

## Effectiveness of aluminum oxide sandblasting, plasma application and their combination on the bond strength of resin cement to zirconia

Beatriz C. Mendonça\*, William M. Negreiros, Marcelo Giannini.

### Abstract

The aim of this study was to evaluate the bond strength (BS) of a resin cement to two zirconia ceramics, after the surface treatment with non-thermal plasma (NTP) and sandblasting with aluminium oxide abrasive. Sixty Lava zirconia and 60 Katana Zirconia plates were cut accordingly to the study required dimensions and randomly divided into 8 groups. For all specimen, two resin cylinders were made using a 1,4 mm diameter x 1 mm height matrix. The resin cylinders were tested after 24 hours, using shear test device. Data were analyzed by 2-way ANOVA and Tukey's test (5%).

### Key words:

Zirconia, Argon Plasma, Bond Strength.

### Introduction

Among new available treatments for zirconia cementation, NTP modification shows promising results. The success of this technology relies on its non-equilibrium nature, which provides high doses of chemically active species at low temperature, potentially increasing reactivity of surfaces without damaging the properties of the material (1).

### Results and Discussion

Sixty Katana zirconia (Kuraray Noritake) and 60 Lava (3M ESPE) plates (9 mm x 7 mm x 1 mm) were prepared and randomly divided into 8 groups (n=15). The zirconia plates were embedded in resin blocks and the exposed surface was submitted to the following treatments: 1) untreated (control); 2) treated with NTP for 30 seconds (model SAP, Surface); 3) aluminium oxide blasting; 4) aluminium oxide blasting followed by NTP for 30s. The resin cement (Panavia V5, Kuraray Noritake) was manipulated and inserted into two prefabricated matrices (1.4 mm diameter X 1 mm height), which were positioned on the zirconia surfaces. Specimens were tested at 24 hours of water storage. A shear load was applied to the base of the resin cement cylinders with an orthodontic wire (0.3 mm) at 0.5 mm/min until failure. Data were analyzed by two-way ANOVA and Tukey's test (at  $\alpha = 5\%$ ).

Table 1. Mean bond strength of resin cement to zirconia (in MPa) in 24h test.

Zirconia	Plasma	Sandblasting	
		Untreated	Treated
Lava	Untreated	12.4 (6.7) B a	19.7 (6.7) A a
	Treated	13.6 (7.9) A a	14.9 (8.0) A b
Katana	Untreated	10.2 (6.2) B a	19.8 (5.1) A a
	Treated	7.8 (5.6) A a	14.6 (8.5) A b

There was no significant difference between zirconias ( $p = 0.1102$ ). Means followed by different letters (upper case - horizontally and lowercase - vertically, within each zirconia) are significantly different ( $p < 0.05$ )

### Conclusions

The plasma application did not increase the bond strength of resin cement when zirconia was not sandblasted.

The sandblasting with aluminium oxide increased the bond strength of resin cement to both zirconias, when they were treated with plasma.

No difference in bond strength was observed between zirconias, regardless treatments used.

### Acknowledgement

This study was supported by PIBIC/CNPq

1. Duan Y, Huang C, Yu QS. Cold plasma brush generated at atmospheric pressure. Rev Sci Instrum. 2007;78(1):015104