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Structure Of The Dentoenamel Junction After Radiotherapy And In Vitro Irradiation

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Introduction

Micro-morphological and physicochemical studies on mechanisms of the rapid caries progress after radiotherapy mainly are focused on enamel. Effects on the crystallite structure, formation of enamel cracks and differences in the demineralisation behaviour are reported. Discrimination between defects induced during the irradiation and damages due to subsequent radio-xerostomia so far is not possible. In consequence, the specific aetiology of radiotherapy induced caries is far from being understood.

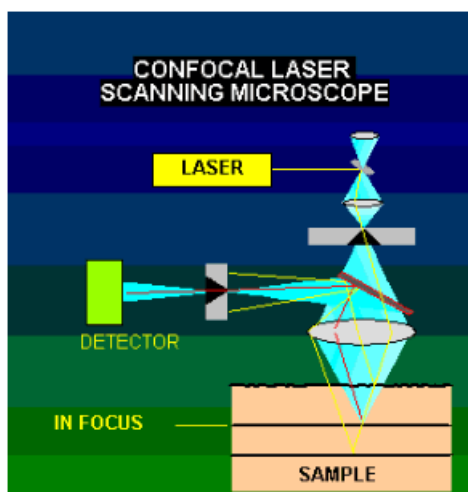
Objectives

Only few investigations deal with effects of radiotherapy on the dentoenamel junction. This experiment was to study the micro-morphology of the dentoenamel junction and to discriminate between: effects due to the irradiation alone defects induced by radio-xerostomia. The concept of the study was the CLSM visualization of the dentoenamel junction: of sound extracted teeth irradiated extraorally in a Co-60 source of teeth extracted from patients in different phases of radiotherapy

Materials and Methods

sound, totally impacted and surgically removed teeth, as standards (n = 50) teeth with 33 ± 10 Gy in vivo, no visible defects; (n = 61, 11 patients) - teeth with 63 ± 6 Gy in vivo, macroscopically visible defects (n = 147, 24 patients) 500 - 2500 Gy in vitro irradiated teeth, doses 0.1, 1 and 10 Gy/min (n = 30) Before microscopical inspection, the teeth were stored humid in a 0.02 % NaN3-solution. Sections used for microscopy were either fresh or from specimens embedded in Technovit.

CLSM is a non-destructive technique for tomographic visualisation of microscopic areas of tooth structures, with the potential of nearly artefact free imaging.



Results

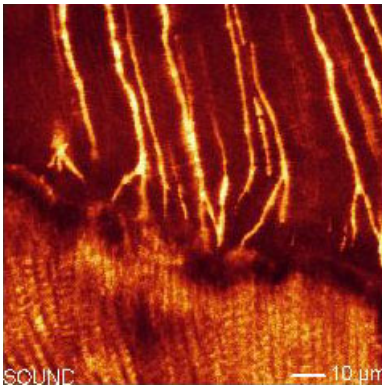


Fig. 1: Sound teeth: Sharp contours of the dentoenamel junction; plenty of tubuli and ramifications; odontoblast processes extend into enamel.

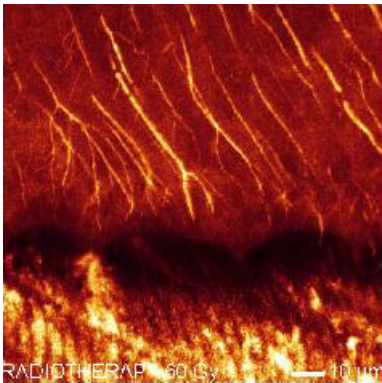


Fig. 2: Teeth extracted after radiotherapy: Diffuse contours of the dentoenamel junction; dentine tubuli and ramifications are rare; odontoblast processes end before junction.

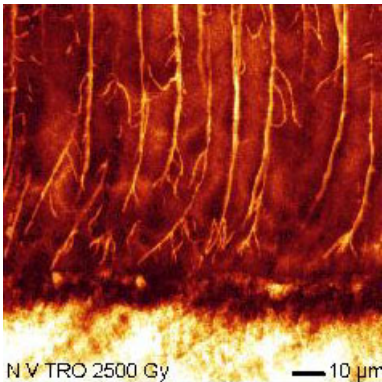


Fig. 3: Sound teeth extraoral irradiation: Contours of dentoenamel junction slightly diffuse; Odontoblast processes appear thinner and are less reflexible, highly reflecting enamel.

Discussion and Conclusions

Radiotherapy induced caries seems to originate from radiation induced defects in the dentoenamel junction. (see Fig. 1)

This Poster was submitted on 14.12.98 by Dr. Dr. med. Knut A. Grötz.

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STRUCTURE OF THE DENTOENAMEL JUNCTION AFTER RADIOTHERAPY AND *IN VITRO* IRRADIATION

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INTRODUCTION

Micro-morphological and physicochemical studies on mechanisms of the rapid caries progress after radiotherapy mainly are focused on enamel. Effects on the crystallite structure, formation of enamel cracks and differences in the demineralisation behaviour are reported. Discrimination between defects induced during the irradiation and damages due to subsequent radio-xerostomia so far is not possible. In consequence, the specific aetiology of radiotherapy induced caries is far from being understood.

OBJECTIVES

Only few investigations deal with effects of radiotherapy on the dentoenamel junction. This experiment was to study the micro-morphology of the dentoenamel junction and to discriminate between:
- effects due to the irradiation alone
- defects induced by radio-xerostomia.

The concept of the study was the CLSM visualization of the dentoenamel junction:

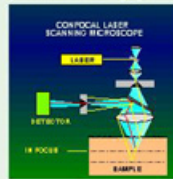
- of sound extracted teeth irradiated extra-orally in a Co-60 source
- of teeth extracted from patients in different phases of radiotherapy

MATERIALS

- sound, totally impacted and surgically removed teeth, as standards (n = 50)
 - teeth with 33 ± 10 Gy *in vivo*, no visible defects; (n = 61, 11 patients)
 - teeth with 63 ± 6 Gy *in vivo*, macroscopically visible defects (n = 147, 24 patients)
 - 500 - 2500 Gy *in vitro* irradiated teeth, doses 0.1, 1 and 10 Gy/min (n = 30)
- Before microscopical inspection, the teeth were stored humid in a 0.02 % NaH₂SO₄ solution. Sections used for microscopy were either fresh or from specimens embedded in Technovit.

METHOD

CLSM is a non-destructive technique for tomographic visualisation of macroscopic areas of tooth structures, with the potential of nearly artefact free imaging.



RESULTS

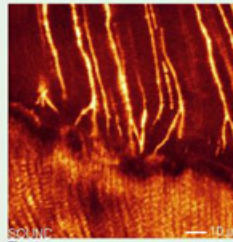


Fig. 1

Fig. 1: Sound teeth:

Sharp contours of the dentoenamel junction, plenty of tubuli and ramifications, odontoblast processes extend into enamel.

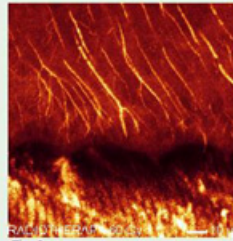


Fig. 2

Fig. 2: Teeth extracted after radiotherapy

Diffuse contours of the dentoenamel junction, dentine tubuli and ramifications are rare, odontoblast processes end before junction.

Fig. 3: Sound teeth extraoral irradiation

Contours of dentoenamel junction slightly diffuse, Odontoblast processes appear thinner and are less reflexible, highly reflecting enamel.

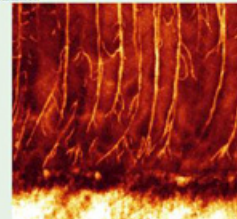


Fig. 3

CONCLUSION: Radiotherapy induced caries seems to originate from radiation induced defects in the dentoenamel junction.