Evolution of Comprehensive Care, Part 6
Aesthetics, Veneers, and Whitening

Authored by Gregori M. Kurtzman, DDS, and David Ouellet, DDS

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Effective Date: 1/01/16 Expiration Date: 1/01/19

About the Authors

Dr. Kurtzman is in private general practice in Silver Spring, Md. A former assistant clinical professor at University of Maryland, he has earned Fellowship in the AGD, American Academy of Implant Prosthodontics, American College of Dentists, International Congress of Oral Implantologists (ICOI), Pierre Fauchard Academy, and Association of Dental Implantology; Masterships in the AGD and ICOI; and Diplomate status in the ICOI and American Dental Implant Association. He has lectured internationally on the topics of restorative dentistry, endodontics, implant surgery and prosthetics, removable and fixed prosthetics, and periodontics, and he has published more than 450 articles. He has been included in Dentistry Today's Leaders in Continuing Education directory since 2006. He can be reached via email at dr_kurtzman@maryland-implants.com.

Disclosure: Dr. Kurtzman received honoraria from DenMat for writing this article.

Dr. Ouellet is a native of Boston and a graduate of Georgetown University Dental School. He maintains a successful practice in Santa Maria, Calif, where he specializes in adhesive cosmetic dentistry. He has conducted clinical research for placement and evaluation of composite resin and has published numerous clinical and research-based papers. An accredited member of the American Academy of Cosmetic Dentistry, he has also conducted lectures and hands-on workshops on aesthetic materials and techniques internationally. He can be reached via email at drill2thdk@aol.com.

Disclosure: Dr. Ouellet is a lecturer for DenMat.

INTRODUCTION

Aesthetic changes are an increasing interest for patients as they seek improvement of their smiles. These may range from minor alterations of the teeth, to reshaping sharp or chipped areas, to full makeovers done to improve not only the shape of the teeth but also the shade. Sometimes, minor issues with the teeth in the smile zone are a subconscious matter for the patient and, when pointed out by the practitioner and corrective options to correct these issues are explored, the patient may choose to have treatment that will achieve a more aesthetic smile.

Anti-Aging Recontouring

As we age, teeth in the smile zone may experience incisal wear, resulting in a squaring-off of the incisal edges and the leveling of the incisors. This may make patients look older than they actually are. Frequently, clinical conditions, such as incisal wear and other age-related changes, are ignored by the dentist and hygienist during recall examinations. But, when pointed out to the patient that minor correction can be performed to give a more youthful smile without the need for anesthetic and completed at that same visit, many patients are willing to agree to a treatment plan. These areas can be colored intraorally with a fine-point black marker to illustrate to the patient when minor recontouring can be performed. This helps the patient visualize what exact changes could be possible if the incisal corners were rounded or the edges of the laterals shortened slightly with minimal changes to the enamel. Once the patient agrees, the enamel can be contoured with finishing diamonds, starting with a fine-grit, and completing the recontouring with an ultrafine diamond (such as Piranha [SS White Burs]; or DET6F and DET9F [Brasseler USA]). Porcelain polishing paste (DenMat) can be applied in a rotary cup to restore the luster lost from years of wear, completing the minor recontouring rehab.

PREP OR NO-PREP? THAT IS THE QUESTION!

Smile improvement may not be achievable with minor recontouring, thus more extensive treatment may be required to meet a patient’s expectations and aesthetic demands. Ceramic veneers are certainly a viable treatment option. There is a controversy over whether the teeth should be prepared or not. However, a rationale to how that decision should be made depends on what is present, and what the patient wishes, in order to achieve in a smile makeover. Is shade the issue? Or, perhaps alignment? Or is it a combination of both?

Factors influencing no-prep versus prepping include the shade of the teeth as well as the position of the teeth in the arch (rotations, tipping, and tooth structure bulges). Veneers can be fabricated with a minimal thickness of 0.5 mm, but as the veneer gets thinner, it is less able to mask the underlying tooth shade. This becomes problematic when shade changes are needed, as in cases involving tetracycline staining. This can also influence the luting resin that will be used. For example, if the veneer is not being used to drive the change to the tooth's shade, or is being made thicker, a clear luting resin can be utilized (ie, Ultra-Bond Clear [DenMat]). But, when dark teeth are to be masked, an opaque resin is required to block the underlying tooth shade; otherwise, the result is dark show-through of the underlying color. This is particularly true when
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a no-prep approach is used. Teeth that are rotated, tipped facially, or already bulky facially will require some preparation to prevent the resulting veneered teeth from being overly large.

It is also important to note that there are finishing differences related to the margins of no-prep and minimal prep veneers. The less the practitioner prepped the teeth prior to impressions, the more time and effort required to finish the margins of the final restorations. To achieve the best results, a stump shade (shade of the resulting prepped tooth structure) should be provided to the laboratory team so that the final shade outcome meets expectations.

No-Prep Indications
When teeth are flattened on the facial surfaces, and no rotations are present, a no-prep approach may be indicated. As an example, a female patient presented with the complaint of dark teeth related to tetracycline staining with generalized minor spaces in the maxillary and mandibular anterior. Incisal wear and facial surface wear were noted in the maxillary incisors (Figure 1). A no-prep approach was determined to be applicable in this case.

Upon return of the completed leucite-reinforced porcelain veneers (Lumineer Cerinate II [DenMat]), the luting process was modified to further mask the tetracycline staining. A thin layer of pink opaque resin (TetraPaque Pink [DenMat]) was applied over the adhesive that had been previously applied to the etched teeth as directed. Next, resin cement (Ultra-Bond [DenMat]) was placed into the veneers, and then they were seated and light cured (Sapphire Plus Plasma Arc Curing Light [DenMat]). The pink tone of the modifier neutralizes the dark stains, resulting in a warmer, natural color (Figure 2).

With many no-prep cases, color can be challenging as practitioners using a no-prep approach are limited to shade selection with lighter base shades. This follows the idea that the lighter (whiter) the shade selected, the better it will be in masking the resulting veneered tooth. If not done properly, the result is often a white tooth with an unaesthetically dark show-through. When a case has extremely dark teeth, ceramics that are more opaque (such as Lumineers [DenMat] made with low translucency [LT] leucite-reinforced [Cerinate II] or LT lithium disilicate [Ivoclar Vivadent’s IPS e.max]) will provide better masking of the dark base tooth structure.2

Minimal Prep

Though many cases can be done with a no-prep approach, there will be times when some preparation of the tooth is required. The key to predictable success when tooth preparation is needed is maintaining as much enamel as possible. This translates to preparing only the portions of the tooth that require some reduction, leaving the remaining tooth unprepared. The rationale is that enamel bond strength is higher and more predictable in the long term than with dentin bonding.3

But how do we determine where to prep and where not to prep? Let’s look at 2 typical cases to illustrate the minimal-prep concept.

In case 2, the patient presented with the complaint of rotated anterior teeth and a desire for an improved smile (Figures 3 and 4). Further, the patient was happy with the shade of the teeth and only wished to address the maxillary arch. The right maxillary cuspid was tipped distofacially and the centrals were both rotated mesially. No wear was noted, and a small diastema was present between the left lateral and the cuspid. Minimal reduction was indicated to achieve a finished case that had normal facial contours and was not too bulky. The cuspids bilaterally would be reduced on the facial incisal half of the tooth in order to tip the tooth slightly lingually and to decrease the prominence with which they presented. Additionally, to address the mesial rotation of the centrals, the distofacial one third of both teeth would be minimally prepared (Figure 5). The incisal edges were also rounded to remove any sharp line angles to prevent stress concentration in the veneers that could potentially lead to stress cracking under function (Figures 6 and 7). Leucite-reinforced porcelain veneers (Lumineer Cerinate II) were returned from the dental lab team (DenMat Lab). The veneers were inserted following the bonding protocol outlined
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earlier in this article and the occlusion adjusted as needed (Figure 8). The resulting treatment restored the anterior teeth to normal contours, correcting the initial complaints with minimal reduction of tooth structure (Figure 9).

**Minimal Prep When Spacing Is Present**

What is the protocol when spacing is present? Case 3 illustrates that minimal preparation may still be needed when spacing is present and no rotations are being dealt with.

The patient presented with chalky discoloration to the teeth with a midline diastema. Examination noted that although the central incisors had a flat facial, the laterals and canines bilaterally were prominent in the mid-facial area. The incisal length of the centrals was slightly long, and the laterals were too short compared to the adjacent anterior teeth (Figure 10).

Minimal preparation was needed to flatten the bulkiness of the laterals and cuspids so that the resulting veneers would be natural in contour. Additionally, the incisal edges were modified slightly on all the teeth involved in treatment. To develop better width-to-length ratios, the distal of the centrals required slight modification to allow widening of the laterals. Marks were made intraorally with a black marker to help the practitioner determine where minimal preparation was required (Figure 11). Following minimal preparation, the arch was ready for impressions and again, as preparation had been confined to enamel with no dentin exposure, temporization was not needed (Figure 12). The IPS e.max (lithium disilicate) Lumineers were returned from the lab (DenMat Labs) and were inserted following the author’s suggested bonding protocol. The result was natural-looking teeth with better width to length proportions and elimination of the chalky appearance (Figure 13).

**Luting Protocol Affects Long-Term Outcome**

How the veneer is luted plays a factor in the long-term success of the treatment, and the luting protocol is important.

Following try-in, the veneers should be etched with a citric acid (Porcelain Conditioner [DenMat]) for 30 seconds to remove any plaque that may have contacted the bondable surface and to acidify the ceramic, thus improving the action of the silane being applied. A silane (such as Cerinate Prime [DenMat]) is applied to
the interior surface of the ceramic veneer and allowed to sit for a minimum of 60 seconds. Silane, a synthetic hybrid of inorganic-organic compounds, improves the bond strength of the luting resin to the ceramic by coupling with the hydroxyl groups on the ceramic and the organic portion of the resin cement.4

The teeth must be isolated and then cleaned with a slurry of pumice and distilled water to remove any plaque. A combination of 25% phosphoric acid with 0.5% aluminum oxalate (Etch ‘N’ Seal [DenMat]) is applied to the teeth for 30 seconds, then rinsed and dried. This etches the enamel and conditions any exposed dentin. Three coats of an adhesive (such as Tenure Multi-Purpose Bonding Agent [DenMat]; CLEARFIL SE BOND [Kuraray]; or OptiBond FL [Kerr]) is applied, air-thinned, but not light-cured.

The veneer is air-dried to remove any remaining silane; rinsing is not advised. A light-curable ceramic veneer luting resin (such as Ultra-Bond) in the desired shade is applied from the syringe into each veneer and they are seated, ensuring they are aligned properly. When tack-curing the veneers, do not apply any pressure to the veneer, as this can lead to ceramic cracking during light curing from polymerization shrinkage of the resin. A curing light is used to tack-cure each veneer for one second and then a sharp instrument is utilized to flake off excess cement. Alternatively, a No. 12 scalpel blade can be used to carefully trim any marginal resin. The veneers are then light-cured for 30 seconds on facial and lingual each. Finishing carbides (such as SE9 20 blade [SS White Burs], ET 12 bladed [Brasseler USA], or FS9F 16 blade [Komet]) are utilized at the margins to remove residual resin and create smooth margins. Used correctly for these purposes, carbide-finishing burs have minimal impact on the ceramic surface, whereas a diamond-finishing bur will abrade the ceramic surface creating plaque retention areas. A Ceri-Saw (DenMat) is utilized to open the contacts and to clear any cured resin in the proximal. This can be followed by the Ceri-Sander (DenMat) or ET Flex (Brasseler USA) if excess resin remains and the proximals need contouring to remove the resin. Final interproximal finishing would then be accomplished using abrasive strips (such as EPITEX [GC America]) or similar product that will remove resin without alteration to the ceramic. The occlusion is checked and adjusted as required. Final polishing of the adjusted surfaces and margins is performed with a Dialite Feather Lite Gray Polisher (Brasseler USA) with Porcelain Laminate Polishing Paste (DenMat) or Dialite Intra-Oral Porcelain Polishing Paste (Brasseler USA).

Patients may also present with dissatisfaction with their smile in general or are just unhappy with the shade of their teeth. Thus, whitening may be the only treatment indicated/desired or it may be a part of the overall treatment. Some controversy still exists with regard to in-office whitening using light; whether the light is effective in enhancing the shade or if it may just be a marketing gimmick. Yet, there are some initial benefits to use of the light, along with potential drawbacks. Light-enhanced whitening is required with some whitening systems (ie, ZOOM! [Philips Oral Healthcare]) and optional with other in-office systems (LumiSmile White [DenMat]). Henry et al5 reported that the use of light with a 25% hydrogen peroxide for in-office whitening produced better results than not using the light, up to one week post-treatment. After one week, subjects were unable to tell the difference with a split-mouth design between the side that was whitened with the light and the side without.5 But, other studies show that using

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**CASE 3**

Figure 10. Patient presented with a midline diastema, chalky discoloration to the enamel and bulkiness to the canines and laterals at the mid-facial area.

Figure 11. Markings have been placed intraorally indicating where minimal reduction was needed. Mid-facial of the laterals and canines will be flattened so that the resulting veneer would not create a bulky appearance. The incisal edges of the teeth to be treated would be contoured slightly.

Figure 12. Following minimal contouring and rounding of all line angles and flattening of the mid-tooth bulges the teeth are ready for impressions.

Figure 13. Following luting of the porcelain veneers, the width/length ratios are more harmonious and the shade offers a more natural aesthetic appearance. (Figures 10 to 13 courtesy of Dr. David Ouellet.)

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**WHITENING**

Patients may also present with dissatisfaction with their smile in general or are just unhappy with the shade of their teeth. Thus, whitening may be the only treatment indicated/desired or it may be a part of the overall treatment. Some controversy still exists with regard to in-office whitening using light; whether the light is effective in enhancing the shade or if it may just be a marketing gimmick. Yet, there are some initial benefits to use of the light, along with potential drawbacks. Light-enhanced whitening is required with some whitening systems (ie, ZOOM! [Philips Oral Healthcare]) and optional with other in-office systems (LumiSmile White [DenMat]). Henry et al5 reported that the use of light with a 25% hydrogen peroxide for in-office whitening produced better results than not using the light, up to one week post-treatment. After one week, subjects were unable to tell the difference with a split-mouth design between the side that was whitened with the light and the side without.5 But, other studies show that using
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Light does not have any significant effects in enhancing whitening after a short initial period. Treatment with or without the light produced satisfactory and long-lasting whitening results. So, for those patients who need a quick effect, related to an upcoming function, use of the light may give an enhanced quicker initial result and can be an option. The improved initial effect with the light appears to be related to dehydration of the enamel, and as the teeth rehydrate for the first week, that benefit appears to even out.

There are some potential negatives to light-enhanced whitening. As the light increases the risk of tooth sensitivity during in-office bleaching, it may be advisable to avoid use of a light in those patients with sensitive teeth prior to whitening. Some have expressed concern with regard to pulpal changes when the light is used. However, this has not been supported in the literature, as no pulpal changes have been reported compared to not using the light.

It has been long accepted that at-home tray whitening can provide similar results to in-office whitening, given sufficient time and proper patient compliance. Since patient compliance is often a challenge, there is still a need for in-office whitening. This removes the patient compliance from the results and provides a kick-start to the results. The patient can follow up with tray whitening less frequently to maintain the results, if they so choose.

LumiSmile White is an in-office whitening system that gives the practitioner the option of use of the light or use without a light. When the light is not to be used, tissue isolation is lessened as the protection from the light burning the lips and tissue is removed from the procedure. But, dramatic results can be achieved in a single visit without patient reports of sensitivity. As a prelude to other treatment, the patient decided to start with in-office whitening and had reported light generalized sensitivity at times. Following treatment, the patient reported no sensitivity during (or in the days after) treatment and a significant shade change resulted that remained stable long-term (Figure 14).

**TRANSITIONAL AESTHETICS AND TEMPORIZATION**

Patients may present with needs for temporary aesthetic improvements. These transitional needs may encompass improvement in the aesthetics for an event they plan to attend or may be part of ongoing treatment. With regard to implant treatment temporization, when the implants cannot be immediately loaded, there are several options. This includes the traditional acrylic partial denture with and without clasps (“flipper”), which requires some palatal coverage in the maxillary arch and tends to be bulky to replace one or 2 teeth. Additionally, there is potential that the temporary prosthesis could under-function, load the top of the implant, and potentially lead to integration failure. An alternative that has been used is the Essix temporary (DENTSPLY Raintree Essix). This consists of denture teeth placed into the edentulous space.
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and a clear vacuform shell fabricated that is retained on the remaining teeth in the arch. This has the benefit of avoiding occlusal pressure on the implants but can be an aesthetic issue with some patients due to the visibility of the clear resin on the anterior teeth.

Snap-On Smile (DenMat) is another available option with the benefits of the Essix, but better aesthetics. These are available in a multitude of shades to match the patient’s shade, or a whiter shade can be selected to allow the patient to “test drive” what an improved smile could look like as part of the treatment. Snap-On Smiles are fabricated from a flexible acetyl resin that engages the cervical undercuts of the remaining teeth for retention. These require at least one tooth distal to the space and cannot be used in cantilever sections (Figure 15). They can be used as unilateral transitional prosthesis (Figure 16) or as a full-arch prosthesis (Figure 17), depending on the patient’s desires and demands. The unilateral (partial-arch) Snap-On Smile has openings in the occlusal surface to maintain the original vertical dimension of occlusion when being used to replace teeth and the occlusion is acceptable prior to treatment (Figure 18).

CLOSING COMMENTS
Aesthetic dentistry fits what the general practitioner does daily. Yet most dentists only assess aesthetic needs when patients express dissatisfaction with their smile. This dissatisfaction is usually not addressed until the dentist or hygienist opens up the conversation with the patient; therefore, when examining patients, we need to determine what aesthetic issues are present and offer options from the beginning. These can range from minor recontouring, to the correction of some age-related wear, to more extensive care that can involve ceramic veneers. Whitening can be used either alone, or as part of the total aesthetic treatment, knowing that in-office procedures offer faster results than at-home whitening without sensitivity issues.

References
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1. As we age, teeth in the smile zone may experience incisal wear, resulting in a squaring-off of the incisal edges and the leveling of the incisors.
   a. True  b. False

2. Factors influencing no-prep versus prepping include the shade of the teeth as well as the position of the teeth in the arch (rotations, tipping, and tooth structure bulges).
   a. True  b. False

3. When teeth are flattened on the facial surfaces, and no rotations are present, a no-prep approach is not indicated.
   a. True  b. False

4. The key to predictable success when tooth preparation is needed is maintaining as much enamel as possible, because enamel bond strength is higher and more predictable in the long term than with dentin bonding.
   a. True  b. False

5. When tack-curing the veneers, one should apply moderate pressure to the veneer, as this will prevent movement and polymerization shrinkage of the resin during light curing.
   a. True  b. False

6. Some controversy still exists with regard to in-office whitening using light; whether the light is effective in enhancing the effect or if it may just be a marketing gimmick.
   a. True  b. False

7. As the light increases the risk of tooth sensitivity during in-office bleaching, it may be advisable to avoid use of a light for those patients who have sensitive teeth prior to whitening.
   a. True  b. False

8. According to this article, there is a potential that a temporary prosthesis could under-function, load the top of the implant, and potentially lead to integration failure.
   a. True  b. False
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Please check the correct box for each question below.

1. ☐ a. True. ☐ b. False
2. ☐ a. True. ☐ b. False
3. ☐ a. True. ☐ b. False
4. ☐ a. True. ☐ b. False
5. ☐ a. True. ☐ b. False
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