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EVALUATION OF TOOTH ENAMEL CONTENT EXPOSED TO BLEACHING GEL

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INTRODUCTION & OBJECTIVES

Due to tooth bleaching growing popularity and to match the public demands, manufacturers have increased the range of bleaching products available, changing its presentation, techniques and concentration of principle actives.[1,2]

Tooth bleaching is a more conservative technique than the application of veneers, crows or even composite resins. Nevertheless, there is still not an agreement among scientific community, namely about the influence of the active principles on the morphology of enamel surface.[3,4,5,6]

The x-ray fluorescence spectroscopy is a qualitative and quantitative elemental analysis method to identify sample elements, by getting its x-ray fluorescence spectra. Some advantages of this technique are its simplicity of interpretation, its low cost and the ability to analyze multiple elements simultaneously in real time. Furthermore, it needs just minimal sample preparation and is a non-destructive method, allowing copies with several sizes and formats.

The purpose of this *in vitro* study was to assess whether the elemental content of Ca, P and Zn in tooth enamel is altered when bleaching the teeth with 10 % carbamide per-

MATERIALS & METHODS

Six anterior healthy teeth, extracted for periodontal or orthodontic reasons and preserved in a 0.5% (w/w) chloramine solution for no longer than 6 months were used. Sound vestibular surfaces of teeth were used. Cuts were made in order to obtain 8mm x 2mm samples. Samples were then treated with the bleaching product (Opalescence PF 10%, Ultradent, USA) accordingly to manufacturer instructions and stocked in artificial saliva between each application.

The elemental content of each samples, before and after treatment were determined by means of micro Energy Dispersive X-Ray Spectrometry (µ-EDXRF)(n=8-16). The equipment consists on an X-ray tube OXFORD XTF5011 with a Mo anode and a Silicon Drift Detector Vortex-60EX® with an active area of 50mm2 and a 12.5µm thickness Beryllium (Be) window. The radiation emitted by the X-ray tube is focused by means of polycapillary optics, allowing a focal spot of 100 µm.

The quantitative analysis of the samples was carried out using WinAXIL software package (Canberra, Belgium). Statistical analysis (paired-sample T Test) was performed by SPSS V.21 (IBM, USA). Results of Ca and P are expressed in % (w/w) and Zn in ppm (w/w).

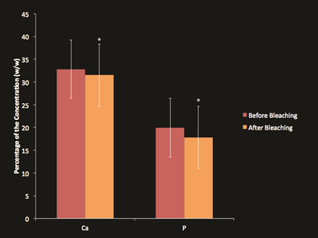

Figure 2 - Bar charts showing average results obtained for the elements Ca and P, concentration expressed as percentage of concentration and the respective standard deviation.

RESULTS

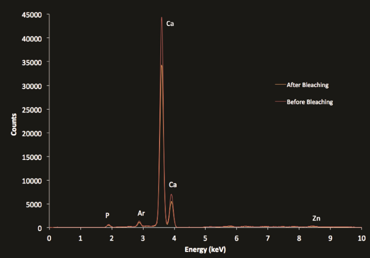

Figure 1 - Comparison of typical EDXRF spectrum obtained before and after bleaching treatment.

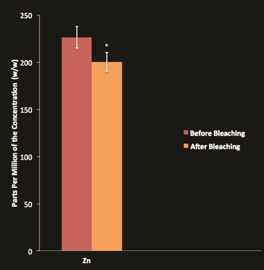

Figure 3 - Bar charts representing averages obtained for Zn concentration expressed in ppm and the respective standard deviation.

SUMMARY

- A common bleaching product containing the gold standard amount of active principle, 10% of CP was used in this study. This amount of active principle is associated with low incidence of adverse effects.
- When compared to referenced studies, our work increase the robustness of methodology using artificial saliva as medium storage between measurements. By this we try to simulate remineralisation occurring in enamel surface and even with this procedure a decreased of Ca, P and Zn was observed.
- Energy Dispersive X-Ray Fluorescence is an accurate technique to detect trace element changes in tooth composition namely when tooth bleaching is performed. Regarding the results obtained is therefore reasonable to question whether the statistically significant decrease of Ca, P and Zn amount present will imply severe and irreversible consequences in dental enamel surface.

CONCLUSIONS

The bleaching procedure performed *in vitro* reduced the mineral content of enamel. More studies are needed to assess the clinical significance of the present study.

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