## DURABILITY OF ENAMEL BOND STRENGTH OF SIMPLIFIED BONDING SYSTEMS

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## ABSTRACT

**Objective:** The purpose of this study was to determine the effect of thermal cycling on the enamel bond strengths of two-step adhesive systems, either self-etching primers or "one-bottle" total-etch systems, to bovine enamel.

Materials and Methods: Three selfetching primer systems-Imperva Fluoro Bond® (Shofu Inc., Kyoto, Japan), Clearfil<sup>®</sup> Liner Bond II (Kuraray Co. Ltd., Osaka, Japan), and Mac Bond<sup>®</sup> II (Tokuyama Corp., Tokyo, Japan)—and four total-etch adhesive systems—One-Step<sup>®</sup> (Bisco Inc., Schaumburg, IL, USA), Opti-Bond Solo® (Kerr Corporation, Orange, CA, USA), Prime & Bond® 2.0 (Dentsply DeTrey, Konstanz, Germany), and Single Bond<sup>™</sup> (3M ESPE, St. Paul, MN, USA)-were used. Labial enamel surfaces of bovine incisors were exposed by grinding with 240-grit and 600-grit wet silicon carbide paper. Enamel was treated according to the manufacturers' instructions. Following the application of adhesive resin, resin

composites were condensed into a mold (diameter = 4 mm, depth = 2 mm) and were light-cured. Bonded specimens were stored in 37°C water for 24 hours. They were divided into a control group (no thermal cycling) and three experimental groups with thermal cycles of 3,000, 10,000, and 30,000 cycles, respectively, between 5°C and 60°C. The shear test was performed at a crosshead speed of 1.0 mm/min. The ultrastructure of resin-enamel interfaces was observed by SEM at times 3,500 magnification.

**Results:** Self-etching primer systems had significant decreases in enamel bond strengths with thermal cycling. In contrast, total-etch systems had no significant differences, except for One-Step. Mixed failures were predominant in these systems, but adhesive failures tended to increase with a greater number of thermal cycles. SEM observations revealed small cracks at the resinenamel interface for self-etching primer systems when subjected to 30,000 thermal cycles. **Conclusions:** Enamel shear bond strengths after thermal cycling of self-etching primer systems appeared to be less stable than were those of total-etch adhesive systems.

## COMMENTARY

Thermal cycling has been used as an accelerated aging test for in vitro studies. However, there is no clear correlation between thermal cycling and clinical service time. Nevertheless, this laboratory study suggests that total-etch adhesive systems might provide better enamel bond durability than the self-etching primer systems. Longterm clinical trials are needed to prove the durability of self-etch resin adhesive systems.

## SUGGESTED READING

- Miyazaki M, Sato M, Onose H, Moore BK. Influence of thermal cycling on dentin bond strength of two-step bonding systems. Am J Dent 1998; 11:118–122.
- Nikaido T, Kunzelmann KH, Chen H, et al. Evaluation of thermal cycling and mechanical loading on bond strength of a selfetching primer system to dentin. Dent Mater 2002; 18:269–275.

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