

Influence of fibre and filler reinforcement of plastic brackets: an in vitro study.

[Faltermeier A](#), [Rosentritt M](#), [Faltermeier R](#), [Müssig D](#).

Department of Orthodontics, University Medical Centre, Regensburg, Germany.
andreas.faltermeier@klinik.uni-regensburg.de

In spite of their popularity in fulfilling aesthetic requirements, plastic brackets still present some disadvantages because of their low elastic modulus, decreased fracture toughness, and reduced wear resistance. Fibre-reinforced composites are well established in dentistry and consist of a polymer matrix in which reinforcing fibres are embedded. Stress is transferred from the polymer matrix to the fibres which present a high tensile strength. Hence, the mechanical properties of polymers could be improved. The purpose of this study was to compare fracture strength, fracture toughness and flexural strength of an experimental fibre-reinforced bracket material, an SiO₂ filler-reinforced bracket and an unfilled plastic bracket material (control group). Experimental brackets and specialized bars were manufactured. Tests were performed after thermal cycling (5 degrees C/55 degrees C) the samples in an artificial oral environment of a device to simulate mastication. Statistical evaluation was undertaken. The median, 25th and 75th percentiles were calculated and a Mann-Whitney U-test was performed. In this study two findings were obvious. (1) Filler reinforcement of plastic brackets improved fracture strength and fracture toughness in comparison with the unfilled bracket material. (2) Glass fibre reinforcement of orthodontic bracket materials resulted in the greatest enhancement of the mechanical properties in comparison with the other test groups. Therefore, the application of glass fibres in plastic brackets is a successful method to enhance fracture strength.

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