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Effects of materials and processing techniques on some properties of various denture base materials

A Thesis

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Abstract

New techniques and material as well as the addition of some additive to acrylic resins were introduced to enhance the physical and mechanical properties of the dentures such as flexibility and high impact resistance and to overcome the limitation of heat cured acrylic.

In this study, some mechanical and physical properties of three denture base material (heat cured acrylic, polycarbonate and injectable acrylic) as well as two processing techniques (conventional and injected molded) were compared.

Material and methods: A total of 150 specimens of conventional Heat cured acrylic, polycarbonate and injectable acrylic and were fabricated according to manufacture instructions and divided into (5) groups, (10) specimens for each group (impact strength test, shore D hardness test, surface roughness test, transverse flexural strength tests, and shear bond strength with acrylic teeth).

Results: The results for this study shows highly significate differences between all 3 experimental materials at P-value < 0.01 except for hardness results of heat cured and injectable acrylic which show no significant differences at P-value > 0.05. Results expressed in descending order for impact strength test; polycarbonate had the higher mean value followed by injectable acrylic and then heat cured acrylic had the lowest mean value. As for shore D hardness test; injectable acrylic had the higher mean value followed by heat cured acrylic, then polycarbonate had the lowest mean value. While for surface roughness test; the higher mean value was for polycarbonate followed by injectable acrylic and the lowest mean value was for heat cured acrylic. Transverse flexural strength tests

at the maximum load (the flexure strength and the elastic modulus); the highest mean value was for heat cured acrylic, followed by polycarbonate and injectable acrylic had the lowest mean value. Finally, for shear bond strength with acrylic teeth test; heat cured acrylic had the highest mean value followed by injectable acrylic then polycarbonate with lowest mean value.

Scanning electron microscope of fracture line after Charpy ‘s impact test shows that both polycarbonate and injectable acrylic had ductile fractured, while brittle fracture for heat cured acrylic.

Conclusion: All injectable materials included in this study exhibit higher flexibility, ductility and impact resistance compared with heat cured acrylic.