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Influence of quantity of bioactive particles on sorption, solubility and contact angle of experimental resin infiltrants.

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Abstract

The aim was to evaluate the water sorption (WS), solubility (S) and contact angle (CA) of resin infiltrants with different concentrations of Hydroxyapatite-Hap, amorphous calcium phosphate-ACP, Zinc-polycarboxylate bioactive glass-BAG-Zn, bioactive glass-BAG45S5, and β-TCP modified calcium silicate cements-HCAT-β. It was found that high amount of particles decreased the WS and S of the resin infiltrants. The contact angle depends on the type and amount of bioactive particles.

Key words: viscosity, infiltrants, chemical properties.

Introduction

Some studies (Rao and Malhotra, 2011; Banerjee et al, 2011) aim to minimally intervention techniques to reduce the loss of dental tissues and the discomfort of patients (Rao and Malhotra, 2011). The caries infiltration technique aim to penetrate the porous lesion with a low viscosity resin, which are light cured and impair the progression of lesion (Meyer Lueckel and Paris, 2008). Nevertheless, the infiltrants can not to remineralize the dental tissues. Currently, some remineralization technologies has been evaluated. The addition of particles with remineralization capacity into low viscosity resins would be beneficial to impair the lesion progression and repair the damage caused by caries. Thus, the aim in this study was to evaluate the water sorption (WS), solubility (S) and contact angle (CA) of experimental resin infiltrants with addition of different concentrations of bioactive particles.

Results and Discussion

A control blend was made with TEGDMA (75wt%) and BisEMA (25wt%). Five bioactive fillers were added in different concentrations (1%, 5%, 10% and 15%wt) in the control blend: Hydroxyapatite (Hap), amorphous calcium phosphate (ACP), Zinc-polycarboxylate bioactive glass (BAG-Zn), bioactive glass 45S5 (BAG 45S5), and β-TCP modified calcium silicate cements (HCAT-β). An available commercially material was used as control (ICON®). The water sorption and solubility were evaluated according to ISO 4049:2009. The contact angle was evaluated in a goniometer. Data were submitted to 2-way ANOVA and Tukey's test (α=0.05). The experimental groups were compared to control by 1-way ANOVA and Dunnet test (α=0.05). Infiltrants with ACP showed the lowest CA, except for 15% concentration; whereas the addition of Hap produced the highest CA. Control group (22.1°) showed significantly lower CA than infiltrants with 15% ACP. The water sorption (WS) of 5% BAG-Zn (36μg/mm^3), 10% βTCP (36.6μg/mm^3) and 10% Hap (49.1μg/mm^3) were significantly lower than infiltrants with the same particles in different concentrations as well as to other infiltrants with different particles and same concentration. The addition of bioactive particles significantly reduced WS, except for 1% particles. The solubility (S) significantly increased as the concentration of particles reduced, except for BAG-Zn-1% (1.9μg/mm^3). Up to concentration of 5%, the solubility of BAGZn was significantly lower than the other particles, whereas in the concentration of 10%, ACP and Hap showed significantly lower S. The 15% concentration of particles significantly reduced the solubility of infiltrants (βTCP-15%-8.3μg/mm^3; Hap-15%-5μg/mm^3; BAGZn-16.6μg/mm^3; ACP-6.2 μg/mm^3) compared to control (38.7μg/mm^3).

Conclusions

It can be concluded that high concentration of particles decreased the water sorption and solubility of the experimental resin infiltrants. The contact angle depends on the type and amount of bioactive particles. The lowest and highest contact angle was shown by ACP, in the 5% and 15% concentration, respectively.

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