

## INTRODUCTION

Self-adhesive resin cements eliminate the need to etch, prime, bond, and cement in separate stages. Only one step is required to cement a restoration, resulting in a simplified procedure that reduces technique sensitivity and saves time.

Maxcem Elite, a dual-cure self-adhering resin cement, was recently introduced with improved adhesive properties as well as enhanced esthetic properties and radiopacity.

Ceramic materials like Lava zirconia are desirable for use in crown and bridge applications due to high strength, durability, and esthetics. However, bonding to these materials can be problematic. Many bonding systems are unable to effectively secure the restoration, leading to degradation over time and problems with bond durability.

With a patented redox initiator system, Maxcem Elite provides an efficient dark cure mechanism, which has shown high initial bond strength to ceramics and metals, including Lava.<sup>1</sup> Evaluation of longer-term bond strength is desirable as an indicator for clinical success.

## OBJECTIVE

To study the bond durability of Maxcem Elite to a zirconia-based ceramic substrate Lava following thermocycling and longer-term storage.

## MATERIALS

Maxcem Elite                      Kerr  
Lava                                      3M ESPE

## METHOD

For Lava substrate, discs ( $\phi \times h = 6 \text{ mm} \times 2 \text{ mm}$ ) were milled and sintered according to the manufacturer's instructions. Specimens were embedded in cold cure acrylic. The substrate surface was polished with 600-grit sandpaper, and air abraded with  $50 \mu\text{m}$  aluminum oxide. The specimens were then cleaned in an ultrasonic bath for 5 minutes. No further treatment was done before bonding.

Each prepared substrate was held securely by a bonding jig (figure 1, Ultradent Inc.) with a cylindrical mold ( $\phi = 2.38 \text{ mm}$ ). The mold was then filled with Maxcem Elite self-adhesive resin cement. The whole bonding assembly was conditioned at  $37^\circ\text{C}$  in a high humidity chamber (85-90% relative humidity) to allow the cement to self-cure for one hour before the bonding jig was removed. The prepared specimens were then stored in deionized water at  $37^\circ\text{C}$  for 24 hours. One group ( $n = 6$ ) of random samples was immediately debonded. Another group was thermocycled 5,000 cycles between  $5^\circ\text{C}$  and  $55^\circ\text{C}$  prior to shear bond testing. The third group was thermocycled and then stored for 5 months prior to testing. Specimens were debonded on an Instron mechanical tester (Model 4467, Instron Corporation) in shear mode using a notched (semicircular) edge (figure 2) at a crosshead speed of  $1.0 \text{ mm/min}$ .

Shear bond strength values in MPa were calculated by dividing the peak load by the bonding area. Statistical analysis was performed using one-way ANOVA ( $p < 0.05$ ).



Figure 1: Bonding Jig

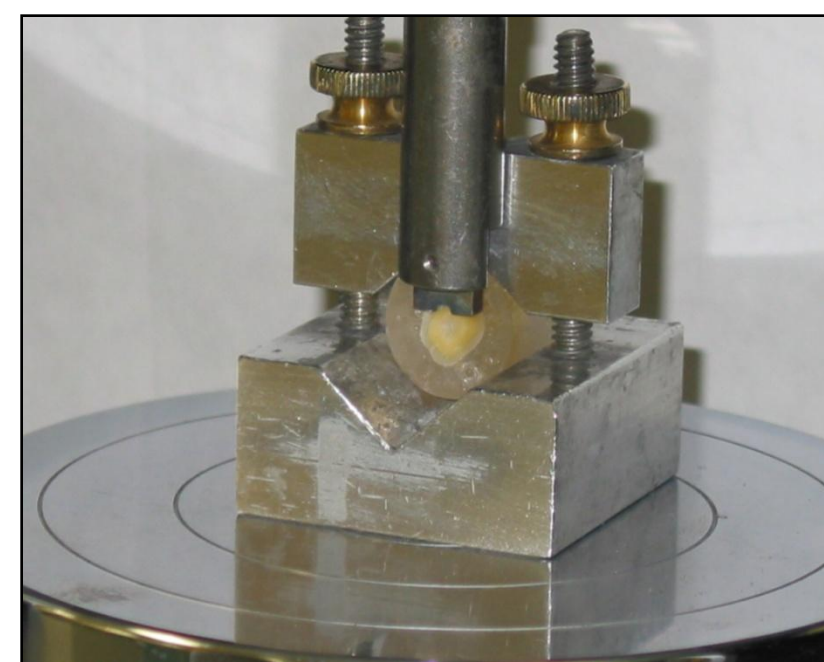


Figure 2: Shear Bond Test Set-Up

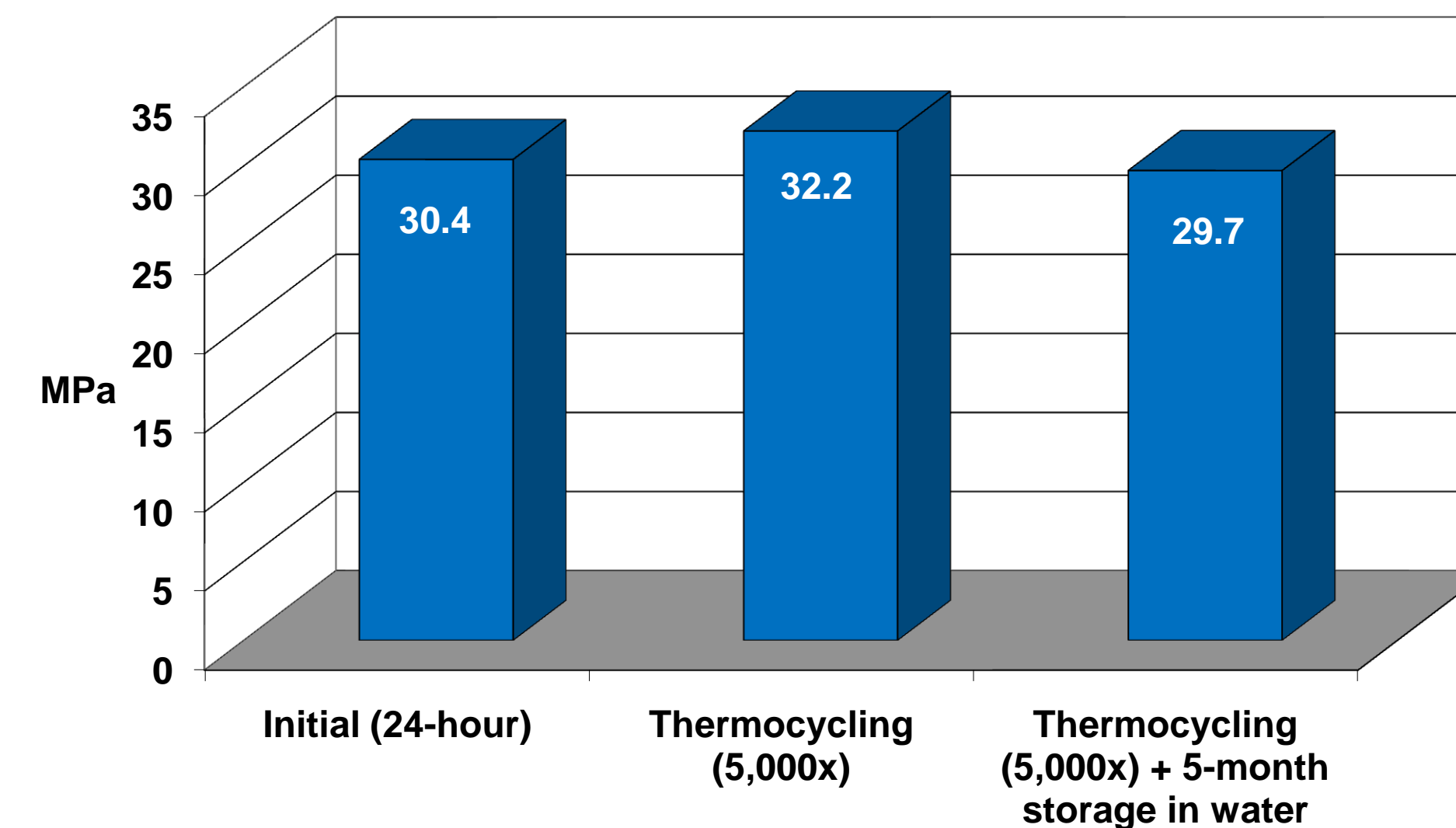
## RESULTS

### Mean Shear Bond Strength, MPa (sd)

Initial (24-hour)	Thermocycling (5,000x)	Thermocycling (5,000x) + 5-month storage in water
30.4 (1.1) <sup>a</sup>	32.2 (12.8) <sup>a</sup>	29.7 (13.2) <sup>a</sup>

Means with the same letter are not statistically different at  $p > 0.05$

### Shear Bond Strength Maxcem Elite Bonded to Lava Substrate



## DISCUSSION

ANOVA analysis revealed there was no statistical difference ( $p > 0.05$ ) in shear bond strength between the groups.

Bond strength remained high, even after the samples were subjected to thermocycling and long-term water storage.

Aging in  $37^\circ\text{C}$  water for 5 months following thermocycling does not negatively affect the bond strength of Maxcem Elite to Lava, indicating that the bond is durable.

The durability of the cement bond could be attributed to incorporation of GPDM adhesive monomer, optimized resin matrix for enhanced wetting ability, and patented redox initiator system for efficient dark-cure mechanism. The one-step self-adhesive cement provides a simplified cementation process with good bond strength.

## CONCLUSION

The bond strength of Maxcem Elite to Lava substrate is quite stable and is not negatively affected by thermocycling and long term storage in deionized water.

## REFERENCES

1. T.T. Nguyen et al: "SBS of a New Self-Adhesive Cement to Metals and Ceramics", IADR Abst #424 July 2008.