

NET-"WORKING"

It is incredible that a happy patient moved to another state and was able to continue to refer patients; this emphasizes the importance of treating all of our patients the best we possibly can.



It is fascinating to discover how patients learn about our practice for the first time. While my marketing budget serves a purpose, it is no surprise that a majority of patients are referred by an existing—and incredibly loyal—patient base. Dani was no exception. A former patient had had porcelain veneers placed in our office months earlier and, shortly thereafter, relocated to Miami, Florida, where she met Dani (this issue’s cover patient). Dani admired her smile and was told that the work was done by our office, in Northern Virginia. I received an e-mail from Dani expressing interest in a smile consultation. After reviewing Dani’s case (her e-mail had provided excellent photographs of her smile from different angles and she described her current smile and her desired changes), I wanted to steer her in the right direction with respect to appropriate treatment options and where she might seek similar treatment closer to her home in Miami.

After a lengthy discussion and reviewing cases on our Web site together, she decided to make the trip from Miami to my office.

On the day of her appointment, I reserved a significant amount of time to ensure that we would be able to deal with any unforeseen issues and to take the preoperative photographs and radiographs. Dani was the perfect patient—she came prepared to discuss her smile design both with images of smiles she loved, as well as smiles she disliked. She knew exactly what she wanted and how to convey that information, and she was happy to include my team in shade and shape selection. In short, everything worked out just as it should!

We were both more than pleased with the result. She said, “I appreciated that everyone involved listened to exactly what I wanted to accomplish, and this was communicated very effectively to the dental laboratory, which created the smile I had always dreamed of. I couldn’t be happier with my smile makeover and the confidence it has given me!”

Cases such as these can truly help to grow our practices. As a result of one happy patient moving to Miami, I was rewarded with the opportunity to meet and treat Dani—an ideal patient with an ideal outcome. It is marvelous that a happy patient moved to another state and was able to continue to refer to our practice; this emphasizes the importance of treating all of our patients the best we possibly can.

For information on the clinical aspects of this case, please turn to page 52.

Restorative dentistry and clinical images: Hamada Makarita, DDS, MAGD, FAACD (Oakton, VA). Laboratory technician: Ryan Chung (Golden Vertical Ceramics; Oakton, VA). Cover photography: Gary D. James (Miami, FL). Cover photos shot with a Canon (Lake Success, NY) EOS-5D Mark II camera.



Preoperative



Postoperative

Long Distance is No Distance

Social media sites make it easy to share experiences and opinions with people across the globe. Thanks to social media, Dr. Makarita's successful restoration for one loyal patient led to an unexpected and exciting chain of events.

A loyal patient moved to Miami, where she works with Dani. Dani admired her new co-worker's smile, which led to a referral to Dr. Makarita. Dani decided to travel from Florida to Virginia to have her smile restored by Dr. Makarita. Immensely pleased with the results, Dani posted pictures of her smile makeover on Facebook. Repeating the cycle, a complete stranger, Veronica (pictured below with Dani and Dr. Makarita), noticed her smile and asked where she had it done. Via e-mails and photographs, Dr. Makarita collaborated with Veronica, who also traveled to Virginia for a smile makeover.

As a result of one happy and loyal patient, Dr. Makarita acquired two more. Goodwill multiplies, and with the help of the Internet and social media sites, it multiplies even faster.

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The Laboratory Ceramist:

An Integral Team Member

A Successful Collaboration Creating Veneer Restorations

Abstract

Dental materials and techniques continue to evolve, especially in response to the surge in cosmetic procedures. Dentists are being inundated with material advances and time-saving techniques. Amidst all these developments, however, the interdisciplinary importance of the laboratory ceramist/technician can sometimes be neglected. This article highlights the collaborative relationship between dentist and ceramist, the significance of their partnership, and the relevance of the scientific knowledge and artistic skills possessed by laboratory personnel in the outcome of predictable and esthetic restorations.





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Producing esthetically pleasing and predictable restorations is a creative process requiring input from the patient, dentist, and ceramist.



Figure 1: Full-face preoperative view of the patient's dentition.

Introduction

The armamentarium of restorative materials available today help make dental procedures faster, easier, and more predictable but can also be somewhat bewildering. Often designed with specific characteristics useful for particular modalities—whether superior esthetics for anterior dentition, strength and durability for posteriors, ease of use, or any myriad of advanced properties—each material has its advantages and disadvantages. Producing esthetically pleasing and predictable restorations is a creative process requiring input from the patient, dentist, and ceramist.

While the roles of the patient and dentist are a given, inclusion of the ceramist during treatment planning can sometimes be overlooked. Dentists should rely on laboratory technicians and ceramists for their knowledge and expertise as important members of the interdisciplinary team. Trained to combine artistic skill with their knowledge of material handling properties, tooth anatomy, stains, glazes, and substrates,^{1,3} laboratory ceramists specialize in recreating tooth color, form, and function according to the patient's and dentist's desired specifications.³⁻⁵ Simultaneously, they are fabricating long-lasting, functional, and life-like restorations indistinguishable from natural dentition.^{1,2,3}

In many cosmetic cases, there will be more than one material and technique suitable for treatment. For instance, conservative smile makeovers with worn and/or misshapen dentition could be treated with porcelain laminate veneers created from feldspathic porcelain layering techniques or with a pressable ceramic using the cut-back technique.⁶⁻¹⁰ An assessment of patient expectations, esthetics, tooth position, color, shape, angulation, and substrate, as well as functional considerations and occlusal relationships, all help dictate the appropriate material and procedure.⁶⁻¹⁰ The importance of communication between dentist and ceramist becomes apparent when the number of factors affecting achievement of a successful restoration are considered.

Also to be considered are the experience levels of the dentist and ceramist. It may be advisable for a less experienced dentist to collaborate with an experienced laboratory partner. Together, a design plan is created to maximize material selection and technique, deliver the patient's anticipated results, and ensure the predictability of the restorative outcomes.^{11,12}

Case Presentation

A 29-year-old female presented with crowding of the anterior teeth and rotation of the central incisors, which she felt were too square (Figs 1-3). She presented with an uneven gum line, and her smile did not represent the desired Golden Proportion. The comprehensive examination revealed an overall healthy dentition with excellent periodontal health, a stable occlusion, and no presence of decay. However, in addition to the rotated and crowded teeth, the patient had slightly worn anterior central incisors; an old, stained, and worn composite resin restoration on the facial of tooth #10; and a deficient buccal corridor. She also presented with flat incisal edges on the cuspids that gave a worn appearance, and teeth #6 and #7 were longer than their contralateral counterparts (Fig 4). Dissatisfied with her condition, the patient desired a brighter and whiter smile with straight, slightly longer teeth, and a “fuller” appearance.

Treatment Planning

The possibility of orthodontics was discussed with the patient as an option, but she wanted longer, whiter teeth with a different shape. Therefore, porcelain veneers were the treatment of choice for teeth ##3-14 and ##19-30. The goal was to improve the proportions, rotations, and length. To achieve proper gingival symmetry, a gingivectomy was required on teeth ##7-10 (WaterLase YSGG hard/soft tissue laser, Biolase Technology; Irvine, CA) (Fig 5).

To minimize the patient’s travel between Miami, where she lived, and our office in Northern Virginia, a wax-up was not prepared in advance. Therefore, as the patient wanted a slightly lengthened dentition, a resin mock-up was performed intraorally to determine the proper length, width, and general proportions of the new smile. The patient was left unanesthetized to evaluate her overall smile, as well as the length of her teeth with her upper lip at rest. Details of the design were noted and included as part of the laboratory prescription.

However, to better visualize teeth proportions and determine central incisor length and width, bulk reduction of proximal line angles of the central incisors was completed prior to the composite mock-up (Fig 6). The patient chose treatment up to and including the first molars to avoid a noticeable shade difference in her smile. Slice preparations between the central and lateral incisors were necessary to straighten



Figures 2 & 3: Preoperative 1:2 views showing overlapping, crowding, and rotation of the short central incisors.



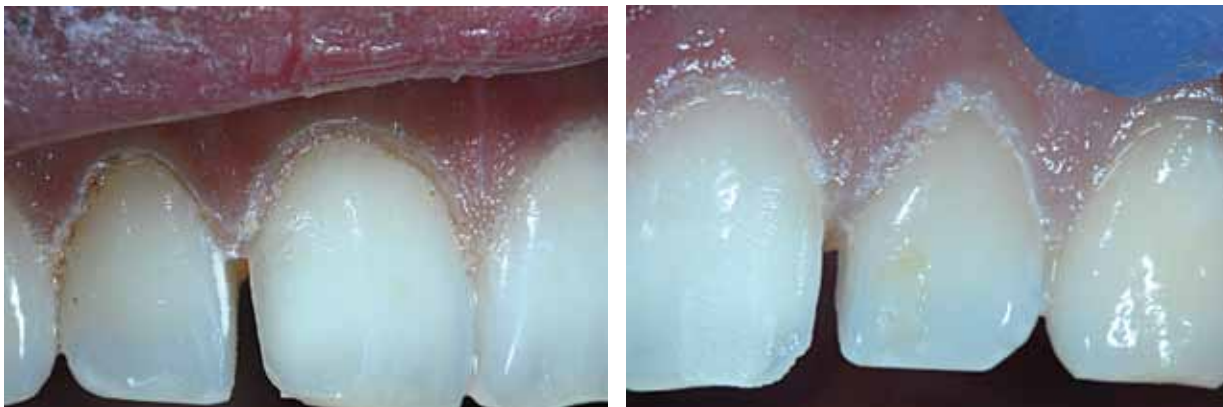
Figure 4: Preoperative 1:2 retracted view of the gingival asymmetry in ##7-10.



Figure 5: Gingival recontouring was performed using a hard/soft tissue laser to achieve proper gingival heights and zenith.



Figure 6: Bulk reduction of the proximal line angles of the central incisors was performed to better visualize teeth proportions prior to the intraoral composite mock-up and to determine the appropriate central incisor length and width.



Figures 7 & 8: Slice preparations between ##7-10 were required to create proper spacing and achieve Golden Proportions.

the central incisors, eliminating both overlap and crowding while simultaneously creating the proper spacing and height-to-width ratio required for the ceramist to produce the desired Golden Proportions (Figs 7 & 8). Minimal preparation was required on the premolars and molars.

To attain the desired difference in length between the incisal edges of the central and lateral incisors, a measurement was taken and included with the laboratory instructions. Adding porcelain to the facial aspect of the premolars would increase the buccal corridor; therefore, the proper information was relayed to the ceramist.

Material Selection

Due to the generally conservative nature of the restorations, several available materials were suitable for use. The feldspathic porcelain layering technique and the cut-back technique using pressable ceramic (IPS Empress, Ivoclar Vivadent; Amherst, NY) were both options. However, high-translucency lithium disilicate (IPS e.max HT)—using the cut-back and layering technique—was the material of choice primarily due to its translucent optical properties and material strength. Featuring a relatively low refractive index, lithium disilicate mimics the light transmission observed in natural dentition¹³⁻¹⁷ and provides a distinct advantage in translucency over other materials, particularly opaque zirconia.¹⁷

Produced with varied optical properties (i.e., high opacity [HO], medium opacity [MO], low translucency [LT], and high translucency [HT]), lithium disilicate ingots display true-to-nature properties and exceptional esthetics, making it ideal for this case due to the patient's preparation shade of A1/B1.¹³⁻¹⁷ Darker teeth would have shown through the translucent lithium disilicate material.

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Figure 9: Provisional restorations were created from the preoperative dentition because a prior wax-up had not been created.

Strength-wise, lithium disilicate contains approximately 70% by volume needle-like crystals in a glassy matrix^{13,14} and is uniquely designed with a controlled size, shape, and density to demonstrate greater strength and durability.¹³⁻¹⁵

After considering all factors involved, the interdisciplinary team agreed to create 24 IPS e.max HT veneers for teeth #3-14 and #19-30. To attain optimal esthetics, an OM2.5/OM3 blend (Vita 3D-Master Shade Guide, Vident; Brea, CA), medium translucency in both volume and intensity, with a light to medium texture, was chosen for the final shade.

Provisionals

As previously mentioned, an intraoral composite diagnostic mock-up was prepared in place of a pre-fabricated wax-up to minimize the patient's trips between Florida and Virginia. An impression was made of her existing dentition to use as a matrix for her provisional restorations once her preparations and final impressions were completed (Fig 9). Prior to placing the provisional restorations, a symmetry bite was taken to verify midline and avoid canting, and a photograph of this in place was sent to the laboratory, along with a photograph of the preparation shade.

A bleach shade was selected for the provisional restorations, which were placed with a resin-based temporary luting material (Telio CS, Ivoclar Vivadent), which was chosen for its high translucency to ensure esthetic results as well as its adhesive properties.¹⁸ As an important step in the treatment process, the provisionals enabled the patient to maintain function and esthetics while protecting exposed surfaces. They also allowed her to preview the planned final restorations and suggest changes in esthetics, size, shape, etc. Serving the dentist as a diagnostic tool, provisionals provide the clinician with an

opportunity to evaluate the proposed esthetic design and function before fabricating the final restorations.¹⁸

Occlusal adjustments were completed, and the provisional restorations were finished utilizing a selection of fine diamond burs, followed with a finishing cup (Enhance, Dentsply; Milford, DE). A thin layer of provisional glaze (BisCover, Bisco; Schaumburg, IL) was brushed onto the restorations, after which they were light-cured. The patient was given home care instructions and provided with an electric toothbrush (Philips Sonicare, Philips Oral Healthcare; Snoqualmie, WA) to maintain optimal tissue health.

Laboratory Protocol

It is imperative for dentists to effectively communicate to the ceramist what the patient wants to accomplish. The dentist and his or her laboratory colleague then collaborate on how best to meet the patient's esthetic expectations while delivering optimal function and longevity.¹² Pre-preparation aspects of the dentition, including mathematical measurements needed to attain the proper proportions, number of teeth involved, preparation design, functionality, and materials all need to be considered by both dentist and ceramist.¹⁹ In this case, detailed instructions relayed to the laboratory included material selection, width-to-length ratios of central incisors, shade selection, value, tooth morphology, surface texture, cervical/body preparation shades, and incisal translucency (volume and intensity).

Photographs are an essential communication tool to be included with the laboratory prescription and should include preoperative, preparation, and preparation shade views. An incisal view of the teeth in occlusion is also beneficial for verifying the mounting of the case. To ensure precision mounting on the articulator and prevent canting and midline discrepancies, a symmetry bite should also be included (Fig 10). Such detailed instructions serve as a "recipe" to enable the ceramist to apply his or her skills and expertise in the fabrication of long-lasting, functional, and esthetic restorations.

In this particular case, due to the patient's distant residence, a review of the final wax-up was preferred for evaluating the smile design and making any final changes before pressing (Fig 11). The case was then returned to the laboratory with a detailed request to shorten the laterals slightly and round off the distal incisal corners of the upper central incisors.

Working with IPS e.max ingots HT BL3, the ceramist cut back from the incisal third onto the labial surface and layered the fabrications with porcelain powder (IPS e.max Ceram) (Figs 12-15). The case was then fired in a Programat P500 oven and mounted on a Stratos articulator (both Ivoclar Vivadent).

As the cervical part of prepared teeth is naturally warmer, and because the veneer was thin, some natural color would show through the translucent veneer. Therefore, preparation shade A1/B1, similar to the ND2 shade referenced in the IPS

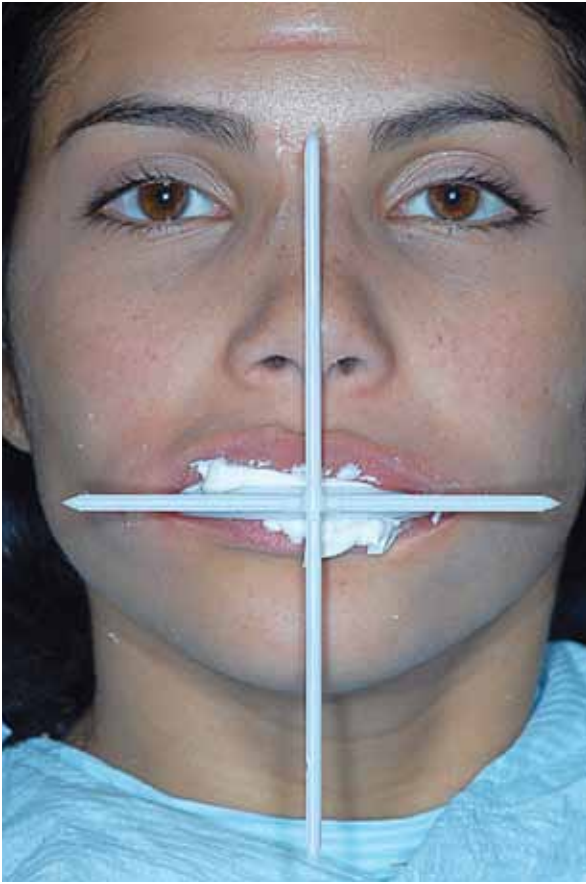


Figure 10: A symmetry bite was taken and sent to the laboratory with a photograph to verify midline and cant.



Figure 11: The dentist performed a review of the final wax-up prior to pressing to ensure that it represented his and the patient's desires.



Figure 12: View of the full-contour lithium disilicate veneers prior to cutback.

Natural Die Material Shade Guide, was chosen to obtain a seamless match. When layering was complete, the veneers were treated with a 9% hydrofluoric acid etch (Porcelain Etch, Ultradent; South Jordan, UT) to prepare them for cementation.

Cementation

Upon return from the laboratory, the veneers were placed on the model to verify proper fit. The patient was anesthetized and the provisional restorations removed. The teeth were cleaned with a pumice and peroxide slurry, followed by a chlorhexidine gluconate disinfecting scrub (Consepsis, Ultradent)

before the veneers were tried in to evaluate fit and esthetics.

Once the patient approved her smile makeover, the restorations were removed, cleaned with 37% phosphoric acid (Ultradent) and rinsed. The veneers were then treated with a primer (Silane Primer, Kerr; Orange, CA) and set aside.

To complete the adhesive protocol, the teeth were treated with a 37% phosphoric acid etch for the required 15 seconds, then rinsed. A thin layer of Excite bonding resin (Ivoclar Vivadent) was applied to the etched teeth and light-cured for 10 seconds. The restorations were bonded with a light-cured resin luting cement (Variolink Veneer Ce-

ment, Ivoclar Vivadent) in shade +1. No catalyst was used. After initial cleanup, a Cerisaw (Denmat; Santa Maria, CA) was used to remove residual cement interproximally, and a sharp sickle scaler was utilized to eliminate excess cement from the margins.

Occlusion was verified using articulating paper (Accufilm, Parkell; Edgewood, NY) with a light coat of petroleum jelly applied to prevent the recorded ink marks from being erased by saliva. To evaluate excursive movements, the patient was asked to chew on rope wax on one side, with the articulating paper placed on the opposite side. The procedure was performed for both sides. Evaluated in this fashion,

It may be advisable for a less experienced dentist to collaborate with an experienced laboratory partner.



Figures 13-15: The cutback allowed for internal incisal staining and layering of the porcelain powder (e.max Ceram).

occlusion was observed during a true chewing cycle to eliminate any excursive interferences. This was especially important in this patient's case to prevent tenderness and potential fractures caused by occlusal interferences.

A fine, football-shaped diamond was used to smooth the lingual surface, followed with an Enhance finishing cup to avoid leaving a discernible margin. The next day, the patient's occlusion was reevaluated to guarantee proper fit and function and eliminate any discomfort. Postoperative photographs were also taken (Figs 16-18).

Conclusion

Clear and direct communication between the dental team, laboratory personnel, and the patient is essential in order to routinely and predictably achieve consistent esthetic results.²⁰ Laboratory ceramists are specially trained as skillful artisans to conceive and construct dental restorations with the goal of satisfying the expectations of both dentist and patient.²⁰ Dentists rely upon their laboratory colleagues' knowledge of dental anatomy and function, coupled with a mastery of materials and their handling properties, to translate their meticulous clinical and esthetic parameters into functional and esthetically pleasing restorations. Ceramists, due to their skills in combining the above with artistic creativity and their ability to foresee superior esthetic results, are an indispensable and integral part of the dental team.^{21,22}

Acknowledgment

The author thanks the patient in this case for entrusting him to complete her beautiful smile makeover and for her willingness to travel from Florida to Virginia to complete the case. He also thanks Ryan Chung (Golden Vertical Ceramics; Oakton, VA) for his talent and attention to detail.

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Figures 16-18: Postoperative views of the final restorations show a natural-looking, beautiful, and harmonious smile.

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