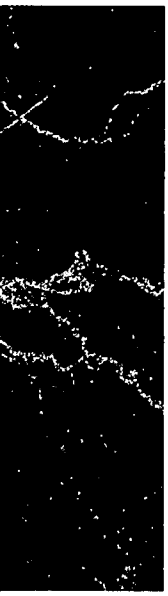

Critical Appraisal

ENAMEL BONDING WITH SELF-ETCH RESINS

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Associate Editor
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Resin adhesion has revolutionized restorative dentistry because it allows conservative preparations and bonding of various substrates to the tooth structure. Until recently all adhesive systems used an etching agent prior to the priming and bonding steps. Despite excellent clinical and laboratory test results for these three-step systems, simplified adhesive systems were desired and consequently developed to reduce the number of steps during the bonding procedure. Currently there are essentially two philosophies of simplification: the total-etch systems, with a separate etchant and a primer/adhesive; and the self-etching systems, which combine etching and priming in one bottle and have a separate adhesive agent or which combine all three steps in a single solution and application. Unfortunately, despite simplification of bonding products, technique sensitivity, substrate variability, and concerns about enamel bonds have increased. This Critical Appraisal addresses a primary concern about self-etching primers: enamel bonding.

AGGRESSIVENESS OF CONTEMPORARY SELF-ETCHING ADHESIVES PART II. ETCHING EFFECTS ON UNGROUND ENAMEL

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Dental Materials 2001 (17:430–440)

ABSTRACT

Objective: The purpose of this study was to investigate the etching efficacy of three self-etching primers on unground enamel by (1) examining the etched surface using scanning electron microscopy (SEM) and transmission electron microscopy (TEM) and (2) evaluating the microtensile bond strengths of these self-etching primers to unground enamel using either their manufacturers' adhesive or a control resin.

Materials and Methods: Three self-etching systems were evaluated in this study: Clearfil® SE Bond (Kuraray Co. Ltd, Osaka, Japan), Non-Rinse Conditioner® (NRC; Dentsply DeTrey, Konstanz, Germany), and Prompt L-Pop® (ESPE, Seefeld, Germany). All-Bond® 2 (Bisco Inc., Schaumburg, IL, USA), a total-etch adhesive system, was used as a control.

Buccal surfaces of human bicuspids were conditioned using either a self-etching primer or 32% phosphoric acid for SEM examination of the

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conditioned enamel. The self-etching materials were rinsed with an ascending series of ethanol. For TEM examination, each adhesive system was used according to its manufacturer's instructions. Unground enamel treated with NRC was bonded using Prime & Bond NT® (Dentsply DeTrey). Uninfiltrated enamel was then completely dissolved, and resin-infiltrated replicas were assessed for the extent of penetration of the adhesives into the enamel.

For microtensile bond strength evaluation, specimens were assigned to two groups. The first group was conditioned and bonded according to each manufacturer's instructions. In the second group the conditioned enamel surfaces were rinsed with ethanol to remove the self-etch primer and then were primed and bonded using the control primer and resin adhesive. Resin composite (Z100®, 3M ESPE, St. Paul, MN, USA) was applied in 2 mm increments. The first resin composite increment was light-cured using the pulse delay technique, followed by conventional light-activation of subsequent increments. Specimens were sectioned into uniform 0.96 mm^2 beams and were subjected to tensile stress until failure.

Results: The etching pattern and the subsurface hybrid layer morphology revealed by SEM and TEM varied by system. Clearfil SE Bond had the mildest etching pattern, whereas Prompt L-Pop had an etching pattern similar to that of 32% phosphoric acid. When adhesive systems were used as directed, the mean microtensile bond strengths of the three self-etching adhesive systems were not significantly different from one another, but they were significantly lower than that of the control group (10–14 MPa vs 27 MPa). When bonding specimens with the control adhesive resin, the mean microtensile bond strengths of NRC with Prime & Bond NT and Prompt L-Pop were not significantly different from those of the control group, but all were significantly higher than that of Clearfil Mega SE Bond.

Conclusions: The self-etching primers evaluated in this study had significantly lower microtensile bond strengths to unground enamel than did a total-etch system. There was no relationship between the etching efficacy of the adhesive systems and the microtensile bond strength.

COMMENTARY

In this study the etching efficacy of each self-etching primer was related to pH; however, bond strengths were not related to etching efficacy. Many studies have shown that enamel bond strengths do not depend on the aggressiveness of the conditioner or the length of the resin tags. Bond strength also depends on the strength of adhesive resins and the tooth substrates. Unground enamel surfaces are hypermineralized and contain more fluoride than does ground enamel, and they appear to be poor substrates for self-etching adhesive systems.

SUGGESTED READING

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