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The impact of adding silanated pearl powder on radiopacity and some mechanical properties of heat cured acrylic denture base material

A Thesis

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By

Safa Ghalib Dekan

B.D.S

Supervised by

Prof. Dr. Raghdaa Kareem Jassim

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

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Abstract

Background: The most widely used material in denture fabrication is heat cured acrylic resin. Although it has many desirable properties but still lacks some of important ones like radiopacity and high strength. Fillers added to improve some properties of this material. Natural types of fillers might be used for this purpose, so the aim of this study was to evaluate the impact of adding silanated pearl powder on radiopacity, impact strength, transverse strength, surface hardness, and surface roughness of heat cured acrylic denture base material.

Materials and Methods: As pearl powder used as fillers so methacryloxy propyl trimethoxy silane (MPS) is a chemical saline used for salination of pearl powder. A pilot study was performed to select appropriate concentrations of pearl powder during process of specimens' making. Accordingly 1.5% and 2% wt. pearl powder were used. A total number of 150 specimens were prepared and divided into three groups (0%, 1.5%, and 2%) of pearl powder by weight, each group further subdivided into five subgroups for the experimental tests which include radiopacity, impact strength, transverse strength, surface hardness, and surface roughness tests. Statistical analysis of data was performed using descriptive and inferential statistics. Data was considered statistically significant at level of < 0.05.

Results: FTIR analysis revealed that methacryloxy propyl trimethoxy silane was chemically bonded to pearl powder and copolymerized with acrylic resin. And results showed a statistically highly significant increase in radiopacity and a statistically non-significant decrease in surface hardness. Also there was a statistically decrease in mean values of impact strength, transverse strength and surface roughness at 2% silanated pearl powder.

Conclusion: Adding 1.5% and 2% wt. silanated pearl powder to heat cured acrylic denture base material improved radiopacity and surface roughness, and this addition causes decrease in mean values of impact and transverse strength but they still within the acceptable requirements of denture base materials with no significant change in surface hardness.