AN EVALUATION OF THE MECHANICAL PROPERTIES OF A LIGHT-POLYMERIZED DENTURE BASE POLYMER

By

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This dissertation is submitted in partial fulfilment of the requirements for the

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DECLARATION

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Title of Research Report: An evaluation of the mechanical properties of a light-polymerized denture base polymer

Field of Study: Prosthetic Dentistry

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ABSTRACT

Objectives: The aim of this study was to compare the hardness and flexural properties of a relatively new light-polymerized urethane dimethacrylate polymer to other denture base polymers.

Methods: Specimens of light-polymerized urethane dimethacrylate denture base polymer (Eclipse), were prepared by first investing a Perspex block of size 70 x 50 x 3mm in a conventional metal flask which was preheated in a special oven at 55˚ C for 2 minutes to improve adaptation of the resin. The resin was adapted using finger pressure. Air barrier coating agent was applied on the resin and pressed with a glass slab to allow uniform thickness of the material. Specimens of heat-polymerized PMMA (Meliodent) were prepared by investing a Perspex block of size 70 x 50 x 3mm in a conventional metal flask. The powder:liquid ratio was 23.4 gm:10 ml. The polymerization cycle was accomplished in a water bath with a cycle of seven hours at 70°C followed by one hour at 100° C. Specimens of chemically-polymerized material (Probase Cold) were prepared using the powder:liquid ratio of 20.5gm:10 ml. The flasks were maintained under constant pressure at 80 bar for 30 minutes at room temperature (23ºC). Specimens were then immersed in water at 37°C for 30 days. Surface hardness test was conducted on a Shimadzu hardness tester, and flexural strength and flexural modulus were measured by using an Instron machine according to ISO specification 1567:1999 for denture base polymers. ANOVA and post-hoc Scheffe's test were used for statistical analysis at significant level of $p = 0.05$.

Results:

Eclipse denture base resin had a surface hardness of 19.37, Meliodent resin recorded 17.03, and Probase Cold resin recorded 16.03.

Eclipse resin had a flexural strength of 103 MPa, Meliodent resin had 78 MPa and Probse Cold resin had 63 MPa.

Eclipse resin had a flexural modulus of 2498 MPa, Meliodent resin had 1969 MPa and Probase Cold resin had 1832 MPa.

Conclusion:

The results of this study showed that light-polymerized denture base polymer (Eclipse) exhibits significantly higher surface hardness, flexural strength and flexural modulus than polymethylmethacrylate (PMMA)-based denture base polymers. A comparison between the two PMMA-based polymers, heat-polymerized denture base polymer (Meliodent) showed a significantly higher surface hardness, flexural strength and flexural modulus compared with chemically-polymerized denture base polymer (Probase Cold).

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