Effect of Resin Cement Polymerization Mode on the Bond Strength to Dentin with Different Dental Adhesives

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1. Purpose

The aim of this study is to assess the bond compatibility of three dual cured resin cements to different dental adhesives when the resin cements were used in the self-polymerized mode.

2. Methods and Materials

Materials

Table 1 summarizes the adhesives and cements that were going tested in this study.

Table 1 Study materials

Adhesives	
Name	**Manufacturer**
Optibond XTR	Kerr Corporation
Prime&Bond NT	Dentsply/Caulk
Excite	Ivoclar-Vivadent
Adper Easy Bond	3M ESPE
Clearfil S3	Kuraray Dental
I-bond	Heraeus
Cements	
Name	**Manufacturer**
Variolink II	Ivoclar-Vivadent
Calibra	Dentsply-Caulk
NX3	Kerr Corporation

Teeth selection and mounting

The dentin substrate to bond the specimens was obtained from freshly extracted, caries-free, unrestored human molars. Teeth were stored at 4 C in a water solution containing 0.1 % chloramine T.

After removing the roots with a diamond band saw, teeth were sectioned buccal-lingually. The outer surfaces of the specimens were then be flattened using a diamond wheel. The sectioned molars were mounted in a chemically polymerized methacrylate with the outer surfaces exposed. The exposed surfaces were coarse ground flat on a model trimmer until an adequate dentin surface was revealed. This surface was polished with 400 grit SiC paper. The specimens were stored in water until ready to be bonded. Prior to bonding the specimens, the surface was finished with 600 grid SiC paper.

Bonding

Twelve dentin specimens were bonded using each of the adhesive/cement combinations, for a total of 18 combinations and 216 specimens (n=12). Bonding was done using the Ultradent jigs for shear bond strength.

All the adhesives were used in light-polymerized mode and applied following the manufacturer's instructions. All the cements were used in self-polymerized mode and applied following the manufacturer's instructions.

Data entry, tabulation and analysis

The measured shear bond strength values were tabulated and analyzed using two-way ANOVA Student's-Newman-Keul's test was used to identify the detected differences.

3. Results

The obtained shear bond strength results are represented in Figure 1.

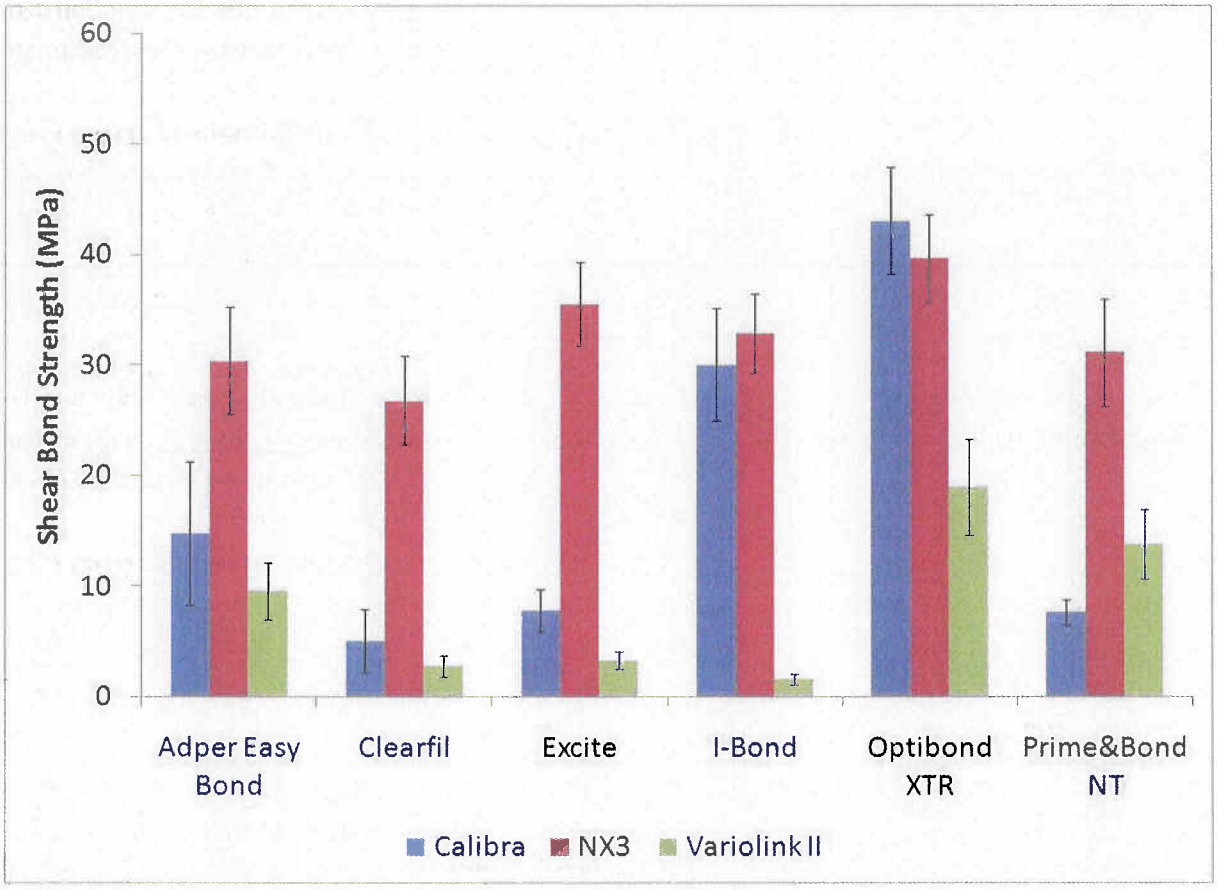

Figure 1 Shear Bond strength of the tested adhesive/cement combinations.

A significant interaction between the effect of the adhesives and the effect of the cements was revealed by the two-way ANOVA, as shown in Table 2.

Table 2 Two-way ANOVA results.

Source of Variation	DF	SS	MS	F	P
Adhesive	5	10630.598	2126.12	62.468	<0.001
Cement	2	21690.208	10845.104	318.643	<0.001
Adhesive x Cement	10	7451.907	745.191	21.895	<0.001
Residual	198	6738.992	34.035		
Total	215	46511.705	216.334		

The shear bond strength values obtained are summarized in Table 3, along with the pairwise comparison using Student-Newman-Keul's test and including all the groups.

Table 3 Mean (SD) values corresponding to the shear bond strength results, expressed in MPa, for all the tested cement/adhesive combinations. Same superscript letters indicate no significant differences

	Calibra	**NX3**	**VariolinkII**
Adper Easy Bond	14.74(10.23)^{e,f}	30.35(7.62)^{c,d}	9.58(4.02)^{f,g}
Clearfil S3	5.06(4.52)^{g,h}	26.78(6.36)^{d}	2.82(1.48)^{g,h}
Excite	7.83(3.03)^{g,h}	35.53(5.91)^{b,c}	3.30(1.25)^{g,h}
I-Bond	29.98(8.01)^{d,c}	32.88(5.69)^{c}	1.58(0.82)^{h}
Optibond XTR	43.08(7.61)^{a}	39.64(6.22)^{a,b}	18.98(6.77)^{e}
Prime & Bond NT	7.65(1.78)^{g,h}	31.15(7.64)^{c,d}	13.81(4.88)^{e,f}

Optibond XTR provided significantly higher bond strength that any other adhesive for all the tested cements. NX3 was the cement with the highest bond strength for all the adhesives, except for Optibond XTR (for which the highest bond strength was obtained with Calibra cement but no statistically significant differences between this cement and NX3 were detected).

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