Overcoming the myths of bulk fill composite materials

Bulk fill composite materials were introduced for restorations more than a decade ago; however, many dentists were reluctant to try them due to the limitations and performance of earlier bulk filling materials.

**MYTH 1**
Bulk fill materials are not aesthetic enough (too translucent).

In the past, bulk fill materials needed a relatively high amount of translucency (low opacity) in order to fully cure in a 4-5 mm increment. The concept is quite simple – if the composite needs to cure all the way through 4.5 mm of material, then it needs to allow the light to penetrate to a greater degree.

In the decade or so since the introduction of the first bulk fill composites, the field of materials science has explored Reaction and development efforts in the past 5-10 years have yielded bulk fill composites that no longer require a choice between fast and effective cure and esthetics. 3M designed Filtek One Bulk Fill Restorative with unique optical properties and improved opacity to provide the simplicity of one-step placement up to 5 mm, without compromising esthetic results.

**MYTH 2**
It is necessary to layer bulk fill materials in order to minimize stress and shrinkage.

Stress is the amount of force exerted on a tooth due to polymerization shrinkage as it cures. This stress can break the adhesive bond, crack enamel and allow leakage at the margins. The amount of stress is determined by the shrinkage of the material and its stiffness.

3M Filtek™ One Bulk Fill Restorative excels as less or equivalent stress on a tooth than some common incrementally placed universal composites, because it uses two new resin components to reduce polymerization stress.

One resin component is an addition-fragmentation monomer (AFM). During polymerization, the central group can fragment to relieve stress and the fragments can then polymerize in a lower stress state.

The other resin component is aromatic urethane dimethacrylate (AUDMA). Because this is a larger monomer than found in traditional dimethacrylates, it limits the number of shrinkage zones. This helps reduce the amount of shrinkage and stress that occurs during polymerization.

Since the introduction of bulk fill materials, a significant amount of technology has been dedicated to addressing shrinkage stress, but depth of cure issues persisted for some time. “Significant advances in materials science and chemistry in the past decade enable more translucent composites that allow curing light to penetrate to a depth of 5 mm with low shrinkage stress.”

3M Filtek™ One Bulk Fill Restorative is designed for the posterior so dentists don’t need to sacrifice wear resistance, strength and handling. It also has opacity equivalent to many typical universal composites materials used today, so dentists don’t need to sacrifice esthetics while working quickly and efficiently.

Unfortunately, despite the great advances made over the last few years, myths about bulk fill materials continue to persist. Let’s take a closer look at the science of Filtek One Bulk Fill Restorative – and break down the myths of bulk fill.

**MYTH 3**
A bulk fill placed in a 5 mm increment won’t achieve the proper depth of cure.

Methacrylate-based dental composites have the ability to achieve a very high depth of cure, but this has often come at the price of lowered opacity/esthetics (see myth 1) in order to achieve a high depth of cure while maintaining a tooth-like opacity. We must look at the interaction of light between the filler particles and the matrix.

If the optical properties (refractive index) of the filler and matrix do not match closely, light is scattered within the composite resulting in higher opacity. This will limit the depth of penetration of the curing light to effectively enable bulk curing. If the optical properties match closely, light penetrates more effectively without the scattering resulting in more translucency. This will allow for greater penetration of the curing light and allow for bulk curing. Traditionally, this resulted in more translucent restorations.

By manipulating the base chemistry that controls this behavior, we can control the active material out of its newly designed unit dose capsule, create the necessary conditions for their curing. This means the viscosity of the material temporarily decreases and the material flows into the cavity prep, resulting in excellent adaptation, as well as fewer defects (voids).

In an in-vitro simulated operatory test with 79 dental restorations placed with Filtek One Bulk Fill Restorative in a 5 mm depth class II cavities had fewer defects compared to restorations made using incrementally placed composites.

**MYTH 4**
It’s necessary to layer filling materials in order to achieve proper adaptation and eliminate voids.

For many decades, the incremental placement of composite has been the prevailing technique in part because this was thought to minimize the potential for introducing voids. However, studies have shown that the opposite is true when compared to using an effective bulk fill composite.

Extruding 3M™ Filtek™ One Bulk Fill Restorative eliminates the science described above to achieve a uniform cure even at the bottom of 5 mm cavity, without sacrificing esthetics.

“We have data and peer-reviewed literature that indicate 3M bulk fill materials work as intended,” says Senior Technical Service Engineer Joe Edgington. “Bulk fills have been around for 10 years and many concerns and challenges have been worked out thanks to advances in materials science and chemistry.”

With fewer defects, fewer voids, less chance of contamination, and less time than universal composites, dentists can make quality restorations with 3M’s bulk fill composites,” adds Dunbar.

For more information, contact your 3M Oral Care sales representative.