Effect of Reduced Phosphoric Acid Pre-etching Times on Enamel Surface Characteristics and Shear Fatigue Strength Using Universal Adhesives.

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Abstract
PURPOSE: To examine the effect of reduced phosphoric acid pre-etching times on enamel fatigue bond strength of universal adhesives and surface characteristics by using atomic force microscopy (AFM).
MATERIALS AND METHODS: Three universal adhesives were used in this study (Clearfil Universal Bond [C], G-Premio Bond [GP], Scotchbond Universal Adhesive [SU]). Four pre-etching groups were employed: enamel pre-etched with phosphoric acid and immediately rinsed with an air-water spray, and enamel pre-etched with phosphoric acid for 5, 10, or 15 s. Ground enamel was used as the control group. For the initial bond strength test, 15 specimens per etching group for each adhesive were used. For the shear fatigue test, 20 specimens per etching group for each adhesive were loaded using a sine wave at a frequency of 20 Hz for 50,000 cycles or until failure occurred. Initial shear bond strengths and fatigue shear strengths of composite adhesively bonded to ground and pre-etched enamel were determined. AFM observations of ground and pre-etched enamel were also conducted, and surface roughness as well as surface area were evaluated.
RESULTS: The initial shear bond strengths and fatigue shear strengths of the
universal adhesives in the pre-etched groups were significantly higher than those of the control group, and were not influenced by the pre-etching time. Significantly higher surface roughness and surface area of enamel surfaces in pre-etched groups were observed compared with those in the control group. While the surface area was not significantly influenced by etching time, surface roughness of the enamel surfaces in the pre-etched groups significantly increased with pre-etching time.

CONCLUSIONS: The results of this in vitro study suggest that reduced phosphoric acid pre-etching times do not impair the fatigue bond strength of universal adhesives. Although fatigue bond strength and surface area were not influenced by phosphoric-acid etching times, surface roughness increased with increasing etching time.

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