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Influence of a dentin adhesive on root caries progression examining sound and irradiated dentin

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Authors:
Dr. Christian Ralf Gernhardt,
Tasula Koravu, cand. med. dent.,
Prof. Dr. Hans-Günter Schaller,
Department of Operative Dentistry and Periodontology,
Martin-Luther-University Halle-Wittenberg

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Introduction

"Radiation caries", a rapidly developing and highly destructive form of tooth decay, is a well-known consequence of radiotherapy of malignant tumors in the head and neck region. Hyposalivation, which is induced by irradiation (1), and dietary changes with concomitant alteration of the oral flora (2) are considered to be the most important aetiological factors (3). In addition to the buccal and oral smooth surfaces as well as to the occlusal or incisal edges of the teeth (4), "radiation caries" frequently occurs on the cervical regions of exposed root surfaces (5).

Objectives

Previous studies have shown that dentin adhesives can prevent root surface caries. Therefore, the aim of the present investigation was to evaluate the caries-protective effect of a dentin bonding system (One-Coat-Bond, Coltene, Swiss) on non-irradiated, sound and irradiated root surfaces in vitro.

Material und Methods

Thirty 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. Fifteen teeth were irradiated. The irradiation dose of 60 Gy was fractionally applied over six weeks (2 Gy per day). The teeth were than coated with an acid-resistant nail varnish, exposing two retangular windows of 6 mm2 each (Fig 1.)

Fig. 1: Specimen coated with an acid resistant nail varnish exposing two retangular windows.

One window served as untreated control, while the other window was treated with the dentin adhesive system as recommended by the manufacturer. The specimens were randomly divided into four experimental groups: group A: irradiated, treated with dentin adhesive; group B: irradiated not treated; group C: non-irradiated, treated; group D: non-irradiated, not treated. All specimens were demineralized with acidified gel (HEC, pH 4.8, 37°C).
From each specimen two 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

The coated, irradiated specimens in group A showed lesions with a mean depth of 63 microns (± 10.2). In group B lesion depth was increased (91 microns ± 6.0). The non-irradiated specimens in group C and D showed a mean lesion depth of 58 microns (± 14.2) and 92 microns (± 6.6) (Tab. 1, Fig. 2).

In group A and C the lesion depth was reduced significantly compared to the untreated groups B and D, the comparison between group A and C and between B and D showed no significant differences ($p<0.001$, closed test procedure).

	Group A	Group B	Group C	Group D
Mean Lesion depth (microns)	63	91	58	92
Standard deviation	± 11	± 6	± 14	± 7

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

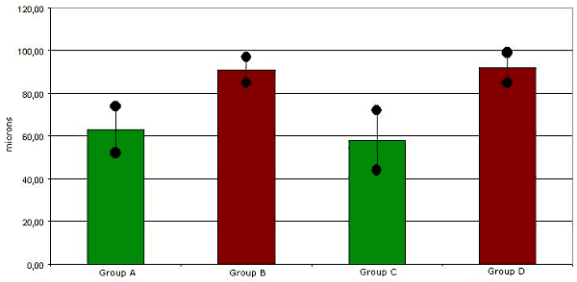

Fig. 2: Mean lesion depth and standard deviation within the different groups.

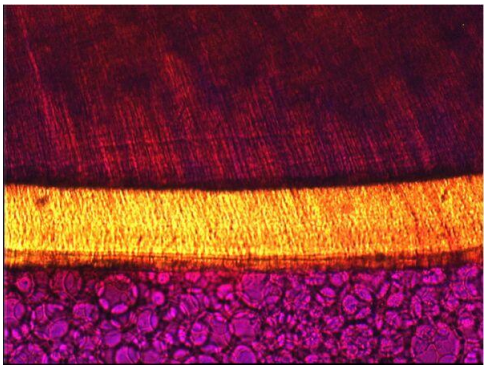

Fig. 3: Irradiated specimen, treated with dentin adhesive system. Polarized light microscopy. 100x.

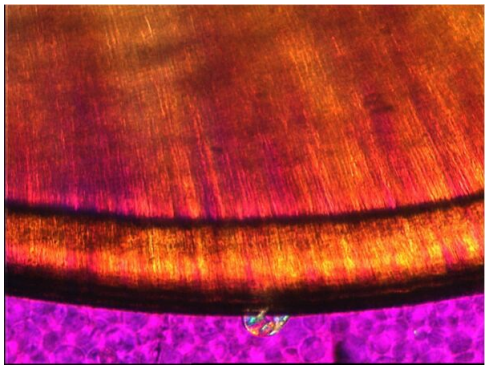

Fig. 4: Non- irradiated specimen, treated with dentin adhesive system. Polarized light microscopy. 100x.

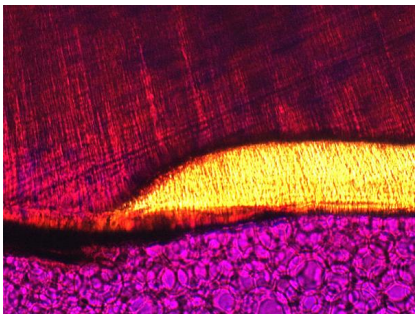

Fig. 5: Irradiated specimen, untreated. Polarized light microscopy. 100x.

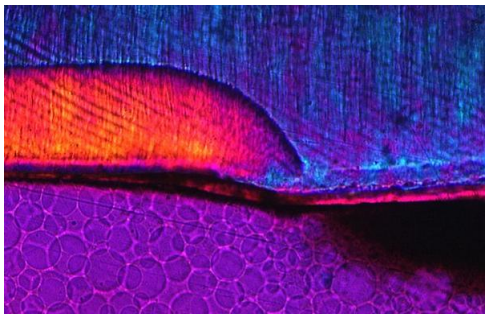

Fig. 6: Non-irradiated specimen, not treated with dentin adhesive system. Polarized light microscopy. 100x.

Discussion and Conclusions

Within the limitations of an in vitro investigation, it can be concluded that the demineralisation of the root surface can be hampered by application of the dentin adhesive tested. In the present study no differences between irradiated and non-irradiated, sound surfaces could be observed.

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This poster was submitted by Dr. Christian Gernhardt.

Correspondence address:
Dr. Christian Gernhardt
Martin-Luther-University Halle-Wittenberg
University School for Dental Medicine
Department of Operative Dentistry and Periodontology
Grosse Steinstrasse 19
06108 Halle
Germany

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