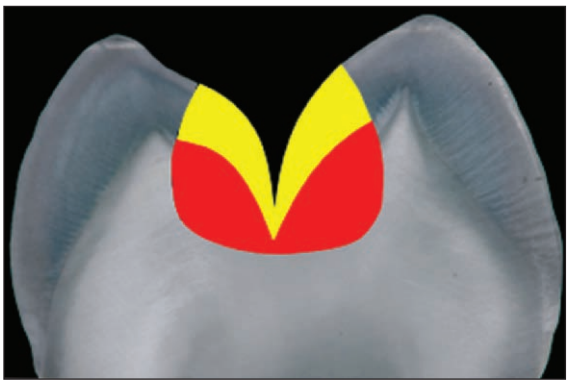

Figure 11. *Diagrammatic representation of the second increment before application of the occlusal index.*

Figure 12. *Application of the occlusal index under digital pressure.*

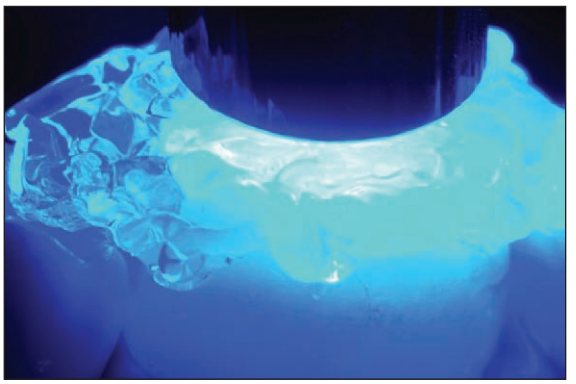

Figure 13. *Light-curing through the transparent occlusal index.*

Figure 14. *Optional step of fissure characterization with composite stains.*

Figure 15. *Polishing of the finished restoration with abrasive impregnated points and brushes.*

(Figure 20). Check to make sure there is no folding of the TFE, especially over the interproximal embrasure. The bite registration custom occlusal matrix is then gently pressed onto the occlusal surface. A rocking motion will assure complete seating of the matrix, which is visually verified by fit. The original anatomy and occlusion will be accurately created. One might maintain digital pressure on the bite registration while curing on the buccal aspect for 20 seconds. Pressure on the matrix and TFE ensures an occlusal anatomy that is minimally distorted. Again, minimal occlusal adjustment is needed (Figure 21).

The opacity of most bite registration materials will not allow for adequate curing of the composite. The occlusal matrix is removed after the transdental cure and the composite is additionally cured with the TFE in place. The TFE will allow the occlusal index to be removed without disturbing the anatomy. In addition,

Figure 16. *Completed restoration immediately after rubber dam removal. Minimal occlusal adjustment is needed to greatly diminishing chair time.*

Figure 17. *Pre-operative image of the occlusal caries on tooth #14.*

Figure 18. *Colored bite registration material.*

Figure 19. *Adaptation of TFE tape.*

Figure 20. *Application of the occlusal index on top of the TFE tape under digital pressure.*

Figure 21. *Completed restoration immediately after rubber dam removal.*

the TFE serves as a barrier for oxygen, so that the cured surface will not be oxygen-inhibited and further saves final polishing time.

Class II Restoration with Matrix Band Placement

The proper placement of proximal contact in a posterior Class II resin restoration is a major challenge.[9-10] With minor adaptation, this technique can be used even with a matrix band holder in place. One does not need to adjust the matrix band before placing the bite registration material. Instead, a notch is cut around the area of the retainer head. The bite registration custom occlusal matrix is gently pressed onto the band and lets the band cut through it. Because of the need to trim, flexible-like material performs better than more rigid material. Ring matrix systems are relatively unstable.

If one uses the sectional matrix and ring system, it is recommended that the proximal wall be built up first, and the sectional matrix and ring removed before applying the TFE and occlusal index. In extreme cases, one might be able to trim more from the occlusal index to avoid contacting the ring.

After anesthesia and rubber dam placement, the cavity is prepared as usual. When the Class II cavity is ready for restoration, a soft metal matrix band with a matrix band retainer (Omni-Matrix, Ultradent Products, Inc, South Jordan, UT, USA) is inserted and secured with a wedge. Alternatively, sectional matrix with ring designs can also be used. After the metal matrix band is adapted and burnished, the clinician can start the incremental insertion of composite materials. The first increment to be placed is the proximal wall up to the contact area. Take care to shape this increment to ensure a tight contact. The occlusal height of the first increment should be slightly shy of the occlusal cavosurface, so as not to interfere with the custom occlusal index.

Once you are satisfied with the proximal wall increment, you may remove the matrix band set-up at this time. The remaining cavity can be restored as a Class I configuration. Two-to-three increments of varying shades may be added, depending on the size of the cavity and the requirement for esthetics. Each incremental should be adequately cured.

POTENTIAL PROBLEMS

For the silorane-based composite, there is no oxygen-inhibited layer to be polished away. However, lack of an oxygen-inhibition layer of silorane composite with cationic polymerization raises the question of the bonding of incremental layers of the composite. Studies have shown that Silorane-dimethacrylate composite showed the lowest shear bond strength among the groups, which was increased significantly by use of phosphate-methacrylate-based intermediate resin.[11]

One potential problem with the TFE tape technique is folding of the TFE under the occlusal index, especially over the interproximal embrasure. This can be prevented by slightly stretching the tape over the occlusal surface and checking it visually before curing. It is anticipated that a learning curve will exist, especially when one plans to restore the interproximal surfaces. The technique also is not applicable in situations where a significant part of the tooth to be restored is broken down or missing.

CONCLUSIONS

The clear occlusal index allows placement of the final composite layer under pressure to reduce voids and gaps. Variations of the technique also allow placement of multiple restorations in a quadrant without reapplying the matrix band. The time required for the procedure is reduced. The chance of establishing anatomically correct occlusal contacts is improved.

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