

EFFECT OF A NEW RESIN MATRIX SYSTEM ON FIBER-REINFORCED COMPOSITES

OBJECTIVES: There are concerns that dental materials based on *bis*-phenol-A-diglycidylmethacrylate (*bis*-GMA) may be hazardous. Alternative monomers for *bis*-GMA, such as 1,6-Hexanediol dimethacrylate (HDMA), is under our current research. The aim of this research was to determine the effect of resin matrix compositions on the biomechanical properties of E-glass FRCs.

METHODS: Three monomer compositions based on *bis*-GMA (Sigma-Aldrich, USA), methylmethacrylate (MMA) (ProSciTech, Australia), HDMA (Esstech, USA), and camphorquinone (CQ) (Esstech, USA), N,N-cyanoethyl methylaniline (CEMA) (Esstech, USA), unidirectional E-glass fibers (Stick Tech, Finland) were used. The ratio of the resin matrix (in weight percentage) were 78.4% *bis*-GMA+19.6%MMA+1%CQ+1%CEMA (control-group), 78.4%HDMA+19.6%MMA+1.0%CQ+1.0%CEMA (EXP-1 group), and 49.0%HDMA+49.0%MMA+1.0% CQ+1%CEMA (EXP-2 group). Samples with two bundles of E-glass fibers (2400 fibers) were embedded in matrix and light-cured for both sides for 3x40s. Three-point bending (2x2x25) mm and Vicker's hardness (2x2x5) mm were tested (n=6). The three point bending samples were tested by a universal testing machine (Torse's UTM, Japan) and the hardness samples by a micro-hardness tester (type MTX 70 Matsuzawa, Japan). The data were analyzed by one way ANOVA.

RESULTS: The three-point bending measurement showed the control group mean value (674.1± 9.9)MPa was higher than the EXP-1 group mean value (638.1 ± 8.6)MPa and the EXP-2 group mean value (448.3±7.8)MPa. The ANOVA showed statistically significant difference in bending values among the 3 different matrix compositions (p<0.05). Hardness measurement proved the EXP-1 group mean value (179.1± 2.5)VHN was higher than the control group mean value (181.5 ±11.5)VHN and the EXP-2 group mean value (168.2 ±7.9)VHN. Further analysis by ANOVA proved there was significant difference (p<0.05) in hardness values among the 3 group matrix compositions.

CONCLUSIONS: A resin matrix system based on HDMA–MMA (EXP-1 group) showed comparable flexural strength and hardness properties to *bis*-GMA–MMA (control-group) system.