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The effect of addition of zirconium Nano particles on antifungal activity and some properties of soft denture lining material

A Thesis

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Abstract

Statement of problem: Microorganisms and fungal growth especially *Candida albicans*, on soft denture lining material are the most common problem which can lead to chronic mucosal inflammation. Antimicrobial polymer development becomes so important.

Purpose: The purpose of this study was to assess the effect of adding various percentages of zirconium nanoparticles(ZrNPs) into acrylic-based heat cured soft denture lining material on the antifungal action; against *Candida albicans*, and the amount of zirconium ion leached out of soft liner/ZrNPs composite. Furthermore, evaluate hardness and shear bond strength after ZrNPs addition to soft liner.

Materials and methods: Zirconium nanoparticles were added into acrylic-based soft denture liner in various percentages (1%, and 1.5% by weight). The zirconium nanopowder was initially dispersed into the soft liner monomer by utilizing probe sonication apparatus then the soft liner powder was added and mixed according to manufacturer instructions. Three hundred specimens were prepared and isolated into four groups according to the test to be done. To determine if there is any chemical reaction between ZrNPs and the soft liner, FTIR analysis was conducted. The antifungal activity of the soft liner/ZrNPs composite was assessed in three different periods by using two methods (viable count of *C. albicans* and disc-diffusion test). In two distinct periods, amount of zirconium released in artificial saliva was detected by atomic absorption spectrophotometer.

Results: the present study demonstrated that no chemical reaction between the soft lining material and ZrNPs by using FTIR analysis. A highly significant decrease in colony forming unit of *C. albicans* in experimental groups (1% and 1.5%ZrNPs) contrast with control group

with more reduce when the incubation period in artificial saliva increase. There was no inhibition zone around any specimen of any test group. In artificial saliva there was no zirconium distinguished to be released at any incubation period. There was a highly significant increase in the mean value of shear bonding strength after incorporation of ZrNPs at 1.5% percentage into soft liner. For all experimental groups ,the mean value of hardness was a highly significant increased.

Conclusion: The addition of ZrNPs into acrylic-based soft denture lining material helps to provide soft denture liner with antifungal properties, thus reducing the susceptibility to develop denture-induced stomatitis. There is no zirconium has been detected at any incubation period and for all experimental groups the hardness was increased. There is increased in the shear bond strength of the soft lining material .