Does The Smear Layer Get In The Way? (5/03)

Effect of smear layer thickness on bond strength mediated by three all-in-one self-etching priming adhesives. Chihiro C, Finger WJ. Oper Dent 2002;4:283-289.

The latest development in adhesive dentistry has been the introduction of dentin bonding products that consist of one solution. These products accomplish all three functions of previous three-step bonding agents, but do so with only one solution. Unlike total-etch bonding agents where the acid etchant is applied separately to the smear layer-covered dentin and then rinsed off, the one-solution products are applied to smear layer-covered tooth structure and not rinsed off. Because of this, researchers have wondered about the effect of the smear layer on the resulting bond. This study evaluated the effect of dentin smear layer thickness on the bond strength of three all-in-one bonding products having different acidity levels. Extracted human teeth were ground to expose a flat dentin surface and then ground with one of various grits of silicon carbide paper (80, 180, 240, 320, 400, 600, 4000) or cut with a diamond bur of one of five degrees of coarseness (super coarse, coarse, medium, fine, extrafine layer). The thicknesses of the resulting smear layers were measured for each of the preparation conditions. For each of the seven grits of silicon carbide paper, mean shear bond strengths were determined for the following three bondings agents: AC Bond, (ph=2.1, an experimental product from Heraeus Kulzer); AQ Bond (ph=2.5, Sun Medical); and Prompt L-Pop, (ph=1.1, 3M ESPE). The modes of failure were also recorded. Results found that the smear layer thickness varied according to grit of the paper or diamond bur. The coarser the paper or bur, the thicker the smear layer. The mean shear bond strengths of the adhesives did not significantly differ when analyzed according to grit size of paper. Overall, the mean bond strength of the experimental product AC Bond was significantly great than those of the other two bonding products. **The authors concluded that the thickness of the smear layer did not significantly affect the mean bond strengths of the all-in-one bonding products.**

DIS Comment: All-in-one bonding products such as Prompt L-Pop, Touch & Bond, and One-Up Bond F have become popular in clinical dentistry because of they are simple to apply and potentially reduce post-treatment sensitivity. Although they consist of only one solution, they produce bonding in the same way that traditional three-step products do: they demineralize the superficial dentin and then infiltrate it with polymerizable monomers to produce the hybrid layer. Some clinicians have questioned the effectiveness of these products because they must penetrate the smear layer before they etch and infiltrate the demineralized dentin. This study evaluated the effectiveness of all-in-one products in bonding to dentin covered with various thicknesses of smear layers. They also examined the effect of the acidity of the product on bond strength. The tested hypostheses were that neither the smear layer thickness nor the product's acidity would affect the bond strength. The results indicated that neither the smear layer thickness nor the acidity of the bonding agents influenced their ability to produce an adequately strong bond. In other words, neither the smear layer thickness nor the product's acidity level adversely affected its ability to solubilize the smear layer, demineralize the underlying dentin, and infiltrate it adequately with resin. This should be reassuring to those who questioned the potentially negative effect of applying these self-etching, all-in-one products to smear layer-covered dentin.