

A Simplified System for Adhesive Bonding Procedures

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Introduction

Luting procedures for indirect restorations should be simple, and dentists today continuously seek products that promote ease-of-use, efficiency, and simplicity for predictably placing indirect restorations. Luting is broadly defined as fastening, attaching, or sealing two components together (e.g., natural tooth structure and restorations). In dentistry, this can be accomplished in one of two ways: cementation or adhesive bonding.

Cementation involves attaching a restoration to natural tooth structure by means of a cement in between the two; mechanical retention and retention form are requisites for cementation. Conventional cements create a hardened layer that attaches restorations to underlying tooth structure, taking advantage of both adequate preparation design and resistance form. The cementation process is relatively straightforward and uncomplicated.

Contraindicated for use with glass-ceramic restorations, conventional cementation is appropriate in cases where the restorations are fabricated from high-strength ceramic materials (e.g., zirconia-, alumina-, and lithium disilicate-based), which typically demonstrate good mechanical properties and an ability to withstand occlusal forces without the use of adhesives. Note that high-strength ceramic materials may also be adhesively bonded. However, these restorations typically require a more radiopaque conventional cement in order to enhance differentiation from recurrent caries, as well as one that completely dual- or self-cures when placed in non-light transmitting areas.

Adhesive bonding in dentistry involves conditioning the enamel and/or dentin to create tags in the tooth structure for chemical and micro-mechanical attachment of the restorative material to the natural tooth. Technical precision during adhesive bonding procedures can have a greater impact on success and predictability than material selection, primarily because adhesive bonding involves multiple steps in the process (e.g., conditioning the tooth structure through etching, cleaning, conditioning with adhesive; preparing the internal aspect of the restoration) and is highly technique sensitive (e.g., proper isolation, ensuring thorough light transmission and depth of cure to the bonded interface).

Unfortunately, realizing simplicity when seating today's indirect restorations can be challenging due to the multiple factors that affect adhesive bonding, including the restorative materials from which restorations are fabricated. Some restorations, such as those fabricated from stacked feldspathic ceramic and pressed leucite glass ceramics—as well as partial coverage restorations—must be adhesively bonded. Other restorations fabricated from metal ceramic or alumina must be cemented, while other materials like zirconia and lithium disilicate can either be cemented or adhesively bonded. Further, when restorations are thick, opaque, or located in areas that cannot confidently be thoroughly light polymerized, dentists may seek to use luting materials that can reliably self-cure and achieve a predictable bond.

Dentists are also simultaneously pressured to remain cost-effective and lower their overhead and inventory. Yet, many adhesive products have required mixing and matching multiple components from various sized bottles, which itself could be unpredictable. In fact, the use of adhesive bonding agents and adhesive resin cements from different manufacturers, or those that require different curing methods (e.g., self-cure, light-cure, dual-cure), could lead to unpredictable bonding results.

As a result, many dentists are faced with the quandary of which adhesive to use in a given situation and with which restorative material. It can be challenging to determine which to use when based on such factors as the characteristics of the case, preparation design, required bond strengths, isolation feasibility, and the type of material used for fabricating the restoration(s). Ultimately, most dentists would prefer to use one universal system for their adhesive bonding needs.

A Simpler, More Predictable Solution

New adhesive resin cement materials introduced in recent years have the potential to simplify the delivery of indirect restorations and simultaneously reduce and/or eliminate many of the challenges clinicians face during the placement process. Universal dual-cure adhesive resin cements are among such materials.

Universal dual-cure adhesive resin cements can enable predictable and secure placement of all types of ceramic, resin, and metal-based inlay, onlay, crown, and bridge restorations, regardless of whether self-curing or light-curing is required. In fact, adhesive resin cements have

been shown to be superior options for seating all-ceramic restorations, including when restorations are placed in locations that cannot be confidently light polymerized.

Specific universal dual-cure adhesive resin cements may also be indicated for the cementation of metal, ceramic, and fiber posts, and cast post and cores, as well as all-ceramic and composite veneers (up to 2teeth). Universal application may also include permanent cementation of crowns and bridges on implantabutments, as well as suitability for CAD/CAM milled hybrid restorations.

Although research has shown that some resin cements demonstrate varying levels of discoloration, dual-cure resin cements may influence the esthetics of restorations. Fortunately, unlike other dual- and self-cure cements that are prone to color shifts over time, universal dual-cure adhesive resin cement options are available that are color stable and demonstrate tooth-like fluorescence for optimized esthetics. When universal dual-cure adhesive resin cements are tack-cured for 2 to 4 seconds, easy clean-up of excess cement from restoration margins can be achieved.

Clinical Protocol

When placing full-coverage ceramic restorations in the anterior (Figure 1), the following protocol is followed. The use of adhesive resin cements requires meticulous isolation. The restoration surface (e.g., internal aspect of glass ceramics, lithium disilicate ceramics) must be etched with hydrofluoric acid, rinsed and dried.

1. After removing the temporary restoration, clean the preparation—and any core build-up restoration that may have been required—thoroughly.
2. Try in the restoration using the corresponding try-in paste.
3. Remove the restoration, then rinse the paste from the restoration with water.
4. After pre-treatment of the restoration with sandblasting or hydrofluoric acid etching, condition the internal aspect of the restoration with a primer such as G-Multi Primer™, which ensures stable chemical adhesion between tooth and restoration surfaces, including ceramics, composites, precious and non-precious metals, hybrid ceramics, zirconia, alumina, and glass fiber posts. Dry with an air syringe.
5. Rinse and dry the tooth preparation.

6. Select from three etching techniques: self-etching, selective etching, or total etching, and etch the preparation accordingly, then rinse and dry (Figure 2). Ensure the adhesive bonding agent of choice can be used with the etching technique selected.

7. Apply a universal adhesive bonding agent such as G-Premio BOND™ to the preparation, and allow to sit for 7 seconds, then air dry for 5 seconds (Figure 3). This universal adhesive bonding agent can be used with self-etch, selective etch, and total-etch adhesive bonding, even to metal abutments and composite resin core build-ups when light-cured. Light-cure the adhesive for 10 seconds (Figure 4). The advantage of using these specific GC materials is that they offer an incredibly thin film thickness (G-Premio BOND (3μ) and G-CEM LinkForce™(4μ) universal adhesive dual-cure resin cement will not interfere with restoration placement, helping to ensure an intimate fit between the restoration and the preparation.

8. Extrude a universal dual-cure adhesive resin cement such as G-CEM LinkForce directly into the restoration (Figure 5), immediately seat the crown onto the prepared tooth, and maintain pressure (Figure 6).

9. Tack cure the restoration for 2 seconds, which will facilitate easier removal of excess resin cement.

10. Light cure the restoration from each surface/margin for 20 seconds.

Conclusion

Not all options demonstrate the same capabilities in different clinical situations and/or with different restorative materials. Therefore, it is important for dentists to choose carefully from among the various universal adhesive resin cements available on a case-by-case basis in order to ensure clinical efficacy, long-term restorative success, predictable esthetics, and efficiency. A truly dual-cure universal adhesive resin cement will simplify the delivery of indirect restorations and simultaneously reduce the challenges dentists face when predictably and securely placing all types of ceramic, resin, and metal-based restorations, regardless of whether self-curing or light-curing is required (Figure 7).

Figures and Captions

Figure 1. Preoperative view of a patient who presented with a Class IV fracture of tooth #9. A core build-up restoration was first placed, after which a full-coverage all-ceramic crown would then be adhesively bonded using G-CEM LinkForce universal dual-cure adhesive resin cement.



Figure 2. In this case, the preparation for the full-coverage crown restoration was etched using a total-etch technique; the G-Premio BOND universal adhesive bonding agent promotes predictable bonds with all etching modes.

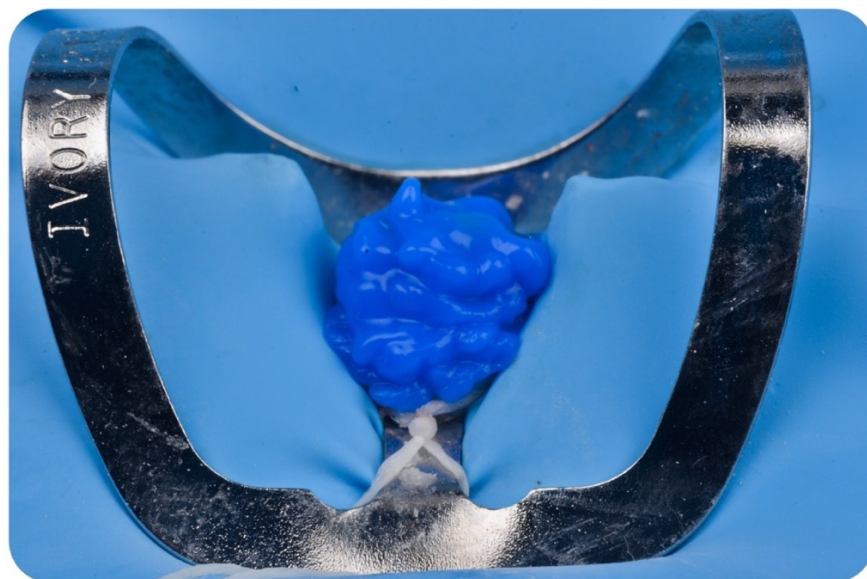


Figure 3. G-Premio BOND universal adhesive bonding agent was applied to the preparation, then allowed to sit for 10 seconds before being air dried with maximum air pressure for 5 seconds.

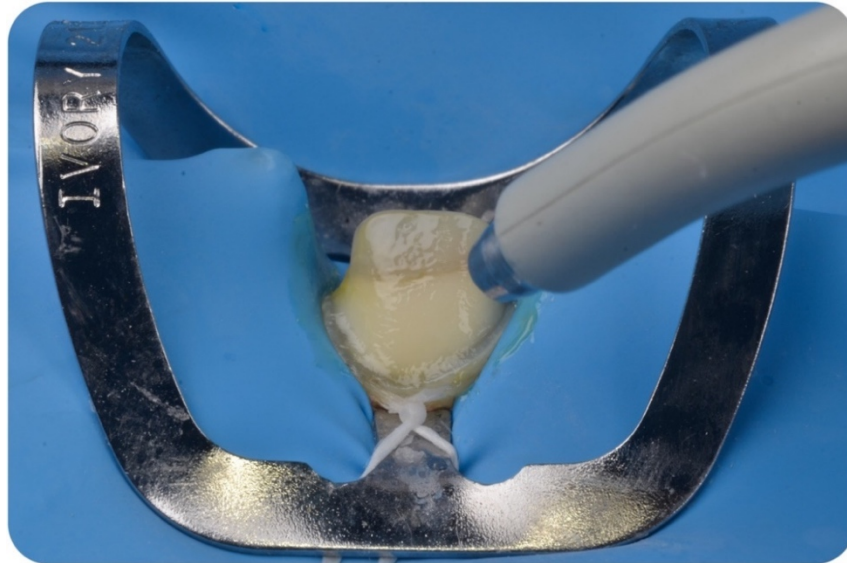


Figure 4. The G-Premio BOND universal adhesive bonding agent was then light-cured for 10 seconds.

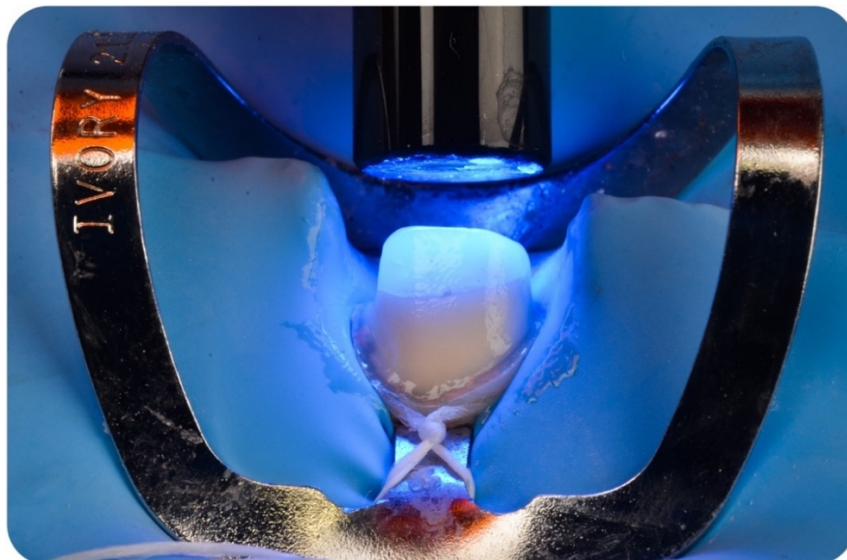


Figure 5. Following pre-treatment of the restoration with G-Multi Primer, G-CEM LinkForce universal dual-cure adhesive resin cement—which is available in four shades (i.e., A2, Bleach, Opaque, Translucent), along with corresponding try-in pastes, to accommodate a variety of esthetic cementation requirements—was extruded directly into the internal aspect of the full-coverage crown restoration.



Figure 6. The full-coverage crown was immediately seated onto the preparation, and pressure was maintained to allow extrusion of excess cement.



Figure 7. Postoperative view of the full-coverage restoration seated with G-CEM LinkForce universal adhesive resin cement. By promoting the atraumatic removal of excess adhesive resin cement from gingival and interproximal areas, G-CEM LinkForce further help to ensure long-term treatment functionality.

