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Influence of Restorative Materials on Caries Development of Irradiated Teeth

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Introduction

"Radiation caries" is a well-known consequence of radiotherapy of malignant tumors in the head and neck region. During the past decade, it was recognized on patients with hip and knee prosthesis, that the radiation effect in vicinity of implants was increased. Tissues in contact with metal implants showed distinctive higher radiation induced defects than tissues of patients without an endoprosthesis. Based on this findings, further investigations will have to show, if different dental filling materials have similar effects on human enamel and dentin.

Objectives

The aim of this study was to evaluate the influence of different restoration materials on demineralization of irradiated enamel and dentin compared to non-irradiated teeth.

Material and Methods

Thirty-two freshly extracted human third molars without caries were used. The teeth were assigned to four groups (n=8). Over the whole experimental period specimen were stored in 0.9% saline. All teeth were prepared with class II-cavities (mesial dentin, distal enamel) (Fig. 1). The specimens were randomly assigned to four experimental groups (Fig. 2). After preparation cavities were filled with four different materials (composite resin, amalgam, glass ceramic inlays and gold inlays). All teeth were bisected along their long axis in the middle of the fillings. One half of each tooth was irradiated with 60 Gy (2 Gy/ day for six weeks), the other half remained non-irradiated. All specimens were demineralized for 6 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 (Fig. 3).

Fig. 1: Specimen preparation. Standardized cavities were prepared.

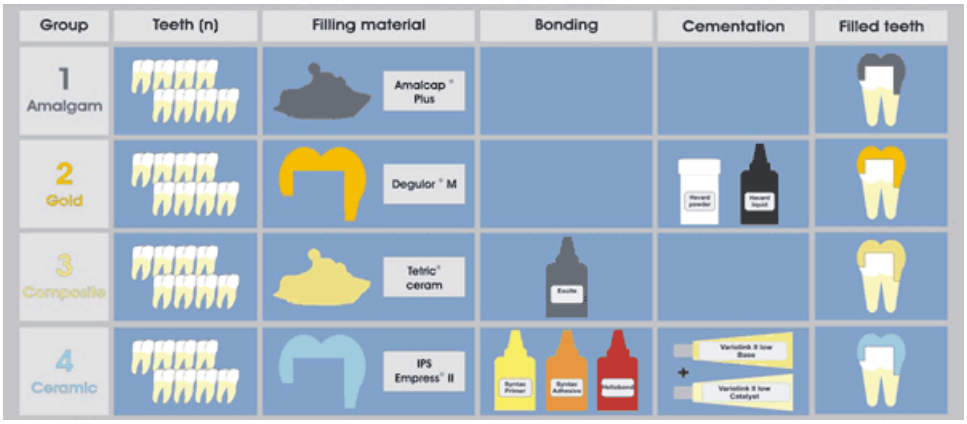

Fig. 2: All specimen were assigned to four experimental groups using different filling materials.

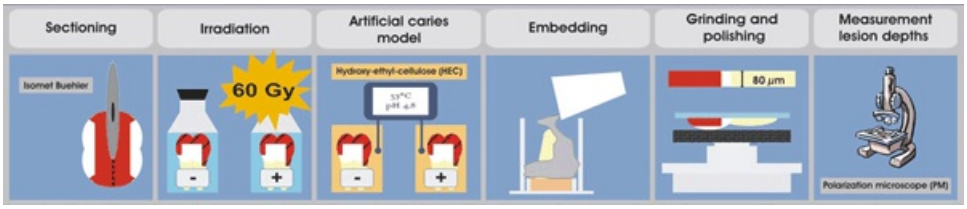

Fig. 3: The experimental design including radiation, demineralization and evaluation.

Results

In all specimens lesion depth could be recorded (Fig. 5, 6). Significant higher lesion depths after irradation were found for the dentin and enamel in group using amalgam as filling material(*p<0.05, **p<0.001). in the following boxplot the evaluated lesion depths are summarized (fig. 4).

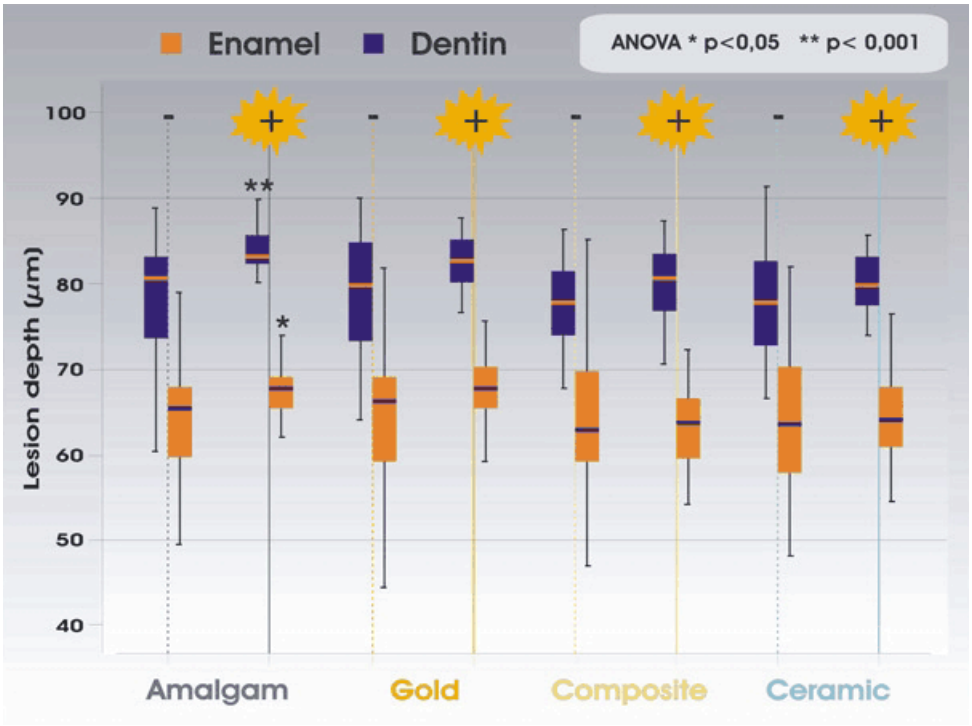

Fig. 4: Boxplot. Lesion depths of all groups (*= significant differences to the non-irradiated control).

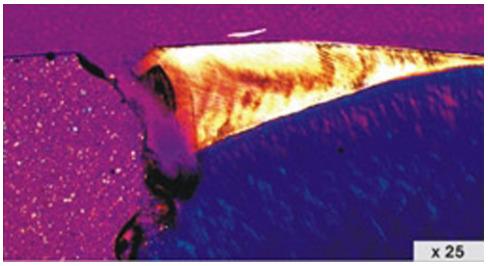

Fig. 5: Image of an enamel lesion. Composite was used as filling material.

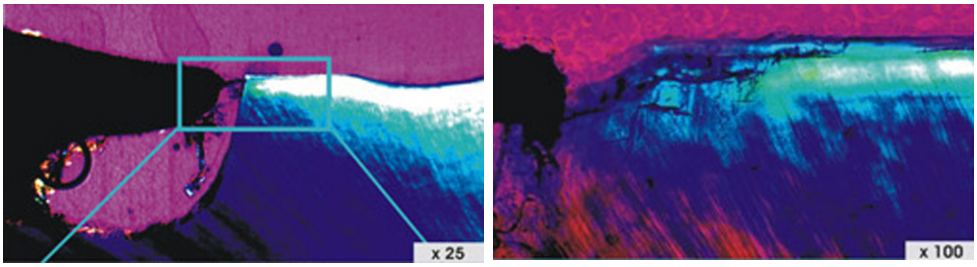

Fig. 6: Image of an irradiated specimen restored with amalgam. The lesion is clearly visible.

Fig. 7: Enlarged view of selected region from Fig. 6

Conclusions

Within the limits of an in vitro study, irradiated dentin with amalgam-fillings showed significantly increased lesion depths after demineralization by an acidified gel system compared to all other groups. In all other material groups irradiation had no significant impact on artificial dentin and enamel demineralization.

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

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