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Comparative Evaluation of Flexural and Impact Strength of 3D Printed and Acrylic Resin Denture Base Materials – An in Vitro Study

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ABSTRACT:

Background and Objectives: The commonly used denture base material, heat cured polymethyl methacrylate (PMMA) resin is often prone to fracture and is cytotoxic. However, denture bases printed three-dimensionally (3D) are accurate, biocompatible, faster and cost-effective. The purpose of this in vitro study was to evaluate and compare the flexural and impact strength of 3D printed and heat cured PMMA denture base resins. A total of eighty specimens were prepared. Forty specimens each were prepared for flexural strength testing (Groups I) and for impact strength testing (Group II) and each of the test groups were further divided into four subgroups of ten specimens each. The subgroups were fabricated from conventionally heat cured PMMA resin, high impact heat cured PMMA resin, PLA resin and ABS resin. The flexural and impact strengths of the specimens were tested. Statistical analysis of the data was done using One-way ANOVA and Tukey's Post hoc Analysis with level of significance at $P=0.001$. Conventionally heat cure PMMA resin exhibited the highest flexural strength followed by high impact heat cured PMMA resin, PLA resin and then ABS resin. ABS resin exhibited the highest impact strength, followed by PLA resin, high impact heat cured PMMA resin and then conventionally heat cured PMMA resin. A statistically significant difference ($P<0.001$) was observed between the values of all the groups. The study concluded that 3D printed PLA and ABS resins are promising materials to be used as denture base materials.

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