COMMENTARY

DIRECT DENTIN BONDING TECHNIQUE SENSITIVITY WHEN USING AIR/SUCTION DRYING STEPS

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Dr. Magne and colleagues wrote an excellent article on the effects of positive versus negative air flow (i.e., use of an air syringe versus high-speed suction tip) on the bond strength of Optibond FL (Kerr, Orange, CA, USA) in extracted teeth. The authors made the results more clinically relevant by preparing cavities with a diamond bur. The test teeth were placed in a quadrant of extracted teeth to limit proximal access as occurs in vivo. Their control specimens had flat occlusal surfaces.

They compared the use of an air syringe used at full force for 5 seconds at a distance of 2.5 cm with "suction drying" using a high-speed suction tip held within 0.5 cm of the dentin surface to control the amount of moisture on the dentin surface, just prior to bonding. Their outcome variable was microtensile bond strength. Their results indicated there was no difference in bond strengths between flat dentin surfaces versus mesiocclusodistal cavity preparation (MOD) bonds using an air syringe, and versus MOD surfaces using suction-drying. All three groups had bond strengths of 49 to 54 MPa, indicating that the authors handled the materials properly.

Removal of excess water prior to bonding with etch-and-rinse adhesives can be done many ways. A short 0.5- to 1-second air blast can be used to literally blow the water from the dentin.[1] This works on flat surfaces but may leave excess water at line angles in complex cavity preparations. Full-strength air flow for 5 seconds while moving the angle of the syringe tip is better but runs the risk of overdrying the pulpal floor and underdrying the gingival floors of proximal boxes. Recently, our research group measured the velocity of air from an air syringe (1,024 m/s), which is very high, even though the volume flow is relatively low (0.5 L/s).[2] In contrast, the velocity of air moved by a high-speed suction is only 69 m/s, even though its volume flow is high (5 L/s). Evaporation of water from acid-etched dentin depends on the relative humidity (RH) of the air used to evaporate water. Compressed gas may have a lower humidity than ambient air, but not if the storage tank contains water. The air moved by a high-speed suction is room air and reflects its humidity. Studies have shown that water evaporates rapidly even at 50 to 70% RH.[2] Humidity of the air is more important than how much air moves across teeth. Moving air saturated with water (98–99% RH) across a wet tooth surface will not evaporate any water. As the relative humidity of air decreases, the water evaporation increases.

The authors only evaluated one dental adhesive system, Optibond FL, which is a very robust product that can tolerate different degrees of wetness. That system uses a hydrophilic primer that is very miscible with water. The authors used an air syringe to evaporate water from the primed surface. The adhesive that is placed over the primed surface using Optibond FL is lightly filled and is solvent-free. If air is used to spread filled adhesives, their increased viscosity tends to prevent overthinning them to the point where atmospheric oxygen might inhibit light-curing.

The cavity design used in this study was not a typical MOD because there were no proximal boxes. That is, the pulpal floor of the cavity preparation was flat from mesial to distal. This would minimize water accumulation at line angles. Creation of proximal boxes brings gingival floors closer to the pulp chamber, making the dentin wetter and interfering with the bonding of etch-and-rinse adhesives.[3]

Thus, the authors should repeat this work with more technique-sensitive systems, such as single-bottle, etch-and-rinse products (Single Bond, 3M ESPE, St. Paul, MN, USA; One Step, Bisco, Schaumberg, IL, USA). Their model system provides an excellent simulation of in vivo conditions.

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