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Influence of Bleaching Agents on Microtensile Bond Strength of Adhesives

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Introduction

Previous studies have shown a correlation between bond strength of dentin adhesive systems and different test modalities like shear or tensile bond tests.¹ Other investigations focused on the influence of perfusion or specimen preparation.^{2,3} It is also known that the composite material and colour of this material have a significant influence on bond strength of dentin adhesive systems.^{4,5} Other investigators focused on the influence of bleaching materials on bond strength of dentin adhesives.⁶ But until now only low information is available on the influence of bleaching materials on microtensile bond strength of recently introduced self-etch dentin adhesive systems.

Objectives

The aim of the present study was to evaluate the influence of different bleaching agents and concentrations used for external bleaching (Fig. 1, 2) on microtensile bond strength of different dentin adhesives in class V cavities in vitro.



Fig. 1: Frontal view before bleaching



Fig. 2: Frontal view after bleaching with Perfect Bleach 17%.

Material and Methods

135 freshly extracted third molars were included in this study. In all teeth cervical class V dentinal cavities were prepared also allowing the simulation of dentin perfusion. The specimens were randomly assigned to nine experimental groups of fifteen each: S0: Syntac/ control; S17: Syntac/ Perfect Bleach 17%; S38: Syntac/ Opalescence Xtra Boost 38%; X0: XP Bond/ control; X17: XP Bond/ Perfect Bleach 17%; X38: XP Bond/ Opalescence Xtra Boost 38%; F0: Futurabond NR/ control; F17: Futurabond NR/ Perfect Bleach 17%; F38: Futurabond NR/ Opalescence Xtra Boost 38%. Bleaching was performed 8 hours at 36°C for 7 days. Microtensile bond strength of the above mentioned bonding agents was measured using an universal testing machine (Fig. 3-9).

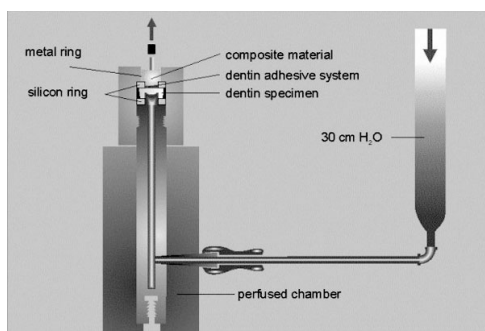


Fig. 3: Special designed apparatus to test tensile bond strength under permanent dentin perfusion.



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

Fig. 4: Experimental device mounted in an universal testing machine (Zwick 005).

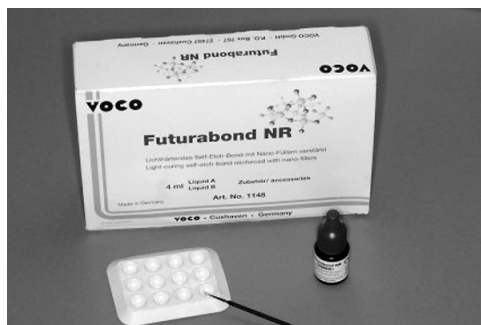


Fig. 6: The dentin adhesive systems XP Bond used in this investigation.

Fig. 7: The dentin adhesive system Futurabond NR used in this investigation.



Fig. 8: The bleaching material Perfect Bleach 17% used in this investigation.

Fig. 9: The bleaching material Opalescence Xtra Boost 38% used in this investigation.

Results

For the nine test series following microtensile bond strengths were evaluated (mean value and standard deviation in MPa). Group S0: 25.89 (\pm 2.97); group S17: 21.44 (\pm 2.05); group S38: 17.09 (\pm 1.94); group X0: 22.15 (\pm 3.53); group X17: 18.99 (\pm 2.96); group X38: 14.61 (\pm 2.24); group F0: 16.25 (\pm 1.72); group F17: 12.95 (\pm 1.74); group F38: 12.91 (\pm 1.25). The results of all groups and the mean microtensile bond strength values are graphially expressed in figure 10.

Statistical analysis showed a significant influence of the used dentin bonding agent and the bleaching agent on microtensile bond strength ($p < 0.001$, ANOVA). Pairwise comparison showed a significant reduction of bond strength in specimen treated with bleaching materials compared to the untreated control groups. In the case of Syntac and XP Bond a significant reduction in bond strength between both bleaching materials could be observed ($p < 0.05$, Tukey's test).

Group	S0	S17	S38	X0	X17	X38	F0	F17	F38
Bond Strenght	25.89	21.44	17.09	22.15	18.99	14.61	16.25	12.95	12.91
Standard deviation	2.97	2.05	1.94	3.53	2.96	2.24	1.72	1.74	1.25

Table 1: Microtensile bond strength of all groups in megapascals.

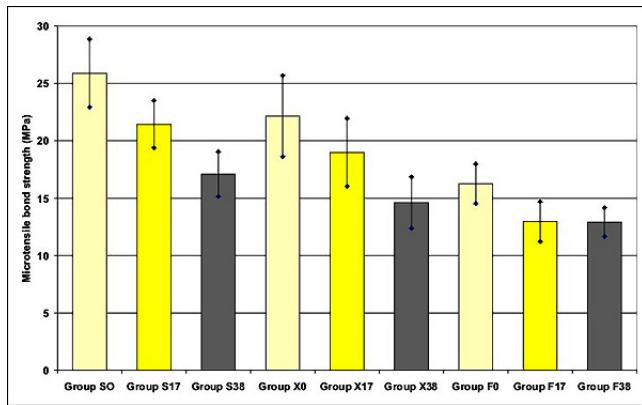


Fig. 10: Graphically expression of the results (Mean values and standard deviation in MPa).

Conclusions

Within the limitations of an in vitro investigation it can be concluded that the pretreatment of dentin using high concentrated bleaching agents might affect tensile bond strength of the dentin adhesives tested.

References

1. May KN, Jr Swift EJ, Bayne SC (1997) Bond strengths of a new dentin adhesive system. *Am J Dent* 10: 195-198.
2. Schaller HG, Kielbassa AM, Daiber B (1994) Tensile bond strength of various dentin bonding agents as a function of dentin permeability. *Dtsch Zahnärztl Z* 49: 830-833.
3. Tagami J, Tao L, Pashley DH, Hosoda H, Sano H (1991) Effects of high-speed cutting on dentin permeability and bonding. *Dent Mater* 7: 240-246.
4. Prati C, Nucci C, Davidson CL, Montanari G (1990) Early marginal leakage and shear bond strength of dentin adhesive restorative systems. *Dent Mater* 6: 201-203.
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This Poster was submitted by Dr. Christian Gernhardt.

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Introduction

Previous studies have shown a correlation between bond strength of dentin adhesive systems and different test modalities like shear or tensile bond tests¹. Other investigations focused on the influence of perfusion or specimen preparation^{2,3}. It is also known that the composite material and colour of this material have a significant influence on bond strength of dentin adhesive systems^{4,5}. Other investigators focused on the influence of bleaching materials on bond strength of dentin adhesives⁶. But until now only low information is available on the influence of bleaching materials on microtensile bond strength of recently introduced self-etch dentin adhesive systems. Therefore, the aim of the present study was to evaluate the influence of different bleaching agents and concentrations on microtensile bond strength of different dentin adhesives in class V cavities in vitro.



Fig. 2: Frontal view after bleaching with Perfect Bleach 17%.



Fig. 1: Frontal view before bleaching.

Results

For the nine test series following microtensile bond strengths were evaluated (mean value and standard deviation in MPa). The results of all groups and the mean microtensile bond strength values are listed in table 1 and graphially expressed in figure 10. Statistical analysis showed a significant influence of the used dentin bonding agent and the bleaching agent on microtensile bond strength ($p < 0.001$, ANOVA). Pairwise comparison showed a significant reduction of bond strength in specimen treated with bleaching materials compared to the untreated control groups. In the case of Syntac and XP Bond a significant reduction in bond strength between both bleaching materials could be observed ($p < 0.05$, Tukeys test).

Group	S0	S17	S38	X0	X17	X38	F0	F17	F38
Bond Strength	25,80	21,44	17,09	22,15	18,99	14,61	16,25	12,95	12,91
Standard deviation	2,97	2,05	1,94	3,53	2,98	2,24	1,72	1,74	1,25

Tab. 1: Microtensile bond strength of all groups in megapascals.

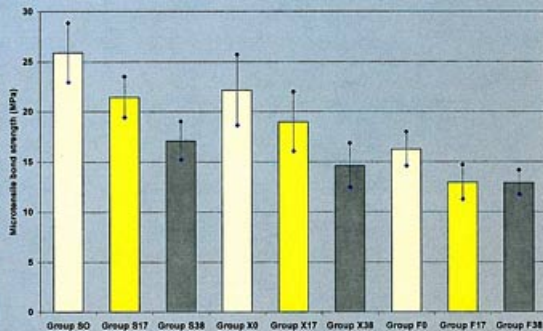


Fig. 10: Graphically expression of the results (Mean values and standard deviation in MPa).

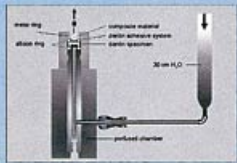


Fig. 4: Experimental device mounted in an universal testing machine (Zwick 005).

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Fig. 5: Syntac dentin adhesive system and bleaching materials used in the investigation.



Fig. 6: Perfect Bleach 17% bleaching material.



Conclusions

Within the limitations of an in vitro investigation it can be concluded that the pretreatment of dentin using high concentrated bleaching agents might affect tensile bond strength of the dentin adhesives tested.

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