

Preliminary Evidence That Bioactive Cements Occlude Artificial Marginal Gaps

Scientific Publication: Preliminary evidence that bioactive cements occlude artificial marginal gaps.
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Study Design**: Dental cement discs (0.8mm thick) were prepared from five different cements, used in accordance with the manufacturers' instructions, and then immersed for 24 hours in distilled water at 37°C.

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Dentin discs (~1 mm thick) and the dental cement discs were assembled, with a 50 μm -thick Mylar strip separator between them except at one end, thereby creating an artificial marginal gap 50-110 μm in width for all materials compared.



*Basic experimental design for artificial marginal gap**

An additional sample using Ceramir C&B was prepared with a 250-300 μm wide gap.

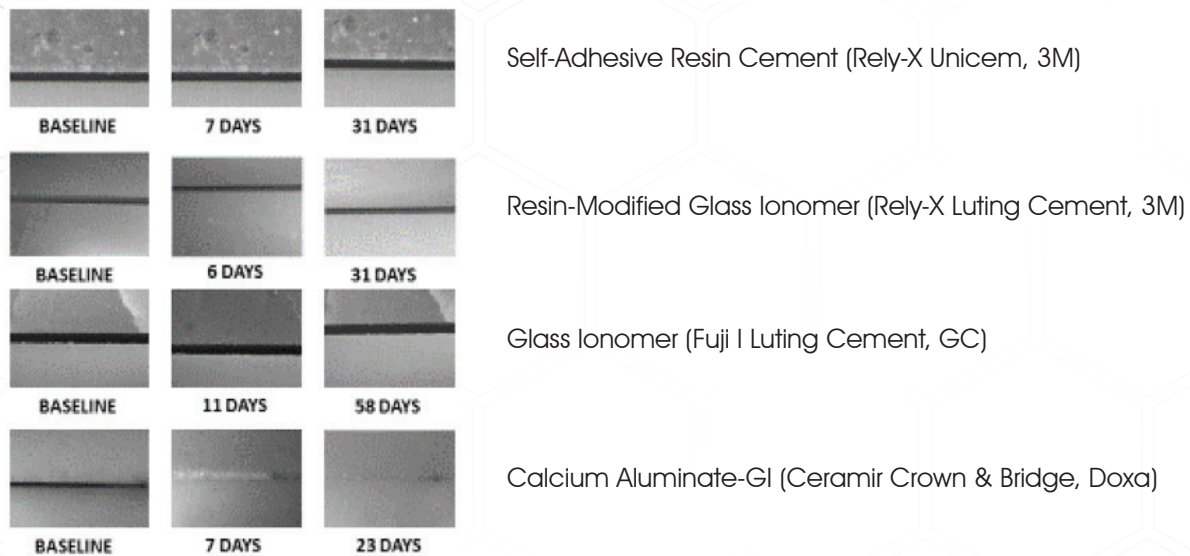
At baseline, the marginal gaps were assessed using light microscopy (50x magnification).

Digital images of the interfacial gap at 50 \times magnification were recorded at baseline (time zero), and at intermittent time periods from 1 day to 8 months after incubation in phosphate buffered saline at 37°C.

At around Month 5, micro-computerized tomography scans were taken of randomly-selected samples for each cement, to determine if radiodense material was present at the edges and within the marginal gaps.

The dentin-gap-cement assemblies were reconstructed digitally, and virtual cross-sectional slices created.

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The figure was edited only to remove the calcium silicate (MTA) group, thereby illustrating the behavior of only the luting cements tested in this study. However, the images themselves were not altered or modified in any manner.

Observations and Conclusions:

At ~1 month: Complete marginal gap occlusion for 3 of 5 samples containing Ceramik C&B cement.

At Day 35: Ceramik C&B had almost completely occluded all marginal gaps initially 50-110 μm -wide; occlusion was slower for the sample with an initial 250-300 μm -wide gap.

At 5 months: Occlusive 'mineralized' material was confirmed to be present at and within the gap areas for Ceramik C&B and White ProRoot MTA.

At 8 months: Complete gap closure was observed for all Ceramik C&B and White ProRoot MTA samples.

There was no evidence of any marginal gap occlusion at any time point for the self-adhesive composite resin, resin-modified glass ionomer and glass ionomer cement assemblies (n=5 each).

Based on these results, bioactive cements may have the ability to partially or completely occlude marginal gaps. If substantiated, the capability of a bioactive reactive cement, such as Ceramik C&B, to reseal and close marginal gaps and defects could potentially add a new, useful protective function.