

The comparison on tensile bond strengths of variable adhesive systems to Class V cavity

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I. Objectives

The purpose of this study was to compare the micro-tensile bond strengths(TBS) and SEM appearances of adhesive bonds made to occlusal vs. gingival surfaces of wedge-shaped defects.

II. Material and Methods

Sixty extracted sound human premolars were used for micro-tensile bond testing and five additional teeth were used for scanning electron microscopy(SEM), which had been stored in normal saline at 4°C. Wedge-shaped cervical cavities, approximately 5 mm wide, 3 mm long, 3 mm deep, were prepared in the buccal cervical dentin with a high-speed handpiece, a fine diamond bur under copious water cooling. One resin-modified glass ionomer, one compomer, two dentin bonding systems and one composite resin were used according to the instruction of manufacturers: Fuji II LC(GI; GC, Japan), Dyract AP(DE & DN; Dentsply, USA), Single Bond(SB; 3M, USA) SE Bond(SE; Kuraray, Japan), Clearfil AP-X(Kuraray, Japan). After all cavities were treated with each of the adhesive systems and restorative materials respectively and restored teeth were stored in water at 37°C for 24hrs and then embedded in the acrylic ring with epoxy resin before testing. The bonded teeth were then serially sectioned into two slices approximately 1.0 mm thick parallel to the long axis of the tooth using a low-speed diamond saw(ISOMET, Buehler, USA) under water coolant. Each slice was trimmed with high-speed diamond point to make hour-glass shape that the area of adhesive interface was approximately 1mm². Alternate sections were trimmed to test either the occlusal or gingival walls of each bonded restoration. The micro-tensile bond test was performed with a universal testing machine(EZ-test; Shimadzu, Japan) at a CHS of 1 mm/min until failure occurred. The data was statistically analyzed using one-way ANOVA/Duncan test at 95% significance level.

III. Results

1. The TBSs for two dentin bonding systems and composite resin(SB and SE groups) were higher than those reported for resin-modified glass ionomer(GI group)($p < 0.05$).
2. The bond strengths to the occlusal wall were significantly higher than those to the gingival wall in the GI, DE and SE groups($p < 0.05$), while, for DN and SB groups. There were no statistically significant differences between the occlusal and gingival wall($p > 0.05$).
3. There was no significant difference to the conditioning protocol on the occlusal wall between DE and DN groups, in contrast there was significant difference on the gingival wall($p < 0.05$).
4. On SEM observation, the direction of the dentinal tubules for the occlusal wall was almost parallel to the interface, while for the gingival wall, it was almost perpendicular to the interface.

IV. Conclusions

In this study the micro-tensile bond strength of resin-modified glass ionomer is lower than that of composite resin, when caries are thoroughly removed and the cavity is isolated from oral fluid, cervical wedge-shaped cavity should be the treatment of choice with composite resin.