In-Vitro Assessment of a Novel Biomimetic-Regeneration of Early Caries Lesions

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ABSTRACT

Objectives: This study investigated the ability of a biomimetic Self-Assembling Peptide (Curodont Repair©) to induce remineralization of white-spot lesions (WSL) compared to fluoride-varnish.

Methods: One hundred sound-enamel specimens were prepared from human permanent molars. Baseline surface micro-hardness (SMH1) was measured. WSL were produced in a treatment window followed by another SMH2. Specimens were randomly assigned to 5 treatment groups (n=20/group): control received no treatment (CON); treated with conventional fluoride-varnish (F), Curodont (C), Curodont followed by MI fluoride-varnish (CF), and Curodont followed by MI fluoride-varnish then daily standard 1100 ppm fluoride toothpaste slurry (CFOTC). After surface treatments, all groups were submitted to a 14-day pH-cycling caries model after which a final surface micro-hardness measurement (SMH3) was performed, and the percentage surface micro-hardness recovery (%SMHR = ([(SMH3- SHM2)/(SMH1-SHM2)] X 100) was calculated.

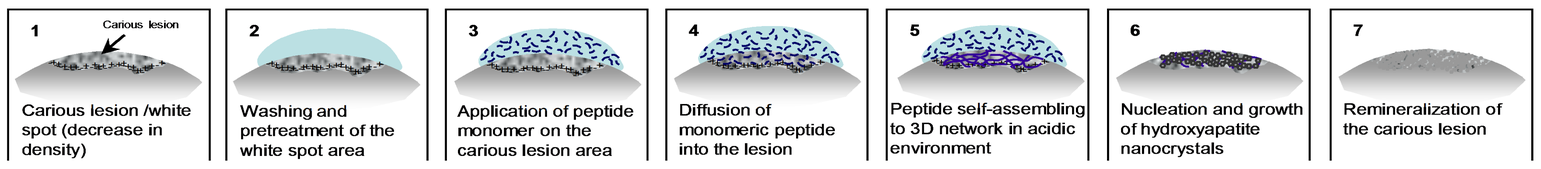
Results: Intragroup comparison using Paired t-test showed significant remineralization in all groups except CON ($p<0.05$). ANOVA followed by post-hoc (Student-Newman-Keuls) indicated significant ($p<0.05$) higher %SMHR in other treatment groups when compared to control (-124.5%). Although the treatment groups were not statistically significantly different from each other, their %SMHR ranked as follows: Curodont(70.3%)>CF(31.2%)>F(17.9%)>CFOTC(15.7%).

Conclusions: The present study demonstrated that Curodont Repair© could enhance remineralization in WSL significantly. It also demonstrated a synergistic potential of combining Curodont and fluoride-varnish treatment compared to fluoride-varnish treatment alone.

INTRODUCTION

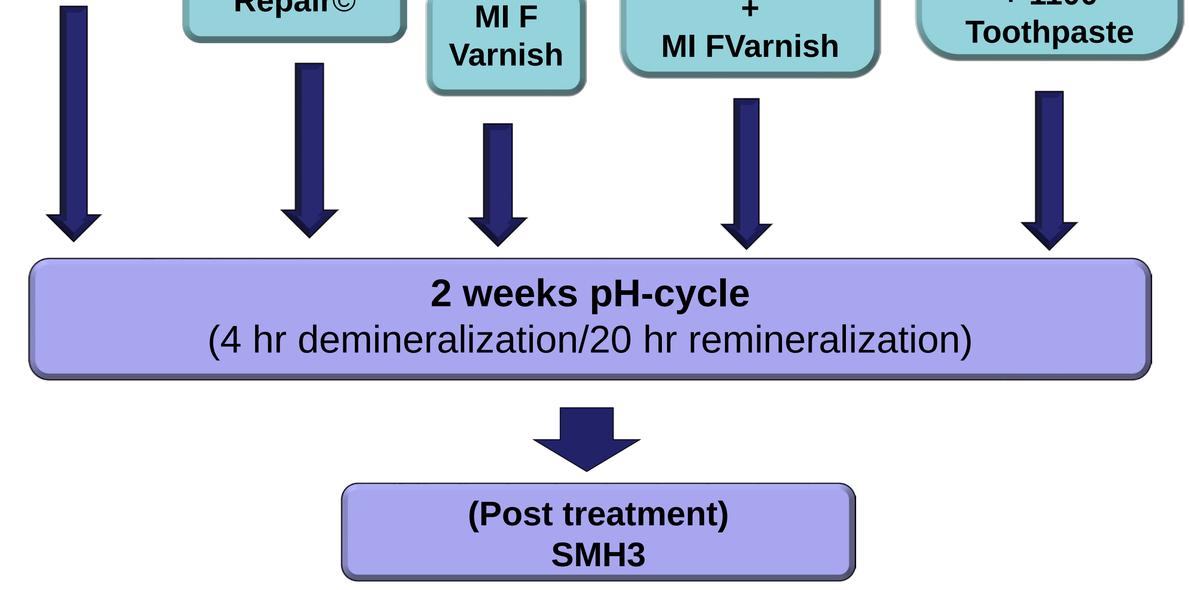
The non-regenerative characteristic of enamel makes it a volatile tissue that is both prone to biologic destruction and unable to heal itself after demineralization[1]. Biomimetic compounds that can aid in the regeneration of tissues such as enamel have been of particular interest. Curodont Repair, which has been in use in the European market, has the ability to NATURALY regenerate enamel.[2,3] This material diffuses deeply into the porous structures of the decayed tooth and under the low pH of the lesion it assembles to a 3D scaffold that has high affinity to and attracts ions such as calcium and phosphate from the patient's saliva or applied dentifrices (Fig. 1).[4] These ions help in the remineralization of the tooth surface (Fig. 1).[4] This study evaluated the potential synergistic effect of combining Curodont Repair and Fluoride Varnish.

Figure 1.



Lucy Kind, 2012

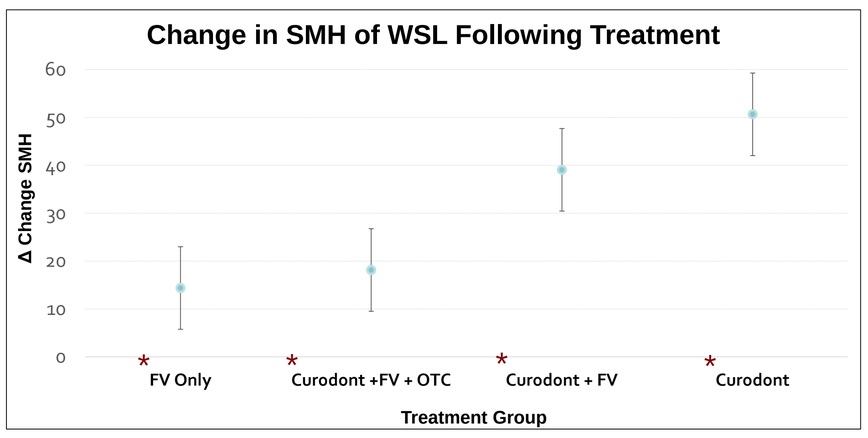
MATERIALS AND METHODS



RESULTS

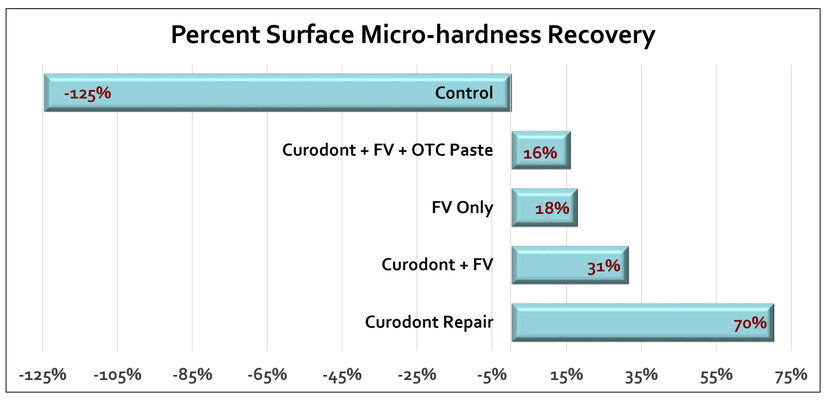
An intra-group Paired t-test in each treatment group showed significant remineralization in all groups except the control group. ANOVA followed by a post-hoc (Student-Newman-Keuls) showed that all the treatment groups had a significant increase in %SMHR compared to the control group ($p<0.05$).

Graph 1 shows that Curodont had the greatest percent change in SMH of WSL following treatment while FV had the least percent change.



*** significantly different compared to Control group ($p \leq 0.05$)**

Graph 2 shows the Percent Surface Micro-hardness Recovery among the groups.



(%SMHR = ([(SMH3- SHM2)/(SMH1-SHM2)] X 100)

CONCLUSION

Under the circumstances and the limitations of this study, the data demonstrated:

1) that Curodont Repair© could enhance biomimetic remineralization in WSL significantly.
2) a synergistic potential of combining Curodont and fluoride-varnish treatment compared to fluoride-varnish treatment alone. The treatment groups, as a whole, did show a significant percent increase, which demonstrates the efficacy of Curodont in this study.
3) Curodont Repair© used exclusively had the greatest percentage increase among all of the groups. This may suggest that an excess of Flouride may have a reverse effect. This conjecture requires further study as there may have been error in procedure or other limitations that may have caused a skew in the data.

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