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The influence of titanium dioxide nanoparticles (TiO_2NPs) incorporation into heat cured soft denture lining material on *Candida albicans* adherence and some other properties

A thesis

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Abstract

Statement of problem: Colonization of the soft denture lining material by microorganisms especially by *Candida albicans (C. albicans),* is one of the most important problems associated with the using of soft lining material, causing denture-induced stomatitis, so the development of antimicrobial polymer became very important.

Purpose: The purpose of this study was to assess the antifungal efficacy of acrylic based heat cured soft denture lining material against *C. albicans* after the addition of titanium dioxide nanoparticles (TiO_2NP_S) and furthermore evaluate some of the mechanical and physical properties of the liner material such as hardness, shear bond strength and spectrophotometer color absorption.

Materials and methods: TiO_2NP_S with concentration of 2% by weight were mixed with acrylic based-heat cured soft lining material. TiO_2NP_S powder was firstly dispersed into the monomer of the soft liner by using probe sonication apparatus and then, this suspension was mixed with the measured amount of the soft liner's powder. One hundred and twenty different specimens were prepared and divided into four groups according to the tests to be performed.

To investigate the chemical interaction between TiO_2NP_S and the soft liner, Fourier Transform Infrared Spectroscopy (FTIR) analysis was conducted. *C. albicans* adherence test was performed to assess the antifungal efficacy of TiO_2NP_S / soft liner composite in different periods of specimens incubation. Shore A hardness, shear bond strength and spectrophotometer color absorption tests were performed to assess the mechanical and physical properties of the TiO_2NP_S / soft liner composite.

Results: Regarding to *C. albicans* adherence test, there was significant decrease in the number of *Candida* cells that adhered on the surface of

the experimental specimens (containing 2% TiO_2NP_S) of soft denture liner in comparison with the control specimens for each incubation periods of the study. There was significant decrease in the hardness of the experimental group of specimens, and a non-significant decrease in the shear bond strength between the soft liner and the acrylic denture base after TiO_2NP_S incorporation into the soft liner, while for the spectrophotometer color absorption test, the result indicate significant increase in the percentage of light absorption of the experimental specimens in comparison with the control group.

Conclusion: The addition of 2% of TiO_2NP_S into acrylic-based heat cured soft denture liner material will provide soft lining material with antifungal properties, reduced hardness, unaffected shear bond strength and with increased ability to absorb light.