Objectives: To assess the calcium release and nanohardness of a new remineralizing treatment strategy on demineralized human enamel.

Methods: Six sound human teeth were cut with a diamond disc to provide blocks of 2 x 2 x 3 mm each. Only the widest exposed enamel surface was demineralized for seven days to simulate a caries non-cavity lesion. Next, these surfaces were treated with an aqueous solution containing bioactive nanoparticles and a polymer induced liquid precursor (PILP) biomimetic analog. The control group had no biomimetic analog added. After seven days, mineral acid biopsies were performed on each carious lesion, and the calcium release was measured by spectrochemistry. In addition, two specimens of each group were cut perpendicular to the surface and transversal hardness was assessed from the top to the bottom using a nanoindenter (iNano, KLA, Milpitas, CA). The difference in calcium release between the treated and the control group was analyzed using repeated measure ANOVA.

Results: The calcium released did not show a statistical difference (p=0.87) among treatments. The mean hardness on the surface of the treated sample was 3.50 GPa and the control sample was 1.09 GPa indicating an increase in the enamel hardness following treatment.

Conclusion: The new remineralizing strategy could recover the hardness of in vitro simulated enamel carious lesions. However, the release of calcium was not affected by the treatment.

Introduction

The enamel remineralization is one of the ultimate challenges in Dentistry, this acellular tissue is not able to heal or recover its properties. The highly dense and organized structures and crystallographic states of the tissue, makes the simulation or reconstruction hard to accomplish.

We used Nanotechnology to provide the ions needed to trigger the healing process. The remaining prism structure of the enamel rod must remain to seed the new crystallites. Therefore the hardness will be recovered, and it is remarkable to note that this hardness must be able to tolerate acid challenge, that eventually would occur in oral environment.

Discussion

- The nanoparticles associated with the PILP were able to recover the Nanohardness of the demineralized (caries simulated) enamel.
- This remineralized substrate resists the acid challenge maintaining the same rate of Calcium and phosphorus release than the sound enamel.

Results

Conclusions


Acknowledgements