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Evaluating The Effect Of Silver Nanoparticles Incorporation On Antifungal Activity And Some Properties Of Soft Denture Lining Material.

A thesis

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Abstract

Statement of problem: Colonization of soft denture liners by *Candida albicans* and other microorganisms continued to be a serious problem, which can result in chronic mucosal inflammation. The development of antimicrobial polymer became so important.

Purpose: The purpose of this study was to evaluate the effect of incorporating different percentages of silver nanoparticles into acrylic-based heat cured soft denture lining material on the antifungal activity; against *Candida albicans*, and on water sorption, solubility, shear bond strength and color change of the soft lining material. Furthermore, evaluating the amount of silver released from the soft liner/silver nanocomposite.

Materials and methods: Silver nanoparticles (AgNPs) were incorporated into acrylic-based soft denture liner in different percentages (0.05%, 0.1% and 0.2% by weight). Four hundred and twenty (420) specimens were prepared and divided into five groups according to the test to be performed. Fourier transform infrared (FTIR) spectroscopy analysis was conducted to determine if there is any chemical reaction between AgNPs and the soft liner. The antifungal activity of the soft liner/AgNPs composite was evaluated in three different periods by using two methods (viable count of *C. albicans* and disk-diffusion test). The amount of silver released in artificial saliva in two different periods was measured by atomic absorption spectrophotometers. The water sorption and solubility of the soft lining material was evaluated according to American Dental Association (ADA) specifications No.12; 1999. The shear bond strength of the soft liner to the acrylic denture base material was measured by Instron testing machine. The resulted color change was measure by Objective method using UV-visible spectrophotometer. The results of the study were statistically analyzed using one-way ANOVA and LSD test.

Results: FTIR analysis showed that no chemical interaction between the soft lining material and AgNPs. All experimental groups (0.05%, 0.1% and 0.2% AgNPs) showed a highly significant decrease in colony forming units of *C. albicans* (with mean values of 160, 158.1, 181.3CFU/ml respectively) in comparison to control group (with mean value of 262.7 CFU/ml) with more decrease as the incubation time in artificial saliva increase. There was no inhibition zone around any test specimen of any test group. There was no silver detected to be released in artificial saliva at any incubation period. The addition of AgNPs resulted in a highly significant decrease in water sorption mean value, while only 0.2% group showed highly significant decrease in solubility. Non significant differences in shear bond strength were found among all test groups. A highly significant increase in light absorption percentage was observed in all experimental groups.

Conclusion: The addition of AgNPs into acrylic-based soft denture lining material helps to produce soft denture liner with antifungal properties, thus reducing the susceptibility to develop denture-induced stomatitis. The developed material still maintains its biocompatibility and low toxicity profile as no silver was detected to be released. This addition resulted in decrease in water sorption properties, and did not affect the shear bond strength of the lining material, yet, it resulted in color change of the material by increasing its opacity.