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Influence of dentin adhesives on root caries development after tooth-brushing abrasion

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Introduction

Root caries is a well known disease. As a result of better health education, as well as improved clinical possibilities, tooth loss is reduced. Therefore, it is supposed that the number of root surfaces, susceptible to carious attack, will increase. Today, there are numerous possibilities to prevent root caries. It is known that application of fluoride preparations can reduce the root caries incidence (1). In addition to fluoride, dentin bonding agents are supposed to create a high acid resistance of the root surface, due to a thin layer of resin-reinforced dentin (2). Earlier investigations have shown a positiv effect of dentin adhesives on root caries development (3,4).

Objectives

Since the effects of mechanical stress on sealed dentin surfaces has not been described in the dental literature, the aim of the present study was to evaluate the caries-protective effect of two dentin adhesive systems on the development of root caries after tooth-brushing abrasion in vitro.

Material und Methods

Fifty caries-free freshly extracted human third molars were used in this study. After extraction the root surfaces were cleaned using polishing discs, thereby removing the cementum. The teeth were than coated with an acid-resistant nail varnish, exposing two retangular windows of 6 mm2 each (Fig 2.).

Fig. 2: Specimen coated with an acid resistant nail varnish.

One window served as unbrushed control, while the other window was tooth-brushed for different brushing cycles (Fig. 1) after dentin adhesive application (compare Table 1).

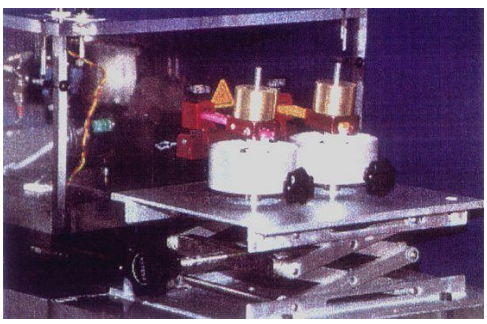

Fig. 1: Special designed apparatus to simulate tooth-brushing abrasion.

	Unbrushed control	Group A 400 cycles	Group B 800 cycles	Group C 1200 cycles	Group D 1600 cycles	Group E 2000 cycles
Optibond® Solo	0.0 (± 0.0)	0.0 (± 0.0)	31 (± 16.3)	12 (± 4.8)	13 (± 5.9)	37 (± 12.6)
Prime&Bond™ NT	0.0 (± 0.0)	0.0 (± 0.0)	36 (± 13.1)	55 (± 20.1)	52 (± 14.6)	57 (± 19.8)

Tab. 1: Mean lesion depth and correlation within the different groups.

Respectively, 25 specimen were treated with one of the two dentin adhesives (1: Optibond Solo; 2: Prime & Bond NT) as recommended. After brushing all specimen were demineralized with acidified gel (HEC, pH 4.8, 37°C) From each specimen three dentinal slabs were cut. Lesion depth was determined using polarized light microscope. For each subgroup mean lesion depth and standard deviations were calculated. Statistical analysis were performed using ANOVA and closed test procedure based on Kruskal-Wallis test.

Results

All unbrushed control specimen showed no signs of caries. In all cases a thin layer, representing the dentin adhesive system was visible on the root surface (Fig. 3).

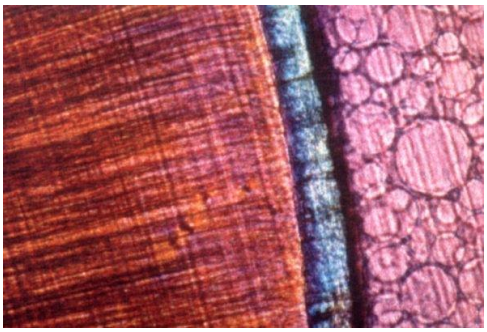

Fig. 3: Unbrushed control specimen, the dentin adhesive layer is visible. Polarized light, 64x.

The brushed specimen exhibited different lesion depth expect the 400 cycles groups (compare Tab. 1, Fig. 4-7). Pairwise comparison showed significant differences between the two materials in group C, D, and E (ANOVA; $p < 0.001$). The comparison between the different brushing cycles in group B, C, D, and E showed no significant influence.

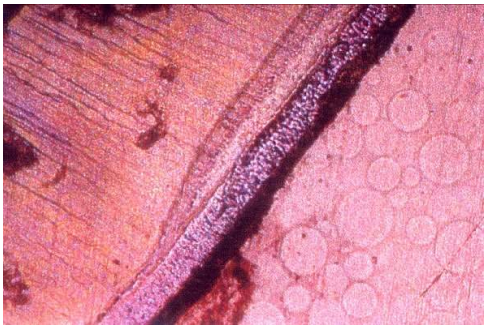

Fig. 4: Brushed specimen, Prime & Bond NT, 800 cycles, Polarized light, 64x.

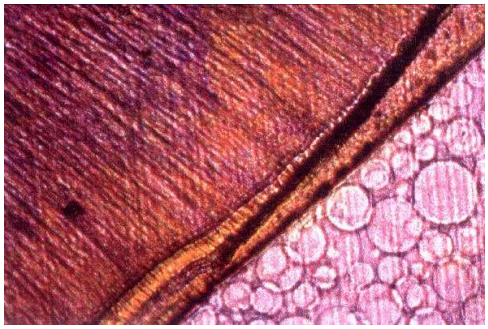

Fig. 5: Brushed specimen, Optibond Solo. 800 cycles. Polarized light, 64x.

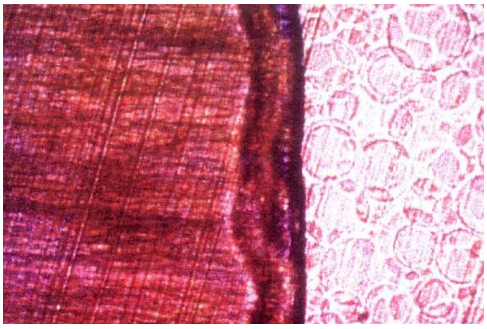

Fig. 6: Brushed specimen, Prime & Bond NT, 1600 cycles. Polarized light, 64x.

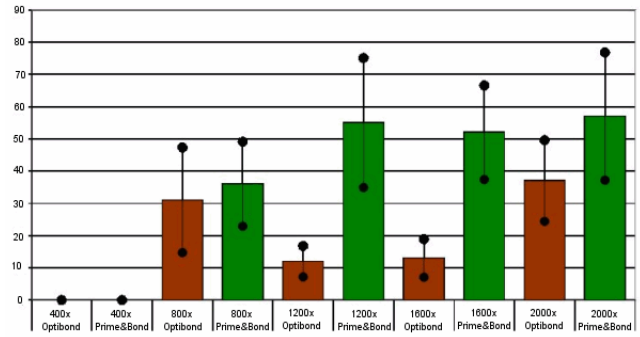

Fig. 7: Mean lesion depth and standard deviation within the different groups.

Discussion and Conclusions

Regarding the dentin adhesive systems tested in this study, significant differences could be observed. In groups with high brushing cyles (1200 -2000), specimen treated with Optibond Solo showed lower lesion depths after tooth-brushing. Within the limitations of an in vitro investigation, it can be concluded that root surface caries can be hampered using dentin adhesives. But both dentin adhesives showed only low mechanical resitance to tooth-brushing abrasion.

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This poster was submitted by Dr. Christian R. Gernhardt.

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Influence of dentin adhesives on root caries development after tooth-brushing abrasion

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Tab. 1: Mean lesion depth and correlation within the different groups.

Fig. 4: Brushed specimen, Prime & Bond NT, 800 cycles, Polarized light, 64x.

Fig. 5: Brushed specimen, Optibond Solo, 800 cycles. Polarized light, 64x.

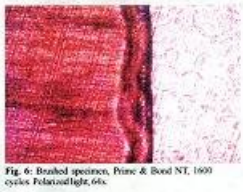
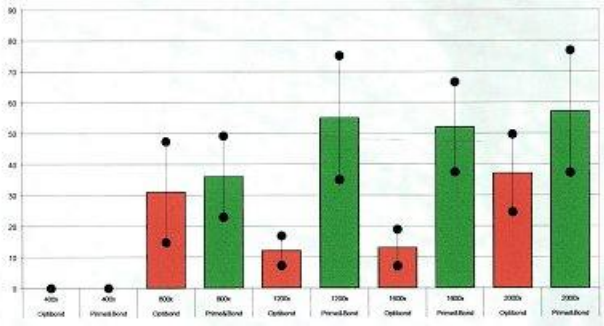


Fig. 6: Brushed specimen, Prime & Bond NT, 1600 cycles. Polarized light, 64x.



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Conclusion

Regarding the dentin adhesive systems tested in this study, significant differences could be observed. In groups with high brushing cyles (1200 -2000), specimen treated with Optibond Solo showed lower lesion depths after tooth-brushing. Within the limitations of an in vitro investigation, it can be concluded that root surface caries can be hampered using dentin adhesives. But both dentin adhesives showed only low mechanical resitance to tooth-brushing abrasion.

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