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LABORATORY RESEARCH

Investigation of Mechanical Properties of Modern Dental Composites After Artificial Aging for One Year

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Clinical Relevance

Dental composite restorations may fail due to the deterioration of mechanical properties.

SUMMARY

This *in vitro* study investigated the aging behavior of dental composites with regard to surface roughness (SR), Vickers hardness (VH) and flexural strength (FS), and the study elucidated the impact of artificial aging parameters. One hundred and sixty-five rectangular specimens were prepared from five composites (*Filtek Supreme XT*, *Filtek Silorane*, *CeramX*, *Quixfil*, experimental ormocer) and subjected to various artificial aging protocols (storage in distilled water/ethanol/artificial saliva for 7, 90 and 365 days; thermal cycling, 2 × 3000 cycles 5/55°C). SR, VH and FS were determined at baseline and after each aging treatment. Means and standard deviations were calculated; statistical analysis was performed using three-way ANOVA and the Tukey-Kramer multiple comparison test ($\alpha = .05$). The results showed a significant influence in the composite and aging duration on mechanical parameters; the aging medium did not have a significant influence on VH and FS, but there was a significant influence on SR. The highest overall VH was found for the experimental ormocer; *Filtek Silorane* yielded the lowest values. For FS, the significantly highest values were found for *Filtek Silorane*, and the lowest values were found for the experimental ormocer. Prolonged aging periods (90 or 365 days) or thermal cycling led to significant decreases in both VH and FS and significant increases in SR. The findings of the current study indicate that composites differ significantly for SR and its mechanical properties with regard to FS and VH, as well as in aging behavior. Generally, artificial aging leads to a significant decrease in mechanical properties, which underlines the relevance of continuous improvement of dental composites.

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