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An in vitro evaluation of the tensile and shear strengths of four adhesives used in orthodontics

PF. McSherry

Department of Child Dental Health, School of Dental Science, University of Dublin, Eire

ABSTRACT

The in vitro shear and tensile strength of four enamel adhesives was investigated. The materials examined were System 1+, Vitrebond, C & B Metabond and Panavia-Ex (original version). The mode of failure of each material was also investigated under a scanning electron microscope. Edgewise mesh-backed brackets were bonded to the buccal surface of extracted premolar teeth and forces applied with an Instron 1011 testing machine. Results indicated that Panavia-Ex (with sandblasted brackets) had the highest tensile strength compared to the other materials ($P < 0.01$). Panavia-Ex had the highest shear strength when compared to C & B Metabond ($P < 0.05$) and to the other materials ($P < 0.01$). C & Metabond had the highest shear and tensile strength of the other adhesives ($P < 0.01$). No significant differences were found for System 1+ when compared to Vitrebond for tensile strength, but System 1+ was stronger for shear strength ($P < 0.01$). Analysis of failure shows that 50% of the samples failed at the adhesive-enamel interface, 25% failed in a combined mode and the remaining 25% failed either adhesively to metal or cohesively.

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