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Tensile Bond Strength of a Self-Conditioning Dentin Adhesive System in vitro

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Introduction

Successful attempts of bonding to dentin have been reported in dental literature (1). Focusing on the specific properties of human dentin, bonding to dentin is more difficult to achieve than bonding to enamel. Therefore, different bonding techniques using dentin adhesive systems have been described recently. The newest developments are the so-called self-conditioning agents (2). They condition and prime enamel and dentin simultaneously in one step without rinsing. The self-conditioning systems hybridize the dentin and have been reported to establish a bond strength which is able to withstand stresses from polymerisation shrinkage clinically (3). The simultaneous treatment of enamel and dentin with one material in one application is a major step towards simplification of the clinical procedure.

Objectives

Therefore, the aim of the present investigation was to evaluate tensile bond strength of a new self-conditioning dentin adhesive system (Xeno III) compared to two established dentin-bonding agents (Excite, Syntac) in combination with different composite materials in vitro.

Material und Methods

Sixty caries-free freshly extracted third molars, stored in saline for a maximum of seven days after extraction, were used in this study. All teeth were prepared in a special manner allowing the simulation of the dentin perfusion (4) (Fig. 1-3).

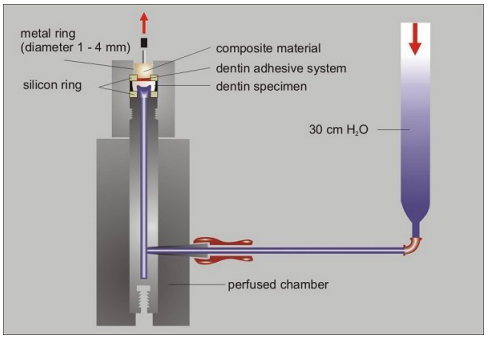

Fig. 1: Special designed apparatus to test tensile bond strength under permanent dentin perfusion.

Fig. 2: Experimental device with dentin sample inside before loading.

Fig. 3: Special designed apparatus mounted in the universal testing machine.

Dentin specimens with a total thickness of 1.5 mm (± 0.2 mm) were obtained under standardized conditions. All specimens were divided at random into four groups of fifteen each. In group A and B the new dentin adhesive system Xeno III was used in combination with the composite Esthet X and QuiXFil (Fig. 4, 7, 8), while group C and D served as control groups (Excite or Syntac in combination with Tetric Ceram)(Fig. 5, 6).

Fig. 4: The dentin adhesive system Xeno III used in this investigation.

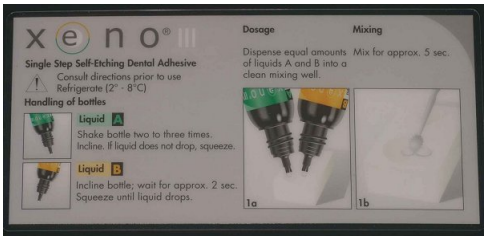

Fig. 7: The directions for the use of Xeno III as recommended by the manufacturer. Step 1.

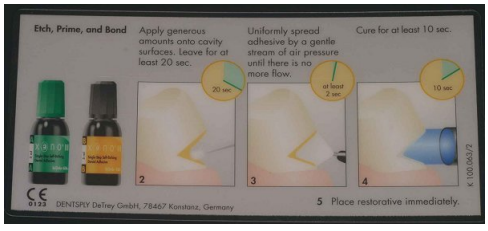

Fig. 8: The directions for the use of Xeno III as recommended by the manufacturer. Step 2.

Fig. 5: The dentin adhesive system Excite used in this investigation.

Fig. 6: The dentin adhesive system Syntac used in this investigation.

In all groups the adhesive systems were applied as recommended by the manufacturer. The experiments were performed 15 minutes after application and light curing of the composite material (colour A2) (Fig. 2, 3). For each group mean value and standard deviation were calculated. Statistical analysis were performed using ANOVA and Tukey's test.

Results

In all groups tensile bond strength could be measured (Tab. 1, Fig. 9).

	Group A	Group B	Group C	Group D
Mean value (in MPa)	6.90	7.48	4.73	3.87
Standard deviation	± 1.29	± 1.53	± 0.87	± 0.54

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

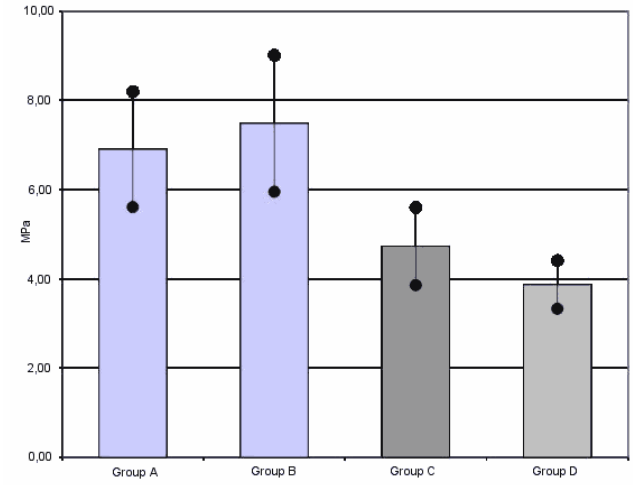

Fig. 9: Mean value and standard deviation within the different groups.

The highest values were observed for the new self-conditioning adhesive system Xeno III with 6.90 MPa (± 1.29) in group A and 7.48 MPa (± 1.52) in group B. Statistical analysis showed a significant influence of the used adhesive system ($p < 0.001$, ANOVA). Bond strengths of Xeno III combined with both composite materials were significant higher compared to the other groups($p < 0.05$, Tukey's test). Between group A nd B no significant difference could be detected ($p < 0.05$, Tukey's test).

Discussion and Conclusions

Regarding the limitations of an in vitro investigation, it can be concluded that the self-conditioning dentin adhesive showed favourable results. Therefore, Xeno III might be a good alternative in clinical practice compared to the other materials tested.

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This poster was submitted by Dr. Christian Gernhardt.

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