International Poster Journal IPJ of Dentistry and Oral Medicine

Int Poster J Dent Oral Med 2004, Vol 6 No 04, Poster 243

Bonding Capacity of Three Different Dentin Adhesives on Moist and Perfused Dentin

Language: English

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Date/Event/Venue:
June, 25-28th, 2003
81st General Session of the International Association for Dental Research
Göteborg/Sweden

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 surface (1). Several in vitro studies have shown that adhesion of dentin adhesive systems is mostly reduced when used on moist, wet or physiological perfused dentin (2,3). For newer dentin adhesives, they are known to have higher hydrophilic properties, the presence of moisture might be desirable.

Objectives

Therefore, the aim of the present investigation was to evaluate the influence of dentin perfusion on dentin bond strength of three different dentin adhesives (Excite, Clearfil New Bond and the self-conditioning adhesive system AdheSE, Fig. 3, 4, 5).

Fig. 3, 4, 5: Different dentin adhesives used in this study.

Material und Methods

The study was carried out on sixty caries-free freshly extracted third molars, which had been stored in saline for a maximum of seven days after extraction. All teeth were prepared in a special manner allowing the simulation of the dentin perfusion (4). Dentin specimens with a total thickness of 3.5 mm (± 0.5 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). All specimens were divided at random into six groups of ten each. In on-half of the specimens the three dentin bonding agents were applied under hydrostatic pulpal pressure of 30 cm H2O (groups EP, CP, XP), in the other half of the specimens the bonding procedures were carried out without hydrostatic pulpal pressure (groups EM, CM, XM) (Fig. 1).

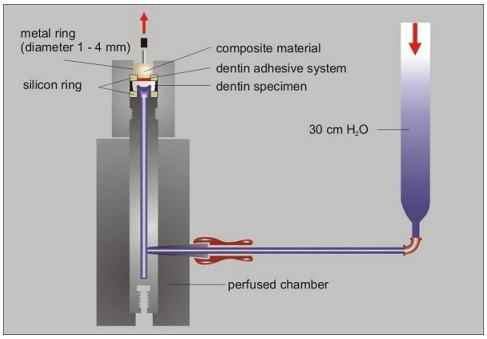

Fig. 1: Special designed apparatus to test tensile bond strength under permanent dentin perfusion.

The adhesive systems were applied as recommended by the manufacturer. Maximum tensile bond strength was evaluated using a universal testing machine (Fig. 2, 6, 7, 8). The experiments were performed 15 minutes after application and light curing of the composite material (Tetric Ceram, colour A2). For each group mean value and standard deviation were calculated. Statistical analysis were performed using ANOVA and Tukey's test.

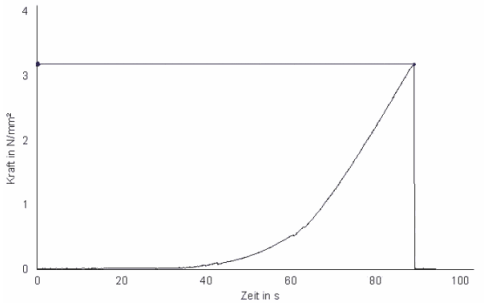

Fig. 2: Graphically expression of the registrated bond strength of a specimen loaded until fracture.

Fig. 6: Special designed apparatus mounted in a universal testing machine.

Fig. 7: Experimental apparatus with specimen inside before loading.

Fig. 8: Experimental device after loading until fracture.

Results

In all groups tensile bond strength could be measured (Tab. 1).

	Group EM	Group EP	Group CM	Group CP	Group XM	Group XP
Mean value (in MPa)	4.09	3.92	4.68	3.18	3.14	2.38
Standard deviation	±1.56	±1.34	±2.41	±0.96	±1.34	±0.69

Tab. 1: Mean value and standard deviation within the different groups.

The highest values were observed for moist specimens treated with Clearfil New Bond with 4.68 MPa (± 2.41) while the lowest were measured for specimens set under hydrostatic pulpal pressure and treated with the experimental self-conditioning adhesive (2.38 MPa (± 0.69)) (Fig. 9).

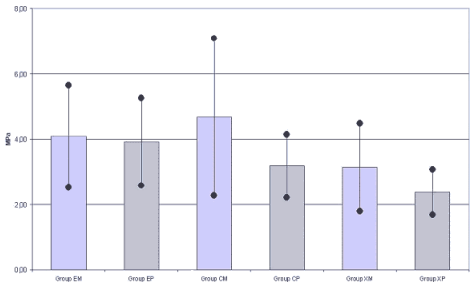

Fig. 9: Mean value and standard deviation within the different groups.

Statistical analysis showed a significant influence of the used dentin bonding agent on tensile bond strength ($p < 0.001$, ANOVA). Pairwise comparisons showed no significant differences between perfused and moist dentin. Tensile bond strength in group XP was significantly decreased to group EM and group CM ($p < 0.05$, Tukey's test).

Discussion and Conclusions

The results of this investigation suggest that newer dentin adhesives are not affected by dentin perfusion to the extends described in previous studies. In the case of Clearfil New Bond the difference between perfused and non-perfused dentin samples was observable but not significant. The other two dentin adhesive systems - Excite and AdheSE - showed nearly the same values when used on perfused dentin compared to the non-perfused specimens.

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Abbreviations

- MPa = Megapascals
- Fig. = Figure
- Tab. = Table

This poster was submitted by Dr. Katrin Bekes.

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