Shear Bond Strength Comparison of a New Dental Cement to Different Adhesive Surfaces

**Purpose:** To determine the bond strength of a new adhesive resin cement to different adhesive surfaces comparing similar commercially available primer-based resin-cements.

**Materials:** *Panavia V5* with *Tooth Primer and Clearfil Ceramic Primer Plus* (Kuraray Noritake Dental Inc.), and *Multilink Automix* with *Multilink Primer A and B* (Ivoclar Vivadent, Inc.)

**Tests:** Ultradent Shear Bond Strength Test

**Substrates:** Human, adult superficial dentin, zirconia (*BruxZir HT*, Glidewell Laboratories) and lithium disilicate (*IPS e.max CAD A2*, Ivoclar Vivadent, Inc.)

**Curing:** self-cured

**Test Conditions:** 24 H in 37 C water

**Replications:** 5/test type

**Methods**

**Pre-treatment of Substrates**

Human, adult, extracted third molars, previously stored in sodium azide solution, then in saline and then in water were embedded in acrylic resin discs and ground through 600-grit SiC paper to form bonding substrates of ground dentin. Zirconia specimens were cut with a diamond saw from the green-state blocks to 12 X 13 X 3 mm coupons, ground flat and smooth using 600-grit SiC paper, sintered, mounted in acrylic discs and sandblast abraded with aluminum oxide (50 μm particles). Lithium disilicate specimens were prepared the same way except they were not sand-blasted and were etched with hydrofluoric acid. Zirconia and lithium disilicate specimens were primed (zirconia) or etched and primed (lithium disilicate) in accordance with cement manufacturer's instructions.

**Use of Cements**

Resin cements were tested using the indirect shear strength method where specimens undergo additional preparation. Single-sided adhesive Teflon tape, 0.13 mm thick, with an approximately 3 mm diameter hole was applied over the previously prepared bonding site and burnished into place. A small dab of the test cement was then placed in the hole in the tape and atop the pre-treated substrate. Stainless steel, 8 mm diameter by 3 mm thick discs, were abraded with 60 grit SiC sand paper, sandblasted and then treated with *Monobond Plus* (Ivoclar Vivadent, Inc.), and then placed on top of the cement. The cement was allowed to self-cure for 10 minutes under a load of 100 g and at 37 C. The excess cement was removed immediately after loading the cylinder. *Liquid Strip* (Ivoclar Vivadent, Inc.) was then applied to the perimeter of the junction between the cylinder and the Teflon tape. During self-curing, the specimen was covered with warm damp towels to prevent drying. At the end of the ten minute curing time, each specimen was moved to a humidor (at approximately 95% relative humidity) for ten minutes and then to a beaker with 37 C water where it remained submerged for 24 H prior to testing.

**Shear bond strength testing**

Testing was performed using a universal testing machine (Instron 5866) at a crosshead speed of 1 mm/min. Means and standard deviations of bond strength were calculated.
Results

Shear Bond Strength Summary

<table>
<thead>
<tr>
<th>Cement</th>
<th>Primer</th>
<th>Substrate</th>
<th>Avg. Bond Strength (Std. Dev.), MPa</th>
<th>% Adhesive to Substrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panavia V5</td>
<td>Tooth Primer</td>
<td>Superficial Dentin</td>
<td>43.8 (5.0)</td>
<td>17</td>
</tr>
<tr>
<td>(Kuraray Noritake Dental Inc.)</td>
<td>Ceramic Primer Plus</td>
<td>IPS e.max CAD A2</td>
<td>37.0 (6.5)</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Ceramic Primer Plus</td>
<td>BruxZir HT</td>
<td>25.1 (4.9)</td>
<td>100</td>
</tr>
<tr>
<td>Multilink Automix</td>
<td>Multilink Primer A&amp;B</td>
<td>Superficial Dentin</td>
<td>25.2 (4.6)</td>
<td>98</td>
</tr>
<tr>
<td>(Ivoclar Vivadent, Inc.)</td>
<td>Monobond Plus</td>
<td>IPS e.max CAD A2</td>
<td>32.3 (6.0)</td>
<td>98</td>
</tr>
<tr>
<td></td>
<td>Monobond Plus</td>
<td>BruxZir HT</td>
<td>28.4 (2.6)</td>
<td>100</td>
</tr>
</tbody>
</table>

Conclusions

Of the two cements tested, *Panavia V5* produced higher bond strength to dentin, and lithium disilicate in the self-cure mode.