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Compressive Strength Evaluation of Fiber-Reinforced Glass Ionomer Cement

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Objectives The aim of this study was to assess the effect of the addition of different percentages of short glass fibers to a commercially available resin-modified glass ionomer cement on its compressive strength.

Methods GC Fuji II LC, a glass ionomer cement, was used for sample preparation. Three experimental groups were prepared by adding a volume of 10%, 15%, and 20% of short glass fibers (6 μ m in diameter, average length of 140 μ m) to the powder portion of cement, while the control group contained no fibers. The material was in encapsulated form and mixed according to the manufacturer's instructions. Five samples for each group (n=5) were prepared using 6mm x 4mm silicone molds and stored in deionized water for 5 days at 37° C in an incubator prior to testing (ISO Standard ISO9917-1). Compressive strength was determined using a linear actuator STEP Lab UD08 at a temperature of 20°C with a load speed of 20 N/sec. The results were analysed using descriptive statistics (mean, standard deviation), and statistical inferences were made using a mixed-design ANOVA. The statistical significance level was set to 0.05.

Results Obtained compressive strength values (N/mm²) were 103.7 \pm 4.8 (control group), 120 \pm 11.31 (10% of glass fibers), 133.2 \pm 11.35 (15% of glass fibers), 136.2 \pm 7.6 (20% of glass fibers), with statistically significant differences noted among the groups (P=0.0001). Unpaired t test results found statistically significant increase of compressive strength in the group modified with 20% wt. of glass fibers compared to the control group (P<0.001).

Conclusions The addition of short glass fibres increases the compressive strength of resin-modified glass ionomer cement. Statistically significant increase occurs at glass fiber wt. of 20%.