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What, Why and How I use Dental Cements

By Todd C. Snyder, DDS

The ever-evolving science of adhesion to tooth structure has created numerous chemically different formulations of luting cements. This, in turn, has created a conundrum for many dentists; namely, deciding what type of cement to use for different restorative applications. The first thing to remember is that luting cements are not the panacea for a poorly designed indirect restoration. Ideally, any indirect restoration still needs to have retention and resistance form built into its design, as the weakest link is ultimately the luting cement. Proper material selection—based on physical properties mated with ideal tooth reduction, retention and resistance form—is critical for ensuring longevity and the least amount of stress possible on the luting cement.

In an attempt to simplify the luting cement dilemma, we need to categorize the types of these materials that are available. To that end, this article will review the characteristics of three chemically different types of luting cements: glass ionomers, resin-modified glass ionomers and resin cements (traditional [requiring a separate bonding agent] and self-etching). Traditional zinc phosphate and polycarboxylic acid cements will be omitted from this discussion because current materials have better physical properties.

Glass Ionomers

Glass ionomers are hydrophilic, fluoride-releasing materials that have some of the best characteristics of any material used in the oral environment. They are virtually insoluble in water once they are set, and are the materials of choice when moisture control is an issue. Although not as strong as resin luting agents, their other characteristics more than compensate for this "short-coming." Glass ionomers are the only cements that truly adhere chemically to tooth structure and have virtually no technique-sensitivity.

Resin-Modified Glass Ionomers

The added resin component in resin-modified glass ionomer cements provide the greater strength properties that are inherently lacking in traditional glass ionomers. GC America's FujiCEM Automix and Fuji PLUS capsules are excellent examples of a glass ionomer and a resin-modified glass ionomer. I use the Fuji PLUS capsules for all of my metal based inlays, onlays and crowns. Using capsules that are properly measured for powder-to-liquid ratio improves accuracy and is a huge time-saver, while also potentially affording better physical properties due to trituration.

Resin Cements (Traditional)

The antithesis of glass ionomers would have to be the traditional resin luting cements, with their requirement for a bonding agent to allow for micromechanical adhesion to tooth structure. NX3 (Kerr Corporation) is an excellent example of such a cement, and comes in both a light-cured and dual-cured formulation, which can be combined with either a self-etch (OptiBond All-In-One; Kerr Corporation) or total-etch (OptiBond Solo Plus; Kerr Corporation) bonding agent. Their product versatility (offering a self-etched-based adhesive or traditional etchant-based adhesive) is only part of the genius of this product. The dual-cure version offers Kerr's proprietary and revolutionary redox initiator, which is said to be more color-stable than camphorquinone-based products. For this reason, this is a product I use for veneers and all ceramic crowns in which long-term color stability is crucial to a successful cosmetic outcome. Due to the redox initiator I always try to use the dual-cured NX3 and the OptiBond All-In-One, but with any dual-cured product one must work especially fast due to the setting time.

Resin Cements (Self-Etching)
The most recent category to be created is the self-etch resin luting cement variety. This category was created to avert the complications associated with more labored, time-intensive bonding techniques and post-operative sensitivity. This type of material is exemplified by Maxcem Elite (Kerr Corporation), which also features the redox initiator. GC America also has a self-etch product called G-CEM. The ease of a single self-etch resin system does, however, have its tradeoffs in that the material is somewhat weaker than traditional resin luting cements. On the upside, they are faster and don't require additional bonding agents, with the added steps and potentially greater risk of postoperative sensitivity if the technique is not adhered to properly.

Material Selection: Weighing the Pros and Cons
All luting cements have distinct advantages and disadvantages. Key to achieving optimal restoration outcomes is a thorough understanding of the ways in which each type works and the role each will play in your armamentarium. No single cement is ideal for every indication and each case can give rise to indications for a specific type of luting cement (Table).

As discussed above, one must, for example, weigh the benefits of a faster, easier system with less postoperative sensitivity with the downside of slightly decreased bond strengths. Cementing indirect metal restorations serves as a case in point. In such instances I want an adhesive cement with fluoride release and insolubility, and use a resin-modified glass ionomer (Fuji PLUS capsules). In this instance, strength properties are not as critical as the elimination of extra steps, such as those required with a bonding agent, which is an important consideration with respect to time and overhead.

For inlays, onlays, veneers and all ceramic crowns (including zirconia) I always want the highest adhesive strength possible, as well as color stability. In such cases I use a traditional resin with a bonding agent (NX3 and OptiBond All-In-One). Resin cements are inherently more technique-sensitive and can be associated with more potential postoperative problems if not utilized properly. For the highest level of adhesion to a zirconia based restoration the intaglio must first be treated with CoJet (3M ESPE) prior to cementing with resin. If there is difficulty with moisture control, a zirconia or porcelain-fused-to-metal crown needs to be placed with a resin-modified glass ionomer luting cement.

Luting Cements: Selection Considerations

Glass Ionomers	Resin Modified Glass Ionomers	Self-Etch Resins	Traditional Resins
Weak Compressive Strength	Moderate Compressive Strength	Strong Compressive Strength	Stronger Compressive Strength
Weak Flexural Strength	Moderate Flexural Strength	Strong Flexural Strength	Stronger Flexural Strength
High Fluoride Content	High Fluoride Content	Minimal Fluoride Content	No Fluoride Content
Low Water Solubility	Low Water Solubility	High Water Solubility	High Water Solubility
Average Esthetics	Good Esthetics	Best Esthetics	Best Esthetics
Low Sensitivity Risk	Low Sensitivity Risk	Minimal Sensitivity Risk	Moderate Sensitivity Risk
Low/Moderate Adhesive Strength	Moderate Adhesive Strength	Moderate/High Adhesive Strength	Highest Adhesive Strength