

Shear bond strength of various cement systems to dentin

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INTRODUCTION: Indirect resin composites, associated with resin-modified glass-ionomer cement (RMGIC) or resin composite-based adhesive cement (RCBAC), form a substantial part of contemporary oral rehabilitation treatment^{1,2}. Shear bond strength (SBS) of composite inlays sealed with four dental cements (1 RMGIC and 3 RCBAC) to dentin was measured. In the second part of this study, the RMGIC base/cement interface of the sandwich technique was simulated and SBS of two dental cements (1 RCBAC and 1 RMGIC) was measured directly at the RMGIC base surface.

METHODS: Normalized Gradia Indirect resin composite cylinders were fabricated according to the laboratory's standards. Flat coronal dentin surfaces were created on extracted third molars. The cylinders were "bonded" to the dentin surface (Fig. 1) using 4 different cement systems (*FP: Fuji Plus, GC; SB: Super-Bond C&B, Sun Medical; RX: RelyX Unicem, 3M-ESPE; B1/C: Bond-1/Cement-it Universal C&B, Pentron*) according to the manufacturers' instructions. To evaluate the SBS of 2 cements to the RMGIC base, flat RMGIC surfaces were also created (FIILC: Fuji II LC, GC) and a similar procedure was performed.

Each group was composed of ten specimens. SBS was measured with an Instron universal testing machine one hour after bonding. Dentin and RMGIC-base sides of all tested specimens were examined by binocular microscopy to determine failure modes. A direct resin composite (Filtek Z250, 3M-ESPE) was bonded (OSP: Optibond Solo Plus, Kerr) to both dentin and FIILC surfaces and tested similarly as control.

RESULTS: The mean values of SBS are presented in *Table I*. A statistical analysis (ANOVA, one factor, $p < 0.05$) was performed (*Table I*). The highest values were obtained on dentin with SB, and on RMGIC-base surface with the OSP+Z250 (control group).

Failure modes are presented in *Table II*. The control, SB, RX and B-1/C groups showed a majority of adhesive failures while the FP group demonstrated primarily adhesive-cohesive failures.

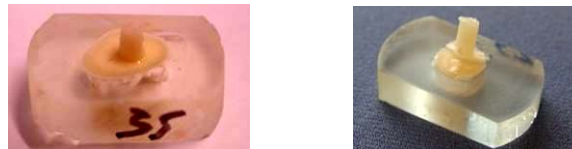


Fig. 1: Bonded specimen [left] - Fractured [right].

Table I. Average SBS for each group tested. Means with same letter are not significantly different

Group	Bonded surface		Mean and Standard deviation (MPa)
SB	Dentin	A	23.01 (6.95)
OSP+Z250	Dentin	B	15.79 (5.79)
RX	Dentin	C	8.80 (4.81)
FP	Dentin	C	7.92 (3.73)
B-1/C	Dentin	C	5.04 (4.42)
OSP+Z250	FIILC	A	24.27 (4.59)
RX	FIILC	B	14.08 (3.85)
FP	FIILC	B	11.62 (2.86)

Table II. Failure modes (A: Adhesive, C: Cohesive, A-C: Adhesive-Cohesive)

Group	Type of failure (%)
SB	C: 20%; A: 50%; A-C: 30%
OSP+Z250	C: 0%; A: 70%; A-C: 30%
RX	C: 0%; A: 80%; A-C: 20%
FP	C: 0%; A: 40%; A-C: 60%
B-1/C	C: 0%; A: 70%; A-C: 30%

DISCUSSION & CONCLUSIONS: SB showed the highest SBS amongst the four cement systems for the case of an indirect resin composite bonded to dentin. No significant difference was seen between the three other cementing systems. Adhesion to RMGIC base was higher than to dentin whatever material was tested.

REFERENCES: ¹ U. Pallesen et al. (2003 Jun) *Clin Oral Investig.* 7(2):71-9. ² Y.-F. Mak et al. (2002) *Dental Materials* 18:609-621.

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