



# Evaluation of MDP-Based Primers: Y-TZP Ceramic and Human Dentin

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## OBJECTIVE

The aim of this study was to evaluate the influence of multimode MDP-based primers and different application protocols on the bond strength of a representative resin cement to a yttrium stabilized tetragonal zirconia (Y-TZP) ceramic as well as of zirconia to dentin.

## MATERIALS AND METHODS

The occlusal dentin from 60 human molars was exposed. The teeth and zirconia cylinders (N = 60) (3 mm of diameter; 4 mm of height) were divided into six groups (n = 10) according to the ceramic surface conditioning: (1) air abraded with SiO<sub>2</sub> particles; (2) Z-Prime Plus; (3) air abraded with SiO<sub>2</sub> particles + Z-Prime Plus; (4) air abraded with SiO<sub>2</sub> particles + All-Bond Universal; (5) air abraded with SiO<sub>2</sub> particles + ScotchBond Universal Adhesive; and (6) untreated zirconia. The luting agent (Duo-Link cement) was applied on the treated dentin surface. Specimens were stored in water (37°C, 24 h) and tested in shear bond strength. Data were statistically analyzed using 2-way ANOVA and Post hoc Tukey tests ( $\alpha = 0.05$ ).

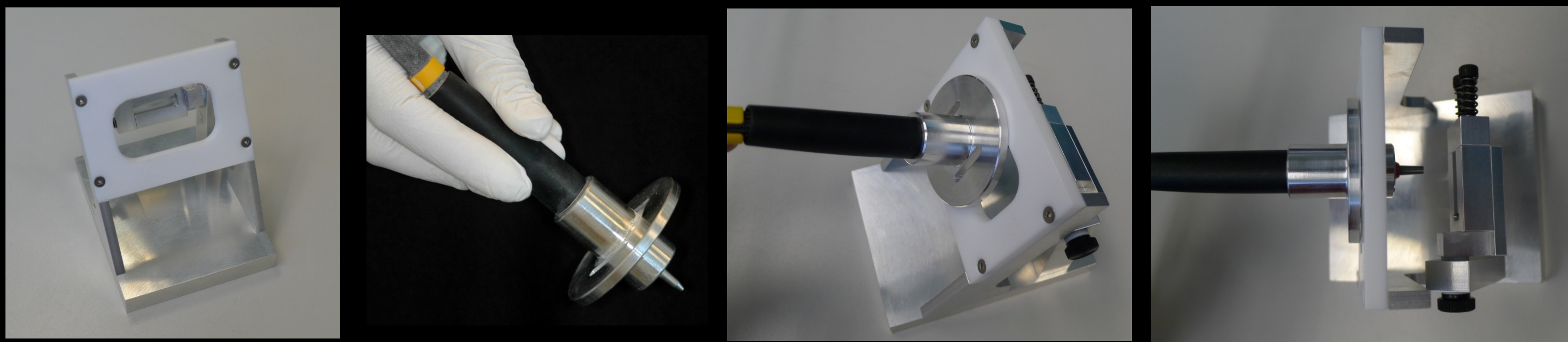


Fig. 1- Sandblasting device.

## RESULTS

Significant effects of ceramic conditioning were found ( $p < 0.0001$ ). The specimens sandblasted with silica particles followed by the application of Z-Prime Plus or All-Bond Universal presented greater bond strength values. For the untreated zirconia, several specimens failed prematurely prior to testing.

Table 1- Mean values (MPa) and standard deviations (in parentheses) of the shear bond strength obtained for the different ceramic surface conditioning.

Untreated zirconia	Z-Prime Plus only	SB only	SB + Z-Prime Plus	SB + ScotchBond Universal Adhesive	SB + All-Bond Universal
5.45 (6.34) <sup>a</sup>	5.18 (4.11) <sup>a</sup>	4.91 (1.07) <sup>a</sup>	26.15 (9.41) <sup>b</sup>	11.83 (5.69) <sup>a,c</sup>	18.56 (9.42) <sup>b,c</sup>

Identical letters indicate no statistically significant differences ( $P > .05$ ).

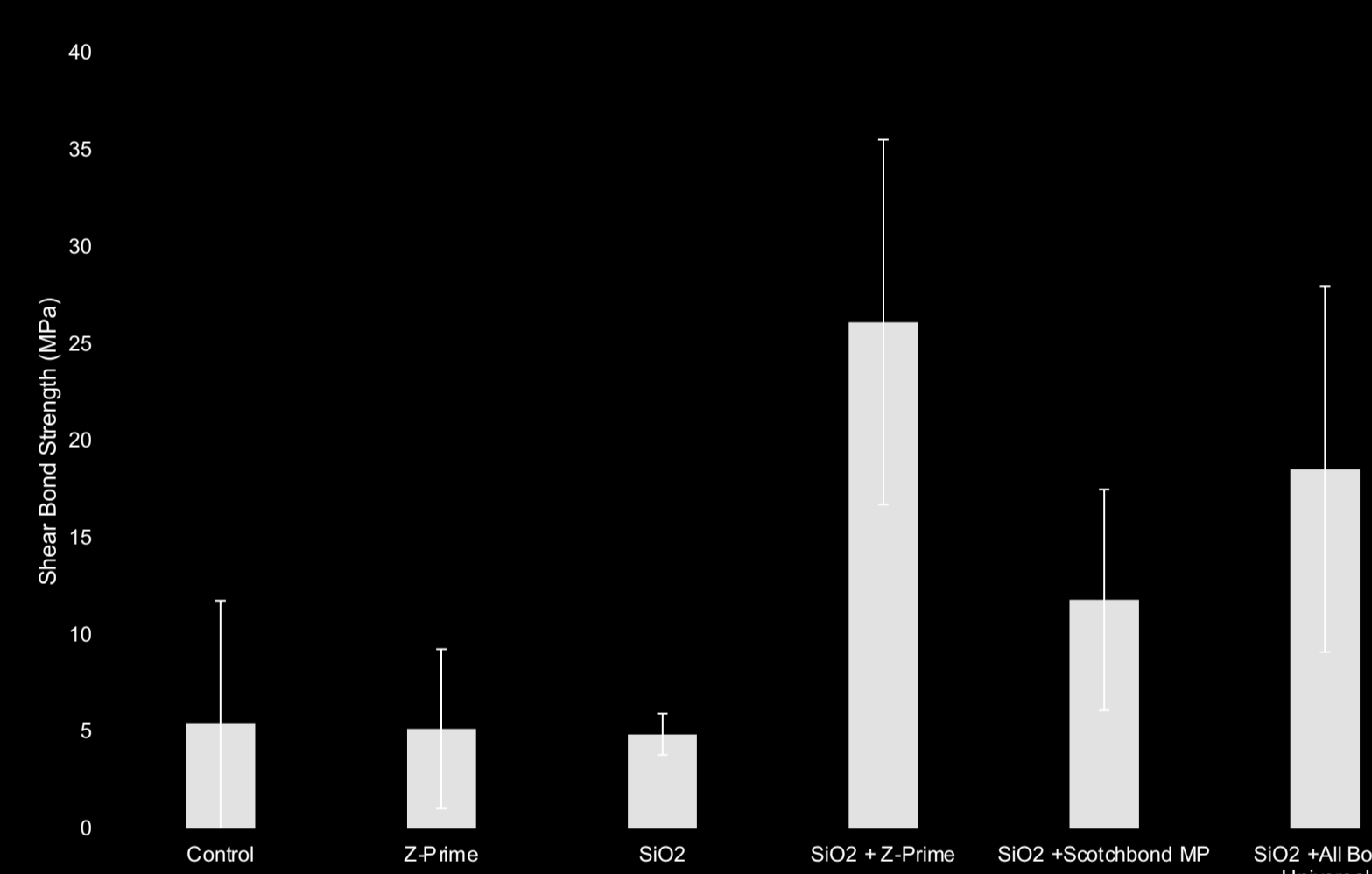


Fig. 2- The mean bond strength values (MPa) according to the surface treatment.

Table 2- Number of specimens per group (n), number of pretest failures (PTF), and failure types of the debonded specimens. Failure between ceramic and cement (Adhes-C-cem); failure between dentin and cement (Adhes-D-cem); cohesive failure of cement and ceramic (MIX); cohesive failure of the ceramic (C-cer); cohesive failure of the cement (C-cem).

Study factors	n	PTF	FAILURE TYPES				
			Adhes-C-cem	Adhes-D-cem	C-cer	C-cem	MIX
Untreated zirconia	10	4	10	0	0	0	0
SB only	10	0	6	0	0	3	1
Z-Prime Plus only	10	1	7	0	0	0	3
SB + Z-Prime Plus	10	0	8	0	0	2	0
SB + All-Bond Universal	10	0	3	0	0	1	6
SB + ScotchBond Universal Adhesive	10	0	5	0	0	3	2

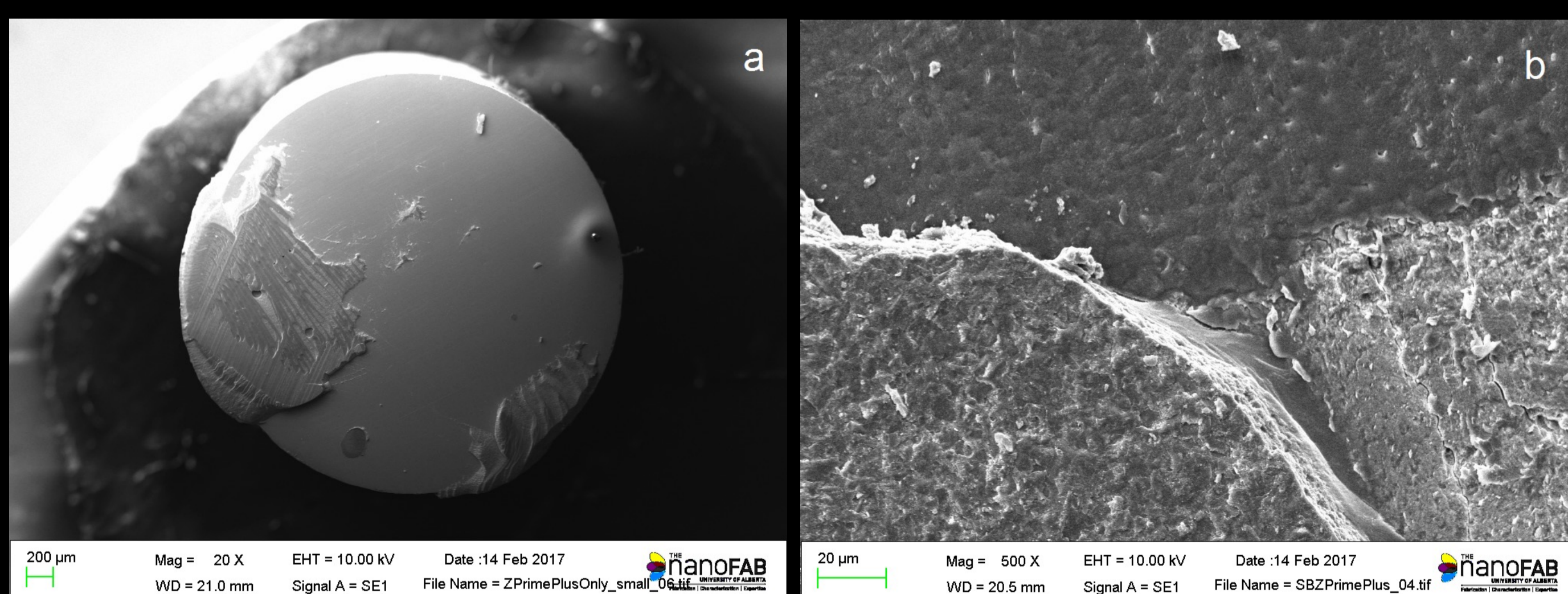


Fig. 3- Representative micrographs of the debonded surfaces: (a) mixed failure – residue of cement left on the left side of the debonded surface from Z-Prime Plus only group; (b) mixed failure exhibiting dentin tubules and cement from SB + Z-Prime Plus group.

## CONCLUSION

Within the limitations of this study, Y-TZP surface sandblasted with 30 micron SiO<sub>2</sub> particles prior to conditioning the bonding surface significantly increased the bonding of Y-TZP to dentin. The SB + Z-Prime Plus protocol resulted in the highest bonding values.

## CLINICAL SIGNIFICANCE

Zirconia surface air abraded with SiO<sub>2</sub> particles and primed with a thin layer of Z-Prime Plus is the recommended surface treatment before cementing a zirconia-based restoration.

We confirm that there are no known conflicts of interest associated with the publication of this work and there has been no significant financial support for this work that could have influenced its outcome.