

OBSERVATIONS

Use of luting or bonding with lithium disilicate and zirconia crowns

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During the past few years, new types of tooth-colored crowns have been introduced and rapidly accepted by both practitioners and their patients. Lithium disilicate (IPS e.max, Ivoclar Vivadent, Amherst, N.Y.), zirconia-based, full zirconia and a few other types of restorations just becoming available have had a significant influence on the fixed prosthodontic marketplace. Laboratories report that some of these newer crowns and fixed prostheses are now used more than are porcelain-fused-to-metal (PFM) restorations.¹

As with any new concept, device or material, a significant period is needed for practitioners to adapt to the new concept, observe the clinical challenges it presents and eventually have mature and reliable opinions about its clinical use. Among the challenges observed with lithium disilicate, zirconia-based and full zirconia restorations have been continuing questions about how to affix the restorations to tooth preparations and how to remove them after cementation when necessary.

In this column, I discuss those specific challenges and provide state-

of-the-art suggestions concerning cementation and restoration removal. This is a controversial topic, and some readers will rebut the opinions I express here.

LITHIUM DISILICATE RESTORATIONS

Cements, cementation and removal. Practitioners commonly ask me whether they should bond or lute lithium disilicate restorations. It has been my observation that bonding has been the most popular technique, probably because of ease of use, high strength, the ability to bond to tooth structure and the tooth-colored appearance of resins, which allows blending of the restoration's color with the tooth's color.²⁻⁵

Sandblasting of the internal aspect of lithium disilicate restorations is controversial because of the creation of microcracks shown in some studies, and some say the practice is contraindicated.⁶⁻⁸

When bonding lithium disilicate restorations, the clinician etches the internal surfaces of the restorations with 5 percent hydrofluoric acid for 20 seconds, silanates them once or twice and then bonds them to tooth surfaces with resin cement.⁹ This technique provides a strong connection between the restoration and the

tooth surface and yields an optimum esthetic result, because the bonded resin cement blends with the tooth's color and the restoration's color.^{2,3}

If the preparation lacks retention—such as is the case with onlays, short full-crown preparations or severely tapered restorations—the decision to use bonding cements appears to be appropriate. However, if the tooth preparation has optimum retention, such as with adequately prepared full-crown or inlay preparations, is bonding the optimal technique, or should luting cement be used? In my opinion, bonding is not the best technique to ensure that tooth preparations have optimum mechanical retention, for the following reasons.

Lithium disilicate has near-optimum esthetic characteristics and can be made to match the color of teeth nearly perfectly.¹⁰ Similarly, resin cements can match tooth color very well. When one is removing a bonded lithium disilicate restoration that has been cemented with resin cement matching the tooth color, it can be nearly impossible to differentiate among the restorative material, the cement and the tooth structure.^{11,12} Research has shown that practitioners often inadvertently remove more tooth structure than desirable when removing bonded,

resin-cemented lithium disilicate restorations.¹³

Luting cements such as resin-modified glass ionomer cement, currently popular in the United States, or conventional glass ionomer cement allow easier removal of lithium disilicate restorations because of the following reasons. The luting cement is more opaque in color and is weaker than resin cement. During the removal of a restoration, the different color observed when cutting through the restoration makes a demarcation between the crown and the tooth and potentially allows for less traumatic crown removal than when a bonded restoration is removed.

Resin-modified glass ionomer cement offers the benefit of fluoride release. Furthermore, this cement is well known to prevent postoperative tooth sensitivity, whereas bonding with resin cement occasionally causes unpredictable postoperative tooth sensitivity.¹⁴⁻¹⁶

When to bond and when to lute.

Although long-term research on this topic is lacking, I suggest the following on the basis of current knowledge and my own use and observations of the products over the past few years. If the tooth preparation has adequate retention provided by acceptable length of axial walls and an optimum near-parallelism of axial walls, luting cements probably are indicated. If the tooth preparation has questionable retention, such as an onlay or a crown preparation with minimal retentive qualities, or if the restoration requires some color modification that can be provided by tooth-colored resin cement, bonding cements probably are indicated.

Removal of a lithium disilicate restoration is extremely difficult and is one of the distinct disadvantages of this type of restoration.¹³ Both diamond and carbide burs and wheels have been promoted for this

procedure, but removal still is much more difficult than it is with PFM or full metal restorations. Later in this column, I will discuss a removal technique.

ZIRCONIA-BASED AND FULL ZIRCONIA RESTORATIONS

Cements, cementation and removal. As with lithium disilicate restorations, the subject of cementation and removal of zirconia restorations has aroused controversy. Zirconia is about three times stronger than lithium disilicate.^{17,18} Zirconia-based restorations have an inner core of zirconia about 0.3 to 0.5 millimeters thick that is veneered with layered or pressed ceramic, whereas full zirconia restorations are composed entirely of zirconia.

Research has shown that cementing zirconia restorations with resin-modified glass ionomer provides adequate retention.¹⁹ Either bonding with resin cement or luting with various conventional cements may be considered,²⁰⁻²² and both techniques are being used by practitioners.^{23,24} Clinicians are aware that regardless of the cement type used, these restorations are extremely difficult to remove.

Some alternative cementation procedures for full zirconia or zirconia-based restorations are as follows. The internal surfaces of the restoration are either sandblasted or cleaned with a commercially available product (Ivoclean, Ivoclar Vivadent).²⁵⁻²⁸ Either procedure appears to provide adequate cleaning of the restorations before cementation. Use of phosphoric acid to clean zirconia restorations before cementation has been criticized by some researchers; sandblasting appears to be less controversial.^{29,30}

When to bond and when to lute.

The decision regarding whether to bond or lute zirconia restorations is based on the same considerations

presented in the previous discussion concerning lithium disilicate. If the tooth preparation has adequate retention, luting may be preferable for reasons discussed previously. In my opinion, only when retention is questionable should bonding be the clinical choice for zirconia restorations because of the extreme difficulty encountered in removing the restorations when they have been bonded.

FINISHING AND POLISHING LITHIUM DISILICATE AND ZIRCONIA

Another challenge with these materials is adjusting them during a clinical appointment. The finishing and polishing of both ceramics are extremely time consuming and difficult.

The best way to overcome this problem is to avoid the necessity of disturbing the surface, thereby averting the need to finish and polish. Many dental laboratories are making these crowns slightly low (out of occlusion) to avoid the necessity for dentists to remove surface ceramic. This technique avoids cutting the restoration surface—but it can have somewhat serious complications, because it results in directing occlusal forces to adjacent teeth that may fracture owing to the additional loading. However, without justifying this technique, I will say that it is well known that usually the occlusion stabilizes gradually as the crowned tooth and the teeth in the opposing arch extrude. Ideally, new crowns should be placed with the same occlusal forces on them as adjacent and opposing teeth, but in reality this does not always happen.

The following instruments have been shown in research to be among those that are best for finishing and polishing lithium disilicate and zirconia:³¹

■ Dialite for IPS e.max and Dialite

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