

Poster Presentations - Research Supported by P&G

Thursday, March 10



0957

Postbleach Tooth Color and Optical Properties of Dental Hard Tissues

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Knowledge on the underlying mechanisms of bleaching is fragmentary. **Objectives:** The aim was to study the bleach induced effects on tooth luminescence by measuring the optical properties of dental hard tissues. **Materials:** Extracted human incisors subjected to various bleaching procedures (0, 6, 24, 48 h; 6 – 14 % H₂O₂ in gel; 37°C), partly hemi-sectioned along their vertical axis. To minimize the risk of artifacts tooth samples were studied naturally wet and without further pre-treatments. **Method:** Prototype fibre glass-coupled combination of a confocal laser scanning microscope, a spectrophotometer (Leica TCS SP2 AOBs) and a Raman spectrometer (Induram). Measurements before and after bleaching were carried out along line scans from tooth surface to dentin/pulp junction including; 1) tooth color (Fuji 1000 CCD); 2) CLSM ultra structure 3) optical spectra (excitation: Ar ion laser at 488 nm) 4) Raman spectra (excitation He/Ne laser at 632 nm). The technique allowed placing cubic-micrometer size subsurface AOIs at discrete distances (some ten µm) from the tooth surface, through enamel and DEJ down to the dentin/pulp junction. **Quantification:** 1) CIELab L*, a*, b* values 2) intensity at peak maximum of the optical spectra 3) Raman spectra total intensity (RSTI). **Results:** The CLSM ultra-structure of teeth is not affected by the present bleaching procedures. Maxima of optical spectra are slightly shifted from enamel to dentin. Bleach induced CIELab color distances from baseline (unbleached) correlate with quenching of tooth fluorescence, both for the peak maxima of the optical spectra as well as for the RSTI values. The effect is most pronounced in enamel and DEJ, in dentin luminescence only slightly is affected. CIELab color distances (b*) exponentially decrease from tooth surface to DEJ. Correlations between b* and fluorescence intensity/RSTI are near to linear. **Conclusion: Bleaching of teeth might affect fluorescent chromophores of dental hard tissues.**

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CIELab Delta b on External Bleaching Correlate with Tooth Fluorescence*

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A complete understanding of the type and location of oxidation which occurs with vital tooth bleaching may prove valuable in development of future formulations. **Objectives:** Studies have demonstrated that bleaching produces changes in external color (b* reductions, L* increases), internal color, and internal fluorescence. This study compared external color changes to Raman fluorescence changes in teeth bleached externally in vitro. **Methods:** Extracted human premolars were cleaned and analyzed for external CIELab color with a Fuji-1000CCD and stratified into treatment groups including 0; 6; 24; 48 hours bleaching (periods ABCD) in bulk 6 % H₂O₂ gel 37°C. External tooth colors were recorded post bleaching and teeth were hemi-sectioned along their vertical axis. Following this, teeth were analyzed in cross section in line scans for ultrastructural effects using non-destructive confocal laser scanning microscopy (reflection mode, He/Ne laser 632 nm). Laser light emitted from subsurface tissues was used for fluorescence and Raman spectra uptake (prototype fiber optic coupling of Raman spectrometer to CLSM, He/Ne laser 632 nm). **Results:** External tooth color changed exponentially with time of bleaching in vitro with maximum b* changes measuring over 4.93 and L* measuring 6.61 units. RSTI (Raman Spectrum Total Integral) reduction was compared with external b changes producing a remarkable linear correlation with r² > 0.90. **Conclusion: The changes in Raman fluorescence properties of teeth internally would appear to correlate well to external color changes produced by externally applied peroxide bleaches. These results suggest that the mechanism of vital bleaching includes phenomena more complex than simple chromagen reductions and may include changes in Raman fluorescence properties of teeth.**