Assessment of the Effects of Different Remineralizing Agents on the Microhardness of Bleached Enamel

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Introduction

Bleaching, although not new to dentistry, has gained much popularity in the recent years due to the increase of the esthetic demands of patients. It is considered to be one of the most conservative treatment methods for tooth discoloration if compared to other procedures such as veneers and partial or full coverage crowns. [1] Home bleaching agents are gaining popularity because of ease of use and safety. These agents are mainly composed of different concentrations of either hydrogen peroxide (HP) or carbamide peroxide (CP).[2]

Home bleaching agents typically contain carbamide peroxide or low concentration of hydrogen peroxide. Peroxides can easily penetrate the hard dental tissues and work by reacting with the organic materials within the hard tooth structure that contains pigments or stains resulting in significant whitening of teeth [3]. The efficacy of bleaching agents in teeth whitening had been validated in vivo and in vitro.[4]

Nevertheless, the adverse effects should be considered to be able to use these agents securely.[5] Unfortunately, the reaction of free radicals affects organic and inorganic matrix of enamel as well. Hence, some concomitant changes to the inorganic matrix takes place. These changes include the loss of some inorganic crystals that are bound to the organic matrix (demineralization) resulting in changes in surface roughness and microhardness.[6, 7] These effects cause discomfort to patient as well as increasing plaque accumulation and bacterial adhesion.

In order to decrease the adverse effects of demineralization that happen upon bleaching, various remineralizing regimens are recommended after the bleaching procedure to promote remineralization and decrease overall tooth sensitivity.[5] These regimens are supplied in different forms such as: mouthwashes, toothpastes, dentifrices, gels, solutions or varnishes. They can

either be applied by the dentist in the dental office, or by the patient at home. Remineralizing agents that are most commonly used include fluoride and calcium-phosphate based systems such as casein phosphopeptide-amorphous calcium phosphate [(6)] with or without fluoride, beta-tricalcium phosphate and bioactive glass. Newly introduced products that combine nano-hydroxyapatite and fluoride [(8)] were also introduced.

Some attempts were made to evaluate mineralization of enamel surface after bleaching and remineralization. Multiple tests can be used to measure the amount of minerals and ions changed in enamel structure before and after bleaching as a direct method to assess mineral loss like transverse microradiography (TMR) or energy dispersive spectrometer (EDS).[(9)] Microhardness test is one of the quantitative simple methods that indirectly assess mineral loss after bleaching procedure.[(10)] Therefore, it is worthy to investigate the effects of different remineralizing agent on microhardness of enamel after bleaching. Additionally, time intervals must be investigated as a critical factor to the success of a comprehensive bleaching protocol to both dentist and patient.

Review of Literature