Clinical Realities

Use of a Zirconia Framework and Pressed Veneering Ceramics to Replicate Natural Interproximal Contours

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Today's dental porcelains have evolved considerably from the metal-ceramic materials that were available to technicians just decades ago. Where ceramists were once limited to metal-ceramic restorative options, recent innovations in material science and laboratory fabrication techniques now enable dental professionals to achieve superlative results that continue to drive patients' aesthetic expectations. In comparison to materials that were available in the 1980s and 1990s, contemporary metal-ceramic and all-ceramic systems now enable the creation of fixed prosthetic solutions with improved biocompatibility, strength, and aesthetics.

Now, CAD/CAM technology has been coupled with zirconium materials (eg, Lava, 3M Espe, St. Paul, MN; Cercon, Dentsply Ceramco, York, PA), allowing the fabrication of single copings and multiple-unit frameworks that can then be layered or pressed with durable porcelain materials. Ultimately, this enables the predictable restoration of a tooth or edentulous space in any intraoral region. Unlike previous all-ceramic framework materials, zirconium allows the technician to develop a framework with a thickness similar to gold. This is important in the design of the interproximal connectors, where the connection must be durable, yet thin enough to replicate natural tooth contours.

Patient Presentation

A 36-year-old male patient presented with a failing porcelain-fused-to-metal (PFM) restoration on tooth #11(23). Tooth #5(14) was missing and demonstrated an open buccal margin, which had resulted in recurrent caries. The patient desired a more aesthetic alternative to his existing PFM restoration, which was compromised by its poor framework design. The goal of treatment was to match the patient's existing all-ceramic restorations with a fixed partial denture (FPD) that would withstand the stresses of the oral environment. During treatment planning, it was decided that a zirconia framework (eg, Lava, 3M Espe, St. Paul, MN) would be designed with CAD/CAM software to ensure the fabrication of a restoration that would optimize porcelain support and ensure its long-term performance. The FPD would be veneered in pressed ceramics (Noritake CZR, Darby Dental, Westbury, NY) for optimal shade matching.

Figure 1A. Preoperative view of the patient revealed the failing restoration on tooth #11(23). An zirconia framework would be pressed with ceramic to provide a durable, aesthetic solution to this dilemma.

Figure 1B. Postoperative view of the definitive result. An all-ceramic FPD replaced teeth #4(15), #5(14), and #6(13), and a porcelain crown was placed on tooth #2(17) to match the existing restorations.

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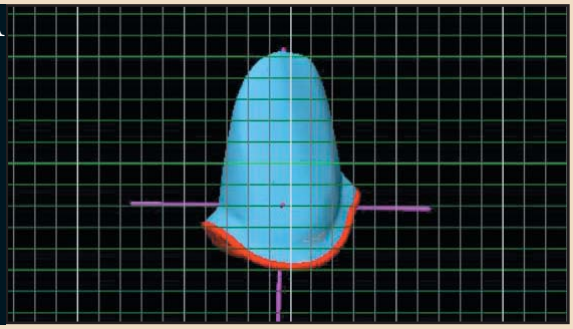
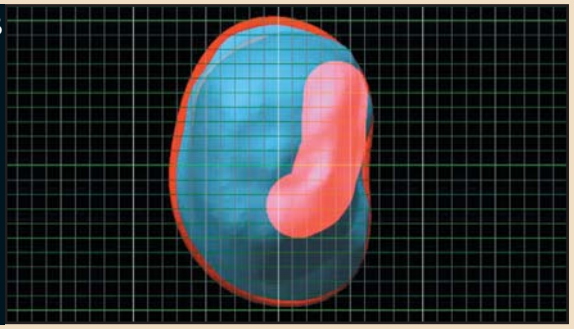
2A

2B

3A



3B



4A

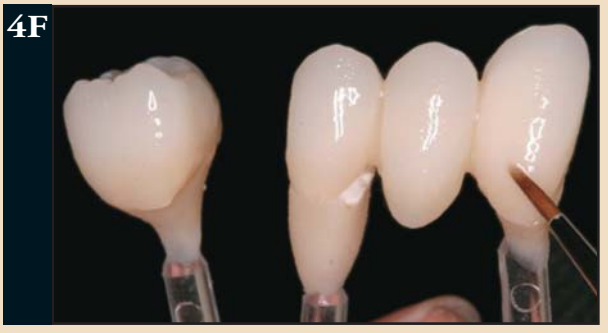
4B

4D

4E

5A

5B



Figures 2A,B,C. Once the proposed treatment plan was accepted, teeth #4 and #6 were re-prepared to serve as abutments for the all-ceramic FPD. Impressions were made of the preparations, and the patient was provisionalized. Working models were created from the impressions, photographs, and related information provided by the clinician. The models were placed on an articulator, and the patient's occlusal patterns were recorded. Interocclusal reduction was carefully evaluated and determined to be excessive. The zirconia framework would need to adequately support the veneering ceramic in order to avoid fracture of this pressed material during function. Care was taken to reproduce the patient's natural axial inclination and occlusal guidance.

Figures 3A,B,C. The working model, an ideal waxup, and shade requirements were forwarded to the manufacturing facility for framework fabrication. The waxup provided design information for the framework, which was created using a CAD/CAM process (Lava, 3M Espe, St. Paul, MN) and its supporting software. The model was scanned digitally, and a virtual framework was designed and milled with proper axial and occlusal support. The milled framework was shipped to the laboratory, where it was evaluated for fit and size. Due to the shade of the underlying preparations, the existing veneers had a chromatic appearance that had to be addressed. The technician accordingly placed an aesthetic porcelain shade on the cervical portion of the FPD framework to ensure an optimal color match.

Figures 4A,B,C,D,E,F. Once the contacts, occlusion, and contours were evaluated in the waxup, the all-ceramic FPD and single-unit crown were sprued and invested. The zirconia frame was then pressed over with Noritake pressed ceramic. After divesting and removal of the sprues, the FPD was evaluated for overall fit. The pressed ceramic was cut back to provide space for the layering ceramic. Successive layers of ceramic were placed, cut back, and fired until all desired internal characterizations, dentin lobes, and natural contour had been rendered. The porcelain restorations were fired once again, and a final translucent shade was added to ensure that the restorations would deliver the desired luster and shine intraorally.

Figures 5A,B,C. The fit of the restorations was determined on the working model, and occlusion was checked on an articulator for proper occlusal guidance and closure. The aesthetic all-ceramic restorations were seated with conventional cement and polished chairside to their final appearance. The definitive restorations demonstrated optimal aesthetics and biocompatibility.

Acknowledgment

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