The Single Anterior

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The single anterior can be the most difficult tooth recreate in cosmetic dentistry. The dental technician challenges include shade mapping, the selection of material for the understructure, longevity and, of course, don’t forget function.

CASE STUDY

The patient came in with an existing crown on tooth 8 and did not like the esthetics. The crown was removed and a post and core was completed. Impressions were taken and the tooth was provisioned. The dentist and the dental technician did the shade mapping. A full-color mapping of all the colors in the patient’s tooth was completed.

The patient was looking to match perfectly tooth 9. The patient was told the choices and procedures available and an all-ceramic restoration was chosen to give him the higher esthetics he sought. One of the issues was that the understructure would need to block the gold core from shining through.

The understructure material should be opaque to mask the underlying dark color. However, an advanced porcelain technician can still mask the underlying dark tooth color by utilizing porcelains with detailed color-masking techniques. It is vital to avoid excessive opacity, which is common in porcelain-to-metal restorations and often results in lifeless-looking restorations. On the other hand, if you have too much translucency, the restoration looks too gray and dark. You may see this on some of the all-ceramic restorations that are less than 1mm in thickness.

Metal-free restorations are not going to entirely replace porcelain fused-to-metal, but it is an alternative for more natural-looking restorations. It is a dental technician’s responsibility to be educated about the latest materials, techniques and proper function of occlusion and muscle position for esthetics, longevity and comfort. The dental technician needs to look at how long a material has been on the market and should review studies that have been completed about the material.

With a wide range of all ceramics to choose from, it is difficult to keep up with all of the new or improved products. With the changes happening so quickly, it can be confusing.

Some of the choices of materials or understructures are as follows:

- Procera, Lava, Cercon, Everest, In-Ceram, etc., are some of the systems using a zirconia understructure. Zirconia, as a whole, is very low in translucency and high in opacity.
- Procera, InCeram, etc., are have an alumina understructure. These are low in translucency and have moderate opacity.
- Pressed: Leucite-reinforced or Lithium Disilicate and Apatite Glass ceramics, such as Empress, OPC, Authentic, GC Initial, are higher in translucency and can be low or high in opacity, depending on the pellet.

Each company will tell you about their system and how it’s better or has more advantages than another. But there is more to consider than just that. You need to know that the company you choose will be there to support you. Many systems are quite expensive and you need to have quite a clientele to justify the costs. However, if you don’t have the capital, but you have the need, there are options. Instead of purchasing a system, you can outsource your frameworks until you have the market to justify the purchase. Then once your market share is stable, you can invest in a complete system. Be sure the company you buy from has a program in place to help you develop and implement a successful marketing strategy for your end product.

Today it is easy to get an understructure fabricated from an outsource provider. The dental technician sends the completed model to a dental laboratory with the desired system. The lab will fabricate the framework and deliver it back to the dental technician. Porcelain will then need to be applied to complete the case. The porcelain work is constructed on the framework and how the restoration’s esthetics turn out depends on the individual ceramist’s skills. This enables small laboratories to offer different systems without a large financial investment.
Fig 1. Preparation on tooth 8, gold post must be noted as stump shade.

Fig 2. Temporary on tooth 8.

Fig 3. Custom shade mapping using shade tabs from the GC Initial porcelain system.

Fig 4. Shade mapping completed by technician.

Fig 5. Porcelain teeth samples showing the morphology made by author.

Fig 6. Teeth samples made by author.
Fig. 8. Testing samples made by author: from opaque to enamel.

Fig. 10. Internal stain applied on GC Initial Pressed Ceramic to modify the base shade.

Fig. 11. Cervical Translucent applied at gingival third and middle third, and then prepared for the addition of a grey band.

Fig. 12. Enamel Intensive applied to the Incisal third, TM05-TM04 (1:1) is applied to the middle third to give gray band affect; enamel powders were also applied.
The layering porcelain the dental technician applies to the understructure is very important. We are using GC Initial porcelain. The GC Initial line has five different porcelain powder systems and pressed ceramic ingots. The five ceramic systems are uniquely formulated for a specific substructure, e.g. zirconia, alumina, titanium, cast alloys and pressed all ceramic. Initial MC is for porcelain-to-metal restorations and for veneers. Initial LF is the lower firing temperature porcelain, used for porcelain-to-metal restorations, layering on top of a pressed framework fabricated with the GC Initial PC ingots, and also for porcelain veneers. The other three powders are GC Initial ZR for zirconium restorations, GC Initial AL for alumina restorations and GC Initial Ti for porcelain-to-titanium restorations.

The GC Initial system has the same color tabs for all the different GC Initial systems. This helps when the case has different types of understructures because the technician has the same color guides. Unfortunately, shade guides are not representative of the value of real teeth, which is why relying on shade tab assessment alone can be problematic. You will need special shade tabs for the opalescence, fluorescence and translucency of natural teeth. The porcelain system has its own effect powders and color-matching tabs.

To give maximum esthetics, the material choice was GC Initial Pressed Ceramics with layering porcelain. We decided on the GC Initial PC (pressed ceramics) because it gives us a wide variety of pellet colors. They have 16 Dentin shades, four bleached shades (AO, AOO, BO, BOO with 75 percent opacity), three veneer shades, four occlusal enamel light, four occlusal enamel milky, four translucent and five opaque ingots. The opaque ingots are valuable when dealing with discolored preparations because the opacity is at 85 percent. The colors are light yellow, pale yellow, red yellow, olive and white. When using pressed ceramics we can often get too much translucency, so more choices are valuable. The opacity level of the Initial PC ingots ranges from 30 percent to 85 percent.
Following dental laboratory procedures, the central was waxed to full contour and cut back for the layering porcelain. The wax-up was sprued, invested and prepared for pressing. Ingot selection is very important. As with all the ingot manufacturers, a wide variety of colors are available.

After pressing, it is important that you do not overheat the pressing when cutting off the sprues or modifying the framework. When the cut-back framework is ready for porcelain application, check your thickness and room for layering. Look at the framework’s shade and if needed, you can modify with internal stains. GC Initial has INvivo, INsitu and INover stains, so you can apply stains on the pressed ceramic material and use internally or externally on your porcelain build-up. The coping should then be checked to ensure there is adequate room for ceramic layering.

The first layer of porcelain was the Inside (IN) powders using shade IN 44 (Sand). GC Initial IN is a specially developed, highly fluorescent primary dentine that gives the color depth.

Dentin porcelain was applied, and shade Dentine A1 was laid over the gingival third and middle third and Dentine B1 over the middle third and incisal third to give the crown optimal chroma (saturation or strength of the hue). The color is produced by reflection from the dentine. We cut back the dentin porcelain to give room for the mamelon effect we desired. The enamel intensive (EI 13 red), Cervical Translucent (CT24 yellow), and a 1:1 mixture of Translucent Modifier (TM05 grey + TM 04 yellow) porcelain powders were applied for effects. Enamel Effect powders were used at the incisal area and helped give the natural appearance that you don’t always find with just one enamel shade.

A thin layer of Clear Fluorescence (CLF) powder was applied. The CLF was used as a thin layer between the dentin layer and enamels on top of it. This was the so-called “sclerose dentin” and brought true-to-nature depth into the tooth color. Translucents were applied over the CLF. They are available in Translucent Neutral (TN) and Translucent Opal (TO).

Fig. 17. Locating concave and convex areas with a pencil.

Fig. 18. Adjust the mesial marginal ridge and the mesial proximal transitional surface.

Fig. 19. Create horizontal line.

Fig. 20. Checking the texture by marking with articulation paper.
**Fig. 21.** Create vertical line angle with diamond.

**Fig. 22.** Define texture with sandpaper.

**Fig. 23.** The crown is naturally glazed and mechanically polished. Photo angle shows texture on gingival third.

**Fig. 24.** Checking the surface texture, the photo angle shows texture on incisal third.

**Fig. 25.** Incisal view showing the mesial and distal marginal ridges is related to the incisal ridge and form part of the incisal line angle.
On the lingual of the crown, we applied the Inside Dentin (IN 47 Sienna), Enamel incisal and Occlusal build-up. The crown was taken off the model and the contacts were added. The crowns were then ready to bake. After firing, any adjustment necessary to complete the restoration can be made on the solid cast.

Surface texture can affect brightness, color saturation, luster and more. A natural tooth in its unworn state does not present an absolutely smooth surface. In general, it may be seen as a gentle, undulating surface traversed horizontally with very fine grooves. Matching the surface texture is as important as matching the shade. If light should reflect off a restoration in a different way from the neighboring teeth, even if the shade is perfect, it will give the effect of being an artificial restoration.

An anterior tooth is more obvious when looking at the tooth’s surface texture. Since the texture is more evident, it will appear heavier and will immediately be visible. The horizontal parallel ridges or growth lines, and the small vertical ridges that run parallel to the marginal ridges, help blend the restoration into the oral environment. If you want an esthetic restoration, surface texture is crucial.

We may not think of using a pressed-ceramic restoration out of fear that the substructure would not keep the gold core from shining through. Today, with the different opacity of ingots and the improved layering porcelain, this is not always true.
Bio
Luke S. Kahng, CDT, is the founder and owner of Capital Dental Technology Laboratory, Inc. of Naperville, Illinois. His laboratory specializes in fixed restorations. Its division, LSK 121, provides highly personalized custom cosmetic work. Kahng developed the LSK 121 Treatment Plan that incorporates a wax-up technique that focuses upon a biomechanical design of occlusal surfaces for reconstructive and esthetic dentistry. He has also developed a series of shade conversion table for porcelain.

Kahng clinics for GC America, Bisco, Captek and others. He is a frequent lecturer and program facilitator, and has been extensively published in clinical and technical journals.

He is master ceramist who has trained extensively with Russell DeVreugd, CDT, Dr. Frank Spear and Dr. Peter Dawson. He is currently a member of American Academy of Cosmetic Dentistry. Case courtesy of Nicholas Svarnias, DDS.

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REFERENCES
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Fig 29. Final outcome: The natural smile shows how the incisal edges of maxillary incisors follow the curvature of lower lip.