DENTAL ECONOMICS

Figure 1: Preoperative natural smile. The patient had existing porcelain-fused-to-metal crowns on all maxillary teeth.

Smile design with zirconia

Sarah Winter, DMD

A 54-YEAR-OLD FEMALE presented for treatment of her anterior teeth (figures 1–3). She had two chief complaints, the first of which was discomfort with the "gaps" between her lower teeth. Her dental history is significant: two gingival grafting procedures to augment the tissue in the lower anterior with incomplete resolution of the problem. She was also unhappy with the shade and shape of the lower anteriors, which contributed to the presence of black triangles.

The patient stated that she disliked her lower teeth so much that she had gotten in the habit of covering them with her tongue when she smiled. Her second complaint was with the shade and contour of her 30-year-old porcelain-fused-to-metal maxillary restorations. She felt they were too yellow and asymmetrical. The patient reported that the crowns she had on her maxillary arch were her third set and that previously she had fractured two sets of veneers within the first month of their placement. In fact, she specifically asked for crowns, as she said she was "too hard on her teeth" for veneers.

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At her initial exam, I observed a flat occlusal plane on her maxillary arch, 3–4 mm incisal thickness on her maxillary anterior crowns, and tetracycline staining on her lower teeth. Her first premolars were missing on both the maxillary and mandibular arches. Decay was noted on the buccal surfaces of Nos. 19 and 20, and Nos. 29 and 30 were in temporaries due to leakage of previous restorations. Her lower anterior teeth showed minimal wear; however, based on the flat occlusal pattern of the porcelain maxillary arch and the patient's report that she fractured her maxillary veneers twice, I was expecting more wear than the patient presented with.

Treatment options, including Bioclear matrices with composite on the lower anterior teeth and porcelain smile design, were reviewed with the patient at length. Together, we decided to replace her maxillary crowns and prepare her lower anterior teeth for an improved smile.

Full-contour zirconia was chosen for its flexural strength of more than 900 MPa, fracture toughness of 6–15 MPa,[1] ability to block out darker prep shades, and minimal thickness requirements. Typically, I would prefer to keep preparations very minimal on the virgin lower teeth. However, because we were using the zirconia ceramic to close the spaces between the lower teeth, and because zirconia's bond strength is only 16–26 MPa,[2] I chose to prepare her lower anteriors for full-coverage crowns. I felt I could still keep her mandibular preparations conservative since zirconia thickness needs to be only 0.5–1 mm on the incisal edge and margins only a 0.3 mm chamfer. I decided not to cut back and layer the zirconia restorations so I could maintain optimal strength of the restorations. I had full confidence that my lab could fabricate restorations with characterization, even without the cutback and layering of ceramic. Additionally, the patient preferred no incisal translucency and wanted brighter bleach-shade teeth.

Maxillary and mandibular impressions were taken using Panasil tray Heavy and XL body impression material (Kettenbach). Kois Dento-Facial Analyzer (Panadent) was used and photos were taken. Bite registration was taken using Blu-Bite (Henry Schein). A waxup and Sil-Tech (Ivoclar Vivadent) overimpressions were fabricated by the lab prior to the prep appointment, based on specifications we decided on during the first appointment.

The patient's preexisting PFM restorations on the maxillary arch were removed, and the prepared teeth were photographed for prep shade communication to the lab (figure 4). Her lower teeth were prepared and photographed as well. Her prepared teeth were dark, so an opaque zirconia was needed to block out the dark tetracycline staining visible on her teeth.

Master impressions of the maxillary and mandibular arches were taken using Panasil tray Heavy and XL body impression material. A prep-to-prep bite was taken with Blu-Bite on all anterior teeth prepared.

Provisional restorations were fabricated using the shrink-to-fit technique for the maxillary and mandibular arches. OptiBond FL Primer (Kerr) was used on the gingival

Figure 2: Preoperative retracted bite

Figure 3: Preoperative mandibular arch. Note the spacing and tetracycline staining.

Figure 4: Prepared maxillary arch with prep shade tabs for laboratory communication

portion of the prepared teeth to prevent leakage. Then the Sil-Tech overimpressions were filled with Luxatemp Ultra (DMG America) in BL shade for the temporary restorations (figure 5).

The patient was given home care instructions for maintaining gingival health, and we saw her again a few days later for evaluation of the temporary restorations (figures 6 and 7). We opted to close the spaces in the lower anterior and lengthen the maxillary anterior teeth by 1 mm. Due to the patient's report of veneer fracture, I chose to keep her in the lengthened maxillary temporaries for more than a month to evaluate how she would accommodate this new overjet/overbite relationship. She reported no challenges with the new length, and the temporary restorations did not fracture or break.

When the time came for the final cementation of the zirconia restorations, which were fabricated by Utah Valley Dental Lab, I wanted to use a dual-cure cement because light doesn't pass well through the opaque zirconia I chose for her restorations. Additionally, the patient reported a history of sensitivity when having composite fillings done, which left me wanting to use a self-etch luting cement to prevent possible bonding sensitivity. Since the prepared teeth were very retentive preparations, I chose to use PermaCem 2.0 (DMG America) as it is a self-etch luting cement that shows excellent adhesive strength to zirconia.

After fit and esthetics were confirmed, the intaglio surfaces of the crowns were prepared for cementation. Ivoclean (Ivoclar Vivadent) was used to clean out the restorations, and each restoration was rinsed and dried. A thin coat of Z-Prime Plus (Bisco Dental) was placed on the intaglio surfaces of the crowns and air thinned for three seconds.

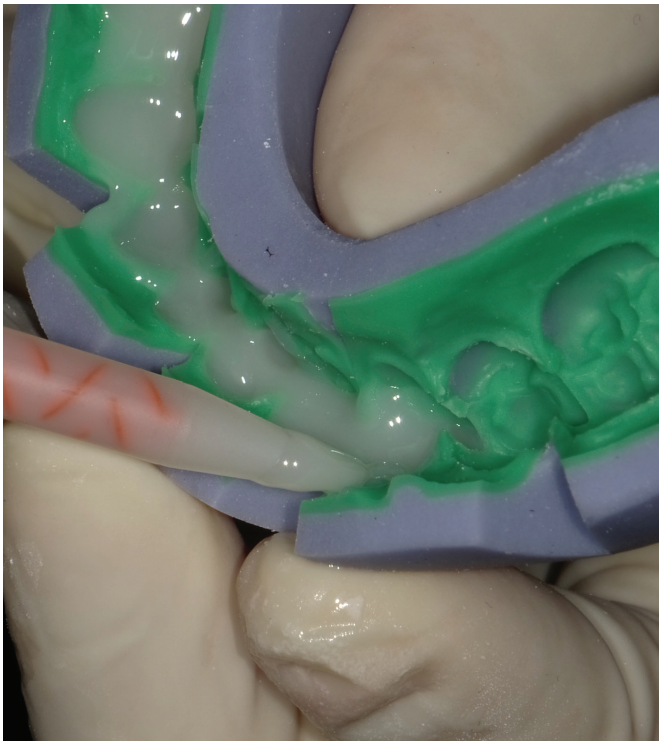

Figure 5: Filling the Sil-Tech overimpression with Luxatemp Ultra (DMG America) to create temporary restorations

Figure 6: Mandibular Luxatemp Ultra (DMG America) temporary restorations

Figure 7: Maxillary Luxatemp Ultra (DMG America) temporary restorations

Figure 8: Final zirconia restorations on anterior teeth

Figure 9: Postoperative smile

The teeth were cleaned with pumice and dried. MicroPrime G (Zest Dental Solutions) was coated and lightly air thinned on all teeth to prevent sensitivity and to increase bond strength.[3] The teeth were then lightly dried and the crowns were individually filled and placed on the teeth. PermaCem 2.0 (DMG America) is a dual-cure cement with a total cure time of seven minutes. To facilitate easy cleanup, I light cured the crowns for one second on the facial and lingual surfaces and then used a universal scaler to clean the excess. I flossed between all crowns and cleaned all of the excess I could see. I used glycerin on all crown margins and finished curing the crowns for an additional minute and 20 seconds, per the manufacturer's specification. The glycerin is used so the surface oxygen inhibition layer is cured. Finally, I checked the bite and adjusted and polished the crowns as needed (figures 8 and 9). **DE**

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SARAH WINTER, DMD, has a private practice in La Jolla, California, and specializes in both cosmetic and restorative dentistry.