

Degradation of the Mechanical Properties of CAD/CAM Ceramics upon Immersion in Various Beverages

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Article Type ABSTRACT

Research Paper

Background and Objective: The durability of restorative materials is crucial for their success, as their physical degradation is affected by the oral environment, such as water sorption and crushing stress. The adaptation of CAD/CAM ceramics to enamel and composite is also key to their success. The aim of this study is to evaluate the effect of different solutions on the mechanical properties (flexural strength and diagonal tensile strength [DTS]) and water sorption of CAD/CAM ceramics when immersed in artificial saliva, ethanol/water, mouthwash and cola.

Methods: In this in vitro study, four different solutions of Artificial Saliva (AS), Ethanol/water (EW), Mouth rinses (MW), and Cola (PI) and a total of 170 standardized specimens were prepared according to ISO 6872:2009 (85 for flexural strength and 85 for DTS), with an additional 20 specimens for water sorption. The specimens were then immersed in the four solutions at 37°C. Then, measurements of flexural strength and DTS were done on days 1, 15, 30, 45, and 60, and water sorption and solubility were evaluated for 180 days.

Findings: Immersion in saliva and mouthwash solutions after 60 days had little effect on the flexural strength of lithium silicate (L-SiC) and Zirconium (Y-TZ). Flexural strength values decreased significantly in ethanol/water (EW), and cola (PI) solutions and were 35.12% and 33.42% for L-SiC, respectively. For Y-TZP, the decrease was small and were 13.92% and 13.09% for EW and PI, respectively. As for DTS, the deterioration of immersion in solution was clear, ranging from 4% to 12% for the L-SiC and from 3% to 10% for the Y-TZP. However, there was no significant difference in water sorption and solubility, which ranged from 18.7 to 13.98 $\mu\text{g}/\text{mm}^3$ and 0.63 to 4.47 $\mu\text{g}/\text{mm}^3$. The flexural strength and DTS of CAD/CAM blocks showed slight variation after immersion in artificial saliva and mouthwash but decreased significantly when immersed in Ethanol/water and cola. Additionally, the mass of specimens immersed in cola decreased after 40 days.

Conclusion: The results showed that the highest degradation of CAD/CAM ceramics was associated with cola.

Keywords: CAD/CAM Ceramic, Water Sorption, Flexural Strength, DTS, Physical Properties.

Received:

Dec 4th 2024

Revised:

Feb 3rd 2025

Accepted:

Feb 23rd 2025

Cite this article: AlNamel HA, AlBadr RM, Refaat MM. Degradation of the Mechanical Properties of CAD/CAM Ceramics upon Immersion in Various Beverages. *Journal of Babol University of Medical Sciences*. 2026; 28: e21.

