All-ceramic fixed bridges

By Dr. Ross W. Nash

This age of esthetic awareness has spurred a quest for materials that are strong enough for the functional requirements of fixed bridgework yet offer a natural appearance. Used for many years, conventional porcelain-fused-to-metal restorations require enough preparation to accommodate a metal substructure, an opaque layer of porcelain to cover the metal, and several layers of esthetic porcelain.

Beyond PFMs

Modern products that use a thin gold understructure allow thicker layers of porcelain and more realistic appearances due to the warm gold color of the core.

Products with white or tooth-colored aluminous cores offer an alternative to metal substructures and provide more realistic looking bridgework. CAD/CAM technology is used to create these substructures in several systems. High-strength pressed ceramics have been developed by several manufacturers that recommend them for fixed bridgework.

Zirconia substructure

A currently available system, Cercon from Dentsply Ceramco, uses pure zirconia as a CAM-milled core. Reportedly strong enough for fixed posterior bridgework, it requires only already-known techniques of PFM design to create metal-free cementable restorations with a fit comparable to PFM alternatives.

According to the manufacturer, zirconia exhibits “transformation toughening” which strengthens the material and allows it to resist crack growth. The veneering ceramic is said to have engineered compatibility with the core material as well as high translucency, vitality, and light dynamics. This system was used in the following case to fabricate two 3-unit maxillary posterior fixed bridges to replace missing first molars. A low-fusing stacked porcelain (Finesse, Dentsply Ceramco) was used to fabricate bonded laminates for 16 other teeth.

Clinical case

The patient in Figure 1 was unhappy with the appearance of her smile. In Figure 2, you can see that her teeth exhibited an orange hue and enamel that was very translucent; there was a mesio-incisal fracture of the right maxillary central incisor. Her maxillary first molars were missing and a provisional crown was in place on tooth 15, as seen in Figure 3. Her mandibular incisors were small with multiple diastemas and incisal wear. The occlusal view of the lower arch can be seen in Figure 4. The patient had excellent periodontal health.

Treatment plan

The patient’s primary goal was to improve her smile. She did not wish to lose any more teeth but decided against implants for replacements of her maxillary first molars. Orthodontic treatment was considered but ruled out by the patient. She chose a restora-
tive treatment plan for its expediency and predictability.

The plan consisted of placing two 3-unit fixed bridges to replace her missing maxillary molars. Her anterior teeth would receive laminate veneers to improve alignment and lighten the color. The patient desired a very white color but wanted to widen her smile. Both fixed bridges would be visible in the smile zone. An all-ceramic bridge material was chosen for its ability to blend with the porcelain veneers.

Bridge preparations
Figure 5 shows the abutment teeth for the maxillary right 3-unit bridge. Routine preps with 1.5 mm of axial reduction and 2.0 mm of occlusal reduction were performed. Chamfer margins just slightly into the gingival sulcus were prepared (Figure 6). The lighter-colored zirconia core of the all-ceramic bridge can be seen in Figure 7; the bridge in place after cementing with a resin-ionomer cement is shown in Figure 8.

Abutment teeth on the opposite side were also prepared. Figure 9 is the occlusal view of the maxillary arch after both bridges have been placed. The incisal fracture at tooth 8 was temporarily repaired with composite resin.

Veneer preparations
The maxillary six anterior teeth were prepared for 360° porcelain laminate veneers by removing only 0.5 mm of axial and 1.0 mm of incisal tooth structure. Gentle chamfer margins were prepared at the level of the tissue and all angles were rounded.

The first premolars were prepared for facial laminate veneers by removing only surface enamel and defining a chamfer margin because we desired to widen the buccal corridor for improved esthetics. Shallow seating grooves were prepared in the facial surfaces of the premolars.

The occlusal view of the maxillary prepared teeth can be seen in Figure 10.

The mandibular four incisors were prepared for 360° porcelain laminate with 0.5 mm of facial and 1.0 mm of incisal reduction. Gentle chamfer margins at the level of the tissue were extended into the interproximal and around to the lingual so that the interproximal porcelain would have both facial and lingual support. Both premolars and the canine teeth on each side were prepared for laminates with 0.5 mm of facial and 1.0 mm of incisal reduction. The final preps from the occlusal view can be seen in Figure 11.

Eighteen laminate veneers, each with etched internal surfaces and glazed outer surfaces, were fabricated using a low-fusing stacked porcelain (Finesse, Dentsply Ceramco). Some laminates wrap all the way around the tooth, while others cover only the facial and incisal surfaces, but all are 0.5 mm in thickness on the axial aspect and 1.0 mm in thickness over incisal edges and occlusal surfaces (Figure 12).

The final result
Figure 13 is the retouched facial view of the finished case 30 days after delivery. Even though the patient chose “Hollywood White” as the shade, the porcelain exhibits ample vitality. Subtle incisal translucency outlines internal developmental lobes in the maxillary incisors. The diastemas and worn incisal edges in the mandibular anterior area were corrected with the laminate veneers. The color blend of the bridges and veneers is excellent.

The finished case can be seen from the maxillary occlusal view in Figure 14 and from the mandibular occlusal view in Figure 15. A digital radiograph of some the maxillary laminate can be seen in Figure 16. The radiograph in Figure 17 illustrates the radiographic resemblance to metal that the zirconia core exhibits. It also illustrates the excellent marginal adaptation.

A close up view of the right all-ceramic bridge and some of the laminate veneers shows the excellent color match, anatomical form and tissue health (Figure 18). A close up occlusal view of the same sextant can be seen in Figure 19. A right-side view of the patient’s smile before treatment shows the dark corner (Figure 20). After her new restorations her buccal corridor was widened and her smile broadened (Figure 21). Finally, the patient’s new look is shown in the full-face portrait in Figure 22.

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