BIOMECHANICAL PROPERTIES OF A NEW FIBER-REINFORCED COMPOSITE

OBJECTIVES: Nowadays the replacement of bis-GMA is gaining more and more interest because of its potential risks. A potential resin matrix component, 1,6-hexanediol dimethacrylate (HDMA) has lower viscoucity than bis-GMA.The present study evaluated the effect of water immersion and HDMA concentrations on the three-point bending and hardness of a new fiber-reinforced composite (FRC) material.

METHODS: In addition to unidirectional E-glass fibre bundles (Stick Tech, Finland), monomers sed were HDMA (Esstech, USA), MMA (ProSciTech, Australia), CQ (Esstech, USA) and CEMA (Esstech, USA). The composition of group-1 was 78.4%HDMA+19.6%MMA+1.0%CQ+1.0%CEMA, and group-2 was 49.0%HDMA +49.0%MMA+1.0%CQ+1.0%CEMA. Specimens with two fiber rovings of 25 mm long were placed in a mould and monomers were added. Light-cured specimens (3 x 40s) were tested for flexural strength (2mm x 2mm x 25mm) and hardness. Each group consisted of 24 specimens. Specimens were prepared also for water storage for periods of 1,2,3, and 4 weeks (n = 6). Data obtained were analyzed by ANOVA and LSD.

RESULTS: Group-1 which was immersed in water for one week showed highest value for the flexural strength (489.1±9.6)MPa and hardness (149.2±1.3)VHN. While group-2 which was immersed in water for 4 weeks proved lowest value for flexural strength (227.4±11.6)MPa and hardness (133.7±1.6)VHN. Statistical analysis showed that water storage and HDMA concentrations significantly influenced the flexural strength and hardness of FRCs ($p < 0.05$). The interaction between water immersion and HDMA concentrations significantly influenced the bending but not the hardness.

CONCLUSIONS: Water immersion and concentration of HDMA influenced the mechanical strengths of FRC. Group-1 showed better flexural strength and hardness.