Advancements in Monomer Technology Take on Stress

Today, we discuss the adverse effects of shrinkage stress during restorations, and how the advancements in bulk fill flowable composites have been proven to reduce polymerization shrinkage.

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Bulk Fill Flowable Tip

Avoid the instinct to use an instrument to manipulate SureFil® SDR® flow after placement. Wait a few seconds and the material will self-level and adapt on its own, minimizing the chance of incorporating voids into the material.
Being first is a good thing!

By Jason H. Goodchild, DMD

Shrinkage of flowable composites can compromise the success of the restoration and contribute to a poor marginal seal, microleakage, deformation of the tooth, microfracture, and recurrent caries. 1 A flowable resin is placed into a confined space, and then shrinks during polymerization. Stress will develop. Several factors have been identified influencing the shrinkage stress of a restoration: the size and geometry of the restoration, materials used, and the curing protocol. 2

Recent advances in monomer technology has ushered in a new category of bulk fill flowable composites that are designed to address material shortcomings of earlier products. The new category of bulk fill flowable composites promote the effective use of four millimeter increments, while decreasing shrinkage stresses generated during polymerization. 3

In 2006, DENTSPLY Caulk introduced the first bulk fill flowable resin, SureFill® SDR® flow with excellent cavity adaptation and self-leveling handling.

The organic resin matrix of SureFill® SDR® flow comprises a particle-registered andate oligomeric matrix with incorporated photocurable groups able to control polymerization kinetics. From DENTSPLY’s website, “through the use of the Polymerization Modulator”, the resin forms a more relaxed network and provides significantly lower polymerization stress. 4 In a 2012 Clinicians Report from Dr. Gordon Chirilusman, SureFill® SDR® flow was shown to have the lowest polymerization stress among the bulk fill flowable resins tested. 5

C-Factor (Configuration Factor) is an estimation of the stresses generated through a given cavity configuration by a ratio of bonded to unbounded surfaces. According to Feilzer et al (the higher the C-Factor (i.e., the higher the number of bonded surfaces) the higher the stress generated (ex. Class I and II). Conversely a cavity with a higher ratio of unbounded surfaces should result in lower shrinkage stress (ex. Class III and IV). 6 Two recent studies have also suggested that cavity depth and diameter may impact shrinkage stress and resulting microleakage. 7,8

Examining the effect of bulk filling high C-Factor cavities with a low shrinkage flowable composite (SureFill® SDR® flow), Van Enke and colleagues showed that four millimeter increments placed in high C-Factor preparations (mesial Class I and II preparations) did not compromise bond strength secondary to shrinkage stress. 9,10 The authors concluded that bulk fill techniques are doomed for restoration of high C-Factor cavities the dentist should consider low stress materials to avoid debonding and microleakage. These conclusions appear to agree with the conclusions of previous studies showing that bulk fill low-shrinkage flowable resin can be used in an open sand technique without a negative impact on marginal integrity. 11

In another study, cuspal deflection and tooth deformation in Class II preparations was examined. 12 The authors compared a conventional resin-based composite with SureFill® SDR® flow low-stress bulk fill flowable composite. After restoration, cuspal deflection was measured and found to be reduced by greater than 50% when SureFill® SDR® flow used. The authors suggest that bulk filling to within 2mm of the occlusal cusp tips can reduce operator time because of reduced incremental layers without additional shrinkage stress or loss of marginal quality. For the final 2mm occlusal layer, take advantage of simple shading, proven durability, and easy handling with TPH Spectra " Universal Composite.

To learn more about how SureFill® SDR® flow can increase the chairside efficiency and effectiveness of your posterior composite restorations, visit www.SureFillSDRflow.com or call 1-800-L-D-Caulk today.

References

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