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Influence of Restorative Materials on Demineralization of Irradiated Dentin

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Introduction

Radiation therapy plays an important role in the management of malignant tumors in the head and neck region. One oral disease linked with radiotherapy is so called "radiation caries" which is a rapidly developing and highly destructive form of tooth decay (1).
Metal plates, designed to be screwed into the bone in reconstruction of mandibular defects are an accepted and widely used procedure in oral cancer therapy. It has been shown that the radiation effect in the immediate vicinity of these plates can be increased and that tissues in contact with metal implants showed distinctive radiation induced defects (2).
Based on this findings, further investigations will have to show, if different dental restoration materials have similar effects on human dentin.

Objectives

Therefore, the aim of this study was to evaluate the influence of different restoration materials on demineralization on irradiated dentin.

Material and Methods

The study was carried out on 55 freshly extracted human third molars without caries. Over the whole experimental period, the specimens were stored in 0.9% saline. Dentin disks were prepared and these disks were assigned to five groups (n=11) including a positive and negative control. After preparation in three groups occlusal restorations with different materials (amalgam, base metal alloy, titanium alloy) were fabricated. Four groups were irradiated with 60 Gy (2 Gy/day for six weeks), the negative control group remained non-irradiated. All specimens were demineralized for 14 days with acidified gel (HEC, pH 4.8, 37 degrees C). From each tooth, two dentinal slabs were cut. The depth of the demineralized areas was determined using a polarized light microscope (Figures 1 and 2). For each group mean value and standard deviation were calculated. Statistical analysis was performed using ANOVA and Tukey's test.

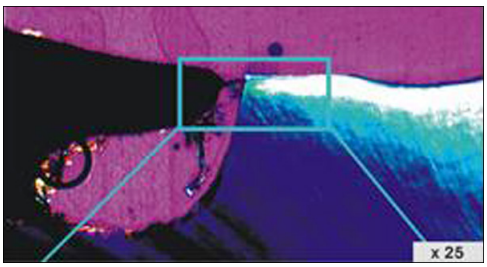

Fig. 1: Image of an irradiated specimen restored with amalgam (Group A60)

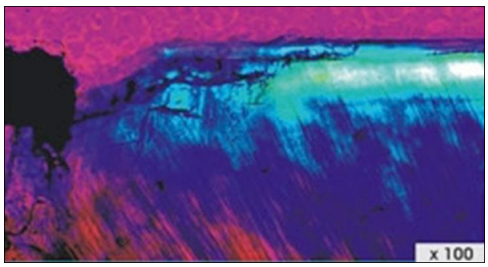

Fig. 2: Enlarged view of the selected region from Fig. 1

Results

In all specimens lesion depth could be recorded. In the following table the evaluated lesion depths are summarized (Table 1, Figure 3).

Group	Restorative Material	Irradation	Mean Lesion Depth (µm)
C	None	0 Gy	155.1 ± 17.0
C60	None	60 Gy	166.5 ± 16.6
A60	Amalgam	60 Gy	276.7 ± 15.8
B60	Base Metal Alloy	60 Gy	260.9 ± 21.8

T60	Titanium Alloy	60 Gy	253.4 ± 15.3

Table 1: Mean value and standard deviations (in µm) within the different groups

- Statistical analysis showed a significant influence of irradiation and the used material ($p < 0.001$, ANOVA).
- Between both control groups (C, C60) no significant differences could be detected ($p > 0.05$, Tukey's test).
- Between the controls and the restored groups significantly increased lesion depths could be observed ($p < 0.05$, Tukey's test).
- Pairwise comparison between the three materials showed no significant differences ($p > 0.05$, Tukey's test).

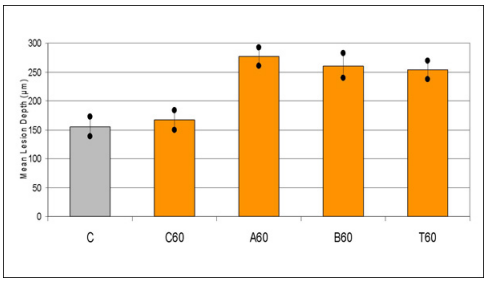

Fig. 3: Mean value and standard deviations (in µm) within the different groups

Conclusions

Irradiated dentin with metal restorations showed the significantly highest lesion depths after initial demineralization by acidified gel compared to the control groups. The different metal materials had no significant impact on artificial dentin demineralization.

Literature

1. Bekes K, Francke U, Schaller HG, Kuhnt T, Gerlach R, Vordermark D, Gernhardt CR: The influence of different irradiation doses and desensitizer application on demineralization of human dentin. Oral Oncology 2009; 45(9):e80-4.
2. Farahani M, Eichmiller TC, Mc Laughlin WL: Measurement of absorbed doses near metal and dental material interfaces irradiated by X- and gamma-ray therapy beams. Phys Med Biol 1990: 35: 369-85.

This Poster was submitted by PD Dr. Christian Gernhardt.

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Influence of Restorative Materials on Demineralization of Irradiated Dentin

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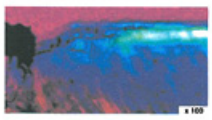

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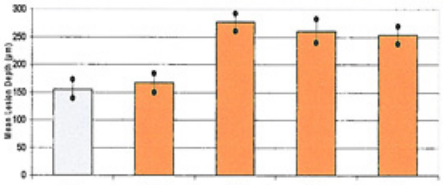

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References

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