It has become well known that all-ceramic crowns offer clinically similar, if not better, results than conventional crown materials such as alloys. However, despite advances in techniques and material sciences, dentists still face many challenges when undertaking restorative cases requiring the placement of crowns in the posterior region. Although entirely possible to overcome, these challenges require the utmost attention to detail in the treatment planning and diagnostic stages to ensure that a patient receives not only the best in esthetics but also the greatest overall benefit to his or her oral health.

For example, cases requiring the restoration of the posterior dentition and areas of the oral cavity that are not easily accessible can still present challenges to even the most experienced and well-trained dental professional. In these areas of the oral cavity, isolation is often not possible and curing may be extremely awkward and difficult.

Additionally, the posterior dentition is subject to the greatest forces of mastication during function. Therefore, conventional ceramic layered over zirconia crowns have demonstrated the tendency to chip or fracture when placed in the posterior. Although esthetics should always be a focus of treatment, the forces that will be placed on restorations in the posterior must be accounted for.

When restoring dentition in these areas, the restorative material chosen should demonstrate excellent esthetics, the strength and durability to withstand function, and offer multiple and durable bonding options. Recently, restorative materials fabricated using computer-aided design and manufacturing technologies have worked to resolve many of the issues often experienced with conventional crown materials.

Further, the bonding or cementation material chosen in the posterior should offer ease of use, quick and easy clean-up and provide a reliable and durable bond to the restorative material to prevent issues such as marginal leakage, secondary caries and restorative failure. Newer generations of universal resin cements feature many of these benefits, along with excellent reliability and the ability to withstand the forces of mastication.

IPS e.max CAD

Resolving the issues typically experienced in posterior restorations, an innovative lithium disilicate material with high monolithic strength, IPS e.max CAD (Ivoclar Vivadent, Amherst, N.Y.), demonstrates many advantageous features over conventional glass-ceramic materials. Most notably, IPS e.max CAD demonstrates two-and-a-half to three times the strength (360 MPa) of conventional materials, making IPS e.max CAD suitable for use in a variety of indications, including inlays, onlays, veneers, partial and full crowns, copings and implant super-

Fig. 1. After try-in, the restorations are cleaned with phosphoric acid, rinsed and dried.

Fig. 2. Monobond Plus universal restorative primer is applied to the internal surfaces of the lithium disilicate crowns.
The exceptional strength of the material is directly related to its ability to crystallize in 20 to 30 minutes at 840 degrees Celsius. Additionally, IPS e.max CAD allows dentists or technicians to impart excellent shading, translucency and brightness to deliver the best in esthetics.

Giving the dentist the option to mill restorations utilizing chairside CAD/CAM technology, IPS e.max CAD restorations may also be laboratory fabricated. To ensure the best in fit and function, the material may be manually cut-back or adjusted, as necessary, in just a few quick and easy steps.

Distributed in block form, IPS e.max CAD is available in three distinct levels of translucency, as well as two different sizes. The high translucency (HT) blocks are ideal in cases requiring minimally invasive, full-contour restorations, including inlays, onlays and veneers. The HT blocks may be characterized with staining materials to further characterize the restoration and to achieve the highest esthetics.

Low translucency (LT) blocks provide the perfect solution for restorations in the anterior region, such as partial and full crowns, and may be completed utilizing a cut-back technique and layered with IPS e.max Ceram (Ivoclar Vivadent, Amherst, N.Y.) stains to further enhance the esthetics of anterior restorations. For vital and slightly discolored teeth, high opacity (MO) blocks may be used to develop frameworks that can then be veneered with IPS e.max Ceram.

Available in 16 A–D shades and four bleach (BL) shades, the HT and LT blocks offer the ideal solution when fabricating full-contour restorations. In cases requiring the recreation of a tooth’s opacity, the MO blocks are available in group shades and work exceptionally well when combined with a layering technique.

Multilink Automix

Demonstrating excellent reliability in the posterior, Multilink Automix (Ivoclar Vivadent, Amherst, N.Y.) is an innovative, multi-purpose, adhesive cement indicated for use in the adhesive cementation of indirect restorations, including inlays, onlays, crowns, bridges and posts for a variety of restorative material selections, including metal and metal ceramics, oxide ceramics, fiber-reinforced composites, all-ceramics and precious alloys. Featuring patented hydrolytically stable acidic monomers that ensure high immediate bond strength and durable adhesion, Multilink Automix allows for a reliable and
long-lasting bond, regardless of restorative material choice.11

Designed for fast and easy application, the Multi-link Automix system includes a one-step primer that self-etches, self-cures and seals the dentin in merely 15 seconds, which provides excellent marginal adaptation and high immediate bond strength.11 Now available in an easy clean-up formulation, excess material may be light cured in 1–2 seconds per quarter surface (mesio-oral, disto-oral, mesio-buccal, disto-buccal), which transforms the material into an easy-to-remove gel-like substance.11

Clinically validated by various independent studies, Multilink Automix offers a simplified procedure with a proven chemistry and is available in three shades.

Case presentation

A 65-year-old female patient presented with previously placed large restorations on teeth #20 and #21, as well as facial erosion caused by acid reflux disease.

Additionally, the patient displayed porcelain-fused-to-metal crowns on other teeth, which she disliked due to the opaque appearance, and feared the possibility of the formation of dark margins as the restorations aged.

After discussing restorative options with the patient, it was ultimately decided that Ivoclar Vivadent’s IPS e.max CAD, cemented with Multilink Automix, would replace her previous restorations and restore the esthetics of her dentition.

Fig. 8. The restorations are seated on the preparations.  
Fig. 9. The restorations are stabilized to ensure proper margins and contacts are obtained.  
Fig. 10. Each quadrant is spot-cured for 1–2 seconds.  
Fig. 11. Excess cement is peeled away using a dental scaler.  
Fig. 12. Dental floss is used to remove excess cement from the interproximal areas.  
Fig. 13. After all excess cement is removed, the restorations undergo a final light cure.
To facilitate the development and fabrication of a provisional restoration, an alginate pre-impression (Identic Fast Set, DUX Dental, Oxnard, Calif.) was taken first. The patient was then anesthetized with 3 percent mepivacaine. To prepare the teeth for full-coverage CAD-fabricated ceramic (IPS e.max CAD) restorations and to allow for ideal ceramic thickness, 1.5 mm of axial wall reduction was completed, followed by 2 mm of occlusal reduction.

After preparation was complete, a final impression, opposing impression, bite registration and shade photographs were taken to provide the laboratory with the proper diagnostic information. A bisacryl provisional (Luxatemp, DMG America, Englewood, N.J.) was then fabricated and cemented with provisional cement (TempBond NE, Kerr Corporation, Orange, Calif.) to allow the patient to function while definitive restorations were fabricated.

Upon their completion, the patient returned to the office for delivery of the IPS e.max CAD lithium disilicate restorations. The patient was anesthetized with 3 percent mepivacaine, and the provisional restorations were removed. The preparations were then cleaned and rinsed to remove any remaining cement or contaminants. The final restorations were then tried-in to confirm margins, contacts and shade. Upon patient and dentist approval, the restorations were prepared for final seating.

The internal surfaces of the porcelain were cleaned with 37 percent phosphoric acid, rinsed and dried (Fig. 1). It is important to note that the laboratory had etched the restorations with a 5 percent hydrofluoric acid for 20 seconds prior to delivery to achieve the proper etch pattern. The crowns were then rinsed with water and air dried.

A universal, single-component, restorative primer (Monobond Plus, Ivoclar Vivadent, Amherst, N.Y.) was then applied to the internal surface of the restorations. After 60 seconds, the primer was air dried (Fig. 2). To facilitate adhesive cementation, the surfaces of the preparations were cleaned, rinsed and lightly dried (leaving the dentin moist) prior to cement placement (Fig. 3).

A self-etching primer (Multilink A/B, Ivoclar Vivadent, Amherst, N.Y.) was dispensed, mixed and scrubbed onto the preparations for 15 seconds on the dentin and 30 seconds on the enamel, then air dried (Figs. 4–6). Immediately following, the universal adhesive resin cement (Multilink Automix) was applied to the internal surfaces of the lithium-disilicate CAD-fabricated restorations (IPS e.max CAD) (Fig. 7). The restorations were then seated on the preparations and stabilized to ensure proper margins and contacts (Figs. 8, 9).

After placement, the restorations were spot-cured per quadrant for 1 to 2 seconds to partially polymerize the excess cement (Fig. 10). Remaining excess cement was then peeled away using a dental scaler (Fig. 11). Utilizing dental floss, excess cement was removed from the interproximal spaces (Fig. 12). It is recommended that no more than two restorations be placed at one time to facilitate faster and simpler clean up. The restorations then underwent a final clean up to ensure all excess cement was removed, and then a final cure (Fig. 13).

Upon completion of the case, the patient was very pleased with the function, strength and esthetics of her new lithium-disilicate crowns (Fig. 14).

Through the use of innovative materials and techniques, the dentist in this case was able to replace the patient’s aging restorations with new highly esthetic crowns and fulfill the patient’s desire for a more naturally appearing smile. Although challenging, all-ceramic crowns may be placed in the posterior region when a comprehensive treatment plan is followed and the proper materials are selected.2 An innovative material (IPS e.max CAD), placed with universal adhesive resin cement (Multilink Automix), will ultimately provide the necessary strength and longevity required of restorations placed in the posterior.

Editorial note: A complete list of references is available from the publisher.