The Magic of Illusion Using Vita VM7

Pinhas Adar MDT, CDT

Matching the single anterior crown to natural dentition is not the challenge it was twenty years ago. Today’s materials allow the dental laboratory technician to fabricate single anteriors in a simple manner that produces all of the illusive qualities of natural dentition. Mixing stains and modifiers to create the illusion of depth and translucency is no longer necessary. Most ceramic materials produced today mimic natural teeth through enhanced optical properties. This does not mean that fabricating a single central incisor does not require effort, time or talent. As always, the technician’s hands and knowledge ultimately decide the quality of the final outcome. In addition, the laboratory technician must observe and understand the characteristics of the materials they use and the natural teeth they are trying to replicate. The ceramist must also understand that every patient’s teeth differ in shape, thickness, size and optical properties.

Key words: Alumina coping, soft tissue, VM7, single central restoration, restorative team

This article features Vita VM7 (Vident, Brea, CA, USA). Vita VM7 is a veneering material that is compatible with any Alumina-based coping with a CTE of 7.2 – 7.9 which includes Vita Inceram, Spinell Alumina and Procera. The wear characteristics of the VM7 material are very similar to natural enamel and its low solubility makes it highly durable in the oral environment producing a long wear life. It possesses enhanced color stability even after multiple firings and can be layered to create a perfect match with the adjacent dentition. In contrast to popular belief, reproducing a single central is possibly the easiest restoration in dentistry. It is however, probably the most time consuming for the technician and the most costly to the patient. What makes reproducing the single central easy is that the natural tooth provides us with the perfect guide. The adjacent tooth exhibits all the detail and characteristics necessary to create a matching crown. Technicians that couple this information with today’s materials and the techniques pioneered by various ceramists from around the world, will find that the single central can be matched quite predictably. However, additional steps are regularly required to achieve such success. A perfect example is that the first crown made often becomes the custom shade guide. This guide then serves as the definitive roadmap for matching the natural dentition. These extra steps, however, ultimately result in an increased time commitment from the patient, dentist and laboratory technician.

The first step in fabricating a single unit is to understand nature and realize that every clinician and technician has unique capabilities and limitations. The patient Figure 1a wanted to replace the crown on #9 that did not match her existing natural dentition. When observing natural teeth, it is quickly discovered that not all teeth are created equal. The right amount of internal layering and translucency must be incorporated into the single tooth restoration in order to blend with the natural environment (Figs. 1b,c).

The patient in Figure 2a also had a single crown on #9 that did not match her existing natural teeth. In this case the natural teeth have a lot of opacity...
patients disliked her single central incisor #8. Orthodontic eruption had previously been done to level the soft tissue as described in the previous case. The tooth was then prepared (Fig. 4b), impressions taken and a temporary fabricated. A final master model was made from the impression so that an Alumina coping could be constructed.

An Alumina coping can be fabricated in two ways. In the first, the Alumina is cut back at the margin to create a porcelain shoulder. If the finish line of the preparation is deep enough subgingivally, a second technique can be used. In this case, a cutback of the Alumina coping and subsequent porcelain margin are not necessary (Fig. 4c). With any all-ceramic substructure there is a lack of fluorescence and this optical challenge must be overcome. A more fluorescent powder (called Effect Liner) can be used around the subgingival area to alleviate this problem. These powders can be used to control the fluorescence in the restoration as well as support light distribution. Since dentin fluoresces more strongly than

Fig. 4a. Pre operative view of an unhappy patient with #8 after orthodontic eruption.

Fig. 4b. Prepped tooth showing the dark tooth structure.

Fig. 4c. Alumina coping on the master die.

Fig. 4d. Alumina coping overlayed with 50% Liner Effect EL1 and 50% EL5.

Fig. 5a. An ultraviolet light showing the fluorescent quality of the liner and the lack of fluorescence in the actual Alumina coping.

Fig. 5b. Supporting the value with Base Dentine 1M1.
enamel, this is the perfect area to place Effect Liner in order to increase light conductivity and prevent shadowing.

To develop the highly color saturated cervical area for this patient, Effect Liner EL1 is mixed with EL5 (60:40%). Mixing the very light EL1 with EL5 develops high color saturation similar to the adjacent natural tooth (Fig. 4d). In Figure 5a the coping with the Liner material is illuminated with ultraviolet light, demonstrating the impressive fluorescent qualities of this Liner product after firing. This high fluorescence will illuminate the surrounding soft tissues around the crown. When there is a need to overcome spacing problems due to insufficient tooth reduction, various Liners can be overlaid on the entire Alumina coping to create either brightness or darkness. This also creates a more fluorescent layer over the Alumina substructure to produce the optimum result even without ideal space for proper crown thickness.

Next, Base Dentin is applied to support the value. If the Base Dentin is not used to support the brightness, the pure dentin will appear low in value. Figure 5b shows that the dentin build up extends beyond the incisal of the Alumina coping. Be careful not to cover the Effect Liner with the Base Dentin in order to allow the Liner’s optical properties to shine through the body of the crown. The Liner can, however, be covered with standard dentin to control the contrast.

Once the Base Dentin is applied it is overlaid with a dentin. In this particular case the Base Dentine and dentin shade are 1M1 (3D Shade Guide, Vita). The cervical Liner can now be overlaid. Always build up the dentin shade to full contour in order to visualize the outcome (Fig. 5c). Once the shape is realized, it is easier to return to the same shape after the cutback. After the full contour has been determined, space for the incisal layers must be made either by cutting back with an instrument or brush (Fig. 5d). The cutback must be irregular so it can better blend with the incisal layer and avoid a definite demarcation between the layers. Allow sufficient space for the incisal layers proximally, incisally and facially. Figure 6a shows the incisal view of the cutback. Figures 6b and c show the lateral view compared with the adjacent natural central. It is important to look at the build up from every angle in order to determine the sufficient space required for the incisal layers. In this case a very routine mixture of Incisal Light, Incisal Light mixed with Incisal Effect EE9 (50:50%) and pure Incisal Effect EE9 were used. The build up is started by applying Incisal Light to the mesial and distal of the incisal third (Fig. 6d). Once the mesial and distal corners are built to the correct height, continue building with a 50:50 mixture of Incisal Light plus EE9 (Fig. 6e). Repeat these steps until the incisal frame is complete (Fig. 6f).

The canvas is now created and the internal effects can be applied. In this case there is a slight low value band on the incisal third just below the mamelons. The Incisal Effect EE11 is mixed with stain liquids so that it becomes very fluid. It is then painted on the surface to create the desired depth and horizontal band (Fig. 7a). The mamelon effects are achieved by mixing MM1 with MM3 in a 50:50 ratio with stain liquid. Stain liquid improves handling and makes it easier to mimic the internal structures found in the incisal of natural teeth. Figures 7a-d provide different views of the mamelon application. Note that there is still sufficient space for the enamel overlay to complete the build up. To further enhance the low value band, a clear incisal ceramic is overlaid in a thin layer (Fig. 7e). To complete the build up the incisal effects are overlaid with the same mixture and in the same segmental manner as before, (Fig. 7f). A mixture of Incisal Light and EE9 mixed half and half with clear (Figs. 8a, b) is placed over the entire shape and built slightly larger than full contour to account for shrinkage (Fig. 8c).

Figure 8d shows the facial-incisal view of the developed layers. The incisal edge must be in line with the adjacent tooth. If the incisal has to be repositioned, it should be manipulated while the ceramic is moist so that the effects will move with it. “It is important to look at the build up from every angle in order to determine the sufficient space required for the incisal layers.”
Fig. 7a. Applying EE11 horizontally.

Fig. 7b. Applying mamelon MM1 mixture with MM3.

Fig. 7c. Applying clear overlay on the low value band.

Fig. 7d. Overlaying the incisal segmental build up with the same mixture.

Fig. 7e. Applying clear overlay on the low value band.

Fig. 7f. Overlaying the incisal segmental build up with the same mixture.

Fig. 8a. Continuing the segmental overlay.

Fig. 8b. Continuing irregular overlay to emphasize the internal structure.

Fig. 8c. Completed buccal overlay of the segmental build up.

Fig. 8d. The incisal view of the buccal build up.

Fig. 8e. Applying the Mamelon effect on the lingual wall MM1 with MM3.

Fig. 8f. Continuing build up of incisal from the lingual to complete the shape.
Fig. 9a. Applying a mixture of 1M1 with incisal light half and half to develop the halo effect on the incisal edge.

Fig. 9b. Completed first bake on the model.

“**The biggest challenge is to visualize the final shape and thickness, in order to develop the effects at the right depth.**”

Due to the lack of spacing on the lingual side, effects are added using an MM1 with MM3 mixture (Fig. 8c). Incisel is then added (Fig. 8f) to complete the lingual shape. While the ceramic is still wet, a 50:50 mixture of Dentin 1M1 and enamel is added around the incisal edge to create the halo effect (Fig. 9a). Once the first bake is completed (Fig. 9b) it is easy to see the internal structure that was developed in the build up. The tooth is still a smaller version of what the final will be. The chance to add or take away effects is still possible if necessary.

At this point we try the crown in the mouth. During this step, pay special attention to the internal characterizations. You may choose to make the mamelons stronger or add other effects like white striations or a band of low value. These additional effects are quickly dried under the ceramic furnace (Fig. 10a) so that they will not move. Then set-fire the effects in a quick bake (Fig. 10b) with a starting temperature of 600ºC with a dry time of 1 minute. The high temperature should be 800ºC with a rate of climb 80ºC per minute. Hold this temperature for one minute followed by immediate removal from the muffle. This will guarantee that the effects will stay in the same position that they were applied in. After baking, evaluate the restoration in the mouth again (Fig. 11a). This ensures that nothing has moved and there is no need for further enhancement.

Once the internal characterization is complete and stabilized, overlay the crown (Fig. 11b) with more translucent layers. For this, Opal Translucent shades EO1 and EO3 were overlaid. Around the cervical area, Incisel Effect EE4 diluted with Incisel Effect EE6 was used. These layers should be in very thin increments so that the internal structure will shine through the effects.

The biggest challenge is to visualize the final shape and thickness, in order to develop the effects at the right depth. Once the translucent layers are overlaid, the effects should be visible in the completed crown. After the second bake, use the solid model to check the contact points and contours, trimming the soft tissue away so that the...
Fig. 13a. The smile view of the final crown intraorally.

Fig. 13b-c. Lateral view of the final alumina crown intraorally.
In nature no two teeth are alike, but there is some sort of harmony and a feeling of belonging.

Once the final anatomy and texture is completed, sandblast the crown with a titanium dioxide using low pressure to clean the surface, and then steam clean the crown. Apply glaze liquid and run the restoration through a rapid glaze firing cycle. The starting temperature of the glaze cycle is 550°C with a 90°C per minute rise to 900°C with a one-minute hold. The crown should then be manually polished with rubber wheels and diamond paste (Fig. 12). Figures 13a-c show various intra oral views of the finished crown (Alumina coping layered with VitaVM7). It blends harmoniously with the adjacent teeth and appears very lifelike. The emergence profile of the new VitaVM7 crown provides better soft tissue support.

When matching a single central incisor, it is crucial that all members of the restorative team recognize the importance of creating color and architectural harmony with the surrounding soft tissues. In order to achieve this, adequate tooth reduction is essential. Tooth preparation requirements vary depending on the clinical situation and the type of restoration employed. In some cases, more aggressive tooth preparation is required in order to accommodate significant volumes of opaque material needed to neutralize the dark underlying tooth structure. In other instances where the color and brightness of the underlying tooth structure is desirable, a less aggressive tooth reduction can be realized. The morphology, emergence profile, surface texture and the tooth color must be duplicated in a precise manner. Manual polishing is one of the keys for developing the illusion that the crown is a real tooth.

In nature no two teeth are alike, but there is always harmony and a sense of belonging. Successfully reproducing this in a single central restoration depends not only on the skills of the ceramist, but the entire restorative team. This includes the patient who ultimately must make the time commitment needed to realize the desired outcome. Although the single unit is one of the easiest things to do in dentistry, it is also one of the most time consuming. Time is always an irreplaceable commodity and there is no replacement for it. Time is money, and this fact makes the single central an expensive restoration to fabricate.

Acknowledgements:
Thanks to the following people for personal and professional influences: Baruch Bidig, my first experience to the wonderful field of dental technology as well as my first inspiration at the age of 14. Willi Geller, who was instrumental to my career. Since I was 15 years old I have had the privilege of having him as a mentor. My dental friends, colleagues and family members - Team Atlanta – Drs. Ronald Goldstein, David Garber, Maurice and Henry Salama, Brian Beauregard, Angelina Hedlund and Anita Tate. Claude Seiber who developed the ceramic VitaVM7 and shared his knowledge with many others including me. A special thanks to my wife, friend and soul mate who made this article possible. Special thanks to all of the manufacturers who develop new products everyday and make this profession even more exciting.

Pinhau Adar MDT, CDT
Oral Design Center, Atlanta
A Division of Adar International Inc.
www.adarinternational.com

Reference Literature
5. Reisch K. We don’t need caviar all the time. Ceramic Layering Techniques. teamwork media 1998: 140-151.