Effect of Discoloration and Simulated Tooth Brushing on Color Stability and Surface Roughness of Artificial White Spot Lesions Treated with Resin Infiltration Technique (A Comparative *in vitro* Study)

A Thesis
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Abstract

The earliest visible sign of enamel caries is the white spot lesions (WSLs). WSLs show an apparently intact surface layer and a porous lesion body. These lesions greatly affect the aesthetic outcome by making color changes and altering the normal color lightness accompanied by increased surface roughness of the affected area.

This study was conducted to evaluate the efficiency of ICON® resin infiltration technique on the color and surface roughness of WSLs and also to study the effect of different discoloring drinks and tooth brushing on these two parameters.

Forty-eight sound premolar teeth were included in this study. WSLs were produced on the buccal surface of each tooth. Each of them received resin infiltration treatment. The samples were randomly divided into three main groups according to their aging medium (n=16): group A, immersed in distilled water; group B, immersed in tea; group C, immersed in coffee. The samples of each group were immersed in their subjective solution for one week to simulate two years of aging. Each group was then subdivided into two subgroups (n=8); Subgroup 1: without-brushing and Subgroup2: received brushing cycles. The teeth of subgroup2 were subjected to mechanical brushing simulation to simulate two years of brushing. The color and surface roughness were measured at different stages: first at the baseline, after production of WSLs, after ICON® resin infiltration stage, after discoloration stage, and after brushing cycles.

Color coordinates (L, a and b) data were recorded using VITA Easyshade® Advance spectrophotometer, and color change was calculated. Surface roughness tester profilometer was used for gathering surface roughness data and atomic force microscopy was used for images analysis at a level of significance of 0.05.

The gathered data were statistically analyzed using repeated measure two-way ANOVA test and Bonferroni test.

The color lightness was decreased with highly significant values (P≤0.00) after production of WSLs, although the color change was increased when compared with the baseline with a highly significant difference for all subgroups. Furthermore; after placement of resin infiltration, there was no statistically significant difference between resin infiltration and the baseline readings for the color lightness and color change which indicates the ability of resin treatment to improve the lightness and color change of WSLs. The masking of color lightness was optimal, but for color change it was less than ideal (still more than 3.7).

Surface roughness increased with highly significant values after production of WSLs. Resin infiltration significantly reduced the surface roughness of the WSLs, but the roughness still significantly higher than the baseline value. Nevertheless, the effect of ICON® is still regarded within the acceptable roughness range of a restorative material.

After immersion in tea and coffee, color lightness and color change were decreased with highly significant values when compared to baseline and resin infiltration treatment. Moreover, the roughness was increased with statistically highly significant magnitude. The distilled water showed a comparable result with resin infiltration and baseline stages for both color parameters and surface roughness.

After brushing simulation, the color lightness of tea and coffee groups was increased with highly significant and significant magnitudes, respectively, and the color change was reduced at significant and highly significant values, respectively. Therefore, brushing was able to restore some color lightness and improve the color of the discolored samples in a manner approaching the values of the resin infiltration treatment. The surface roughness of brushed discolored

samples was statistically non-significant when compared to the resin infiltration treatment. This finding means that brushing was able to restore the surface roughness with comparable values to resin infiltration treatment but not reaching that of the sound enamel.

Resin infiltration may be considered as a promising material for masking the color of WSLs and to decrease the surface roughness to within the acceptable range of restorative materials.