

Latest Innovations With Flowable Composites

By Dr. Michael Miller

Light-cured flowable composites were introduced to the dental profession in 1995 with Revolution. The original manufacturer (E & D Dental Products) recommended that it could be used for Class III, IV, and V restorations, porcelain veneer cementation, porcelain and marginal defect repairs, sealants, and core buildups. Amazingly, one of the most popular contemporary uses of flowable composites, namely as the first increment at the bottom of the proximal box of a Class II preparation, was not even mentioned as an indication for Revolution.

While Revolution was (and still is) basically a modified resin cement, the new flowables have branched into three new directions: low stress, self-adhesive, and high strength/low wear.

Low Stress

Conventional flowable composites have comparatively higher shrinkage than sculptable composites probably due to flowables having a lower filler load and a higher resin percentage. Since it is the resin that shrinks, it is quite logical to assume that flowables will shrink more, causing increased stresses on the developing bond. However, the resin in the new low stress flowables has presumably been modified to minimize this stress even though the material is still shrinking more than sculptable composites.

The big advantage with low stress flowables is that they can be placed in relatively thick layers (about 4mm), which can speed up the procedure, a goal that most of us want anyway. But shrinkage stress is only one part of the equation. If you place any composite in thicknesses greater than 2mm, the ability to cure it thoroughly comes into question.

So what do we really know about these products? The REALITY Research Lab (RRL) has studied the depth of cure of two recently introduced products, Venus Bulk Fill (Heraeus) and SureFil SDR flow (Dentsply Caulk). The results found that both products can exceed the 80% cure goal comparing the surface hardness to that at the bottom of the proximal box even if the thickness is 4mm, but to achieve this cure goal, you have to cure for 40 seconds, not the 20 seconds recommended by their manufacturers.

But what about the lower curing stress claim? The RRL found that both Venus Bulk Fill and SureFil SDR flow had significantly less shrinkage stress compared to a conventional flowable (Filtek Supreme Plus Flowable, 3M ESPE). And this shrinkage stress was statistically the same as that of a glass ionomer base (Fuji IX GP Extra, GC).

The unanswered question, of course, is what does this lower shrinkage stress mean when it comes to tooth integrity and restoration stability over time. A lab study cannot give us that answer, but at least we have some peace of mind that we are not putting undue stresses on a tooth since glass ionomers like Fuji IX have been used successfully for many years.

Nevertheless, if you fill a proximal box with 4mm of flowable, there is a good likelihood that this flowable increment will be occlusal enough to form all or part of the contact area. However, it is still questionable whether any flowable, low stress or not, is wear-resistant enough to use it to restore contacts. Therefore, I still believe it would be prudent to continue restoring contacts with a more heavily filled, sculptable composite.

Self-Adhesive

When it comes to resin-based materials, cements were the first to wear the self-adhesive label. So it's not surprising that flowables followed on their footsteps, since in many respects, cements and flowables can be used interchangeably. Just as with the low stress category, two products, Vertise Flow (Kerr) and Fusio (Pentron), kick-started the self-adhesive trend.

From a clinical standpoint, a self-adhesive flowable has great appeal since it eliminates the need for a bonding agent. But while the application procedure is not difficult, it is quite specific. This means you can't just syringe these materials into preparations like you would with a conventional flowable. With Vertise Flow, for example, you inject the first increment in a thin layer (less than 0.5mm) after cleaning and drying the tooth. The thin layer is necessary since it is acting, in effect, as a self-etching adhesive. This first layer is then agitated aggressively using the disposable brushes that come with the kit. After this first increment, you can add another layer to finish restoring a small Class I or, in the case of a larger preparation, you should then switch to a more conventional composite.

To complicate matters, the technique with Fusio has important differences. Instead of leaving the preparation dry after cleaning, Fusio bonds better to a glistening wet tooth surface. And a rubbing technique for the initial layer is used instead of the agitation method for Vertise Flow. These technique variances point out that the application protocol for these products are material-specific, which means that there is a learning curve if you switch from one product to another.

Other differences between products in this category are their indications. Fusio is being called "liquid dentin", which would seem to mean it should only be used as a base or liner, but in fact, it is being recommended for definitive small Class I, Class III, and Class V restorations.

On the other hand, Kerr is taking a more conservative stance with Vertise Flow by restricting its indications at this time to small Class I restorations, pit and fissure sealants and liners/bases under larger restorations. In other words, using it for other types of definitive restorations such as Class V or core buildups is not yet part of its bag of tricks.

So can you achieve as good a level of adhesion to tooth structure with these new products as you can if a bonding agent were used in combination with a more conventional flowable? The simple answer is not according to tests performed in the RRL, where the bond strengths, especially immediately after light curing, were substantially lower with the self-adhesive products compared to the more conventional approach. Interestingly, with Vertise Flow in particular, bond strengths to feldspathic porcelain, zirconia (Lava), and three different types of metal were quite high especially after 24 hours.

However, simple answers may not always be correct. For example, RRL bond strength tests of self-adhesive resin cements are significantly lower than when a more conventional bonding agent/cement combo is utilized. On the other hand, anecdotal reports show these cements don't seem to be suffering mass debondings. Therefore, the jury is still out on the bond stability of these self-adhesive flowables.

High Strength/Low Wear

Notwithstanding the comments I made about low stress flowables having questionable wear resistance for restoring contact areas, the last new trend with flowables is the claim that some of them are actually strong and wear resistant enough to be used for the entire restoration regardless of the classification. This means these specialized flowables can presumably be used to restore even Class II and IV lesions

and/or fractures. Indeed, G-aenial Universal Flo (GC) is being tagged as the “first injectable flowable” that “can also be used as a restorative”.

But GC is not alone in claiming its flowable is as strong and wear resistant as sculptable, more heavily filled composites. Voco is promoting Grandio Flow as the “first flowable composite that is strong as universal composites” and Shofu is bringing to the market Beautifil Flow Plus, which is stated to be “a flowable for complete anterior and posterior restorations”.

Is this a positive trend? Well, on the surface, this seems to be an attractive option since squirting a flowable into a cavity preparation is a fairly easy task compared to having to pack a thicker composite, especially in areas such as a proximal box. But, as noted in my comments on the low stress flowables, depth of cure can rear its ugly head as evidenced by GC recommending G-aenial Universal Flo be layered in increments of only 1.0-1.5mm depending on the shade. These are wise instructions, verified by tests in the RRL, although the 10 second curing time with a high powered LED curing light is not adequate according to the RRL tests. If you use this product, I strongly recommend curing each increment for at least 20 seconds or even 40 seconds for the first increment deep in the proximal box.

However, if the depth of cure conundrum can be solved, can you feel confident that one of these “strong” flowables will be adequate for totally restoring virtually any lesion? My gut feeling is no at this point. These products will probably perform adequately in primary teeth and minimally invasive preparations, but I would urge caution placing them as the sole restorative material in moderate to large Class I and II restorations.

The Bottom Line

Flowable composites used to be merely low viscosity versions of their sculptable brethren, but this legacy is changing fast. This article is intended to give you a peek into the new flowables before you jump in head first.