COMMENTARY

Effect of Home-Use and In-Office Bleaching Agents Containing Hydrogen Peroxide Associated with Amorphous Calcium Phosphate on EnameL Microhardness and Surface Roughness

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This study evaluated the effects of different bleaching agents, associated with amorphous calcium phosphate (ACP), used as "at-home" or "in-office" protocols on human third molar teeth (enamel). Measured outcomes were enamel microhardness (KHN) and surface roughness (SR).

Tooth bleaching has become a common treatment over the last years, and much research has been reported on the effects of those procedures on tooth structure. Microhardness and SR are the most common methods used to evaluate possible changes on tooth structure.

ACP has been added to different products to help in restoring the necessary mineral balance in the mouth, resulting in increased mineral deposition on the tooth. Therefore, this study intended to clarify whether or not the addition of ACP would provide any beneficial effect to bleaching agents containing hydrogen peroxide at 7.5 and 9.5%. However, the authors did not explain what would be the clinical significance of these measured outcome changes (KHN and SR).

The authors presented data concerning the potential morphological and chemical changes on the enamel of human teeth when treated with different agents and protocols of dental bleaching. For doing so, they used 60 enamel slabs prepared from 30 extracted human third molars. Bleaching agents (at-home and in-office) were applied according to the manufacturers' instructions. During bleaching intervals, specimens were stored in artificial saliva, which was changed every other day, trying to simulate clinical conditions; however, the authors did not consider the presence of other salivary components, such as mucins, present in natural saliva, and just considered the mineral content of saliva.

After 21 days of bleaching treatment, enamel slabs were stored for 14 days in artificial saliva. Microhardness and SR were measured at baseline, 7, 14, and 21 days of treatment and at 7 and 14 days after bleaching treatment. There was a significant decrease in enamel microhardness during bleaching treatment for all agents; however, at 14 days after treatment, KHN values did not show statistically significant difference to baseline values. Regarding SR, only Opalescence Xtra Boost (38% hydrogen peroxide) resulted in significant increase in SR during bleaching treatment; however, after 14 days of post-treatment storage in artificial saliva, the SR values were statistically similar to those at baseline. In this study, the addition of ACP to bleaching agents showed reduced beneficial effects in SR only restricted to lower hydrogen peroxide concentrations in association with the remineralizing effect of artificial saliva.

The authors mentioned that the possible explanation for this may be related to the fact that ACP precipitates into defects on the enamel surface and hydrolyzes to form apatite, filling these defects, resulting in a smoother enamel surface when ACP is added to the bleaching agent. However, for products with higher concentration (hydrogen peroxide 9.5%), neither the addition of ACP nor the storage of the enamel slabs in artificial saliva resulted in any effect on SR.

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This commentary is accompanied by article, "Effect of Home-Use and In-Office Bleaching Agents Containing Hydrogen Peroxide Associated with Amorphous Calcium Phosphate on Enamel Microhardness and Surface Roughness" Daniel Rodrigues De Abreu, DDS, Robson Tetsuo Sasaki, DDS, Flávia Lucisano Botelho Amaral, DDS, MS, Flávia Martão Flório, DDS, MS, SCD, Roberta Tarkany Basting, DDS, MS, PhD, DOI 10.1111/j.1708-8240.2010.00394.x.

 DOI 10.1111/j.1708-8240.2010.00395.x

Basically, according to this "in vitro" study, the addition of ACP to "at-home" or "in-office" bleaching agents has little to no beneficial effect on enamel microhardness and SR; and the immersion of the enamel slabs in artificial saliva after bleaching for 14 days was able to remineralize the enamel slabs, resulting in values of KHN and SR similar to those at baseline.

As the authors mentioned at the end of the Discussion, it would be more clinically meaningful if "in situ" and "clinical studies" could be conducted to confirm whether the microhardness loss could be reversed by ACP and/or saliva.[1–4]

In an "in situ" study, Rodrigues and colleagues[5] mentioned that the effects of bleaching treatments on the tooth structure are not known yet and are believed to be clinically insignificant because of the relatively small reductions observed in enamel microhardness. Therefore, it would be important to clarify what is the clinical significance of these microhardness and SR changes and which are the clinical consequences in the long term for the patients treated with dental bleaching agents.

REFERENCES

1. Lewinstein I, Fuhrer N, Churaru N, Cardash H. Effect of different peroxide bleaching regimens and subsequent fluoridation on the hardness of human enamel and dentin. J Prosthet Dent 2004;92(4):337–42.
2. Wiegand A, Schreier M, Attin T. Effect of different fluoridation regimes on the microhardness of bleached enamel. Oper Dent 2007;32(6):610–5.
3. da Costa JB, Mazur RF. Effects of new formulas of bleaching gel and fluoride application on enamel microhardness: an in vitro study. Oper Dent 2007;32(6):589–94.
4. Schmidlin PR, Wegehaupt F, Wiegand A. Influence of study design on the impact of bleaching agents on dental enamel microhardness: a review. Dent Mater 2009;25(2):143–57.
5. Rodrigues JA, Marchi GM, Ambrosano GM, et al. Microhardness evaluation of in situ vital bleaching on human dental enamel using a novel study design. Dent Mater 2005;21(11):1059–67.

 DOI 10.1111/j.1708-8240.2010.00395.x