Self-Adhesive Resin Cements—Part II

Author and Associate Editor
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This is the second part of a two-part piece on self-adhesive resin cements; Part I was presented in the previous issue of the Journal. Here in Part II, the specific topics concerning self-adhesive cements are clinical performance, post-cementation sensitivity, and cementation of endodontic posts.

Two-Year Clinical Evaluation of a Self-Adhesive Luting Agent for Ceramic Inlays

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ABSTRACT

Objective: This was a randomized, controlled clinical trial to evaluate the 2-year clinical performance of ceramic inlays cemented using RelyX Unicem (3M ESPE, St. Paul, MN, USA) self-adhesive resin cement.

Materials and Methods: Thirty-one adult patients requiring Class II restorations were enrolled in the study. Each patient received two IPS Empress (Ivoclar Vivadent, Schaan, Principality of Liechtenstein) ceramic inlays following a split-mouth design. One restoration of each pair, randomly chosen, was cemented with RelyX Unicem following the manufacturer's instructions, that is without selective etching of the enamel. This was the control group. In the experimental group, enamel margins were etched with 35% phosphoric acid prior to cementation.

Two operators prepared the teeth and placed the restorations. The inlays had a minimum thickness of 1.3 mm and a minimum width of 2 mm at the isthmus. Any onlays were at least 1.5-mm thick at the cusp tips and 1-mm thick at the margins. The restorations were fabricated by a single laboratory technician and were delivered within 2 weeks after tooth preparation. The ceramic restorations were etched with hydrofluoric acid and silanated. They were cemented under rubber dam isolation. The powder/liquid version of Unicem was used, and it was light-activated after excess cement was removed from the seated restoration.

All restorations were evaluated at baseline (1 month after insertion), 6 months, 1 year, and 2 years according to the modified US Public Health Service criteria. Two independent investigators performed the evaluations.

Results: All but 2 of the 62 restorations were clinically acceptable at 2 years. The survival rates calculated with the Kaplan–Meier algorithm were 100% in the experimental (etch) group and 93.3% in the control (no etch) group. The two failures were debonded restorations. Although there were two failures in one group and none in the other, the difference was not statistically significant. Other criteria, notably marginal integrity, were virtually identical for the two groups at 2 years.

In regard to restoration quality over time, obvious differences in marginal integrity were observed. The rating of "excellent margin" decreased from 70.7% of

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restorations at baseline to 21.7% at 2 years (control = 20%; experimental = 23.4%). An additional 68% of restorations had a "good" rating for marginal integrity at 2 years.

Conclusions: The self-adhesive resin cement RelyX Unicem demonstrated acceptable clinical performance with ceramic inlays after 2 years of service. Selective enamel etching prior to cementation has no significant effect on marginal integrity or other restoration characteristics.

COMMENTARY

Traditionally, ceramic inlays and onlays have been bonded using resin cements that require an etch-and-rinse adhesive system or a self-etch primer. Although successful, these bonding procedures can be time-consuming and technique-sensitive. Because of that, many clinicians are now using self-adhesive resin cements to simplify placement of partial-coverage ceramic restorations. Anecdotally, this is probably most common with computer-aided design/computer-aided manufacturing (CAD/CAM) restorations.

Until recently, however, very little evidence from controlled clinical trials has been available to support the use of self-adhesive resin cements for such procedures. The present study is from a highly respected research group and indicates that self-adhesive resin cements *are* an acceptable alternative for ceramic inlays and onlays.

Self-adhesive resin cements do not bond particularly well to enamel, and in vitro studies have reported that their enamel bond strength can be improved by prior etching with phosphoric acid. This study evaluated the effect of selective enamel etching and found that it provided no improvement in marginal integrity. It is worth noting, however, that selective enamel etching *could* prove beneficial over longer time periods.

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The Postoperative Sensitivity of Fixed Partial Dentures Cemented with Self-Adhesive Resin Cements: A Clinical Study

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ABSTRACT

Objective: This study compared post-cementation sensitivity experienced by patients receiving fixed partial dentures (FPDs) cemented using self-adhesive resin cements or an etch-and-rinse resin cement system.

Materials and Methods: Fifty abutment teeth (all mandibular premolars and molars) were prepared in 20 patients using standard methods. One laboratory fabricated all of the porcelain-fused-to-metal (PFM) prostheses, which were delivered under local anesthesia. The choice of cement for a specific FPD was chosen at random. Two self-adhesive resin cements were used:

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RelyX Unicem and Breeze (Pentron Clinical Technologies, Wallingford, CT, USA). The control material was RelyX ARC (3M ESPE), which uses the etch-and-rinse adhesive Single Bond.

Tooth sensitivity was assessed preoperatively, and at 24 hours, 2 weeks, 6 weeks, and 12 weeks after cementation. Each abutment tooth was checked for sensitivity to biting pressure, cold water, and compressed air. Subjects rated sensitivity on a 0 to 10 visual analog scale (VAS) ranging from "no sensitivity" (0) to "most sensitivity" (10).

Results: The distribution of cements by number of abutments were as follows: Breeze 20, Unicem 18, and RelyX ARC 12. At the various post-cementation intervals, sensitivity scores for all three tests were significantly higher for RelyX ARC than for Breeze or Unicem. Differences between the two self-adhesive cements were not significantly different for any test at any recall.

All three cements resulted in sensitivity to cold at 24 hours. The mean VAS score for RelyX ARC was 8, and it was in the 4 to 5 range for the self-adhesive cements. By 12 weeks, the mean VAS scores decreased to 3 for RelyX ARC and 0 for the self-adhesive cements. In fact, cold sensitivity with the self-adhesive cements had essentially disappeared between 2 and 6 weeks.

Conclusions: Two self-adhesive resin cements were associated with significantly less post-cementation sensitivity than an etch-and-rinse control.

COMMENTARY

Much anecdotal evidence indicates that the self-adhesive resin cements cause very little post-cementation sensitivity, and this controlled clinical trial confirms that evidence. Of note for clinicians, subjects did report some cold sensitivity at 24 hours after FPD cementation, so informing patients of this possibility is a good idea, regardless of the type of cement used. However, this sensitivity resolved relatively quickly and was not a persistent problem.

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Influence of Resin Cement and Post Configuration on Bond Strength to Root Dentine

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ABSTRACT

Objective: The purpose of this study was to test the hypothesis that fiberglass post configuration and resin cement type affect adhesion to root dentin at different depths.

Materials and Methods: Ninety-six bovine incisors were selected for the study, all with similar internal and external morphology and a specific canal diameter. Coronal portions of the teeth were removed to create 15-mm roots. The root canals were instrumented using standard methodology, and were filled with gutta

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percha and a calcium hydroxide-based sealer. Post spaces were prepared immediately after filling to a depth of 10 mm. A heated instrument to remove gutta percha and post spaces were completed using appropriately shaped burs for the two types of posts to be placed.

Serrated, parallel-sided, and smooth, tapered fiber posts were cemented into the prepared spaces using RelyX ARC, RelyX Unicem, Maxcem (Kerr Corporation, Orange, CA, USA), or Cement-Post (Angelus, Londrina, PR, Brazil), a self-cured resin cement. For both RelyX ARC and Cement-Post, canals were etched with 37% phosphoric acid and treated with Scotchbond Multi-Purpose (3M ESPE) primer and adhesive. The adhesive was light-activated. For Unicem and Maxcem, the canals received no treatment other than rinsing and drying. Except for the self-cure cement, the others were light-activated for a total of 120 seconds at 3 minutes after post insertion.

Each tooth-post specimen was sectioned into six slices using double-sided diamond disks in an Isomet low-speed saw device (Buehler, Ltd., Lake Bluff, IL, USA). These slices were mounted in a testing device for application of a compressive load to displace the post. Push-out bond strengths were calculated by dividing the failure load by the interfacial area.

Results: Data were reported by post type, cement type, and canal region (cervical, middle, or apical). Significant differences were found for canal location and cement type, but not for post type. RelyX Unicem, the self-adhesive resin cement, had the highest push-out bond strengths, regardless of post type or location in the canal. Its bond strengths were consistent through the length of the canal. For example, with the smooth post, the mean bond strengths from cervical to middle to apical were 13.7, 14.5, and 13.1 MPa, respectively. In contrast, the bond strengths of RelyX ARC decreased from cervical to apical, from 9.8 to 5.6 MPa.

Conclusions: Bond strengths of RelyX Unicem to root dentin were higher than those of the other cements tested, regardless of canal region or post configuration.

COMMENTARY

Perhaps because they are so easy to use, but still provide a reasonable bond to dentin, self-adhesive resin cements have become a popular means of placing fiber endodontic posts. Evidence from in vitro studies is accumulating to support their use in this procedure.

An interesting finding of the present study is that the bond strength of RelyX Unicem was consistent throughout the length of the root, which was not the case with RelyX ARC. The difference could be that Unicem's self-cure component provided better polymerization in deeper areas of the root than those achieved with Scotchbond Multi-Purpose, the adhesive used with ARC.

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THE BOTTOM LINE

- Self-adhesive resin cements generally provide a good bond to dentin, but bond strengths vary among different products.
- Although not specifically reviewed in this Critical Appraisal, enamel bond strengths are generally low but can be improved by phosphoric acid etching.
- Because of their inherent chemistry, some self-adhesive resin cements bond well to zirconia with no treatment of the substrate. Airborne-particle abrasion, silicoating, and appropriate ceramic primers can increase adhesion.
- Because of their bond to both dentin and zirconia, these materials may be the material of choice for routine bonding of zirconia crowns.
- Self-adhesive cements cure via both chemical and light activation. Wherever possible, they should be light-activated to optimize their physical properties.
- Post-cementation sensitivity associated with self-adhesive resin cements is very little and typically resolves within a short time.
- Self-adhesive resin cements are an acceptable option for use with ceramic inlays and onlays. Selective etching of enamel margins may or may not be necessary.
- Self-adhesive resin cements represent a simple and effective option for placement of fiber posts.
- Anecdotally, some clinicians state that they prefer the "self-healing" adhesion and fluoride release provided by glass ionomer and resin-modified glass ionomer cements.

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