

Thermo-Viscous Bulk-Fill Composite Resin Restorations

INTRODUCTION

Restorations in the posterior are usually performed because of tooth decay, tooth fractures, restoration damage, and filling replacement. They are probably one of the most performed procedures in restorative dentistry. Composite resin is the material of choice used in this direct approach because of the aesthetic results and longevity.¹

The incremental technique was largely used to execute posterior teeth restorations with regular composites. There are different approaches, such as horizontal layering, oblique layering, vertical layering, and stratified layering, among others.² Regardless of the technique used, the procedure can potentially lead to voids forming between the layers as the air can be trapped within it. Another handicap is the 2-mm maximum thickness.³ This makes the technique time-consuming for large cavities, impairing clinical productivity.

To overcome these disadvantages, the bulk-fill composite resin was created, which features a depth of cure of up to 4 mm. This made it possible to often perform fillings with just one layer, sav-



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ing time and avoiding possible flaws between layers. The use of a preheated bulk-fill material is an interesting alternative to restore posterior teeth. Its ease of use seems more suitable to conforming to an irregular tooth cavity. The viscosity of VisCalor bulk (VOCO) is reduced to a rate higher than 90% at 69°C.⁶ This decreases the extrusion force needed to dispense the composite during placement.⁵ According to Fróes-Salgado et al,⁷ the marginal adaptation of the preheated composite to the cavity margin is better than when not heated, and it is probably the reduced viscosity that leads to a superior adaptation, notably in angled areas. The same authors affirm that although the temperature of the composite is not so high during its adaptation to the walls, it is sufficient to allow better wetting, promoting better conformity to the whole cavity.⁷

DISCUSSION

Even though the composite resin can be warmed, the rise of temperature must be limited. Beyond this limit (close to 90°C), reactive, low-molecular-weight components can be volatilized, impairing the polymerization kinetic.⁸ The Caps Warmer (VOCO) used in these clinical cases works at the maximum temperature of 68°C—far from the temperature limit mentioned above. Another concern regarding the use of warmed composite is pulpal safety. The temperature (68°C) used for preheating the composite was close to 40°C above the room's temperature, which heightens clinicians' worries about the safety of the procedure. After all, a 5.5°C intrapulpal temperature increase could induce pulp necrosis.⁹ Despite warming, the temperature rise inside the pulp chamber seems to be quite minute compared to the figure derivatives of photoactivation.⁹ After removal from the Caps Warmer and placement within the Caps Dispenser (VOCO), the temperature drops quite quickly, but there is still a sufficient working time of 20 seconds. In these 20 seconds, the temperature decreases by approximately 5°C only⁵ and is still providing the desired flowable consistency. It takes very little time to position the capsule

The use of a thermo-viscous bulk-fill composite resin can be a good option to perform posterior teeth restorations.

ing time and avoiding possible flaws between layers.

Although, theoretically, the procedure is quite simple, a high-volume insertion of a viscous composite in just one step is likely to produce voids at the bottom of the cavity between the incremental technique layers when there are irregularities and angles within it. Stickiness and high viscosity are responsible for the difficulty in adapting the material to the tooth surface.⁴ Therefore, an alternative technique has been developed that consists of using an on-demand flowable composite to fill the bottom of the cavity. The low viscosity is more suitable for filling an irregular cavity due to its better wettability, but the poor physical properties of flowable composites require coverage with a packable composite to resist occlusal challenges.

It is well-known that the viscosity of a composite resin can be modified by warming it.⁴ The rise in temperature lowers the com-

continued on page 64

Thermo-Viscous Bulk-Fill...

continued from page 62

point inside the cavity and perform the extrusion, during which the temperature will drop even more, alleviating any concerns regarding pulpal health. Also, the dentin works as a temperature isolator, and we need to be aware of that fact when facing a very thin dentin thickness.

Preheating composite resin induces a greater mobility of the monomers' molecules, increasing reactivity during photoactivation.⁸ Therefore, one could expect a higher degree of conversion when using a warmed composite resin to restore a tooth. Nevertheless, a significant increase in the degree of conversion is unlikely to occur when performing a patient tooth restoration. It takes time to insert the material; properly accommodate it inside the cavity; and, after all that, sculpt the tooth anatomy. The temperature of the filling material will be equal to that of the tooth surface, which does not promote any positive influence on the degree of conversion.

CASE REPORTS

Case 1

A 40-year-old man presented with 2 lower premolars with unsatisfactory conditions and in need of replacement (Figure 1). The restorations were removed, and the cavities were cleaned. After the rubber dam was placed, the enamel of the second pre-

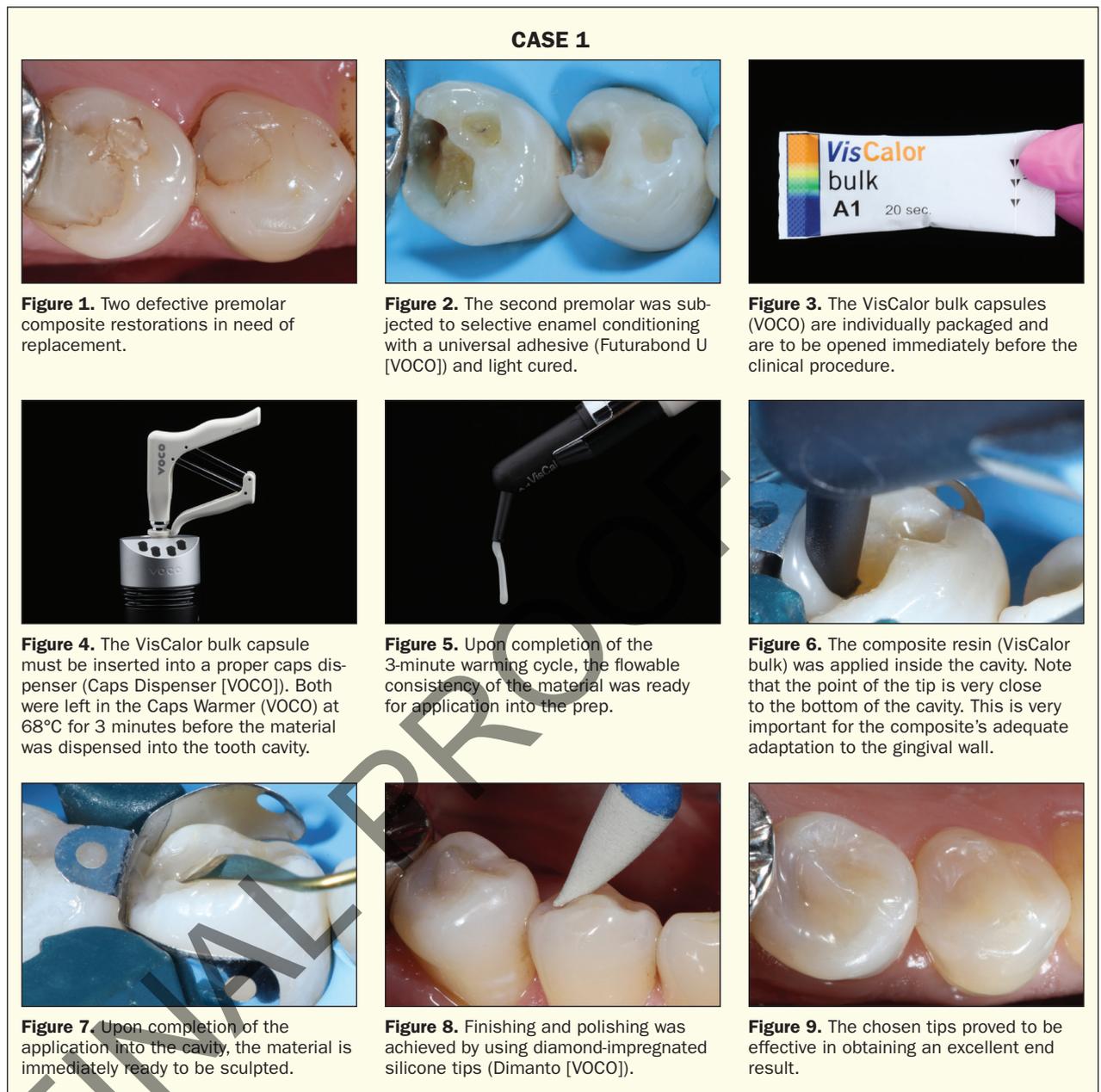


Figure 1. Two defective premolar composite restorations in need of replacement.

Figure 2. The second premolar was subjected to selective enamel conditioning with a universal adhesive (Futurabond U [VOCO]) and light cured.

Figure 3. The VisCalor bulk capsules (VOCO) are individually packaged and are to be opened immediately before the clinical procedure.

Figure 4. The VisCalor bulk capsule must be inserted into a proper caps dispenser (Caps Dispenser [VOCO]). Both were left in the Caps Warmer (VOCO) at 68°C for 3 minutes before the material was dispensed into the tooth cavity.

Figure 5. Upon completion of the 3-minute warming cycle, the flowable consistency of the material was ready for application into the prep.

Figure 6. The composite resin (VisCalor bulk) was applied inside the cavity. Note that the point of the tip is very close to the bottom of the cavity. This is very important for the composite's adequate adaptation to the gingival wall.

Figure 7. Upon completion of the application into the cavity, the material is immediately ready to be sculpted.

Figure 8. Finishing and polishing was achieved by using diamond-impregnated silicone tips (Dimanto [VOCO]).

Figure 9. The chosen tips proved to be effective in obtaining an excellent end result.

...there was not a bulk-fill material designed to be warmed until now.

molar was conditioned with 37% phosphoric acid for 30 seconds. The area was rinsed to remove the acid and dried. The adhesive (Futurabond U [VOCO]) was applied actively over the conditioned enamel and dentin for 20 seconds. With a gentle burst of air, the solvents were evaporated and light cured for 10 seconds. The tooth was then ready to be restored (Figure 2). VisCalor bulk in shade A1 was selected (Figure 3). The Caps Warmer was set at the highest temperature (68°C), and after 20 minutes,

the composite capsule was placed into the Caps Dispenser and inserted in the Caps Warmer for 3 minutes (Figure 4). Warming the composite provided the material with a flowable consistency (Figure 5). The pre-loaded dispenser was ready for direct composite placement into the tooth cavity (Figure 6). It is important to start the material insertion from the bottom. Following the manufacturer's recommendation, there is an application time of 20 seconds after removing the capsule from the

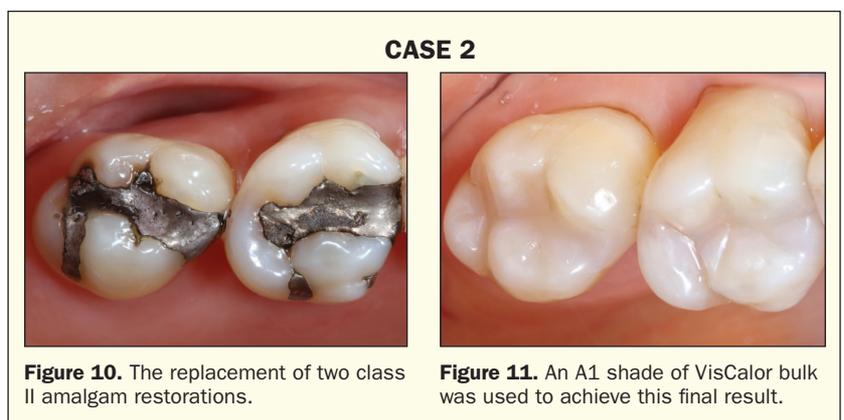


Figure 10. The replacement of two class II amalgam restorations.

Figure 11. An A1 shade of VisCalor bulk was used to achieve this final result.

warmer, and this must be followed to ensure that there is ideal flowability. The material was immediately ready to sculpt upon filling the prep (Figure 7). Upon completion of carving the anatomy of the tooth, the restorative was light cured for 20 seconds, posi-

tioning the curing light tip directly over the cavity's top. The finishing and polishing were performed with diamond-impregnated silicone tips (Dimanto [VOCO]) (Figure 8). These tips proved to be effective in obtaining an excellent end result (Figure 9).

CASE 3



Figure 12. The old amalgams were removed from both posterior teeth while preserving the molar's marginal crest that had a tunnel preparation in the first molar. VisCalor bulk was the chosen material to alleviate any depth-of-cure concerns.



Figure 13. First, the composite was used to seal the proximal wall of the tunnel; then the material was filled to the proximal level of the pulpal wall and light cured.



Figure 14. The material capsule was warmed again for 3 minutes, and the cavity was then fully filled.



Figure 15. The final result after finishing and polishing with diamond-impregnated silicone polishing tips (Dimanto).

The material capsule was warmed for another 3 minutes to complete the filling of the cavity (Figure 14). After finishing and polishing, the patient was happy with the final result (Figure 15).

CONCLUSION

The use of a thermo-viscous bulk-fill composite resin can be a good option to perform posterior teeth restorations. The warmed capsules used with a dispenser facilitate material insertion into the cavity.♦

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...we present clinical cases in which this new material class is used....

Case 2

A 65-year-old woman presented with upper molar amalgam restorations to be replaced (Figure 10). After removing the old fillings, it was decided to use VisCalor bulk shade A1 as the composite resin as in the first clinical case. The immediate result can be seen in (Figure 11).

Case 3

A 39-year-old woman presented with 2 posterior amalgam fillings. The old amalgam was removed while preserving the molar's marginal crest that had a tunnel preparation (Figure 12). VisCalor bulk is an excellent choice when there are polymerization concerns. This material is designed to be light cured where light activation can be challenging. After placing a Mylar matrix strip, the composite in shade A1 was inserted until the pulpal wall was level and light-cured (Figure 13).