Research Report

Assessment of Enamel Remineralisation after treatment with four different remineralising agents: A Scanning Electron Microscopy (SEM) Study

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CURODONT™ PROTECT

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Introduction

Fluoride has been recognized as the main reason for the decline in caries due to its cariostatic potential. Despite its profound effect in halting caries progression, it has been met with certain limitations. Fluoride does not aid in eliminating caries totally. Moreover, an in depth mineralization does not occur.

Aim of Study

The present in vitro study was designed to evaluate the remineralising capacity of four remineralization agents on artificial enamel lesions, through Surface Microhardness (SMH) analysis and SEM examination, tested in a pH cycling model over 30 days:

- Self-Assembling Peptide P11-4 (CURODONT™ PROTECT)
- Casein Phosphopeptide-Amorphous Calcium Phosphate Fluoride (CPP ACPF - GC Tooth Mousse Plus; GC Corporation, Tokyo, Japan)
- Bioactive Glass (BAG- NovaMin (SHY-NM, Group Pharmaceuticals Ltd., India))
- Fluoride enhanced Hydroxyapatite Gel (Remin-Pro (VOCO-GmbH, Germany)

Material and Methods

Sixty human maxillary and mandibular teeth were embedded in resin, flattened and prepared in a way, that a 5 mm * 5 mm window of the buccal enamel surface was exposed.

Lesion formation: Test samples were subject to demineralization for 96 h (2.2 mM calcium chloride, 2.2 mM potassium phosphate, and 0.05 M acetic acid; pH adjusted with 1 M sodium hydroxide to 4.4).

pH cycling: Cycle was repeated for 30 days. 1 cycle consisted of:

- Application of remineralizing pastes 2 min & rinse with deionized water
- Placement into demineralizing solution (pH 4.4) for 3 h and a second rinse
- Re-application and rinsing off of the respective remineralizing agents and placement into remineralizing solution (pH 7) for 17 h

Measurements: Surface Microhardness (SMH) was measured prior and after demineralization, as well as at the end of the pH cycling treatment. Remineralization was measured as increase in Vickers Surface Microhardness after the Demin / Remin cycle.
SEM were taken for to determine and compare morphological variations between samples.

Group	Agent	Artificial lesion	Demin / Remin cycling	N
A	Non treated samples - Control			12
B	CPP-ACPF	✔	✔	12
C	BAG	✔	✔	12
D	Fluoride enhanced HA gel	✔	✔	12
E	Self-assembling peptide P11-4	✔	✔	12

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Study design

Randomised, controlled, prospective in-vitro study.

Diagnostic

Surface microhardness measurement (Vickers) & SEM examination.

Conclusion

Self-assembling peptide P11-4 [CURODONT™ PROTECT] demonstrated promising results by effectively and significantly remineralizing the enamel lesions as compared to other test agents.

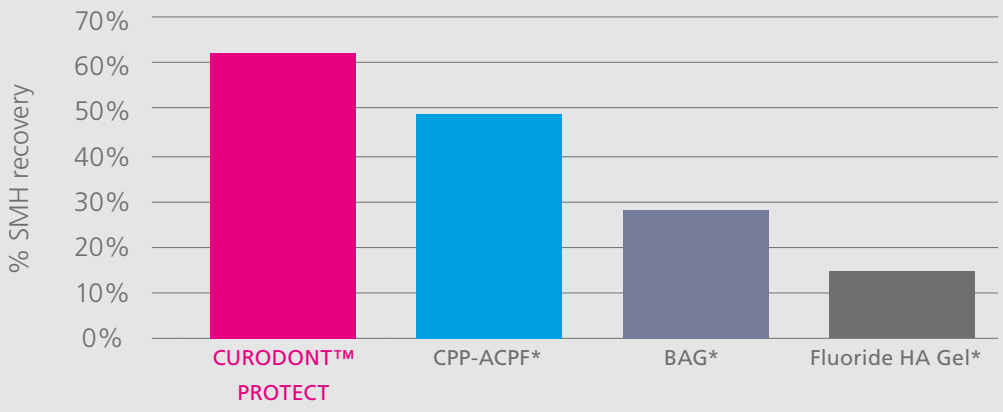
Literatur

Soares et al., Journal of Clinical and Diagnostic Research. 2017 Apr, Vol-11(4): ZC136-ZC141

Results

The Surface Microhardness (SMH) measured before and after demineralization shows a significant reduction in hardness of the artificial carious lesion.

The remineralizing potential demonstrated by Self-assembling peptide P11-4 [CURODONT™ PROTECT] was observed to be the highest, followed by CPP-ACPF, BAG and fluoride enhanced HA gel. The samples treated with CURODONT™ PROTECT were the only samples which, after the 30 day pH cycli ng, raised in SMH to a level where no significant difference to the sound control samples could be found.



* All but CURODONT™ PROTECT show significant less hardness after remineralization than the untreated sound enamel of the control.

Fig.: Comparison of surface microhardness (SMH) recovery in percent of untreated control.