

# **Immediate and Delayed Bond Strength of Different Self-Adhesive Cements to Different Substrates**

**Phase I: Enamel and Dentin**

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## **OBJECTIVE:**

The purpose of this study is to evaluate the initial bond strength of a newly developed resin cement (Maxcem Elite) to different substrates and comparing the results to other commercially available self-adhesive cements. Phase I of the study will evaluate the bond strength of Maxcem Elite to dentin and enamel at 15 minutes and 24 hours.

## **MATERIALS AND METHODS**

The experimental resin cement was supplied by the manufacturer and the other resins well purchased in the open market.

### **Teeth Selection and Mounting:**

The dentin or enamel substrate to bond the specimens was obtained from freshly extracted, caries-free, unrestored human molars. Teeth were stored at 4 °C in 100% humidity containing 0.1 % chloramine T. Twelve teeth were used per group.

The teeth were sectioned using a water-cooled diamond grit cutting disc. For enamel testing, teeth were sectioned mesio-distally. For dentin testing, teeth were sectioned buccal-lingually. These sectioned molars were mounted in a chemically polymerized methacrylate with the outer surface exposed. The exposed molar surface was coarse ground flat, on a model trimmer, until an adequate dentin or enamel surface was revealed. This surface was finished with 400 grit silicon carbide wet/dry sanding paper. The prepared specimens were stored in deionized water until ready to be bonded. Prior to bonding the specimens, the surface were slightly refinished with 600 grit silicon carbide paper to expose fresh enamel or dentin. 60 enamel specimens and 144 dentin specimens were prepared.

### **Cements tested:**

- A) Maxcem Elite
- B) Maxcem
- C) RelyX Unicem Cliket
- D) G-Cem
- E) FujiCem Automix

### **Test Groups:**

**(Phase I)** Groups A to E. All groups were bonded directly to the cement to be tested. In other words, the cement served as the rod.

- A) Enamel 24 hours (Self-cure)
  - 1) Maxcem Elite
  - 2) Maxcem
  - 3) Unicem
  - 4) G-Cem

- 5) FujiCem
- B) Dentin 24 Hours (Self-cure)
  - 6) Maxcem Elite
  - 7) Maxcem
  - 8) Unicem
  - 9) G-Cem
  - 10) FujiCem
- C) Dentin 15 minutes (Self-cure)
  - 11) Maxcem Elite
  - 12) Maxcem
  - 13) Unicem
  - 14) G-Cem
  - 15) FujiCem
- D) Dentin 15 minutes (Light cure)
  - 16) Maxcem elite
- E) Dentin 24 hours (Light cure)
  - 17) Maxcem Elite

**Testing:**

Excess cement was removed and the bonded specimens were placed in a 37<sup>0</sup>C incubator. Groups A, B and E were left for 24 hours in the incubator. Groups C and D were tested after 15 minutes.

Shear bond strength was measured using a Dillon Quantrol testing machine at a test speed of 1mm/min. A notched crosshead designed to match the diameter of the bonded specimen was used to apply the testing load.

The specimens were placed in a test base clamp, which is free to move to facilitate positioning under the load. The test base was then be positioned so that notched crosshead is placed against the dentin/enamel surface and the notch is fitted on the diameter of the bonded composite specimen.

The load required to debond the specimens was recorded and the mean bond strength of the ten specimens calculated by dividing the load by the surface area of the bonded specimen and expressed in MPa's.

**Data entry, tabulation and analysis**

The calculated parameters were analyzed by using one-way analysis of variance (ANOVA) to evaluate if there is any difference between the tested materials. If differences were found, a Newman Keul's test was used to identify the differences.

**Results:**

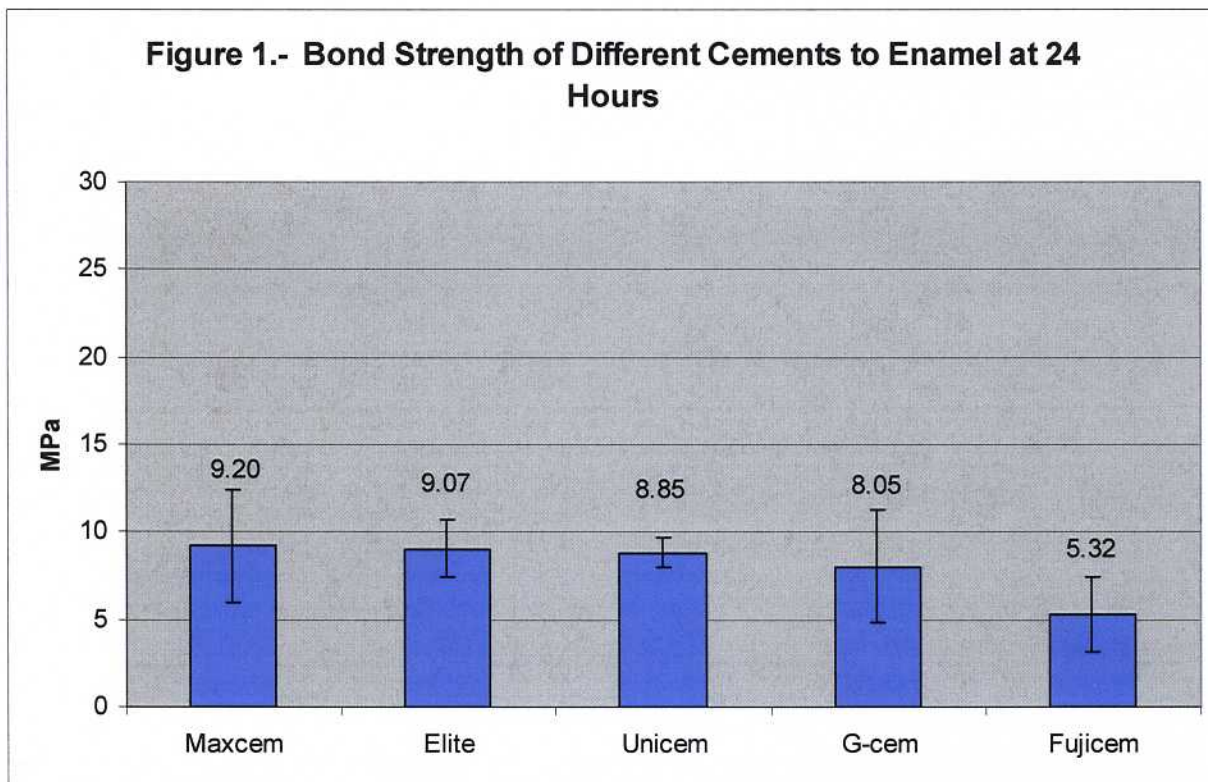
Results are found in Table 1 and Figures 1-3.

**Table 1.- Bond Strength of Enamel and Dentin to different Cements**

Mean (SD). MPa

	Enamel (24 Hrs)	Dentin (24 Hrs)	Dentin (15 Min)
<b>Elite (LC)</b>		21.30 (5.75)c	10.11 (4.13)c
<b>Elite</b>	9.07 (1.59)a	16.44 (4.94)a	6.37 (4.94)b
<b>Maxcem</b>	9.204 (3.22)a	8.62 (3.38)b	4.84 (2.10)a
<b>Unicem</b>	8.85 (0.85)a	7.34 (3.34)b	2.30 (1.53)a
<b>G-cem</b>	8.15 (3.18)a	16.37 (5.28)a	3.62 (0.38)a
<b>Fujicem</b>	5.32 (2.28)b	3.18 (3.77)d	3.41 (1.29)a

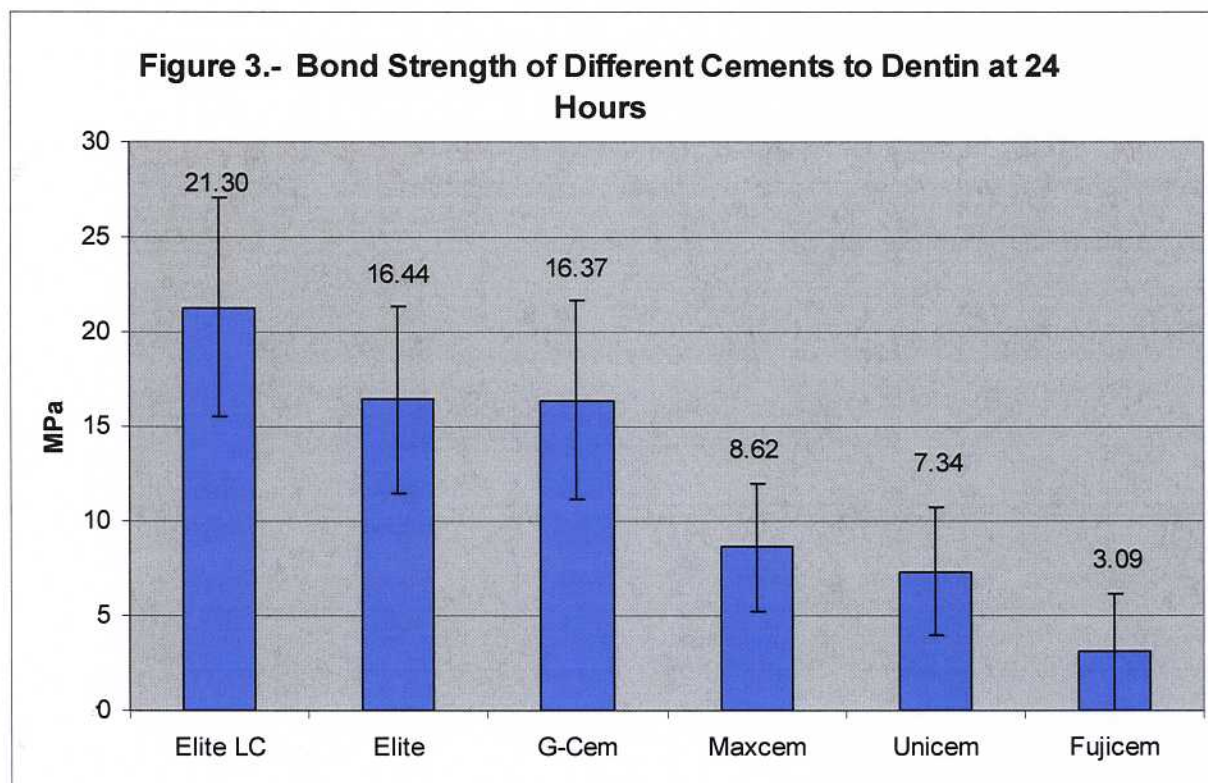
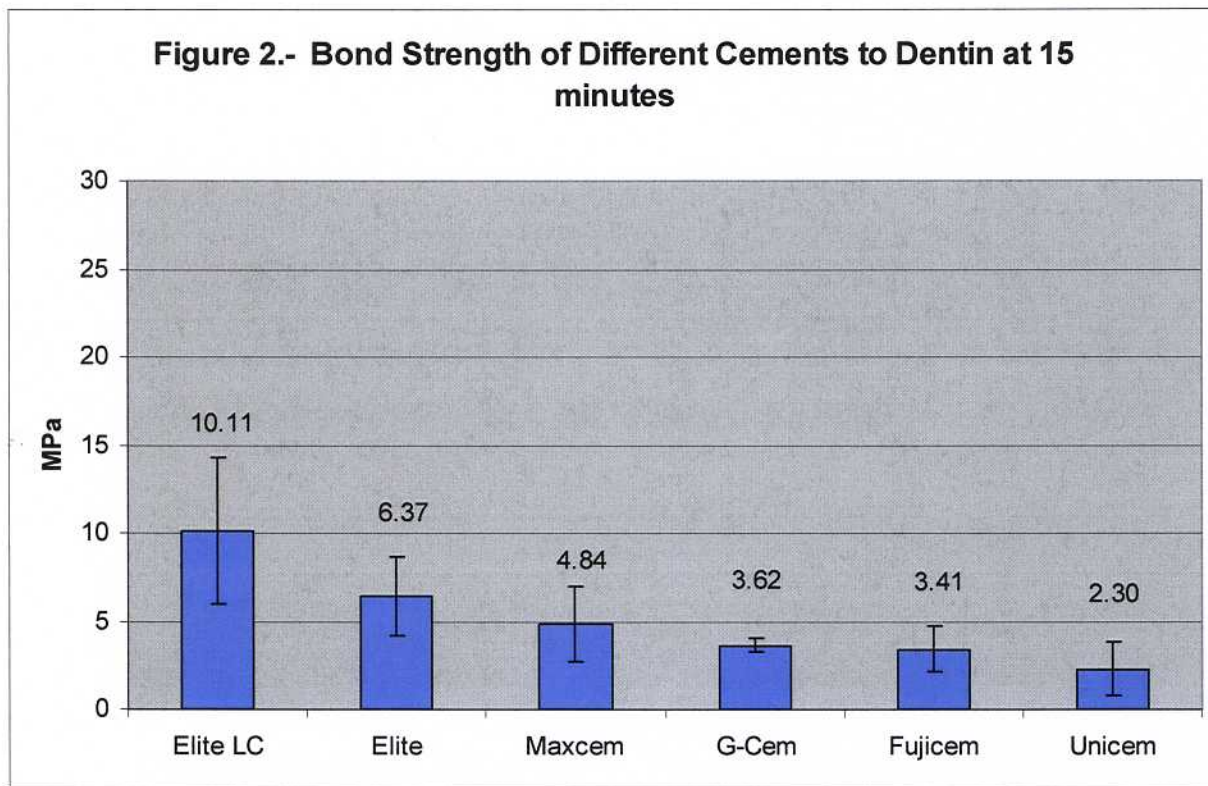
Groups identified by the same letter are not statistically different



When Maxcem and Maxcem Elite were bonded to enamel and tested at 24 hours, both had the highest bond strength but were not statistically different to each other. ( $p>0.05$ ). Unicem and G-Cem were also not statistically different to each other or to Maxcem Elite. FujiCem had the lowest values and was statistically different to all the other groups. ( $p=0.002$ ).

When the cements were tested to dentin at 15 minutes, Maxcem Elite Light polymerized (LC) had the highest bond strength and was statistically different to all the other groups ( $p<0.001$ ). When Maxcem Elite was left to polymerize in self cure mode, it had the second highest bond

strength and again was statistically different to all other groups ( $p < 0.001$ ). Maxcem, G-Cem, FujiCem and Unicem were not statistically different to each other ( $p > 0.05$ ). Mean and standard deviation values for each tested group are summarized in Table 1 and Figure 2.



When the cements were tested to dentin at 24 hours Maxcem Elite light cured had the highest bond strength of all cements 21.30 (5.74) MPa and was statistically different to all the other groups ( $p < 0.001$ ). Maxcem Elite self cured had the second highest bond strength but was not statistically different to G-Cem ( $p > 0.973$ ). Fuji-Cem had the lowest values when compared to the other groups. Mean and standard deviation values for each tested group are summarized in Table 1 and Figure 3.

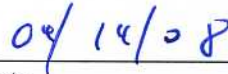
Optical microscope analysis indicated that all failures were adhesive in nature.

**Summary:**

Maxcem Elite self-adhesive cement in self cure or Light cure mode to dentin and enamel provides clinically acceptable results when compared to other cements.



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