Effects of Staining on Color Change of Pre-whitening and Whitened Tooth

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Abstract: Even after discolored teeth have been treated with whitening agent, discoloration occurs again. The causes of tooth discoloration are various. Extrinsic discoloration is caused by deposition of external pigments on the tooth surface. Tooth whitening roughens the surface of tooth enamel. So, we hypothesized that the whitened tooth surface is highly contaminated by pigments compared with the non-whitened tooth surface. The purpose of this study was to determine the dye penetration into pre-whitening and whitened teeth.

Twenty-four extracted human teeth were used in this study. The tooth color was measured by ShadeEye NCC. Each tooth was soaked in coffee for 24 hours, then the color of the stained tooth was measured. The stained tooth was treated with Shofu Hi-Lite (35% hydrogen peroxide) as an office whitening system and PolaNight (16% carbamide peroxide) as a home whitening system at three weeks. The color of the tooth was measured every week. Then the whitened tooth was soaked in coffee, and the recurrence of dislocation was investigated. The values of L*, a* and b* were determined, and the color difference was calculated using the formula \( \Delta E^{*}_{ab} = (\Delta L^*)^2 + (\Delta a^*)^2 + (\Delta b^*)^2 \). The value of L* was observed to decrease after soaking in coffee, then the value of L* was increased by both of the office whitening and the home whitening. A slight reduction of L* was observed due to the recurrence of discoloration tooth. The color difference \( \Delta E^{*}_{ab} \) of the tooth before and after staining with coffee was 10.22±1.62 in the office whitening group, and 10.85±3.35 in the home whitening group. The value of \( \Delta E^{*}_{ab} \) between whitening and relapsing operation was 1.59±1.02 in the office whitening group, and the color difference was 4.76±2.37 in the home whitening group. These results suggested that the whitened tooth had resistance to staining with pigment.

Key words: Whitening, Staining, Relapse