Improving the Hydrophilicity of Dental Filling Composite

McCraine, Sasha (School: Niceville High School)

Dental composites are widely used in restorative dentistry and typically require a dry environment for optimal bonding, which is challenging to maintain in the inherently moist conditions of the mouth. This study investigates whether modifying dental composite materials with hydrophilic additives can enhance their adhesion in such environments. The study focuses on testing various hydrophilic additives—polyethylene glycol, glycerol, and ethylene glycol—by modifying standard dental composite materials and comparing their performance to unmodified composites like standard dental composite and glass ionomer. The experimental setup involved simulated tooth models treated with standard and modified composites under controlled dry and moist conditions. Composites were prepared with varying additive concentrations and cured under controlled conditions using UV light. Bond strength was evaluated using a digital force gauge. Results were assessed for tensile strength across different additives and concentrations, with a focus on determining the optimal formulation for enhancing adhesion in moist environments. Preliminary findings suggest that incorporating hydrophilic agents, particularly PEG and glycerol, improves adhesion in moist conditions. This study has significant implications for improving dental restoration outcomes by overcoming the limitations of current hydrophobic materials. Enhanced hydrophilic composites could increase the longevity and reliability of dental fillings, reducing the need for replacements and improving patient outcomes.

Awards Won: