What's the Right Bonding System for You?

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It's generally agreed that adhesive dentistry began in 1955, when Dr. Michael Buonocore's pioneering research first documented that the acid-etching of enamel could provide a suitable surface for bonding with resins. Fast forward 67 years to 2022, and you can now choose from at least six different types of bonding systems that are commonly used for enamel and dentin restorations:

1. **3-step etch-and-rinse systems** (sometimes referred to as "4th Generation" bonding systems) that use an etchant, a primer and an adhesive
2. **2-step etch-and-rinse systems** (sometimes referred to as "5th Generation" bonding systems) that use an etchant and a primer/adhesive combination
3. **2-step self-etch systems** (sometimes referred to as "6th Generation" bonding systems) that use an acidic primer and an adhesive
4. **1-step self-etch systems** (sometimes referred to as "7th Generation" bonding systems) that use a no-mix acidic primer/adhesive combination for direct restorations
5. **1-step universal self-etch systems** (sometimes referred to as "8th Generation" bonding systems) that (a) use a no-mix acid/primer/adhesive combination for direct and indirect restorations, and (b) can be used in conjunction with a total-etch step, a self-etch step, or a selective-etch step involving only the enamel.

So what's the right bonding system for you?

Newer isn't Necessarily Better

As you might imagine, the potential advantages of the newer 1-step bonding systems include being simpler, faster, more forgiving and less technique-sensitive than 2- or 3-step systems that require a technique with more steps. In addition, tooth sensitivity can be a bigger issue with the 3-step systems because of the need to rinse the acidic etchant following the etching step. Drying the tooth following the rinsing can also be a bit tricky, sometimes. If the tooth is too dry, the collagen fibers that help hold the resin to the tooth can collapse; if the tooth is too wet, the resin can become diluted and won't penetrate as well as it should. In either case, the bond could be significantly weaker than with a self-etch system.

With that being said, many dentists choose to use whatever 2- or 3-step etch-and-rinse bonding system they were taught in dental school, even if they graduated 30 or more years ago. And *there's absolutely nothing wrong with that.* True, the main challenges with these systems stem from the fact that the more steps and bottles you have to manage, the more potential there is for human error. However, the bulk of these errors can perhaps be attributed to improper application and rinsing of the etchant, which could lead to tooth sensitivity.

Case in point: If the practitioner's technique is sound, there's every reason to expect excellent outcomes.

Reducing Steps Does NOT Eliminate the Risk of Error

It needs to be pointed out that the relative simplicity of 1- or 2-step self-etch systems doesn't rule out the possibility of human error. If the materials associated with those systems are applied using an insufficient amount or too few coatings, the material won't penetrate adequately, and the bond will suffer. Because the material is acidic, it begins to neutralize the instant it touches the tooth and its ability to work effectively starts to dissipate. The only way to get adequate coverage and penetration of the tooth is to repeatedly apply multiple coats. It's important to follow each self-etch system's directions closely; most recommend spending 10-to-20 seconds applying multiple costs of the materials to the tooth for optimal results.

Another important technique-related consideration is evaporating off the volatile solvents after the primer or the primer/adhesive combination (depending on the type of bonding system) has been applied. The most common carrier agents for the primer are ethanol, acetone and water. While these carrier agents need to be present for the resin to be able to penetrate the tooth, they must eventually be removed by blowing a gentle stream of air using an air/water syringe or a dedicated air dryer. The solvents will typically evaporate more quickly than the water. However, if you don't apply the air for an adequate amount of time, some water and even some solvents can be left behind, compromising the strength and longevity of the material.

Generation Jargon

For all of these reasons, I prefer not to refer to bonding systems by their "generation." I feel this terminology could imply that a later generation is better than a prior generation, simply due it being newer. In truth, the efficacy of any bonding system is in large part determined by both the technique employed and the skill exhibited in employing that technique. A bonding system that employs a single step but is supported by an incorrect or poorly applied technique will almost certainly yield inferior results to a 2- or 3-step system supported by an impeccable technique. Thus, the "best" bonding system is whatever system can be most effectively used by a given practitioner to achieve the best results for their patients.

What's the Right Resin?

The bonding systems discussed above should work with any light-cured resin for direct restorations. When using universal systems for techniques that require dual-curing for indirect restorations, however, it's a good idea to only use dual-cure resins made by the manufacturer of whatever universal system you're using due to possible incompatibility issues. For example, if you're using DMG's Ecosite Bond 1-step universal self-etch system for an indirect restoration, you should use DMG's PermaCem Dual as your dual-cure cement.

Conclusion

Simply put, there are benefits to each type of bonding system, depending on your perspective or preference. 1-step self-etch universal system offers a versatile, simplified system for any type of application I might require for both direct and indirect restorations. But, if you prefer a technique you've been comfortable with for years and don't mind taking an extra step or two, there's certainly no need to change your approach.

DMG offers clinicians a choice of bonding systems that includes a 1-bottle universal adhesive system (Ecosite Bond) that pairs perfectly with their bulk-fill composite (Ecosite Bulk Fill), and a 3-bottle dual-curing adhesive system (LuxaBond Total Etch) that is ideal for use with the manufacturer's award-winning core material (LuxaCore Z Dual).

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