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College of Dentistry

The Effectiveness of Aluminum Potassium Sulfate Micro-Particles Addition into Heat Cured Soft Denture Lining Material on *Candida aalbicans* Adherence and Some Other Properties

A Thesis

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By

Ali Mohad Abdulsahib

B.D.S.

Supervised by

Asst. Prof. Dr. Abdalbasit Ahmad Fatihallah

B.D.S. ,M.Sc , Ph.D

Baghdad - Iraq

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Abstract

Background: The soft resilient denture lining material plays major role in modern prosthetic dentistry. Because of its viscoelastic properties so it can act as shock absorber to minimize and re-allocate applied pressure on the denture bearing tissue area. One of the major problems associated with using of soft denture liner its colonization by microorganism especially by *Candida. albicans* triggering denture-induced stomatitis, so the development of soft lining material with antimicrobial properties became essential.

Aims of the study: To evaluate the antifungal activity of aluminum potassium sulfate KAL $(SO_4)_2$ micro particles against *C. albicans* adherence to the soft denture liner when either incorporating into soft denture lining material or immersing the soft liner in a solution of KAL $(SO_4)_2$ micro-particles. In addition, the (KAL $(SO_4)_2$ micro-particles effect on the peel bond strength, tensile strength and Shore A hardness tests of soft liner.

Materials and methods: KAL $(SO_4)_2$ micro particles powder with concentration of 2%, 3% by wt. was firstly dispersed into the monomer of the soft liner mixed by using probe sonication apparatus and then this suspension was mixed with the measured amount of the soft liner's powder. Another part of study include immersion of soft liner specimens into prepared 5%, 10% solution of KAL $(SO_4)_2$ (KAL $(SO_4)_2$ powder dissolved in distilled water) for 10 min. time intervals then compared both incorporation and immersion groups with control group. Two hundred different specimens were prepared and divided into four groups, where 50 specimens for each test group and each test group subdivided in to 5 subgroups.

To inspect the chemical interaction between KAL $(SO_4)_2$ particles and soft line, Fourier transform infrared spectroscopy analysis (FTIR) was directed which stated that the absence of any chemical reaction between the KAL $(SO_4)_2$ micro-particles and soft liner. Scanning electron microscope (SEM) results

showed well distributed and slight agglomeration of the KAL $(SO_4)_2$ micro particles within the soft liner matrix.

Results: Concerning *C. albicans* adherence test, there was significant decrease in the number of *Candida* cells that adhered on the surface of the experimental specimens of soft denture liner after KAL $(SO_4)_2$ additions in comparison with the control specimens. There was significant decrease in the peel bond strength of the experimental groups, significant increase in the tensile strength and significant decrease in shore A hardness of the experimental specimens in comparison with the control groups.

Conclusion: The addition of KAL $(SO_4)_2$ into acrylic-based heat cured soft denture liner material can enhance soft lining material antifungal activity, reduce the peel bond strength to a limited extent, improve tensile strength but decrease the hardness of the soft liner. The clinical implication of the soft liner antifungal activity enhancements ,it will reduce fungal growth and elongate the service life of the soft liner. Increase in tensile strength make the soft liner more resistant to force trying to make plastic deformation. Increase in soft liner softness (decreased hardness) is preferable thus increase the soft liner ability to act as cushion to absorb the occlusal forces.