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Microtensile Bond Strength of Resin Cements Used with Different Ceramics

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Introduction

A number of new self-etch adhesives have been developed to simplify clinical bonding procedure. The efficiency of these simplified bonding systems is still controversia (1). Most of the published reports used these dentin adhesives as recommended by the manufacturer and in combination with one composite material (2-4). Actually, these self-etching dentin adhesive systems are also available as dual-curing systems (Fig. 1-4). However, the adhesive properties of the new, all-in-one system (Futurabond DC) used as light-curing and dualcuring system in combination with the dual curing resin cement Bifix (Voco, Germany) have not yet been extensively reported.

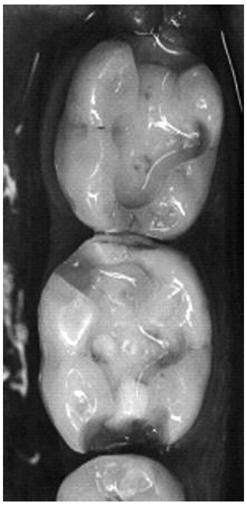

Fig. 1: Clinical procedure in ahesive dentistry. The prepared cavities before cementation of two IPS Empress inlays.

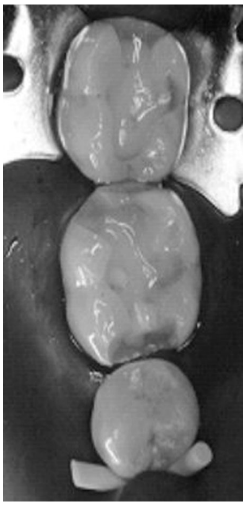

Fig. 2: Clinical procedure in ahesive dentistry. The prepared cavities after rubberdam placement.

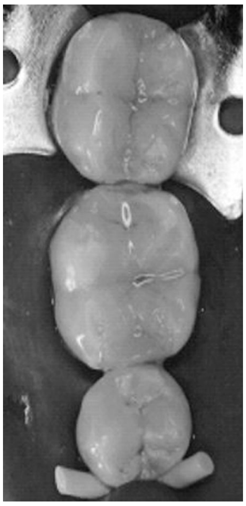

Fig. 3: Two IPS Empress inlays were inserted using a dual curing resin cement in combination with Futurbond DC.

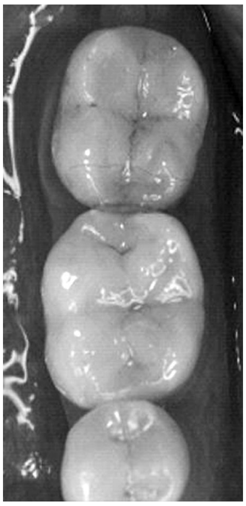

Fig. 4: Clinical procedure in ahesive dentistry. Final result after cementation of two IPS Empress inlays.

Objectives

The aim of this study was to evaluate microtensile bond strength of different ceramics (Empress (lithium-disilicated based all ceramic) and Cercon (zirconia based ceramic) compared with a light- and self-curing resin cement (Futurabond DC, Bifix) cements (Fig. 5, 6).

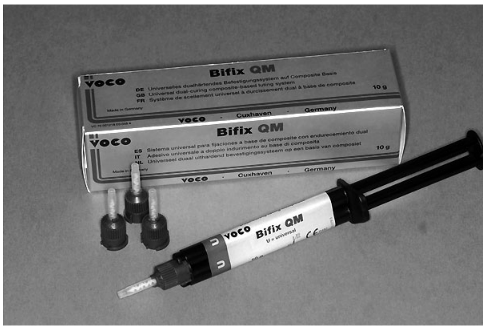

Fig. 5: The dentin adhesive system Futurabond DC used in this investigation.

Fig. 6: The resin cement Bifix QM used in this investigation.

Material and Methods

Sixty ceramic blocks (30 Empress, 30 Cercon) were made with standardized dimensions (length 5 mm, diameter 1 mm) (Fig. 8). Ninety freshly extracted third molars were included in this study. All teeth were specially prepared allowing the simulation of dentin perfusion (Fig. 7).

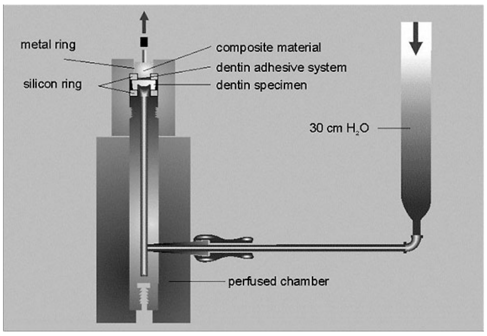

Fig. 7: Special designed apparatus to test tensile bond strength under permanent dentin perfusion.

Fig. 8: Ceramic specimen. It fits exactly in the experimental device.

The specimens were randomly assigned to six experimental groups of fifteen each: Group O-l: Bifix, light-curing (Control Group); O-s: Bifix, self-curing (Control Group); Group C-l: Bifix, Cercon, light-curing; C-s: Bifix, Cercon, self-curing; E-l: Bifix, Empress, light-curing, E-s: Bifix, Empress, self-curing. Microtensile bond strength of the above mentioned material combinations was measured using an universal testing machine (Fig. 5-10).

Fig. 9: Experimental device after loading until fracture.

Fig. 10: All Empress specimens were conditioned using hydrofluoric acid prior to cementation.

Results

For the six test series following microtensile bond strengths were evaluated (mean value and standard deviation in Mpa). Group O-l: 24.56 (± 7.63); group O-s: 14.25 (± 3.48); group C-l: 23.18 (± 4.00); group C-s: 15.58 (± 2.38); group E-l: 22.56 (± 4.46); group E-s: 15.93 (± 3.67). The results of all groups are graphically expressed in figure 11.
Statistical analysis showed a significant influence of the used curing modality on micrcrotensile bond strength ($p < 0.001$, ANOVA). The highest bond strengths were evaluated in the light-curing groups (O-l, C-l, E-l). Pairwise comparison showed a significant reduction of bond strength in specimen treated with the self-curing resin cement compared to the light-cured groups. Between the different types of ceramic no statistic differences could be detected ($p < 0.05$, Tukey's test).

Group	O-l	O-s	C-l	C-s	E-l	E-s
Bond Strenght	24.56	14.25	23.18	15.58	22.56	15.93
Standard deviation	7.63	3.48	4.00	2.38	4.46	3.67

Table 1: Microtensile bond strength of all groups in megapascals.

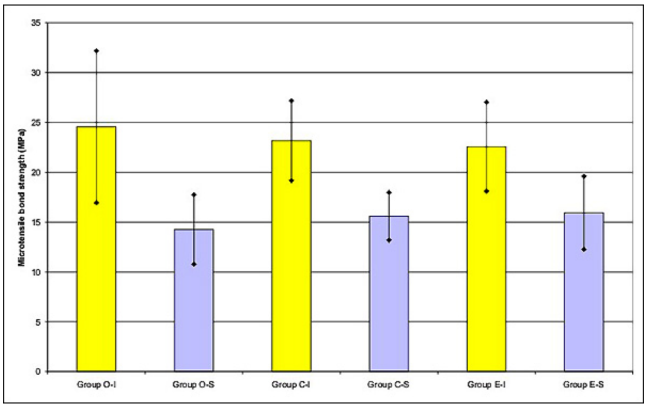

Fig. 11: Graphically expression of the results (Mean values and standard deviation in MPa).

Conclusions

Regardless of the curing modality, it was possible to establish bond strengths in every experimental group. Nevertheless, in the self-curing groups significant lower bond strength were evaluated.

Literature

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