BEFORE

Before a. The patient's smile before treatment–PFM crown and bridges and dia

Before b. Retracted view before treatment.

AFTER

After. The patient shares her newfound confidence with a new and radiant

Figure 1. Retracted view of the prepared teeth.

Figure 2. Zirconium oxide bridges (Lava [3M ESPE]) shown on a mirrored surface.

Figure 3. Two zirconium oxide crowns (Lava) and 4 feldspathic porcelain veneers (CZR [

Figure 4. Retracted view of the finished case.

Figure 5. Incisal view of the final preparations for the maxillary (6) anterior teeth.

Figure 6. Close-up view of the 2 veneer preparations and the 2 full-crown preparations.

Figure 7. Close-up view of the 2 feldspathic veneers and the 2 zirconium oxide

INTRODUCTION

The desire for aesthetics in our society has spawned the development of dental materials that provide the strength for function and the appearance of natural teeth. Conventional PFM crowns have been used for this purpose for many years; however, they have some aesthetic

drawbacks. The metal foundation required to support the layering ceramic can sometimes result in a dark line at the gingival margin. This has been one of the main objections that I have heard from my patients in my 32 years of practice. The metal foundation requires an opaque layer of porcelain to block out the color, and this can sometimes result in a less than translucent appearance decreasing the vitality. Of course, natural contours and aesthetics can be achieved with modern PFM systems, but the dental ceramist is dependent upon the clinician to design the preparations in such a way that enough room is provided for the opaque liner and the artistic layering of multiple overlying porcelains.

Zirconium Oxide as a PFM Alternative

Zirconium oxide (also called zirconia) foundations for crowns and bridges have given dentistry another strong material alternative that also provides lifelike aesthetics. However, with this metal oxide core material, no opaque layer is needed and nonmetal color (varies from white to other various tooth-colored shades, depending on the system) eliminates the dark line at the margin. Aesthetically, I have found wide acceptance of these restorations by my patients. The preparation is similar to a PFM alternative with 1.5 mm (axial) to 1.5 to 2.0 mm (incisal/occlusal) thickness usually recommended. The restorations may be resin cemented or conventionally cemented (when adequate retention and resistance form is present.) If less than ideal retention and resistance form is present in the preparation, universal primers (such as Z-Prime [BISCO] and Monobond Plus [Ivoclar Vivadent]) can be used to treat the internal surfaces of these restorations prior to adhesive resin cementation.

Porcelain Choices for Laminate Veneers

When tooth surface coverage is desired for aesthetic reasons, and conservation of tooth structure is a priority, laminate veneers can often perform well, especially when there is no untreated occlusal disease present. While pressed and stained ceramics offer high flexural strength, a vital appearance can be more difficult to achieve. With feldspathic porcelains, customized layering techniques allow the dental ceramist to blend shades and to vary translucency, resulting in truly lifelike appearances. Adhesive bonding is a necessity for achieving the retention needed, and the lamination process is important in achieving the maximum strength of these restorations.

The Challenge

One of the biggest challenges for any dental ceramist is to develop a uniform appearance when using different materials in the same patient. Can a zirconium oxide reinforced crown “match” an adjacent feldspathic, pressed leucite-reinforced, or lithium disilicate porcelain veneer? That is where artistic skills come into play. Fortunately, a zirconium oxide crown can be layered with the same ceramic from which the adjacent laminate veneer is made. Such is the case in the following clinical example.

CASE REPORT

Diagnosis and Treatment Planning

Judy presented with a desire to improve the appearance of her smile (see Before images a and b). Because she did not feel that her teeth were attractive, Judy hesitated to smile. Her maxillary central incisor was restored with a PFM crown. A large diastema existed between her maxillary central incisors. Her maxillary lateral incisors were small and malformed. Her missing mandibular lateral incisors had been replaced using a 6-unit fixed bridge, from canine to canine. She wished for more natural-looking restorations and a more symmetrical smile-line with no diastema.

Preoperative impressions were taken with a polyvinylsiloxane (PVS) alginate substitute material (StatusBlue [DMG America]), and stone study models were fabricated in the dental laboratory. The ideally designed preparations were cut on the preoperative study models in the laboratory, and then a diagnostic wax-up was created to simulate the desired final result. PVS putty stints were fabricated over the waxed models for use in fabrication of the provisional restorations.

Preparation

At the preparation appointment, the previous PFM restorations were removed and the preparations completed. At least 1.5 mm of axial and incisal reduction was accomplished using a KS2 diamond bur (Brasseler USA). Chamfer margins were prepared at the height of the tissue. Zirconium oxide crowns were planned for the 2 maxillary central incisors. The maxillary lateral incisors and canines were prepared for feldspathic porcelain veneers. Conservative facial depth cuts of 0.5 mm were made with the LVS1 bur (Brasseler USA). The depth cuts were then joined, and the axial preparation was completed with the LVS4 chamfer-ended diamond bur (Brasseler USA). Incisal reduction was performed with the same diamond bur and a “butt” margin was placed over the incisal edges. Next, the 6-unit mandibular PFM bridge was removed and the preparations were refined to allow for 1.5 mm axial and incisal restorative material using the KS2 diamond bur. Chamfer margins were finished at the height of the tissue. The finished preparations can be seen from the facial view in Figure 1. Shade M1/0.5 was chosen from the VITA Lumen Bleach Shade Guide (Vident). Digital photographs of the teeth before and after preparation, as well an image of the shade guide in front of the prepared teeth, were sent to the dental laboratory via e-mail for use in fabrication of the restorations.

Impressions and Provisionals

Final impressions were taken with a PVS impression material (Aquasil Ultra Xtra [DENTSPLY Caulk]) and an occlusal registration was made (Flexitime Bite [Hereaus Kulzer]). A bisacrylic provisional material (Luxatemp Flourescence Shade BL [DMG America]) was injected into the lab-fabricated putty stints and then placed over the prepared teeth. The provisional material was allowed to set and the stints were removed. The margins of the temporary restorations were trimmed with a small carbide-finishing bur (ET3 [Brasseler USA]) and polished with an Enhance Cup (DENTSPLY Caulk).

Dental Laboratory

At the dental laboratory, 2 zirconium oxide crowns (Lava [3M ESPE]), 2 3-unit zirconium oxide bridges (Lava), and 4 feldspathic veneers were fabricated according to the patient's desired aesthetics. The same porcelain (CZR [Noritake Dental Materials]) was used for the veneers and to add the layered porcelain over the zirconia oxide cores (crowns) and framework (bridge). In Figure 2 you can see the 3-unit porcelain-fused-to-zirconia bridges on a mirrored surface. The zirconia oxide crowns and feldspathic veneers for the maxillary teeth are shown on a mirrored surface in Figure 3.

Delivery

The crowns and bridges were cemented with a glass ionomer cement (FujiCEM [GC America]). The veneers were bonded into place using a total-etch technique and a fifth-generation light-cured bonding agent (ALL-BOND 3 [BISCO]). Silane (BISCO) was applied to the internal surfaces of the veneers which had been acid-etched in the dental laboratory to maximize micromechanical retention. A light-cured composite resin-luting agent (Choice 2 [BISCO]) was then placed inside the veneers and they were seated and light-cured. Excess cured luting composite was removed with a small carbide-finishing bur (ET3) and the margins were polished with a finishing cup (Enhance Cup).

Finished Case

The finished case is shown in the retracted view in Figure 4. Figure 5 shows the incisal view of the final preparations for the maxillary (6) anterior teeth. Notice that the original PFM crown preparation is slightly more aggressive than the new zirconium oxide crown preparation. The veneer preparations are in enamel and are more conservative than the adjacent crown preparations. A close-up view of right canine and lateral incisor veneer preparations next to the full zirconium oxide crown preparations is shown in Figure 6. Two feldspathic veneers and the 2 Lava crowns are shown in place in Figure 7. Note the "extreme" artistry exemplified in the uniformity in shade, texture, value, and character.

Judy's new smile (After image) is radiant and she was extremely pleased with the result. Judy cannot stop smiling now!

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Dr. Nash is president and co-founder of the Nash Institute for Dental Learning in Charlotte, NC. He owns and operates Cosmetic Dentistry of the Carolinas located in Huntersville, NC, where

he and his associates provide general, aesthetic, and cosmetic dental care. He is an accredited Fellow in the American Academy of Cosmetic Dentistry and a Diplomate of the American Board of Aesthetic Dentistry. An international presenter on dental aesthetics and oral rehabilitation, he is also a consultant to numerous dental products manufacturers. He can be reached at (704) 364-5272 or via e-mail at the address ross@nashinstitute.com , or visit his Web site, nashinstitute.com
.

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