

Bond Strength of Six Dentin Adhesives on Perfused Dentin

Language: English

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Introduction

The bond strengths of resin composites to dentin have been widely investigated in the last years. It is known from dental literature that there is a relationship between bond strength and a moist or perfused dentinal surface¹. Several in vitro studies have shown that adhesion of dentin adhesive systems is mostly reduced when used on moist, wet or physiological perfused dentin. For newer dentin adhesives, they are known to have higher hydrophilic properties, the presence of moisture might be desirable.

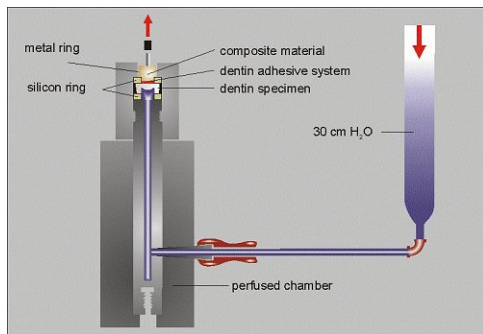


Fig. 1: Special designed apparatus to test tensile bond strength under permanent dentin perfusion.

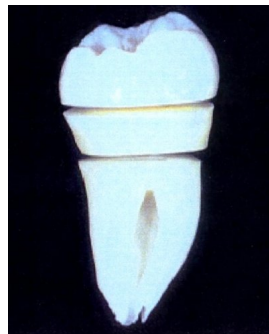


Fig. 2: Cutting a dentinal slab from a specimen.

Objectives

The aim of this study was to evaluate tensile bond strength of six different dentin adhesives (Excite, Admira Bond, Clearfil New Bond, AdheSE, Xeno III, Syntac) combined with the corresponding composite material on perfused dentin in vitro.

Material and Methods

Ninety freshly extracted molars, stored in saline for a maximum of fourteen days after extraction were included. All teeth were specially prepared allowing the simulation of dentin perfusion. Dentin specimens with a total thickness of 3.5 mm were obtained under standardized conditions. The distance between the pulp chamber and the occlusal plateau was adjusted to 2.0 mm (± 0.2 mm). The specimens were randomly assigned to six experimental groups of fifteen samples each: Group A: Excite/ Tetric; group B: Admira Bond/ Admira; group C: Clearfil New Bond/ Clearfil Core; group D: AdheSE/ Tetric; group E: Xeno III/ Esthet X; group F: Syntac/ Tetric. The adhesive systems were applied as recommended by the manufacturer. Maximum tensile bond strength was measured 15 minutes after application and light curing of the composite material (colour A2) using a universal testing machine. For each group mean value and standard deviation were calculated. Statistical analysis was performed using ANOVA and Tukey's test.

	Group A	Group B	Group C	Group D	Group E	Group F
Mean	4.74	4.62	4.68	2.59	6.90	3.87
Standard deviation	1.81	1.21	1.04	0.79	1.33	0,94

Tab. 1: Mean values and standard deviations within the different groups in Mpa.

Results

For the six test series following tensile bond strengths were evaluated (mean value and standard deviation in MPa): group A: 4.74 (± 1.81), group B: 4.62 (± 1.21), group C: 4.68 (± 1.04), group D: 2.59 (± 0.79), group E: 6.90 (± 1.33); group F: 3.87 (± 0.94). Statistical analysis showed a significant influence of the used material combination on tensile bond strength ($p < 0.001$, ANOVA). Pairwise comparisons showed no significant differences between group A, B, C and F. Tensile bond strength in group E (Xeno III) was significantly increased compared to all other groups ($p < 0.05$, Tukey's test) while bond strength in group D (AdheSE) was significantly reduced ($p < 0.05$, Tukey's test).

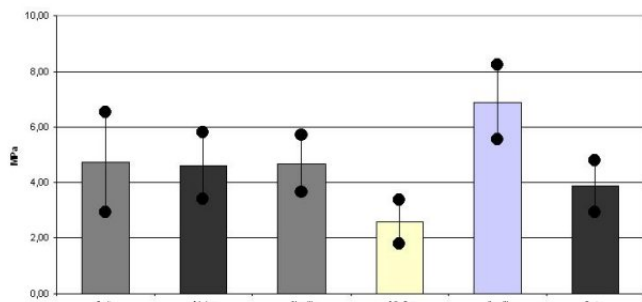


Fig. 3: Mean values and standard deviations within the different groups.



Fig. 4: Special designed apparatus mounted in a universal testing machine.



Fig. 5: Experimental device after loading until fracture.



Fig. 6 : Used dentin adhesive system Syntac (Vivadent)



Fig. 7: Used dentin adhesive system Xeno III (Dentsply DeTrey)



Fig. 8: Used dentin adhesive system Admira (Voco).



Fig. 9: Used dentin adhesive system Clearfil New Bond (Kuraray).

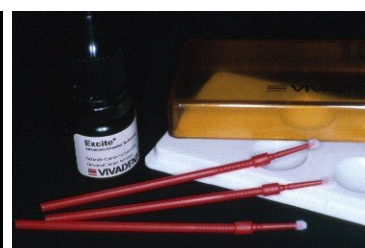


Fig. 10: Used dentin adhesive system Excite (Vivadent).



Fig. 11: Used dentin adhesive system Adhese (Vivadent).

Conclusions

It can be concluded that all bonding agents used in this study were able to establish bond strength on perfused dentin. The newer self-conditioning bonding agent Xeno III showed significant higher values compared to the other five systems.

Literature

1. Perdiago J, Swift EJ, Cloe BC (1993): Effects of etchants, surface moisture, and resin composite on dentin bond strengths. Am J Dent 6: 61-64.
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This Poster was submitted by OA Dr. med. dent. Christian Ralf Gernhardt.

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Introduction

The bond strength of resin composites to dentin have been widely investigated in the last years. It is known from dental literature that there is a relationship between bond strength and a moist or perfused dentinal surface. Several in vitro studies have shown that adhesion of dentin adhesive systems is mostly reduced when used on moist, wet or physiological perfused dentin. For newer dentin adhesives, they are known to have higher hydrophilic properties, the presence of fillers might be desirable.

The aim of this study was to evaluate tensile bond strength of six different dentin adhesives (Excite, Admira Bond, Clearfil New Bond, Adhese, Xeno III, Syntac) combined with the corresponding composite material on perfused dentin in vitro.

Material and Methods

Ninety freshly extracted molars, stored in saline for a maximum of 50 days after extraction were included. All teeth were specially prepared allowing the simulation of dentin perfusion. Dentin specimens with a total thickness of 1.5 mm were obtained under standardized conditions. The distance between the pulp chamber and the occlusal plane was adjusted to 2.0 mm (+/- 0.2 mm). The specimens were randomly assigned to six experimental groups of fifteen samples each: Group A: Excite/Tetric; group B: Admira Bond/ Admira; group C: Clearfil New Bond/ Clearfil Core; group D: Adhese/Tetric; group E: Xeno III/ Bisfil X; group F: Syntac/ Tetric. The adhesive systems were applied as recommended by the manufacturer. Maximum tensile bond strength was measured 15 minutes after application and light curing of the composite material (colour A2) using an universal testing machine. For each group mean value and standard deviation were calculated. Statistical analysis was performed using ANOVA and Tukey's t-test.

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References

Prati C, Pashley D, Montanari G (1991): Effects of adhesion, surface wetting, and resin composite on dentin bond strength. J Dent 19: 41-46.

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Schaller HG, Kielbassa AM (1994): Tensile bond strength of various dentin bonding agents as a function of dentin permeability. Dtsch Zahnärztl Z 49: 830-833.

Fig. 3: Mean values and standard deviations within the different groups.

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