Dentifrice Protection Against Dentin Demineralization in an In Vitro Study

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International Association of Dental Research

IADR Abstract
March 21–24, 2007
New Orleans

Abstract # 1764

OBJECTIVE: When applied directly to the tooth surface or incorporated into a dentifrice, NovaMin® relieves hypersensitivity by occluding dentinal tubules through the formation of an acid-resistant apatite layer. This work evaluates the ability of two calcium phosphate-containing materials to protect dentin from demineralization during a 10-day *in vitro* remineralization/demineralization (remin/demin) study.

METHODS: Bovine tooth roots were ground, polished, and acid-etched to expose the dentin layer and create an *in vitro* hypersensitivity model. Randomly-selected samples were left untreated and represent "sound" dentin.
The remaining samples were subjected to a 10-day remin/demin cycle that consisted of a twice-daily 30-minute soak in demineralizing solution (pH=4.52) at 37°C followed by a two-minute brushing with either NovaMin®-containing SootheRx™, RECALDENT™-containing MI Paste, or DI water. Samples were soaked in artificial saliva (pH=7.00) at 37°C between the two daily demineralization/brushing periods. Samples treated with only DI water are referred to as "demineralized" dentin.

Knoop hardness (KH) was measured on all dentin surfaces using a load of 50 grams for 15 seconds. Results were analyzed using ANOVA and Holm-Sidak tests ($p<0.01$).

RESULTS: All data are mean±S.E.M. with n=15. Demineralized dentin had a KH (50.85±0.85) that was significantly lower than sound dentin (65.43±0.50, $p<0.001$). The KH of dentin treated with NovaMin® during the remin/demin cycle (79.75±1.10, $p<0.001$) was significantly greater than sound and demineralized dentin. Dentin treated with RECALDENT™ had a KH (52.12±1.27) that was significantly lower than sound dentin ($p<0.001$) and did not differ from demineralized dentin ($p=0.358$).

CONCLUSION: Current microhardness data indicate that treatment with a NovaMin®-containing dentifrice creates a tenacious surface layer that protects dentin from demineralization caused by repeated acid challenges. Within the limitations of this model, however, the same protection was not provided by amorphous RECALDENT™. These results further explain the observed reductions in clinical hypersensitivity following treatment with a NovaMin®-containing dentifrice.

KEY WORDS: Hypersensitivity, Remineralization, Demineralization, Dentin, Microhardness

J Dent Res 86(Spec Iss A): 1764, 2007 (www.dentalresearch.org)

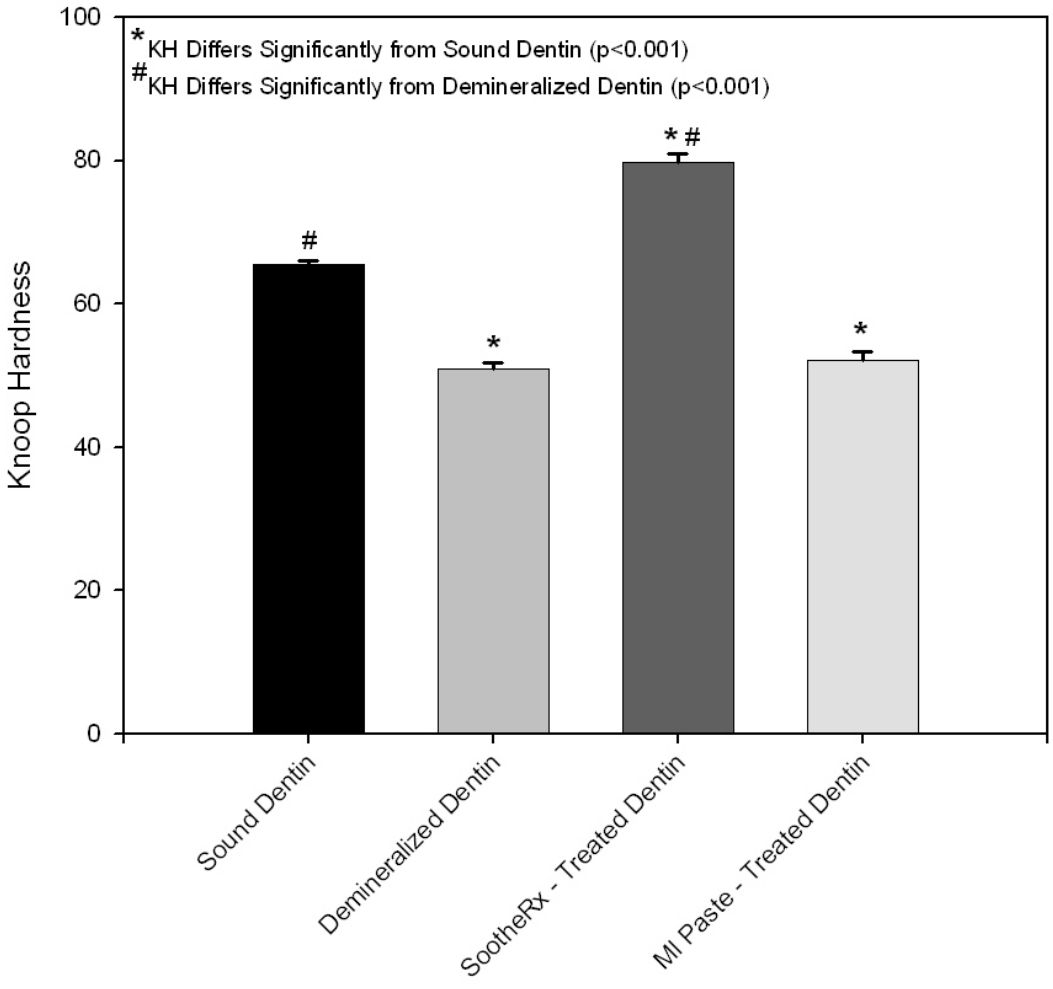

Figure 1: Dentinal Microhardness Before and After 10-day