

Porcelain Laminate Veneer Therapy

Ultra-thin veneer options using no-prep or partial-prep philosophy

By Gary M. Radz, DDS

Dentistry is entering a new era in respect to porcelain laminate veneer therapy. Calamia's article in 1983 was one of the first introducing porcelain veneers as we know them today.¹ Since then, porcelain veneers have gone through significant changes from both a materials and technique aspect.

During the past 25 years, there has been a lot of discussion regarding the preparation techniques used for porcelain veneers. Calamia and other early pioneers looked at veneers as a non-invasive, additive process and worked primarily with a no-preparation concept. Early on it was found that a little enamel preparation could help to enhance the esthetic outcome and improve the marginal fit. Later, in the mid to late 1990s, pressed ceramic was introduced as a material option. Its excellent esthetics, strength and easier fabrication process paved the way for an industry shift away from stacked porcelain to the pressed product. However, the physical demands of proper pressed-ceramic fabrication required an increased amount of tooth reduction (0.8 to 1.0 mm compared to 0.5 mm for stacked porcelain) to make room for the required thickness of pressed ceramics. Porcelain veneer therapy with pressed ceramics became a more aggressive treatment.

Starting early this decade there began to be much debate over the ethics and advantages involved with the more aggressive pressed-ceramic preparation vs. the more conservative stacked-porcelain preparation. Many well-known clinicians lined up on either side of this debate. Over time it

began to appear that the more conservative-minded clinicians were more correct in their arguments. Friedman's 1998 publication² followed by others³⁻⁶ points to a very high clinical success rate for veneers when bonded to a mostly enamel surface. The pressed ceramics of the 1990s (which carried into the 2000s) required a preparation design that all but eliminated any enamel within the veneer preparation.

A new debate is now present in the world of porcelain veneer preparation design: preparation of the tooth vs. no preparation at all.⁷ There is concern that a no-preparation design will have the negative effects of compromised soft tissue health at the margin resulting from an over-contoured restoration, an unesthetic final result resulting from compromises required with no tooth reduction, and an inability to fabricate porcelain thin enough to be used in an "additive only" process. This debate has been fueled by many dentists observing clinically esthetic and functional failures of no-preparation veneers fabricated in a less than esthetic manner and placed oftentimes by practitioners who have inadequate training or experience. These failures have led many cosmetic dental experts to believe that the no-preparation concept is a compromise. However, the argument could be made that many of these failures are due to the limited esthetic abilities of the porcelain that was used, the artistic ability of the ceramist or dentist, and/or the inexperience of the ceramist or dentist.

Many dentists have had excellent esthetic results using a no-preparation

concept. Wells recently published several no-preparation cases that demonstrated excellent esthetic results.⁸ The no-preparation veneer concept can and does work. However, as with any procedure, it has its limitations. The dentist who wants to incorporate no-preparation veneers into his/her practice needs to understand the importance of proper case selection, material limitations, and have clinical experience with handling and finishing thin veneers. For many reasons, no-preparation veneers can be as challenging, if not more so, than conventionally prepared veneers.

Case selection is of the upmost importance. Wells gives the following parameters of cases that have high success potential⁸:

- bicuspid extraction orthodontic cases
- cases with short, worn teeth (assuming occlusion/bite forces are managed)
- misalignment cases in which one or more teeth are in a lingual position
- cases in which teeth need more "presence" (big lips and small teeth)
- narrow maxillary incisors with diastema(s) or wide incisal embrasure form

The following are presentations of case studies that demonstrate the esthetic potential of porcelain veneers created using a prepless philosophy. Additionally, a new pressed ceramic that has the ability to be fabricated to a minimal thickness of 0.3 mm to 0.4 mm will be discussed. This new material now provides a pressed ceramic for those cases appropriate for a no-preparation technique.

No-Preparation Case Studies

Case 1

A 24-year-old woman presented six months after completing orthodontic treatment. The patient had a comfortable and balanced occlusion, excellent periodontal health, and no history of existing dental restorations on any of her anterior teeth. Her chief complaints included wanting whiter, bigger teeth and a fuller smile.

Clinically, her teeth had been orthodontically moved to an occlusally stable position and were aligned with no spaces (Figure 1). However, on closer inspection, the maxillary teeth were seen to be in a slight lingual version (Figure 2). An extra-oral view shows that the patient's upper lip was thin and appeared to lack hard tissue support (Figure 3).

From a case selection standpoint, this patient was an excellent candidate for veneers using a no-preparation concept. To confirm this, one of two techniques could be used. The first technique involves the use of a direct resin composite mock-up.⁹ A composite resin veneer could be temporarily fabricated on the teeth to be treated with the no-preparation porcelain veneer. The second technique requires the fabrication of a wax-up of the final desired result. A matrix of the wax-up is created; then, using a temporary acrylic or bis-acryl material, the wax-up is transferred onto the patient's teeth.¹⁰ Either technique allows for the patient and the dentist to get an excellent visualization of the final result both from an esthetic and functional aspect.

In this case, the latter technique was used. Pre-operative impressions were obtained along with a bite registration and sent to the ceramist for evaluation and fabrication of a wax-up. When the wax-up was returned, a matrix of the wax-up was created with a putty impression material.

The patient returned for an esthetic preview appointment. At this time

orthodontic retractors were placed and the maxillary anterior teeth were dried. The putty matrix was loaded with a bis-acryl automix temporary material (Luxatemp®, DMG America), and set in the mouth for four minutes. After four minutes, the matrix was removed. Any excess flash was removed and the temporary material was polished. Now the patient and the dentist were able to get a preview of the esthetics and phonetics. At this time, the patient and the dentist agreed that the patient's esthetic goals and phonetic needs could be accomplished and together they agreed to proceed with treatment.

The temporary material was completely removed from the teeth. The teeth were cleaned with a prophy cup and coarse-grit prophy paste. Final impressions were taken using a polyvinylsiloxane (PVS) impression material (Take 1® Advanced™, Kerr Corp. <http://www.kerrdental.com>). The bite registration from the previous appointment was re-used.

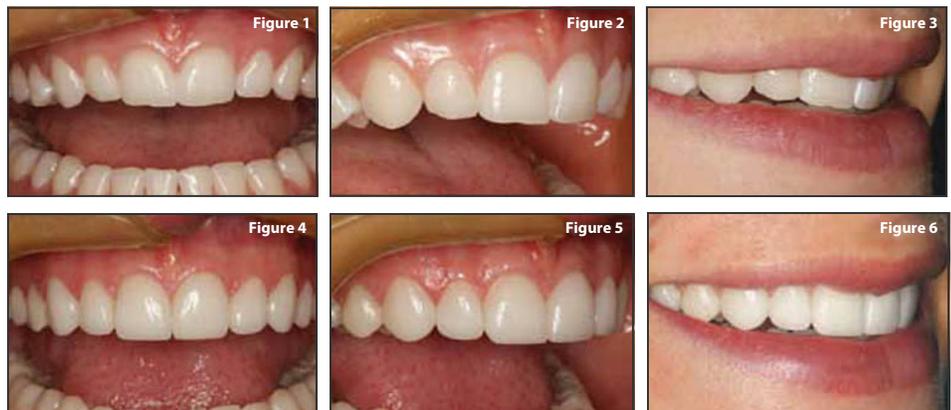
This information, along with pre-operative photographs and written instructions, were sent back to the ceramist. The ceramist fabricated stacked porcelain veneers on teeth #4 through #12 using a highly esthetic stackable porcelain (Venus®, Heraeus, <http://www.heraeus-dental-us.com>). The clinician's expectation was to receive porcelain veneers that were of

minimal thickness (0.3 mm to 0.4 mm) and would slightly raise the value of the treated teeth. On the patient's return, the veneers were tried in and evaluated by the patient and the dentist. Once both agreed that their goals were met, the veneers were cemented into place using a light-cure only translucent shade resin cement (Vitique®, DMG America).

A one week post-operative photograph shows an excellent final result (Figure 4). The no-preparation veneers have filled out and added some needed bulk to the maxillary anterior teeth and eliminated the appearance of a generalized lingual version of the teeth (Figure 5). Also note in Figure 5 the excellent soft tissue health at the one week post-operative point. The veneers also will provide for more hard tissue support of the upper lip and help to create a full and broader smile (Figure 6).

Stacked Porcelain vs. Pressed Ceramic

The previous case demonstrated was completed using stacked porcelain. Stacked porcelain is routinely used in no-preparation veneer cases because it is possible for a talented, experienced ceramist to fabricate stacked porcelain to a minimal thickness of 0.3 mm. A majority of no-preparation cases will tolerate only the smallest addition of porcelain without looking too bulky.



CASE ONE (1.) Retracted pre-operative view. **(2.)** Lateral view shows short incisors with a slight lingual inclination. **(3.)** The patient's smile shows the lingual inclination of the maxillary teeth and the minimal lip support. **(4.)** One-week post-operative view of the ten stacked no-prep porcelain veneers. **(5.)** At the one week post-operative visit, the soft tissue was healthy and there was a greater facial prominence to the teeth. **(6.)** The patient's smile demonstrates how the veneers created a full smile with the addition of facial volume to the teeth.

Until recently, pressed ceramics' minimal thickness was in the 0.7 mm to 0.8 mm range. The inability to fabricate pressed ceramic any thinner than this made it a difficult material to use successfully in no-preparation cases. New technology in pressed ceramic has brought to the dental market a material that is now able to provide a pressed ceramic option for no-preparation veneer cases. A lithium-disilicate material (e.max®, Ivoclar Vivadent, <http://www.ivoclarvivadent.us>) has demonstrated the ability to be pressed as 0.3 mm to 0.4 mm in thickness. Additionally, within the last year, this material has been brought to market in a high-translucency formulation that makes it ideal for use in "no-preparation" veneers.

The pressed version of the e.max material has excellent potential for use as an ultra-thin veneering material. There are many benefits of having the ability to create thin veneers in pressed ceramic. First of all, the pressed ceramic technique is an easier and faster process. Fabricating stacked porcelain veneers is an art form that takes years to learn and perfect. Pressed ceramics is an easier technique to learn. This allows for more laboratories and ceramists to be able to offer ultra-thin veneers. Pressed ceramics are also stronger than stacked ceramics. This has several benefits. There is less chance of fracture during the fabrication and delivery process. Additionally, the better physical properties may mean better longevity for the patients.

The following case study will demonstrate the potential of pressed ceramic veneers using a "no-preparation" concept of treatment.

Case 2

A 24-year-old woman presented for a cosmetic consult. Her chief complaints were that she felt she had a gummy smile and that her teeth were short and uneven. Upon clinical examination, it was noted that there was excessive display of gingival tissue, the incisal edges of teeth #6 through #11 were uneven due to

occlusion and minor acute trauma, there was negative space noted in the buccal corridor, and there was a slight lingual inclination of the central incisors (Figure 7). Aside from an unbalanced occlusion, the patient was in excellent dental health.

To achieve the patient's goals, the following treatment plan was presented: occlusal equilibration; gingivectomy on teeth #6 through #11; and porcelain veneer therapy using a "no-preparation" concept on teeth #4 through #13. The patient agreed to the above treatment plan.

At the first appointment, upper and lower impressions and a bite registration were taken for fabrication of a Kois deprogrammer for facilitation of occlusal correction. After impressions were obtained, the maxillary anterior teeth were anesthetized. Teeth #6 through #11 were evaluated to confirm that a gingivectomy could be performed without violating biological width. Using a diode laser, the gingival levels were raised to decrease gingival display, increase tooth length, and create better soft tissue symmetry. The patient then returned for delivery of the Kois deprogrammer the following week. Then she returned once a week

for three weeks as her occlusion was refined. Figure 8 shows the patient at her last equilibration appointment demonstrating the results of the gingivectomy. At this point, the patient was ready to proceed with the veneer therapy.

Study models were now obtained of the patient with her new gingival contours and balanced occlusion. These models were sent to the laboratory for wax-up for visualization of final restorations. The laboratory was informed that a "no-preparation" concept was desired and that these veneers were to be used to re-establish proper functional occlusion.

For the past year, the author has worked with Dental Arts Laboratories (Peoria, IL) on a concept called Partial Prep Veneers (P²Veneers). Experience over time with the "no-preparation" concept has led to the realization that in some of these veneer cases some preparation is required on a few teeth. But by calling this "partial preparation," the hope is that dentists will grasp that oftentimes preparation can be limited to enameloplasty of only certain parts of specific teeth and not the entire tooth surface.

This case is an example of a partial preparation case. During the wax-up



Case Two (7.) Pre-operative full smile demonstrating excessive gingival display, short uneven teeth, and negative space in the buccal corridor. **(8.)** Post-operative photograph one month after completing the gingivectomy. **(9.)** A sandpaper disc was used to recontour the enamel. **(10.)** A fine diamond was used to reshape the enamel. **(11.)** The post-operative smile shows a decrease in the amount of gingival display, a slight filling of the buccal corridor, and a more symmetrical smile. **(12.)** A retracted view shows the excellent soft tissue response. **(13.)** The patient's new smile after placement of ten DAL Partial Prep Veneers.



phase, the ceramist was able to identify a few areas of the patient's teeth where the porcelain would be either too thin or over-contoured if minor contour changes were not made. He indicated on the study model and re-inforced with a phone call the specific areas that required enamel reshaping.

Figure 9 and Figure 10 demonstrate that many times the reduction required can be accomplished with a sandpaper disc and small fine diamond. This re-contouring was accomplished without the need for anesthetic. New impressions were obtained using a PVS impression material (Take One Advanced) and a new bite registration was sent to the laboratory. The porcelain used for these veneers was the high-translucency (HT) shade of e.max.

The patient returned two weeks later for the delivery appointment. The veneers were tried in with a clear try-in paste (NX3, Kerr Corporation) and evaluated for fit and esthetics. With the approval of the patient and the dentist, the veneers were cemented to place using a light-cure-only translucent composite resin cement (NX3). When the patient returned for her post-operative evaluation, an excellent result can be seen. Figure 11 shows the patient's new smile. The teeth were now even, symmetrical, and slightly whiter. The amount of gingival display was noticeably reduced and there was a filling of the buccal corridor creating the appearance of a bigger, wider smile. Figure 12 shows in a closer retracted view that there was excellent soft tissue health and that there was no excess bulk to the teeth. A full-face photograph shows that the new veneers helped to create a beautiful smile and a patient who was very happy with her smile transformation (Figure 13).

Conclusion

We are now starting to enter a new era in porcelain veneer therapy. It is an important step for cosmetic/elective dentistry. To be able to be truly minimally invasive if not non-invasive in our elective treatment

options gives dentistry the opportunity to make significant changes in patients' smiles and lives with minimal trauma to the patients' teeth. Because tooth structure is sacred, if we do have treatment options that can minimize or eliminate the need for unnecessary removal of tooth structure, we are ethically bound to investigate that option with our patients.

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