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in situ Comparison of Surfaces by Optical Profilometry

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Introduction: Surface roughness on tooth structure can have deleterious effects on esthetics, plaque retention and mineralization. Reducing this roughness will improve surface characteristics, but has been difficult to evaluate quantitatively. Therefore, this study's purpose is to describe a technique to quantitate surface changes on in situ samples of a potential remineralization agent, SootheRx, by non-contact optical Profilometry.

Objectives: Evaluate a 28 day clinical model to detect changes in surface roughness and quantitate the surface changes using SootheRx on three sample types in situ.

Methods: Sample preparation includes extracting unerupted 3rd molars, ethylene oxide sterilization, sectioning into 1mm disks of enamel or dentin treated as follows; Abraded Enamel (AE) with 600 grit paper, Enamel Etched (EE) and Etched Dentin (ED). Each sample was sectioned, ½ stored and ½ embedded in a passive orthodontic appliance. Each appliance contained EE, EA, & ED chips. Consented subjects wore the appliances 24 hrs/day for 28 days. Chips were brushed intra-orally w/ SootheRx 2X/day for one minute. Reassembled samples were evaluated using SEM and Optical Profilometry. SEM evaluations were ranked for surface roughness categorically and analyzed for significance using a Mann-Whitney test. Average surface roughness was evaluated using a Zygo 100 Optical Profilometer. Each sample had 20 Ra values calculated and the mean was used comparing control to treated side. Significance was determined for each pretreatment group (EE, AE, ED) by a paired t-test.

Results: SEM evaluations showed significant differences in the categorical ratings for all pretreatment groups ($p < .01$). Surface Roughness values: EE Control 1.225 Treated 0.435, $p < .0001$, AE Control 1.651 Treated 0.824, $p < .001$, ED Control 0.907 Treated 0.497, $p < .0001$.

Conclusions: The 28 day paired sample clinical model is sensitive enough to detect surface roughness changes by SEM and Optical Profilometry. SootheRx significantly improves surface roughness with twice daily use for 28 days on in situ passive orthodontic appliances.

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