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# cosmetic dentistry

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Bioactive materials support proactive dental care

## _technique

Esthetics, caries control and gingival health with a versatile giomer composite system


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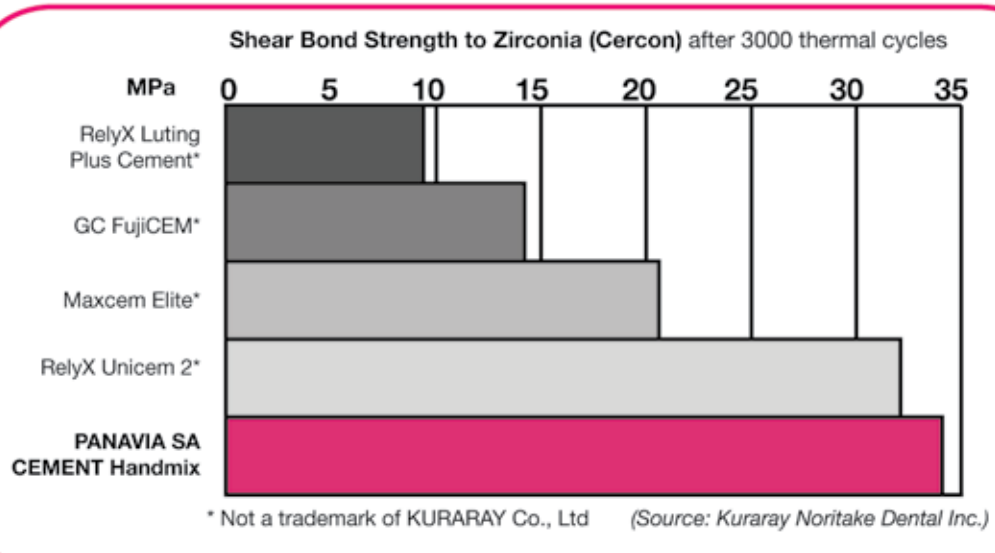


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# Some 'styles' are eternal

Lorin Berland, DDS, FAACD

_Cosmetic dentistry will never go out of style. Why? Because a beautiful smile is always in style.

I first became interested in cosmetic dentistry when I was in high school, working with dentures for my family dentist. I couldn't believe what a boost a nice denture can give a patient. It was more exciting than plastic surgery. In fact, given the acrylic nature of dentures, it was "plastic surgery" at its finest. The dentist I worked for taught me a valuable lesson that applies to all aspects of cosmetic dentistry: A good-looking denture always fits better.

After dental school, I began my residency at the dawn of adhesive cosmetic dentistry. Back then, cosmetic dentistry wasn't considered "serious" dentistry, at least not by most dentists. Yet, my patients thought it was serious. Heck, they thought it was damn exciting. They even thought it was glamorous too, which made me even more excited to get involved. I was there at the beginning for good and for bad. The good is that I've seen a lot and learned a lot, and the bad is that I made many mistakes in the beginning. This is why what we do is called "a practice."

It's also why I urge all cosmetic dentists to always consider first the most conservative approach. As health-care providers our first obligation is to do no harm. The least amount of treatment that yields the desired outcome is the best treatment. You can always do more, but you can't put back what you've already taken away.

That's why almost all cosmetic cases begin with whitening, then consider bonding before veneers, veneers before crowns, endo before extractions, implants before bridges and so on. Unfortunately, with all the excitement over cosmetic dentistry from both the public as well as the dentists' perspective, too much cosmetic dentistry is being done, and not always conservatively nor correctly. This has led to another growth industry in dentistry — the redos. And these are not always the happiest or the most appreciative patients.

That's why the American Academy of Cosmetic Dentistry (AACD) is so important. It's the only organization that's dedicated to training cosmetic dentists, and the accreditation process substantiates that commitment. The AACD recommends that all cosmetic dentists visually document everything. Moreover, with digital photography, it's now very easy to do this. A cosmetic dentist should be his or her own worst critic. Everyone should have a digital camera and take a full series of before-and-after photos of every patient. These can be just as important as radiographs, and when it comes to esthetics, even more so. In addition, be sure you share all these pictures with your patient. This is an important start and finish to every cosmetic case.

And please keep in mind that recent studies have proven that certain axioms — such as men have square teeth and women have round teeth — are not always true. That's why it's important to use smile guides to help the patient choose the appropriate shape and length combination for the front teeth, especially for worn dentition and redos. I also recommend composite mock-ups, cosmetic imaging and/or a "trial smile" before beginning any big cosmetic case. You always want to know where you're going before you begin.

I truly believe that only a dentist that's forever critical of his or her own work can continue to improve. Finally, I encourage every dentist who wants to provide cosmetic dentistry to join the AACD and begin the accreditation process.

Sincerely,
Lorin Berland, DDS, FAACD


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## | trends



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# Bioactive materials support proactive dental care

**Author**_John C. Comisi, DDS, MAGD

**_Resin bonding of the human dentition has become a "standard" in the United States and Canada.** There are more than 80 different bonding systems on the market today. We have seen them evolve through multiple generations in an attempt to "simplify" the bonding process. Yet, as these agents have simplified, many in our profession have seen many challenges arise.

A significant number of reports in the literature have been showing that the "immediate bonding effectiveness of contemporary adhesives are quite favorable, regardless of the approach used [however] in the long term, the bonding effectiveness of some adhesives drops dramatically."[1] The hydrophillicity that both etch-and-rinse and self-etch bonding agents offer initially in the dentin-bonding process becomes a significant disadvantage in terms of long-term durability.[2]

It is this hydrophillicity of simplified adhesive systems combined with other operator-induced challenges that contribute to these failures. Tay, Carvalho, Pashley, et al. have reported repeatedly in the literature of this problem.[3,4] They continue to report that these bonding agents do not coagulate the plasma proteins in the dentinal fluid enough to reduce this permeability. The fluid droplets contribute to the incompatibility of these simplified adhesives and dual-/auto-cured composites in direct restorations and the use of resin cements for luting of indirect restorations.

The term "water-tree" formation has been coined to describe this process, which originated from the tree-like deterioration patterns that were found within polyethylene insulation of underground electrical cables. It is now being applied to the water blisters formed by the transfer of dentinal fluid across the dentin-bonding interface. These "water blisters ... act as stress raisers and form initial flaws that cause subsequent catastrophic failure along the adhesive-composite interfaces."[4]

**_c.e. credit part I**

This article qualifies for C.E. credit. To take the C.E. quiz, log on to *www.dtstudyclub.com*. The quiz will be available on Sept. 28.

(Photos/Provided by Dr. John C. Comisi unless noted otherwise)


Fig. 1


Fig. 2


Fig. 3


Fig. 4


Fig. 5


Fig. 6


Fig. 7

The previously mentioned plasma proteins are released by the dentin when subjected to acids and cause hydrolytic and enzymatic breakdown of the dentin and resin bonding agent interface.[5] These enzymes are called matrix metalloproteinases (MMPs).

Currently, there are only three methods of reducing these MMPs: 2 percent chlorhexidine solutions that are used prior to application of bonding agents; etchants containing benzalkonium chloride, otherwise known as BAC (i.e., Bisco's Uni-etch products); and polyvinylphosphonic-acid-producing products (glass ionomer and resin-modified glass ionomers).

Due to the short efficacy of these chlorhexidine solutions being used before bonding, this methodology has come into question as of late.[6] Etchants with BAC have been shown to be valuable in the reduction of MMPs and should be considered in all bonding processes.[7] However, the most intriguing methodology of reducing MMPs and remineralizing tooth structure is with the use of glass ionomer cements (GIC) and resin-modified glass ionomers (RMGIC).

## _Glass ionomers and resin-modified glass ionomers

Glass ionomer cements have long been used as a direct restorative material. Their early formulations made the material difficult to handle, and the break down of the material made it an undesirable solution in dental restoration. However, these materials, especially in today's formulations and pre-encapsulated presentations, have many properties that make them very important in the restorative process.

The work at companies such as SDI North America (Riva product line), GC America (Fuji product line) and VOCO (Iono product line) have continued to make great strides in improving these products for easier and longer-lasting use of GIC and RMGIC products.

First, these materials are bioactive, and up until recently, they were the only materials with this property; that is they have the capacity to interact with living tissue or systems. Glass ionomers release and recharge with ions from the oral cavity.

This transfer of calcium phosphate, fluoride, strontium and other minerals into the tooth structure helps the dentition deal with the constant assault of the acidic nature of day-to-day ingestion of food and beverages and encourages remineralization; and the incorporation of phosphorous into the acid in today's GICs creates polyvinylphosphonic acid.[8]

This property of GICs makes them a major agent in the reduction of MMP formation, and thereby minimizing if not eliminating the collagen breakdown commonly found in many resin-dentin bonding procedures.[9]

Second, they bond and ultimately form a union with the dentition by chemically fusing to the tooth. The combination of the polyacrylic acid and the calcium fluoroalumino silicate glass typically found in GICs reacts with the tooth surface, which releases calcium and phosphate ions that then combine into the surface layer of the GIC and forms an intermediate layer called the "interdiffusion zone."[10]

No resin bonding agents are required due to this chemical fusing to the tooth structure. This ion release helps inhibit plaque formation and provides an acid buffering capability that helps to create a neutralization effect intraorally. In addition, these GICs have very good marginal integrity with better cavity-sealing properties, have better internal adap-


Fig. 8


Fig. 9


Fig. 10

(Fig. 8/Provided by Brian Novy)


Fig. 11


Fig. 12

tion and resistance to microleakage over extended periods of time, have no free monomers, can be bulk filled and offer excellent biocompatibility.[11]

Another important consideration is that GICs are moisture-loving materials, which makes them very sensible for use in the intraoral cavity.

The transfer of dentinal fluid from the tooth to the GIC essentially creates a "self-toughening mechanism of glass ionomer based materials ... serves to deflect or blunt any cracks that attempt to propagate through the matrix [and] ... plays an adjunctive role by obliterating porosities [which] delay the growth of inherent cracks in the GIC under loading."[4]

The intermediate layer of the GIC provides flexibility during functional loading and acts as a stress absorber at the interface of the restoration and the tooth.[12]

Resin-modified glass ionomers (RMGIC), which are a hybrid of traditional glass ionomer cements with a small addition of light-curing resin, exhibit properties intermediate of the two materials.[13] This material has been shown to have properties similar to GIC, but with better esthetics and immediate light cure. RMGICs have been shown to undergo slight internal fracturing from polymerization shrinkage, yet have an inherent ability to renew broken bonds and reshape to enforce new forms.[12]

Application of RMGIC to all cut dentin in Class II composite restorations has been shown to "significantly reduce micro-leakage along (the) axial wall" of the restoration,[14] and helps prevent bacterial invasion of the restored tooth. RMGIC biomaterials are multifunctional molecules that can adhere to both tooth structure and composite resin, thus providing an improved sealing ability by chemical or micromechanical adhesion to enamel, dentin, cementum and composite resin.

They, like GICs, can be bulk filled to reduce the amount of composite necessary to restore the cavity preparation and act as dentin substitutes in the restoration.[15]

The use of GIC and RMGIC in the restoration of posterior Class V restorations and conservative Class I restorations provides many benefits. They are easy to place and reasonably forgiving, even in a slightly moist environment. They should be placed in a moist but not wet environment, so familiarity with technique is imperative as it is with all dental restorations. I will often use Riva SC (SDI) or Fuji 9 GP Extra (GC America) in posterior Class I and V restorations (Figs. 1–7).

Polishing and shaping of the materials must be done with water spray and fine/ultra fine composite finishing burs and polishers so as not to destroy the surface of the material (Fig. 8). The use of RMGIC products, such as Riva LC or Fuji II LC, is great in bicuspid and anterior Class V restorations, especially in high caries prone patients (Figs. 9–12).

Class II restorations, however, have always presented a challenge to the clinician. If the operator wanted to use GIC or RMGIC, there was no easy way to do this that appeared to provide satisfactory results. It is with this in mind that the "sandwich technique" was developed.