Seven ways to increase dentine bond strength

1. Etch for the appropriate length of time

Whether you are using self-etch or phosphoric acid etch, etch for the appropriate length of time. Most phosphoric acid etch preparations can etch too deeply if left for too long on the surface. A filum silicate-type phosphoric acid like Ultra-Etch (Ultradent) is more forgiving in this regard (Fig. 5).

2. Ensure ideal dentine moisture conditions

Manufacturers use solvents (acetone, ethanol, water) in adhesives to thin resins, allowing the adhesive resins to flow into the depths of the etched zone. With self-etch adhesives the adhesives time to penetrate the adhesives if the manufacturer recommended by the manufacturer. In a busy dental practice, it is easy to count too quickly; watch 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 is, 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 the ETCH 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.

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 a busy dental practice, it is easy to count too quickly; watch 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 is, 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 the ETCH 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

If left for too long on the surface, the adhesive resins will slightly decrease bond strength. With self-etch adhesives being less acidic than phosphoric acid is, 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 the ETCH 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.

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 significant amount of energy at a distance that they actually emit more than one colour of blue.

This is important owing to the fact that many dental materials contain initiators (light-sensitive chemicals) that react to deeper blue and violet colours.
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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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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.

After the first layer has adapted, place standard increments of 1–2 mm in thickness. Another way to improve adaptation to the adhesive layer is to use a flowable composite for the first layer. However, avoid bulk filling owing to stress build-up issues.

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, severe 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.