In the past decade cosmetic dentistry has changed dramatically with the ability to utilize newer more durable ceramic restorations to alter the appearance of one’s smile. In the 90’s the advent of pressed ceramics allowed for veneers to be fabricated from a stronger material but more aggressive preparations were necessary at approximately eight tenths of a millimeter or more necessitating dentin bonding. The original feldspathic porcelain veneering technique described in the 80’s utilized about half a millimeter of tooth reduction along with enamel bonding to achieve high bond strengths and great success. By comparison the more extensive tooth reduction that came with pressed ceramics utilized more dentin bonding which at the time offered lower bond strengths compared to enamel and restorations often had a reduced longevity.¹

Thinner and more aesthetically appealing restorations have come back into popularity in more recent years with the introduction of lithium disilicate restorations. These modern high strength ceramics can be utilized to fabricate conservative veneers that are approximately three tenths of a millimeter in thickness just like feldspathic porcelains. Furthermore due to enhanced material strength and improved optical properties the ability to create true to life aesthetics with modern materials can again be achieved in extremely thin restorations.

Creating a beautiful smile for our patients is very rewarding but it can also be very challenging. Ceramic veneers have changed the way we approach treating patients in the past twenty five years. Whether it is restoring one tooth or a whole smile with ceramic veneers it is nothing short of amazing in the difference we can make to someone's appearance and life. When veneers were first introduced, they were a minimally invasive procedure to alter the appearance of the teeth and the smile. For many the veneering process changed with time and the advent of newer materials into a more invasive means to alter a smile with the cost often being significant tooth reduction of the teeth and the exposure of dentin. In more recent years, modern lithium disilicate ceramics with their higher strength properties have allowed for less invasive tooth reduction or no reduction just like traditional preparation designs done with feldspathic ceramics. Furthermore the ability to alter the appearance of teeth while maintaining enamel to adhere to and utilizing strong pressed ceramics or traditional feldspathic porcelain veneers yet having substantially higher material strength properties. The current ability to alter the appearance of teeth while maintaining enamel to adhere to and utilizing strong pressed ceramics or traditional feldspathic porcelain is as good as or better than ever before. The continued growth in smile makeovers and porcelain veneers continues to be an area of interest as public awareness grows from more visibility in movies, television and other
media. Based on aesthetics, strength and technique there are many options available to alter our patients appearance, but more importantly that anyone can offer the procedure where applicable with minimal to no damage of the tooth structure. Through proper training and the use of talented technicians we can make incredible changes in a patient’s appearance and recreate beautiful, natural smiles to enhance their lives far better than they could ever imagine while being minimally invasive.

In this case a patient presents post orthodontic therapy with the desire to close spaces, change the shape and remove unsightly decalcifications on the anterior teeth. The patient presented with no periodontal disease and a stable posterior occlusion, but has minimal canine guidance. The treatment plan would be to have the patient’s teeth cleaned followed by impressions to create four sets of diagnostic models. The first set would remain untouched documenting how the case originally presented. The second set would be used to fabricate custom whitening trays for the patient to use at home prior to starting the case while the diagnostic waxup was being fabricated. The third set of models would be to use as a practice preparation model where testing of the hypothetical veneer design takes place. The fourth set of models would be sent to the laboratory for a diagnostic waxup where the models would be waxed to ideal contours (while taking into account the patient’s desired appearance) so that jigs and reduction guides could be fabricated.

There are many ways to work up a cosmetic case diagnosis and treatment plan. Photographs of the case are very important to the diagnostic process in evaluating shapes, color and overall appearance in relation to the face. Various templates and smile design books can assist in development and discussion with the patient and ceramist as to the desired final appearance of the restorations. Additionally digital photographs can be measured and evaluated for symmetry and proportion where modifications, possible treatment procedures and outcomes can be hypothesized and created. Outlines of various teeth shapes can be overlaid onto the existing dentition digitally whereby the aesthetics and positions of teeth and gums can be evaluated more thoroughly by the dentist, specialists, technicians and the patient. Ultimately a diagnostic wax-up needs to be created by using the various forms of input on shape, texture, color, translucency and effects. The diagnostic wax-up, upon approval from the patient, is considered the final treatment plan and can then be used to fabricate a template to create an actual mockup on the patient of the final shape/appearance for further evaluation and verification. In this case the maxillary incisors were in a favorable position facially and adding an additional layer of porcelain was determined to position the facial surfaces out further than what would be aesthetically pleasing. These teeth would need minimum reduction to resurface the facial aesthetics and add to the incisal edges. The canines were determined to be deficient bilaterally from the center line of the tooth to the mesial contact along with the incisal edge needing to be lengthened.

Based on the diagnostic wax-up and the preparation designs attempted on the diagnostic models the dentist and ceramist can determine the type of material to be utilized and any unforeseen problems or hypothetical situations can be discussed prior to starting the case. Feldspathic porcelain which has a flexural strength of approximately 80 mpa can be used when very minimal porcelain is extended off of tooth structure. Leucite based ceramics offer about 125-180 mpa. Lithium disilicate ceramics have a flexural strength of approximately 360-400 mpa and are ideal for conservative veneers or ones that require more strength
when lengthening teeth or replacing larger amounts of unsupported tooth structure.

The first step in this case was to have the patient’s teeth cleaned and polished. (Fig 1-6) Next we had her whiten her teeth at home using the custom fabricated whitening trays until she achieved a plateau in approximately 10-14 days. The color selection needs to be taken approximately 10-14 days after whitening to allow enough time for the color to stabilize. Furthermore no adhesive dentistry should be performed on teeth for two weeks after whitening as bond strengths may be compromised from the residual components.3

While the patient is whitening for two weeks the diagnostic models (Fig 7) are being waxed to ideal shapes based on input from the patient as well as a digital mockup.4 The final diagnostic wax-up was presented to the patient during the two week whitening follow-up. (Fig 8) Based on the patient’s approval we will receive an authorization signature to move forward with the case using the wax-up as a template by the patient so that we could then fabricate depth reduction guides, a buildup provisional template, custom impression tray and assorted jigs for the master ceramist.

Local anesthetic (2 carpules 2% Lidocaine w/ 1:100,000 epi) was given. Prior to preparing the teeth a periodontal probe is used to sound to bone anywhere that an interproximal contact needs to be created or a gingival embrasure black triangle needs to be closed. This will help determine where the final contact point will need to be in the restoration to have the gingival
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tissues fill in the area such that gingival black triangles can be eliminated. The four maxillary incisors were next to be prepared for veneers. The first step is to cut depth grooves so that minimal yet ideal tooth structure can be removed. All of this should have been predetermined as to how much reduction would be necessary prior to the preparation appointment by practicing on one of the four sets of diagnostic models of the patient’s dentition. Using specially designed depth cutting burs that offer tenth of a millimeter increment depth cuts (Lasco Corporation) followed by diamond burs from the Aesthetic Dental Designs® bur kit (Brasseler USA) in an e-Stasis SLM electric handpiece (SciCan) the teeth would be reduced to ideal depths. (Fig 9-11) #00 retraction cord (Ultradent Products Inc) was placed on all six teeth with no astringents. The gingival margins were then refined on the maxillary incisors with a sonic handpiece and diamond coated inserts (Komet USA). The canines had no preparation done to them as the deficient areas already had adequate space that would be filled in with partial coverage veneers. Photographs were taken to document the prepared tooth shade for the laboratory. Impressions were taken with a vinyl polyether silicone impression material (EXA'lence, GC America) in a customized stock Heat Wave impression tray (Clinician’s Choice). (Fig 12) A wax bite (Delar Corp) and earbow (SAM 3, Great Lakes Prosthodontics) were used along with shimstock (Almore Corp) to be able to mount the final models and maintain the same occlusion. The provisionals were then fabricated from a baseline over impression of the diagnostic wax-up using a polyvinyl siloxane (Template, Clinician’s Choice). The teeth were treated with tuberculid red (Global Dental) prior to placement of the Structur 3 temporary acrylic shade B1 (VOCO). The provisional restorations were locked on mechanically.
and hence did not need temporary cement. The minimal flash of acrylic was due to the excellent adaptation that a beadline provisional template imparts when used for aesthetic cases. The restorations needed to just be wiped with an alcohol gauze to remove the minimal oxygen inhibition layer. (Fig. 13-14)

At the next visit local anesthetic (2 carpules 2% Lidocaine w/ 1:100,000 epi) was given followed by removal of the temporaries. The teeth were cleaned with a Crystal Air heliabrasion unit (CrystalMark Dental Systems, Inc. Glendale, CA.) taking care to avoid contact with the gingival tissues. The veneers were evaluated as to shape, color, texture, margins and contacts on
the models. (FIG L1-3) The veneers were silanated prior to try-in with porcelain prime / bis-silane (Bisco Corporation). A translucent water soluble try-in gel (Choice 2 Bisco) was used so the restorations could be evaluated for fit, occlusion and esthetics. The restorations were evaluated by the patient and upon approval a signature was received to authorize cementation. The restorations were steam cleaned and the teeth were rinsed thoroughly to remove any water soluble try-in paste. The veneers were then redundantly silanated and placed under a heating element briefly and allowed to dry. Preparations in enamel have a better longevity for many reasons, however the most substantial one is that bonding to dentin with resins can have a 30-40% decrease in microtensile bond strengths in as little as 6 to 12 months.9-13 The teeth were isolated and etched followed by All Bond 3 adhesive and translucent Choice 2 light cured resin cement (Bisco Corporation) were used per the manufacturer’s instructions. The majority of the excess resin cement was removed leaving only a small amount on the margins. The restorations were cured with a Vaio LED curing light (Ultradent Corporation). Excess material was then cleaned off with tungsten carbide carvers (HuFriedy) and the contacts were flossed. Leaving a small amount of excess resin allows for certainty of complete curing without having an air inhibition layer on a margin in addition to avoiding having a margin that is not sealed completely. The final restorations having been cleaned, contacts checked and any excess resin on the margins been removed were then evaluated.(Fig 15-23) Occlusion and excursives were then verified with TrollFoil (Troll Dental) and shimstock (Almore). (Fig 24-26) The patient returned a few weeks later for post-operative evaluation and a clear overlay retainer.

This case highlights the importance of recognizing that where deficiencies in tooth structure, positions or length are involved traditional feldspathic porcelain can be used to recreate ideal shapes, color, texture and function. When higher strength properties are required the modern high strength lithium disilicate ceramics can be utilized in the same fashion to compensate and replace the deficient tooth space with a non-invasive prepless veneer technique. However where teeth are already in a favorable facial position, minimally invasive preparation techniques that maintain enamel are still necessary to allow for adequate space for beautiful ceramics and ideal tooth shape.14

References

About the Author
Todd C. Snyder, DDS, AAACD attended three years of college at the University of California at Riverside, forgoing the last year and a Bachelor’s of Science degree to enroll early into dental school. Dr. Snyder received his D.D.S. in 1994 from the University of California at Los Angeles, School of Dentistry. He subsequently completed a General Practice Residency at the V.A. Medical Center, La Jolla, California.