

Dentistry 3000

Vol 13 No 1 (2025) DOI 10.5195/d3000.2025.866

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and DLP 3D-Printed Dental Ceramics: A Comparative Study

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Abstract

Objective: Three-dimensional (3D) printing technology is highly promising for producing nanoceramic resin dental restorations. However, the effects of environmental stressors on the structural integrity and clinical performance of these restorations require further elucidation. To investigate the effects of Stereolithography (SLA) and digital light processing (DLP) 3D printing technologies on the physical/mechanical

properties of a 3D-printed resin material used in dental applications.

Methods: A total of 120 resin specimens (Senertek P-Crown V2) were fabricated using SLA and DLP technologies. The microhardness, flexural strength, and surface roughness of the specimens were evaluated under control and thermocycling conditions to evaluate their long-term performance. To assess statistical significance a two independent sample t-tests ($P < 0.05$) were used to analyze the data.

Results: SLA samples exhibited significantly higher microhardness ($P = 0.001$) and flexural strength than DLP samples, both in the control state and after thermocycling. After thermocycling, the microhardness of SLA samples increased, whereas that of DLP samples decreased. Surface roughness values increased significantly in both SLA and DLP samples after thermocycling, with SLA samples exhibiting higher roughness values.

Conclusion: SLA-printed resin demonstrated superior microhardness and flexural strength compared to DLP-printed resin. However, its long-term durability is affected by immersion and thermocycling. This