Seven ways to increase dentine bond strength

Dr Dan Fischer

1. Control of bleeding, saliva and subcular fluid is paramount to predictable bonding. I cannot imagine performing adhesive dentistry near or under soft tissue without ViscoStat, Astringedent X and the Dento-Infusor tip (all Ultradent; Figs. 1a–d).

A clean and dry air source is required for quality bonding to occur. It is recommended that clinicians use a dedicated air syringe in each operator to avoid water leakage, which is common in air and water combination syringes.

2. A clean and dry air source is required for quality bonding to occur. They are used to prepare the enamel and dentine. Each solvent type works differently with moisture levels.

Acetone-containing adhesive systems

Ensure that the dentine surface is glistening with moisture. This can be easily achieved by using a cotton pledget and dabbing off the excess moisture. Adhesives that contain acetone are particularly sensitive to overdrying. If the tooth surface is not moist prior to adhesive application, a substantial loss in bond strength will result.

Ethanol-containing adhesive systems

Adhesives that contain ethanol do not require as much moisture. Leave the dentine surface damp by using the air syringe for no more than 2 seconds, blowing off visible surface moisture. Do not direct any substantial sustained air at the surface. A chalky white or over-dried surface will decrease bond value.

Selfetching adhesive systems (water containing)

Systems that contain water can be placed on slightly drier surfaces. The water in the selfetch adhesive is the carrier for its acid. Thin for 1–3 seconds prior to adhesive application.

3. Pay attention to application time and technique

It is important to leave adhesives in place for as long as recommended by the manufacturer. In busy dental practice it is easy to count too quickly, check the clock, instead. It is crucial to give the adhesives time to penetrate or wet the deepest zones to be etched. With self-etch adhesives being less acidic than phosphoric acid, it is important to leave the adhesive in place for long enough to etch and penetrate the dentine and enamel properly. Also, ensure that you scrub in the adhesive if the manufacturer recommends it. Usually, scrubbing adhesives into dentine will increase bond strength by a few per cent and allow for a much more consistent and reliable bond. Conversely, scrubbing enamel will slightly decrease bond strength. When possible in the same preparation, treat enamel more delicately and dentine more aggressively.

4. Thin and dry the adhesive layer

All adhesives should be dried before they can polymerge properly. This means that all adhesives need to be aired so that they are paper thin (in the case of Peak Universal Bond) and then air-dried.

The best way to accomplish this is with a gentle air stream, using half pressure, at 5–5 cm from the surface. A properly thinned adhesive will appear uniformly glossy without pools; pooled product contributes to a substantial decrease in bond strength due to trapped solvents.

Leave the air on for long enough in a gentle stream so that there is no movement in the resin, just drying, to finish volatilising the solvents. This allows monomers to polymerise properly for the highest bond strength possible.

5. Light cure close to the surface with a compatible light

Place the curing light as close to the restored surface as reasonably possible. This ensures that the materials are exposed to sufficient energy for a proper cure. At a distance of 25 mm, most lights will only produce 10 per cent or less of the energy than they do at 1 mm.

Only a few of the newest generation of LED lights produce a sufficiently wide beam meaning that they actually emit more than one colour of blue.
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[*] Based on research by Strategic Data Marketing. Dental product categories include chairs, delivery systems, lights, and cabinetry.

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Ultradent products exhibit unsurpassed quality broadband to quartz halogen lights. An unsurpassed quality broadband LED curing lights inspire more confidence in those situations, since they emit several wavelengths, similar to quartz halogen lights. An unsurpassed quality broadband LED is the VALO curing light (Ultradent).

6. Place the first increment of composite in a super-thin layer

In order to achieve a monoblock restoration (tooth, adhesive and composite acting as one), it is important to place the first layer of composite at a depth no greater than 0.2 mm so that thorough and complete adaptation can occur.

If a thicker first layer is applied, it is likely that slight voids will result beneath the composite, which can be a point of failure over time.

7. Never use an expired product

Since all restorative materials contain reactive components, it is important to refrigerate materials that are not used on a daily basis in order to slow the degradation process. The higher the temperature, the faster the chemistry will react and become unsuitable for use. Manufacturers give expiration dates based on data that shows when the product becomes unacceptably degraded.

At Ultradent, we typically set that marker at not less than 90 per cent of new performance, meaning that the product’s performance has not decreased by any more than 10 per cent since it was manufactured. Typically, it is even less than that. When the expiration date arrives, it does not mean that the product has suddenly gone bad, but it means that the product has reached a marker set by that manufacturer.

Products that contain solvent are subject to problems with evaporation. Tighten the lids of these products securely in order to reduce the risk of solvent loss, which could lead to poor product performance.

Conclusion

Many clinicians can increase dentine bond values in their practice by incorporating a few simple practices into their bonding procedures. It is important to start with a solid understanding of bonding fundamentals. After this base has been established, several controllable steps contribute to the final bond value achieved; in combination, this increase or decrease can be dramatic.

Editorial note: A complete list of references is available from the publisher.

Conflict of interest: Dr Dan Fischer is President and CEO of Ultradent Products.