Ask the Experts

DENTIN BONDING

Associate Editor
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QUESTION: I am confused by the various "generations" and product alternatives for dentin bonding. Can you help me sort this out?

ANSWER: Although some authors, speakers, and companies continue to use a "generations" scheme to classify resin-based dentin adhesives, I find that this is not particularly helpful for most clinicians. It makes more sense to group the various products into sets of current options.

In considering these current options, there are two major approaches—total-etch (or etch and rinse) and self-etch. For each of the two major approaches, a more traditional and a somewhat simplified option can be identified, resulting in four distinct approaches to dentin bonding.

The total-etch approach became popular in the early 1990s with the introduction of the three-step systems. Resin-dentin adhesion requires three processes: acid-etching, priming, and placement of a hydrophobic resin bonding agent. As their name implies, the three-step systems (including products such as All-Bond 2, Bisco Inc., Schaumburg, IL, USA; and Scotchbond Multi-Purpose, 3M ESPE, St. Paul, MN, USA) involve sequential application of three separate agents. These systems perform well in laboratory testing and have a proven clinical track record. Although most clinicians probably do not know this, many experts in the field still consider these materials the "gold standard" for adhesives. Despite being the oldest of the current options, they certainly remain a viable alternative for resin-dentin bonding.

In the mid-1990s, we saw the introduction of simplified total-etch systems, which rapidly gained popularity because of their convenience. They are commonly termed "one-bottle" systems because they combine the primer and bonding agent steps into a single solution that is applied after etching with phosphoric acid. Examples include OptiBond Solo Plus (Sybron Kerr, Orange, CA, USA), Prime & Bond NT (Dentsply/Caulk, Milford, DE, USA), Single Bond (3M ESPE), and others too numerous to mention. These provide an excellent bond to enamel and a good bond to dentin as well. Although clinical trials are limited, it appears that the simplified total-etch systems do not perform quite as well as the three-step systems.

At the present time, we are seeing a major shift toward self-etching systems that do not require a separate etching step. The chemistry of these materials is such that they achieve dentin demineralization and resin infiltration simultaneously. Clinically, the primary benefit of this approach is a very low incidence of postoperative sensitivity. The biggest drawback to most self-etch systems is their relatively poor bond to uncut enamel.

Self-etch systems can be classified as either two-step or one-step. The two-step systems (such as Clearfil SE Bond, Kuraray Co. Ltd., Osaka, Japan) include a self-etching primer and a separate resin bonding agent. The one-step systems (such as Prompt L-Pop, 3M ESPE) deliver all three functions—etch, prime, and bond—simultaneously. Although a simplified approach of

this type is clearly desirable for clinical convenience, it is quite difficult to achieve technically.

Most of the research and development in resin-dentin bonding is occurring in the self-etch area. Unfortunately, many or most of the self-etch systems remain unproven clinically, and some current self-etch products are almost certainly doomed to fail. Nevertheless, we *are* seeing improvements in this area, and I believe that those improvements will continue.

In summary, the clinician can choose from four different approaches to dentin bonding. Regardless of which category seems best suited to your practice, be sure to choose a product that is from a reputable manufacturer and is clinically proven if possible.

SUGGESTED READING

Roulet J-F. Adhesive dentistry in the 21st century. Oper Dent 2000; 25:355–366.

Swift EJ, Perdigão J, Heymann HO. Bonding to enamel and dentin: a brief history and state of the art 1995. Quintessence Int 1995; 26:95–110.

Van Meerbeek B, De Munck J, Yoshida Y, et al. Adhesion to enamel and dentin: current status and future challenges. Oper Dent 2003; 28:215–235.

Editor's Note: If you have a question on any aspect of esthetic dentistry, please direct it to the associate editor, Edward J. Swift Jr, DMD, MS. We will forward questions to appropriate experts and print the answers in this regular feature.

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