

# Treatment Of And Delivery Of An All-Ceramic Restoration

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by John Kanca, III, DMD

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Ceramic prosthetics can provide patients with durable, functional and esthetic restorations. While all phases related to this process are important, this article will focus on the proper delivery of a ceramic restoration. Proper delivery will mean utilization of the right materials and the proper technique. Among the materials necessary is a dentin-enamel bonding system, a ceramic primer and a luting resin. There are varying opinions as to the treatment of the ceramic itself. Considerations in the treatment of porcelain surfaces include surface roughening of the porcelain, the use of hydrofluoric acid and the use of silane.

## *Surface roughening*

It has shown that surface roughening will improve bond strengths to porcelain. The roughening may be accomplished via air-driven particulates (i. e. sandblasting) or by the use of hydrofluoric acid. The use of sandblasting alone has been shown to improve bond strengths to porcelain, although it is most frequently used in conjunction with hydrofluoric acid.<sup>1-3</sup> Ironically, while surface roughening improves bond strength of resin to porcelain, roughening, including sandblasting, has also been shown to decrease the flexural strength of porcelain.<sup>4-8</sup> The use of a resin following defect introduction is shown to improve flexural strengths.<sup>9-10</sup>

## *Hydrofluoric acid*

Horn<sup>11</sup> first suggested the use of ceramic etching to aid retention and it was further explored by Simonsen and Calamia.<sup>12</sup> They used 7.5% hydrofluoric acid to create a micro-porous porcelain surface to aid retention. Later, Stangel, Nathanson and Hsu used both 20% and 52% hydrofluoric acid to etch porcelain.<sup>13</sup> Currently there is no one recommended approach to porcelain treatment, although some are similar to one another. Chen et al reported that the use of 5% HF for 120 seconds yielded the highest bond strengths.<sup>14</sup> Gler et al suggested 9.6% for 120 seconds.<sup>15</sup> Nagayassu et al recommended 10% HF for 120 seconds.<sup>16</sup> Boscato, Della Bona and Del Bel Curry found 9.5% HF for 120 to yield the highest bond strengths,<sup>17</sup> while Peumans et al found 4.9% HF for 60 seconds to be effective.<sup>18</sup>

### ***Silane***

Silane has long been recommended for the treatment of porcelain surfaces.<sup>19-21</sup> Although there is sometimes a debate as to its necessity, many researchers feel that not only is it important, it is the most important element in porcelain bonding.<sup>14,22,23</sup> Barghi asserted that silane provides a bond more reliable than with HF alone.<sup>24</sup> Silane also is reported to improve the long term stability of resin bond to porcelain.<sup>25</sup>

A ceramic onlay is treatment planned for the mandibular first molar seen in Figure 1. A facial view shows staining under an old resin composite restoration (Fig. 2). The preparation for the onlay is seen in Figure 3. A temporary onlay is formed (Fig. 4) and the preparation is sealed with a no-rinse dentin-enamel resin adhesive (Surpass<sup>®</sup>, Apex Dental Materials, Sure Dental Innovations, Oakville, Ontario, CA). Surpass<sup>®</sup> is a three bottle self-etching bonding system capable of affixing any type of resin composite — light-cure, dual-cure and self-cure resin composites. It can be made exquisitely thin and can be utilized for both direct and indirect procedures. Surpass TM has been tested at Tufts, the University of North Carolina and at an independent, non-profit dental education and product testing foundation, generating over 50 MPa of bond strength at each venue within two hours (notched shear test method). As it has a separate conditioner, primer and bonding resin, it is similar to 4th generation systems. It performs as well as any 4th generation system yet is easier to use.

Delivery of a ceramic restoration can be described as having three components; treatment of the tooth, treatment of the prosthesis, and the cement to join the two.

### ***The Tooth***

In the present case, the preparation sealed with the resin adhesive on the day it was prepared. Surpass<sup>®</sup> 1 was applied to dentin and enamel for 10 seconds and left wet. Three brushfuls of Surpass<sup>®</sup> 2 were applied directly to the wet prep and then dried very thoroughly for ten seconds. A thin layer of Surpass<sup>®</sup> 3 was applied to the prep and dried to a very thin layer. Each surface was light-activated for ten seconds. The temporary was inserted with a non-eugenol temporary cement (Fig. 5).

On the day of delivery, the temporary is removed, the prep is cleaned of the temporary cement, and the onlay is tried in for fit. Removal of the temporary cement fragments may be facilitated with the use of Consepsis Scrub<sup>™</sup> (Ultradent, Sandy, UT) on a small brush or even on a cotton pellet. Particle abrasion is discouraged as it may induce bleeding from the surrounding soft tissues.

### ***The Restoration***

To ready the onlay for insertion, the inner surface of the onlay is carefully inspected for defects and is carefully cleaned with either steam or an acetone wash and dried. The inner surface of the onlay will be treated with Interface (Sure Dental Innovations). Interface<sup>™</sup> is a combination silane and ceramic conditioner. The use of hydrofluoric acid is not necessary with Interface. In addition, Interface can be used to treat porcelain prostheses being inserted and can be used for ceramic repairs. Interface is highly rated by an independent, non-profit dental education and testing foundation. In an investigation including three different types of porcelain — VMK II Cerec Blocks (Vident, Brea, CA), Procad, the CAD/CAM version of Empress (Ivoclar Vivadent, Amherst, NY), and Ceramco 2 (Dentsply Ceramco, York, PA) — Interface and Simplicity<sup>®</sup> 2 were shown to perform as well as the control HF etching and a one bottle adhesive.<sup>26</sup>

A drop of Interface A and Interface B are mixed together in a well. After approximately 30 seconds the silane conditioner/primer is ready for application. The mixture is applied to the inner surface of the ceramic onlay and it is dried thoroughly. A coat of Surpass<sup>®</sup> 3 is then applied to the internal surface, blown with compressed air to a very thin layer and light-cured for ten seconds.

Surpass<sup>®</sup> 3 is then re-applied to the preparation and light-cured once more (Fig. 6).

### ***The Cement***

The luting resin composite of choice is Anchor<sup>®</sup> (Sure Dental Innovations). Anchor<sup>®</sup> is a dual-cure resin composite that serves as a core build-up material, post luting resin cement and a ceramic crown and onlay cement. The resin cement is dispensed from the auto-mix cartridge into the prosthesis (Fig. 7) and the onlay is seated (Fig. 8). A dual-cure resin cement, Anchor<sup>®</sup> offers a

prolonged gel phase prior to hardening. This provides a comfortable period of time during which the excess cement may be easily removed from the margins. Then floss is run downward and outward through the proximal spaces. The complete onlay is then light-activated for 10 seconds per surface. The occlusion is adjusted as necessary and the porcelain is polished (Fig. 9). The completed restoration is shown in Figures 10 and 11. The recall image is seen in Figure 12.

This article has illustrated a predictable method of delivering a ceramic onlay using dependable materials. Success can be obtained on a regular basis if proper and effective protocols are utilized and kept fairly simple. While the present article depicts the insertion of a ceramic onlay, the principles remain the same for other types of ceramic restorations as well.

More information can be obtained at [suredental.com](http://suredental.com) and at [apexdentalmaterials.com](http://apexdentalmaterials.com). Video instructions are available for each of the products mentioned above. **oh**

*Dr. Kanca is a lecturer, author, researcher and inventor. He has lectured all over the world and maintains a private practice in Middlebury CT. He is known for discovering wet bonding and making dentin etching viable and is a leading authority on bonding.*

*Oral Health Welcomes This Original Article.*

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The use of sandblasting alone has been shown to improve bond strengths to porcelain

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Interface can be used to treat porcelain prostheses being inserted and can be used for ceramic repairs

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