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EFFECT OF INCORPORATION OF SILVER NANOPARTICLES ON FLEXURAL STRENGTH AND TENSILE STRENGTH OF POLY METHYL METHACRYLATE RESIN SUBJECTED TO TWO DIFFERENT CURING METHODS –AN INVITRO STUDY

By

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ABSTRACT

Background: Polymethyl methacrylate (PMMA) is the most popular denture base material currently available and used for fabrication of denture bases due to their acceptable aesthetics, ease of handling, strength, low water sorption and solubility, good biocompatibility and also that they can be easily repaired.The desirable qualities of PMMA is offset by certain drawbacks, such as reduced strength, stiffness and brittleness. Several attempts have been made to improve the mechanical properties with other stronger materials with superior properties. Silver nanoparticles incorporated to acrylic resin have shown to have antimicrobial properties which may alter the mechanical properties of PMMA. Denture base resins used in dentistry are polymerized by heat, chemicals, visible light, and microwave energy. The use of microwave energy for PMMA polymerization is an increasingly popular method in which the polymerization process occurs in a very short time when compared to that of the heat-polymerization technique. However silver nanoparticles as additives and short curing time can affect the mechanical properties of the final product.

Objectives: To evaluate

1. Effect of incorporation of 0.5% silver nanoparticles to conventional heat cure Polymethyl methacrylate resin and compare the tensile and flexural strength subjected to two different curing methods

Methodology: For Flexural and Tensile Strength tests- A total of 48 heat cure acrylic resin specimens were fabricated of dimension 60x20x20mm in length, breadth and thickness respectively. The specimens were divided into 2 groups in which 24 specimens were cured by conventional water bath and the rest 24 were microwave cured. These 2 groups were further divided into 2 subgroups in which 12 were

unmodified PMMA specimens and the rest 12 were modified PMMA with silver nanoparticles. The flexural and tensile strength were evaluated using the universal testing machine. Comparison of flexural strength and tensile strength between each sub-group was by Kruskal-Wallis test and pair wise comparison was done by Mann-Whitney test to obtain the results.

Results: The strength test for acrylic samples for tensile strength showed statistically significant result when the specimens were subjected to conventional curing with the addition of silver nanoparticles when compared with the control group. The strength test for flexural test showed statistically significant result when the specimens were subjected to microwave curing with the addition of silver nanoparticles when compared to the control group.

Conclusion: Within the limitation of this study, it was concluded that the tensile and flexural strength of PMMA did vary with the addition of silver nanoparticles and subjecting them to microwave curing.

Keywords: Flexural Strength, Tensile strength, microwave curing, silver nanoparticles.