Revisiting the Mystery of Adhesive Dentistry

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The developments in adhesive dentistry that have allowed for conservation of tooth structure and esthetics have had a major impact on how we plan treatment in restorative dentistry. Even though it has taken a good 40 years or more since Hagger, Buonocore, Quigley, Kramer, and McLean introduced etching and bonding,[1-6] its slow acceptance was mainly a result of inadequate materials with high polymerization shrinkage. Polymerization shrinkage and the resulting marginal gap, along with the inability to bond to dentin, were the early demise and roadblock of adhesively retained restorations.[7,8] The late 1980s and early 1990s brought improvements in materials and in the ability to bond to dentin.[9-16] Since then, materials and techniques have been introduced to the profession at stealth speed.

Attempting to keep up with this deluge of information has been a challenge and sometimes a mystery to the restorative dentist. Ten to 20 years ago, we could rely on our dental school education to be as current as the materials and techniques we used. Today, however, dentistry parallels the computer industry in that materials and techniques are superceded and supplanted every year. Compounding this problem is the lack of continuing education (CE) requirements by most states. In the author's opinion, existing CE requirements are grossly inadequate to keep us abreast and able to remain experts in our field. With the initial shortcomings of the last 40 or more years, and the sometimes inadequate continuing education being acquired by new and seasoned dentists, it is no wonder there exists a mystery and uncertainty concerning adhesive dentistry.

CASE REPORT

The following case reports rehabilitating a quadrant of failing silver mercury fillings with an adhesively bonded, pressed ceramic (**IPS Empress®, Ivoclar Vivadent, Inc.**) restoration. The following protocol was adapted from the authors' own hands-on learning experience. The step-by-step clinical procedure is simple and easy to implement, however, strict adherence to detail with no deviation is the only way to ensure success and remove the mystery from adhesive dentistry.

According the manufacturer, IPS Empress® is a leucite-reinforced ceramic based on glass containing latent nucleating agents. In a process comprising several stages, controlled crystallization is used to produce leucite crystals, measuring a few microns, in the glass matrix. A semi-finished powder product is manufactured into ingots of consistently high quality. These are ceramic ingots for the shading technique, slightly shaded and in different degrees of translucency, and for the layering technique, color-coordinated to the **Chromascop® Shade Guide (Ivoclar Vivadent, Inc.)**. The constant high quality of the ceramic ingots ensures the reproduction of the physical values of the restorations. This process yields a very esthetic, well-fitting restoration with unmatched strength, wear and biocompatibility, in the author's opinion.

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A 38-year-old woman presented with some slight sensitivity to cold, sweet, and biting pressure on teeth Nos. 2 and 3 (Figure 1). An endodontic examination was uneventful and it was determined that possible leakage and/or decay was developing. Her medical history and periodontal examination were all within normal parameters. Radiographs revealed decay under the distal box of tooth No. 4. After discussing the patient's restorative options in great length—from traditional crowning to adhesive inlays and onlays, the patient chose adhesive restorations mainly for the peace of mind involved in conserving tooth structure, decreasing trauma to the teeth, and esthetics. Even though the preoperative radiograph on teeth Nos. 2 and 3 looked normal, once entered clinically, decay was detected in all three teeth to be restored (Figure 2).

The teeth were properly anesthetized, shades were taken cervically, incisally, and occlusally using the Chromascop® and **Mosaic (Dental Illusions)** shade guides, and a rubber dam was placed to ensure proper isola-

Figure 1—Preoperative x-ray of teeth Nos. 2 through 4.

Figure 2—Alloys are removed and decay is still present.

Figure 3—Teeth Nos. 2 through 4 with decay removed.

Figure 4—Teeth Nos. 2 through 4, final preparations.

marginal fit, color, and contour, and flossed interproximally to verify solid contacts. The restorations were then rinsed with water, air-dried with the **A-dec Warm Air Tooth Dryer (A-dec, Inc.)** and etched with 35% phosphoric acid gel (**Ultra-Etch®, Ultradent Products, Inc.**). Ultra-Etch® was then rinsed with a copious amount of water, and dried again with the A-dec air dryer. A silane primer agent (**Silane Primer, Kerr Corp.**) was then applied to the internal surface of the restorations to improve the chemical bond between the polymers in the resin filling cement and the ceramic filler particles in the restoration. The preparations were then disinfected with an antimicrobial rinse (**Consepsis®, Ultradent Products, Inc.**) and rinsed thoroughly. Phosphoric acid was then used with a total etch technique.[17-19] All internal aspects (enamel and dentin) of the preparation were etched, starting with the enamel layer first for 10 to 15 seconds. These were then rinsed with copious water spray for approximately 10 seconds. The preparation was lightly air-dried, using care not to dessicate the teeth. A second antimicrobial solution (**Tublicid Red, Global Dental Products, Inc.**) was used as a wetting solution and lightly blotted with a multibrush to prevent oversaturation of the dentin. The dentin should be moist, with a glistening surface. **Optibond™ Solo Plus (Kerr Corp.)** was then applied for 15 seconds with a multibrush using a light brushing motion. The primer was lightly air-thinned with the A-dec air dryer for approximately 3 seconds to remove the alcohol carrier. A shiny, glistening surface should be evident at this point in time.

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The preparation was then light-cured for 20 seconds. A dual-curing, radiopaque, fluoride-releasing luting resin cement (**Variolink® II, Ivoclar Vivadent, Inc.**) was mixed carefully and placed into the preparations with a **Unidose™ Gun (Kerr Corp.)**. At the same time, a dual-curing bonding agent was applied to the internal aspect of the restorations and the restorations were seated with firm pressure to verify positive seating. Excess luting material was removed with a multibrush and a rubber tip instrument (**Stimulator™, John O. Butler Company**). The restoration was spot-tacked in place and excess resin was removed interproximally using dental floss. Final polymerization was achieved using an argon laser and curing the restorations on the buccal, occlusal, and lingual surfaces for 20 seconds per surface. Excess polymerized cement was removed with a curette and **carbide and diamond finishing burs (Kerr Corp.)**. Occlusion and proper anatomy were established and final polishing was accomplished with a **diamond polishing paste (Kerr Corp.)**. The final analysis reveals a very lifelike restoration with exceptional contour, marginal fit, anatomy, color, and strength (Figures 6 and 7).

CONCLUSION

Gordon Christensen stated in 1992 that indirect bonded Empress® restorations showed much promise, but that long-term longevity was still unknown.[20] Issues of longevity have since been addressed, and improvements in this area made.[21,22] It appears, then, that the real mystery is why more dentists do not offer this conservative restoration to their patients as an alternative to full-coverage restorations requiring more aggressive preparation. As dental surgeons, it is our obligation to our patients to offer the best and most conservative restorations available. Why is it, then, that we still continue to take healthy along with unhealthy tooth structure in our treatment plans?

Dentists today must maintain professional status by keeping abreast with the latest that dental education has to offer. It is then and only then that the burnout syndrome disappears and the excitement and enthusiasm for dentistry returns. Learning will open up a whole new world of opportunities, energy, and enthusiasm—and will eliminate the mystery of adhesive dentistry in the process.

ACKNOWLEDGMENT

The author wishes to thank Tim Evart of Evart Crown and Bridge for his meticulous and artistic fabrication of these lifelike restorations. Without talented laboratory technicians, our preparations could never be transformed into natural-looking restorations. ○

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Product References

Product: IPS Empress®, Chromascrop® shade guide, Fermit®-N, Variolink® II
Manufacturer: Ivoclar Vivadent, Inc.
Address: 175 Pineview Drive, Amherst, NY 14228
Phone: 800.533.6825
Fax: 716.691.2285

Product: Mosaic shade guides
Manufacturer: Dental Illusions
Address: 2020-C Warner Center Lane, Woodland Hills, CA 91367
Phone: 818.703.5913
Fax: 818.787.4964

Product: Seek®, Ultra-Etch®, Consepsis®
Manufacturer: Ultradent Products, Inc.
Address: 505 W. 10200 S., South Jordan, UT 84095
Phone: 800.247.3368
Fax: 801.572.0600

Product: LVI bur kit
Manufacturer: Brasseler® USA
Address: One Brasseler Blvd., Savannah, GA 31419
Phone: 800.841.4522
Fax: 912.927.8671

Product: Take 1, Silane Primer, Optibond™ Solo Plus, Unidose™ Gun, carbide and diamond finishing burs, diamond polishing paste
Manufacturer: Kerr Corp
Address: 1717 West Collins Ave., Orange, CA 92867
Phone: 800.537.7123
Fax: 800.537.7345

Product: A-dec Warm Air Tooth Dryer
Manufacturer: A-dec, Inc.
Address: 2601 Crestview Drive, Newberg, OR 97132
Phone: 503.538.9471
Fax: 503.538.0276

Product: Tublicid Red
Manufacturer: Global Dental Products
Address: P.O. Box 527, North Bellmore, NY 11710
Phone: 516.221.8844
Fax: 516.785.7885

Product: Stimulator™
Manufacturer: John O. Butler Company
Address: 4635 W. Forest Ave., Chicago, IL 60630
Phone: 800.528.8537
Fax: 800.553.2014

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ion. The silver mercury fillings were removed with copious water spray and high-speed suction, and the teeth were then stained with a caries detection dye (**Seek®, Ultradent Products, Inc.**) to confirm the presence of decay. Decay was noted under all three restorations (Figure 2). The teeth were then prepared (**LVI bur kit, Brasseler® USA**) for adhesive indirect restorations per the manufacturer's recommendation for Empress®. Because of major structural fracture lines running horizontally along both facial and lingual cusps of tooth No. 3, the preparation design was more aggressive than ideal for tooth No. 3, to compensate for compromised tooth structure (Figures 3 and 4). The final preparations were obtained (Figure 4) and the rubber dam removed. An impression was taken with a hydrophilic impression material (**Take 1, Kerr Corp.**), showing excellent detail and clarity. The teeth were then temporized with **Fermit®-N (Ivoclar Vivadent, Inc.)**. Occlusion was adjusted and the teeth were polished. Color mapping was performed using the LVI color mapping system with both Chromascop® and Mosaic shade guides (Figure 5).

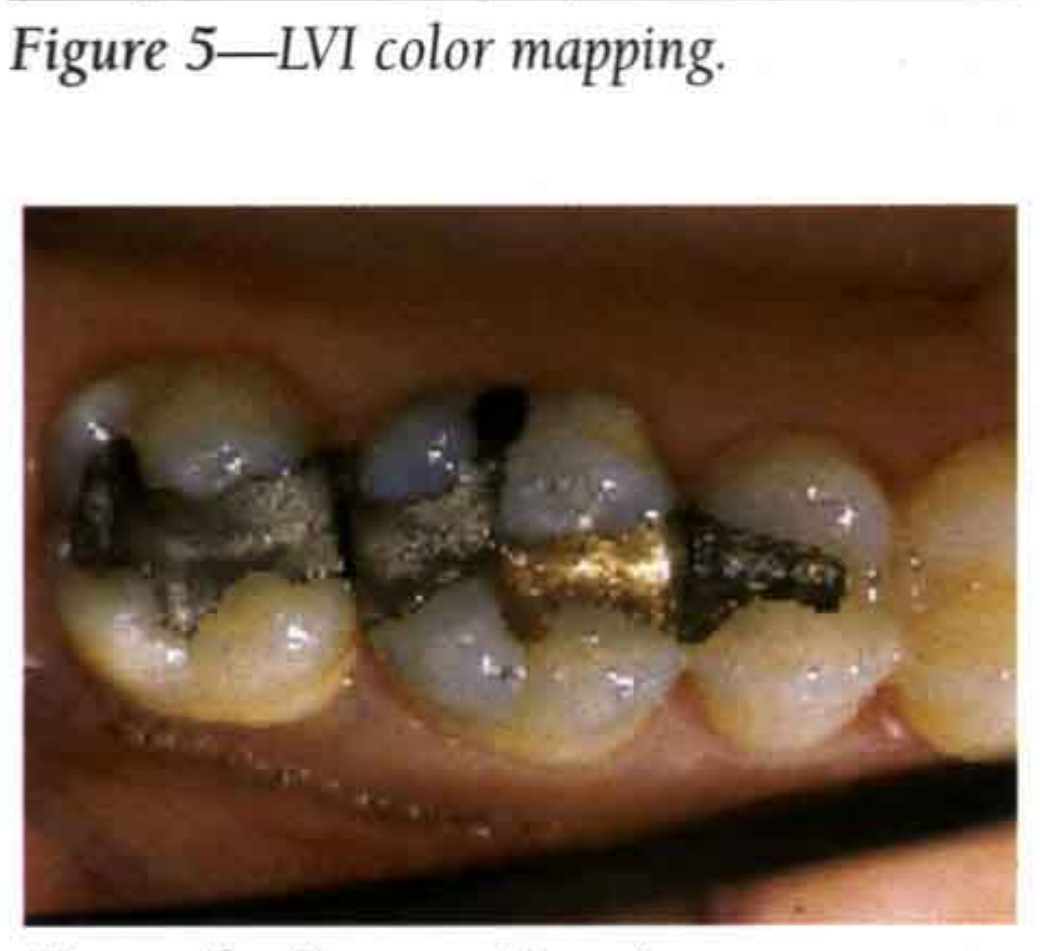

Figure 5—LVI color mapping.

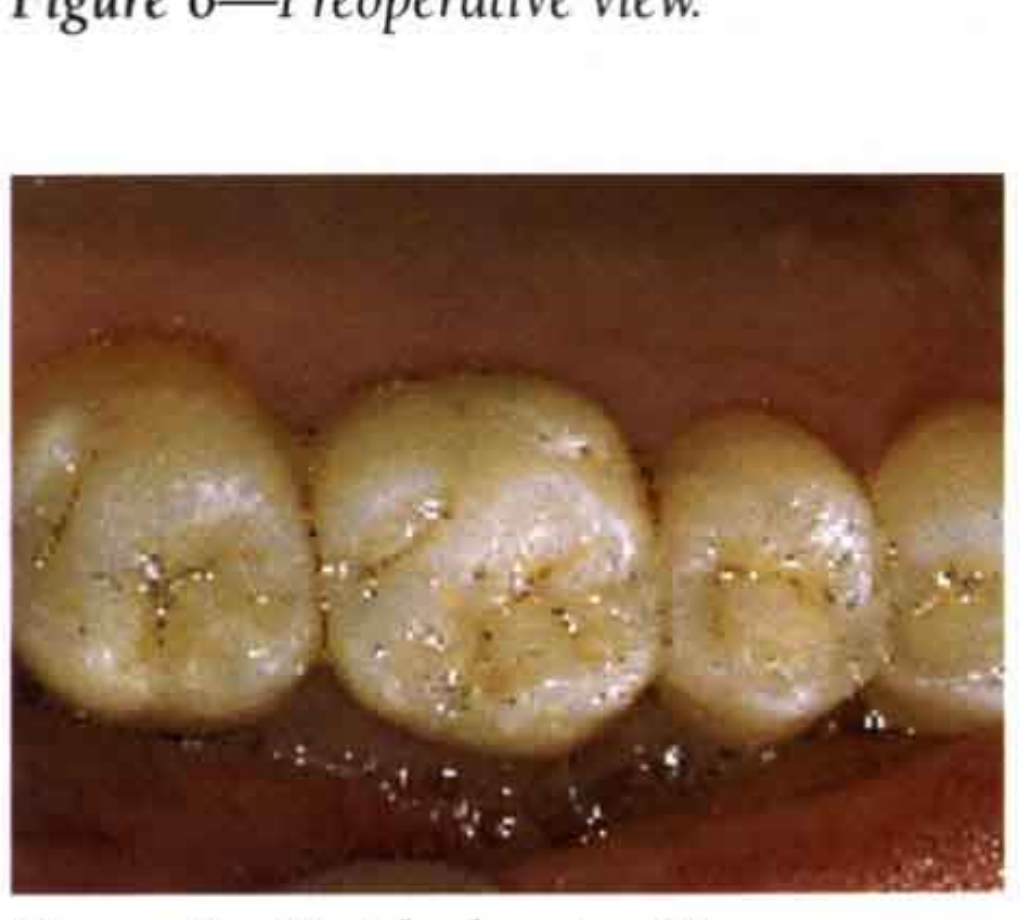

Figure 6—Preoperative view.

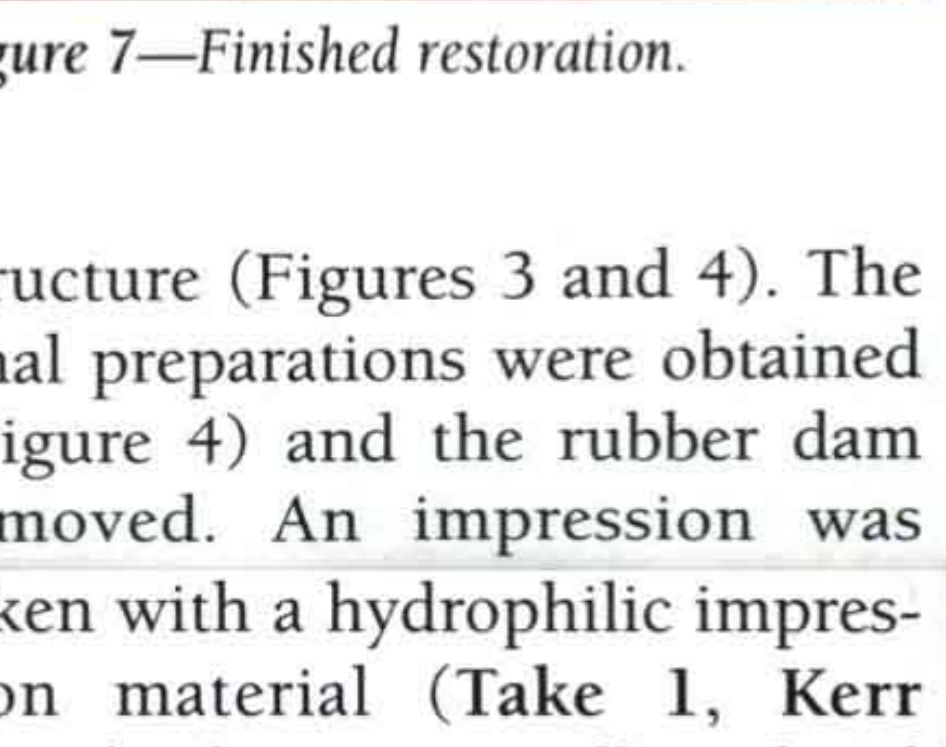

Figure 7—Finished restoration.

Fabrication of the Restorations

Upon the patient's return, the teeth were once again anesthetized, a rubber dam was placed, and the Fermit®-N temporary was removed. Hydrogen peroxide was used to clean the preparations and the Empress® restorations were tried-in for