

Flowable Composites

Flowable composites can be characterized as lower viscosity versions of the respective company's standard composites. The increased quantity of resin results in higher shrinkage and a lower modulus of elasticity. After years of monotonic propaganda concerning filler levels and volumetric shrinkage, many believed that flowable composites would demonstrate high wear rates and cause increased gap formation.

Wear rates

Generalized wear: there is no scientific reason to expect higher generalized wear, which is primarily dependent on filler particle size and the conversion rate of the monomer matrix.

Contact point wear: scientifically, the vast majority of composite resins contain too much filler for optimal wear. Optimal two body wear properties of composites are generally achieved with a volumetric filler fraction of 50%. Flowable composites should perform as well as, or slightly better, than their higher viscosity brothers. (Htang A, et.al. Dent Mat 1995;7-13)

Shrinkage

Shrinkage per se does not break bonds, the force produced by the shrinkage is the real problem. A classic study showed clearly that increased shrinkage stress (i.e. force) is much more dependent on elasticity modulus than shrinkage.

- Condon JR and Ferracane JL. Assessing the effect of composite formulation on polymerization stress. JADA 2000;131:497-503

A low elasticity modulus has advantages in relation to gaps and shrinkage, but is a negative factor in relation to flexure. Under occlusal load, the tooth/restoration complex deforms more. Marginal fractures are the result, which can then stain. In a clinical study, Class 2 restorations were restored with either a flowable composite or the standard high viscosity composite (same adhesive). At six months, the only difference was less post-operative sensitivity with the flowable. At two years, there were no significant differences between the groups.

- Waldo B, et.al. Clinical Evaluation of Highly Filled and Flowable Composite Resins. J Dent Res 2009; Abstr.3242 and 2010; Abstr.450

Indications

Although flowable composites have been recommended for everything, they should not be used where high occlusal stress is expected (Class 1 and 2 occlusal margins, Class 4 restorations), where more rapid and severe marginal breakdown will occur.

In addition to the obvious indications such as fissure sealing, small Class 3, and Class 5 restorations, using them as "liners" or "filled adhesives" is by far the most popular.

- Unterbrink G, Liebenberg W. The use of a flowable composite as a „filled adhesive“, literature review and clinical recommendations. Quintessence International 1999;30:249-57

Interesting also is that within eight years from the first publication, 87% of practicing dentists in the USA were using this technique for their direct composites. (Survey CRA 2007)

Clinical studies to date have not demonstrated any significant improvements with the use of a flowable liner, nor have disadvantages been reported for these studies of relatively short duration (maximum 2 years).

- Loguercio AD, et.al. *Clinical Oral Investigations* 2005;9:18-20
- Lindberg A, et.al. *Oral Investigations* 2005;9:77-83
- Efes BF, et.al. *J Adhesive Dentistry* 2006;8:119-26
- Celik C, et.al. *Operative Dentistry* 2007;32:313-21

A large number of studies with flowable composite as a liner show a general improvement of the bond to dentin or less microleakage. Perhaps more importantly, it should be noted that almost no investigations have demonstrated any negative effects.

- Olmez A, Oztas N, Bodur H. The effect of flowable resin composite on microleakage and internal voids in class II composite restorations. *Oper Dent*. 2004;29(6):713-9.
- Tung FF, Hsieh WW, Estafan D. In vitro microleakage study of a condensable and flowable composite resin. *Gen Dent* 2000;48(6):711-5
- Fabianelli A, Goracci C, Ferrari M. Sealing ability of packable resin composites in Class II restorations. *J Adhes Dent* 2003;5(3):217-23
- Belli S, Inokoshi S, Ozer F, Pereira PN, Ogata M, Tagami J. The effect of additional enamel etching and a flowable composite to the interfacial integrity of Class II adhesive composite restorations. *Oper Dent* 2001;26:70-5
- He Z, et.al. The effect of cavity size and filling method on the bonding to Class I cavities. *J Adhes Dent* 2008;10:447-3

I also use flowable composites as a light curing cement for veneers or thin crowns, and also to make corrections or additions to temporary restorations.

Application technique

Basically, I try to apply the flowable composite in a thin layer to dentin only. Naturally it sometimes covers the gingival margin of proximal boxes. Using the flowable composite at the gingival margin of Class 2 restorations improved adaptation but led to an increase in overhangs (depends on matrix technique).

- Frankenberger R, et.al. *Clinical Oral Investigations* 1999;3:208-15

When used at the gingival margin, the flowable composite should be cured before applying a normal viscosity material.

- Yazici AR, Baseren M, Dayangac B. The effect of flowable resin composite on the microleakage in Class V cavities. *Oper Dent* 2003;28:42-6

Although I am not a proponent of immediate dentin sealing because of complications with the impression and temporary, using a flowable liner (with adhesive) to seal the dentin prior to taking impressions for inlays significantly improves the internal adaptation.

- Iida K, Inokoshi S, Kurosaki N. Interfacial gaps following ceramic inlay cementation vs direct composites. *Oper Dent* 2003;28(4):445-52
- Jayasooriva PR, et.al. The effect of a "resin coating" on the interfacial adaptation of composite inlays. *Oper Dent* 2003;28:28-35

If the flowable is applied in a thin layer, it can be cured together with the adhesive. The adhesive should however be cured first if a thicker layer (of any composite) is applied.

“Bulk-fill flowables”

Many companies will be introducing materials for this application technique. We did investigations many years ago, but never published the results. A thick first flowable layer was better than a thick first layer of normal viscosity composite. However, a thin flowable layer (polymerized) followed by the normal composite was best.

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