Bond Strength of OptiBond All-In-One on Enamel

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INTRODUCTION

The conventional form of dental adhesives requires three steps with successive applications of 1) an acid etchant, normally phosphoric acid, 2) an adhesion promoting agent or primer, and 3) a bonding resin or adhesive. Between the first and second steps, water rinsing and drying are generally required. Between the second and third steps, drying is required. After all these three steps, light-curing is generally required to polymerize and harden the adhesive. This procedure is complex and, hence, technique-sensitive.

Efforts have been directed toward developing new types of dental adhesives to simplify the above dental adhesive application procedure. During the past several years, self-etching adhesives (the 7th generation) were commercialized that combine etching, priming and adhesive into one component. OptiBond All-In-One, a single component, self-etching and self-priming dental adhesive, is a product from Kerr.

OBJECTIVE

This study is to evaluate the influence of surface treatments on shear bond strength (SBS) of OptiBond All-In-One on bovine enamel surface.

METHODS

Extracted bovine teeth were embedded in cold-cure acrylics with part of enamel surface exposed for bonding. Uncut bovine enamel substrates were cleaned with pumice. To obtain cut surface, enamel was polished with diamond a bur, followed by cleaning with pumice. For etched substrates, Gel Etchant (Kerr) was used to etch enamel substrates for 3 s and 15 s, followed by thorough water rinsing. OptiBond All-In-One adhesive was then applied according to the manufacturer's instruction. A composite (Herculite XRV, A2, Kerr) was condensed into the mold (D=2.38mm) of a bonding jig (Ultradent) and light-cured. Sets of twelve specimens were prepared for each group. Prepared specimens were stored at 37ºC in water for 1 day before being subjected to debonding on an Instron mechanical tester (Model 4467) using a notched (semi-circular) edge at a crosshead speed of 1.0 mm/min. Shear bond strength values in MPa were calculated by dividing the peak load by the bonding area. Statistical analysis was performed using one-way ANOVA (Bonferroni's method) to determine significant differences among groups (p>0.05).

RESULTS

Table 1. Shear Bond Strength of OptiBond All-In-One on various enamel substrates

	Un-cut Enamel			Cut Enamel		
Etching time	No etch	3 s	15 s	No etch**	3 s	15 s
SBS in MPa (STDEV)	28.7 (5.5)[a]*	32.2 (5.5)[a]	30.8 (4.5)[a]	30.4 (3.7)[a]	30.8 (5.2)[a]	28.9 (3.5)[a]

*Means in the same row with the same letter are not statistically different at p> 0.05.
** Recommended by the manufacturer.

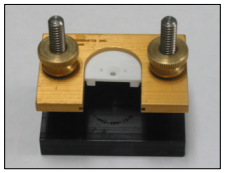

Figure 1: Bonding Jig

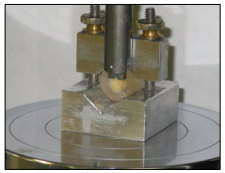

Figure 2: Shear Bond Test Set-Up

DISCUSSION

Figure 1 shows a bonding jig and Figure 2 shows shear bond strength testing set-up. Shear bond strength (SBS) results are summarized in Table 1. Bonding on cut and un-etched enamel is recommended by Kerr. SBS on all uncut and cut enamels are around 30 MPa. The results of ANOVA analysis show that there are no significant differences among groups (p>0.05). Bonding on uncut enamel is as good as that on cut enamel. Phosphoric acid gel etching does not significantly benefit bonding on both cut and uncut enamel.

These results show that OptiBond All-In-One can effectively bond on both cut and uncut bovine enamel, with or without phosphoric acid etching.

CONCLUSIONS

Shear bond strength of OptiBond All-In-One on un-cut and un-etched enamel are not significantly different.

MATERIALS

OptiBond All-In-One (Kerr)
Herculite XRV (A2 shade, Kerr)