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The Influence of Irradiation on De- and Remineralization of Dentin

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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 edge of the teeth, "radiation caries" frequently occurs on the cervical regions of the exposed root surfaces (4,5).

Objectives

The aim of the present study was to evaluate the effect of irradiation on de- and remineralization of human dentin in vitro.

Material und Methods

Fifteen 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 then coated with acid-resistant nail varnish, exposing four rectangular windows (Fig. 1).

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

Two windows served as a non-irradiated control, while the other two windows were irradiated. The irradiation dose of 60 Gy was fractionally applied over six weeks (2 Gy/day). All specimens were distributed among the following experimental groups: A: non-irradiated, only demineralization; AA: non-irradiated, de- and remineralization; B: irradiated, only demineralization; BB: irradiated, de- and remineralization. All specimens were demineralized for 21 days with acidified gel. The remineralization was performed using a calciumphosphate model for 12 days. From each tooth, two dentinal slabs were cut (Fig. 2).

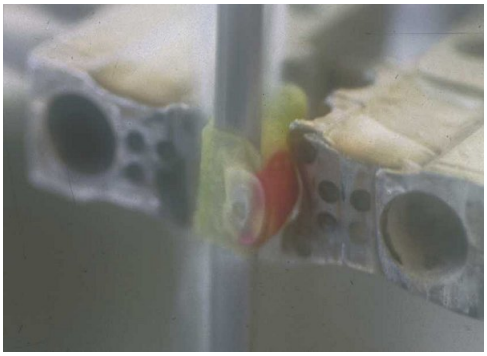

Fig. 2: Cutting a dentinal slab from a specimen.

The depth of the demineralized areas was determined using a polarized light microscope. For each group mean value and standard deviation were calculated. Statistical analysis was performed using ANOVA and Tukey's test.

Results

In the case of the non-irradiated specimens a mean lesion depth of 205 µm (± 51 µm, group A, Tab. 1, Fig. 3, 4) after demineralization and 178 µm (± 32 µm, group AA, Fig. 3, 5) after remineralization was observed.

	Non-irradiated Demineralization	Non-irradiated De- and remineralization	Irradiated Demineralization	Irradiated De- and remineralization
Lesion depth (microns)	205	178	195	177
Standard deviation	± 51	± 32	± 51	± 42

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

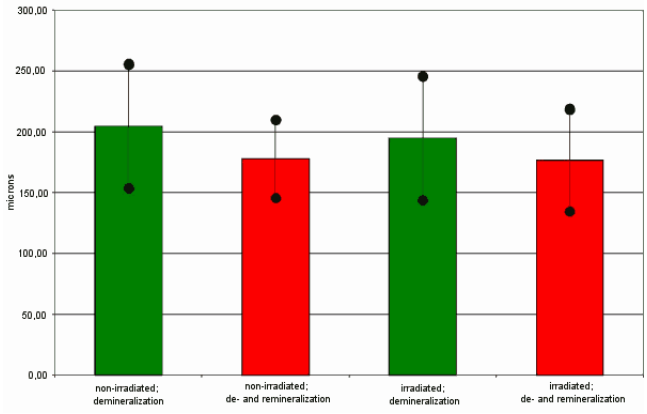

Fig. 3: Mean value and standard deviation within the different groups.

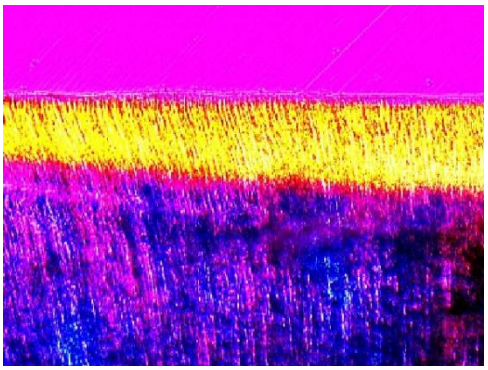

Fig. 4: Non-irradiated, demineralized specimen (group A), 10x.

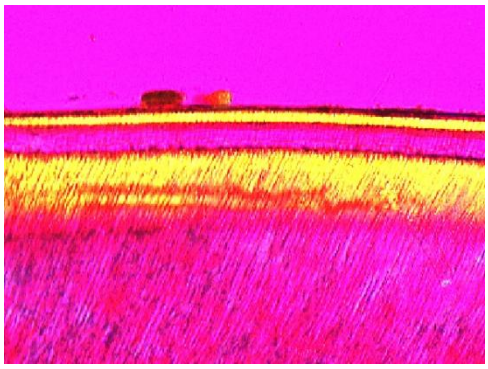

Fig. 5: Non-irradiated, de- and remineralized specimen (group AA), 10x.

The irradiated specimens showed a mean lesion depth of 195 µm (± 51 µm, group B, Tab. 1, Fig. 3, 6)) after demineralization and 177 µm (± 42 µm, group BB, Tab. 1, Fig. 3, 7) after remineralization. Statistical analysis showed in both cases a significant decrease of the lesion depth after remineralization ($p < 0.05$, Tukey's test). Between the irradiated and non-irradiated groups no significant differences could be detected.

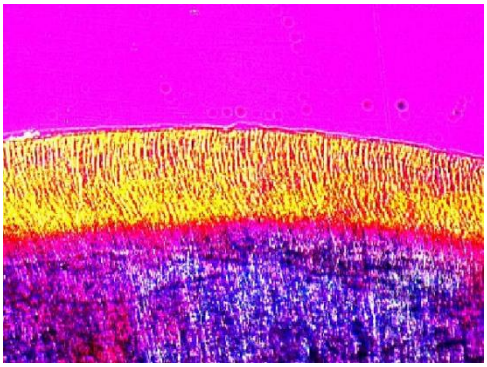

Fig. 6: Irradiated, demineralized specimen (group B), 10x.

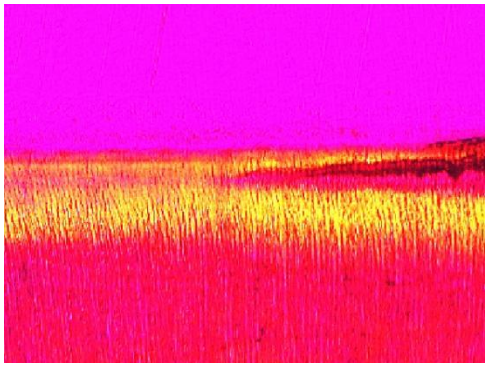

Fig. 7: Irradiated, de- and remineralized specimen (group BB), 10x.

Discussion and Conclusions

Within the limitations of an in vitro investigations it can be concluded that irradiation has no effect on de- and remineralization of human dentin. No significant differences between irradiated and non-irradiated dentin could be detected after de- and remineralization.

Bibliography

1. Frank, R.M., Herdly, J. & Phillipe, E. (1965) Acquired dental defects and salivary gland lesions after irradiation for carcinoma. Journal of the American Dental Association, 70, 868-883.
2. Brown, L.R., Dreizen, S., Handler, S. & Johnston, D.A. (1975) Effect of radiation-induced xerostomia on human oral microflora. Journal of Dental Research, 54, 740-750.
3. Kielbassa, A.M., Beetz, I., Schendera, A. & Hellwig, E. (1997b) Irradiation effects on microhardness of fluoridated and non-fluoridated bovine dentin. European Journal of Oral Science, 105, 444-447.
4. Jongebloed, W.L., s-Gravenmade, E.J. & Retief, D.H. (1988) Radiation caries. A review and SEM study. American Journal of Dentistry, 1, 139-146.
5. Pyykönen, J.G., Malmström, M., Oikarinen, V.J., Salmo, M. & Vehkalahti, M. (1986) Late effects of radiation treatment of tongue and floor-of-mouth-cancer on the dentition, saliva secretion, mucous membrans and lower jaw. International Journal of Oral and Maxillofacial Surgery, 15, 401-409.

This poster was submitted by Dr. Christian Gernhardt.

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