Continuing Education

PART II: INCORPORATING THE HUMAN TOUCH IN RESTORATIVE OUTCOMES

Integrate technology with a humanistic plan to ensure your patients' care

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Abstract

With digital solutions today, dentists and ceramists can provide more consistent and efficient restorations that are esthetically pleasing, and all at an excellent value. However, it is important to understand that the human touch makes an epic difference in achieving restorative excellence. This article explains the "personal touch" that dental professionals must apply to several aspects of esthetic restorative cases. Exercising the "personal touch" is demonstrated in the processes of material selection and, ultimately, fabrication.

Learning Objectives

AFTER READING THIS ARTICLE, THE READER SHOULD BE ABLE TO:

- Discuss the elements of a fabrication process for an all-ceramic restoration with a zirconia core
- Communicate effectively with patients
- Describe the difference a skilled ceramist brings to an esthetic restoration

TECHNOLOGY IS EXPENSIVE and ever changing. Certain factors must be considered for the investment to be successful. These include market trends, the uniqueness of the product, what the learning curve is, and its marketability to patients. All are best analyzed by the people who will be affected by them, not an algorithm.

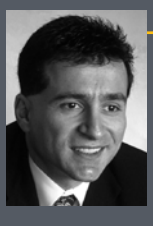
A humanistic plan for integrating technology will ensure it is embraced for, not dictating or ruling, your patients' care. Patients should feel that technology enhances, but does not replace, your personal, professional services.

This article explains the "personal touch" that dental professionals—whether dentists or ceramists—must apply to several aspects of esthetic restorative cases. Part I of this article addressed the diagnosis, treatment planning, and communication among all dental team members (eg, dentist, ceramist, patient, specialists). Part II explores the depths of the human touch that can be applied to restorative outcomes. The "human touch" accounts for the uniquely different perspectives, interpretations, and experiences that affect successful restorative cases. Exercising the "personal touch" is also demonstrated in the processes of assessing patient expectations, smile design, provisionalization, material selection, and, ultimately, the fabrication of the restoration.

While the ease and efficiency presented by new technologies and materials have certainly made a significant impact on dentistry, it remains the human touch that makes an epic difference in the success or failure of a restoration. This is certainly the case with zirconia-based and some other higher-strength CAD/CAM material restorations. Zirconia materials are a practical option for metal-free restorations; they provide ideal light transmission in certain clinical situations and have been shown in studies to demonstrate strength and longevity when used as frameworks.[1-3] In fact, fixed partial denture frameworks fabricated from all zirconia can now span up to 14 units on natural teeth and edentulous implant-retained restorations (Figure 1). However, thought processes and approaches must be different in order to ensure sufficient space for creating the same illusion of reality anticipated with other, previously used materials. Substrate color, thickness, and type of material are important factors for consideration and manipulation by the ceramist.[4]

The fabrication process for an all-ceramic restoration with a zirconia core is similar to processes for porcelain-fused-to-metal restorations. However, some of these materials can appear too chalky and unesthetic if not handled by a skilled ceramist. The ability to artistically cut back, layer,

About the author



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stain, and understand the post-mill process for these materials is what transforms them into natural-looking restorations, regardless of how much translucency the product demonstrates when formed into full-contour crown restorations (Figure 2).[1-3] For example, based on a typical monolithic implant bridge framework (Figure 3), two bridges can be milled from the same shaded zirconia block in the same machine (Figure 4 and Figure 5). However, they can appear different as a result of the human touch. Ultimately, it is how they appear to the patient that matters most in terms of meeting their expectations and avoiding the need to modify or redo the restoration. It is therefore important for ceramists to ask their dentist clients, as well as for dentists to ask their patients, these three questions: Do you see a difference? What do you see? What is your preference?

Correctly interpreting patients' responses to these questions and others can help the dental team get a sense of their expectations. However, in reality, esthetics is very subjective. Because dentists and ceramists need to know precisely what terms such as "white," "natural," "straight," "big," and "small" mean to patients using such words to describe what they want, it is often helpful to use communication tools (discussed in detail in Part I). This can help to avoid patient disappointment and enhance communication among team members.

Therefore, although the zirconia fabrication process involves computer aided design (CAD), experienced ceramists will respect the boundaries, limitations, and capabilities of the materials with which they are working in order to maximize esthetics and function (eg, compensating for zirconia shrinkage when visualizing restoration size; creating internal color effects during the green stage).[2] Even with implant-supported, screw-retained restorations, once milled, the "green state" zirconia is much softer than other materials (Figure 6), making the human touch of contouring, adding anatomical surface enhancements, and multi-shading for improved esthetics significant. After the bridge is sintered at a high temperature for between 8 and 13 hours (Figure 7), custom stain can be applied to the zirconia and pink porcelain (eg, Creation ZI CT) layered on to create the illusion of soft tissue (Figure 8).

When communication tools are properly provided and shared among dental team members, zirconia-based restorations can be predictably fabricated for any number of implants. The restorations can be single units, up to 14-unit bridges, or full-contour monolithic structures with or without minimal cut-back in non-functional areas for ceramic layering to enhance the esthetics.[3] However, if inaccurate impressions are used, or a verification jig is not provided prior to cementation of the titanium abutment in the laboratory using a resin cement (Multilink® Implant Resin Cement, Ivoclar Vivadent, ivoclarvivadent.com) (Figure 9 and Figure 10), the strong yet brittle zirconia bridge could break (Figure 11). Therefore, it is important for ceramists and dentists to follow the processing protocol for fabricating

Detailed communication and skilled collaboration resulted in a smile transformation that exceeded the patient's expectations.

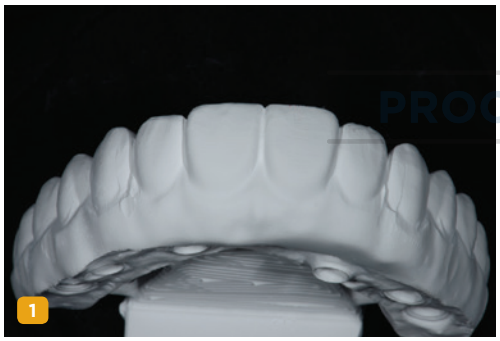

Fig 1. Screw-retained zirconia (Prettau Zirconia) implant framework after milling.

Fig 2. The patient and dentist were unhappy with the typical screw-retained zirconia restoration after delivery (Prettau Zirconia).

Fig 3. Typical monolithic full-contour zirconia screw-retained framework (Prettau Zirconia).

Fig 4. Monolithic framework (Prettau Zirconia) after sintering.

Fig 5. Monolithic framework (Prettau Zirconia) after sintering with a minimal cut-back on non-functional areas for ceramic application.

large zirconia implant bridges to avoid costly and frustrating remakes.

Fortunately, lithium disilicate is a predictable and durable material that can be pressed utilizing the hot-wax technique or milled in the laboratory or chairside using CAD/CAM technology, offering more consistent and affordable price points for patients (IPS e.max® CAD, Ivoclar Vivadent) (Figure 12).[5,6] Additionally, its ability to be cut back and layered or stained and glazed enables ceramists to further characterize IPS e.max restorations based on their skills and understanding of the material's characteristics and the patient's unique esthetic preferences.[5,6]

IPS e.max incorporates true-to-nature shades and a low refractive index to provide optimal optical qualities (eg, life-like translucency and high light transmission).[5,6] It has a flexural strength of 360-400 MPa and is up to three times more durable than other glass-ceramic systems,[5] and can be seated using either conventional cementation or adhesive bonding methods. Compared to traditional all-ceramic materials, IPS e.max lithium disilicate is composed of 70% needle-like crystals in a glassy matrix and, therefore, demonstrates optimal strength, durability, and esthetics.[5,6]

These characteristics make lithium disilicate (IPS e.max) ideal when creating restorations for a patient who was unhappy with the size of his teeth and the spaces between them (Figure 13 and Figure 14). For a non-invasive treatment approach, the dentist relied on the ceramist to utilize lithium disilicate technology in a no-preparation design. This plan was first approached by developing the diagnostic wax-up that was tried in as a Trial Smile.

With a Trial Smile, not only can patients see and feel their proposed new teeth and their color, shape, and size in their mouth, but it also serves as a blueprint for definitive restorations. For the Trial Smile to serve this purpose, however, it is important and necessary that the ceramist who will be fabricating the final ceramics create a highly detailed diagnostic wax-up that will replicate the anatomy sufficiently to enable the patient to experience its phonetic function, as well as to assess its appearance, being able to remove and replace it in the mouth to show friends and family the planned restoration.

After the patient confirmed his esthetic desires and the dental team's final vision, the restorations were pressed with IPS e.max lithium disilicate ingot LT BL2 and minimally cut back for ceramic application (Figure 15). The porcelain was

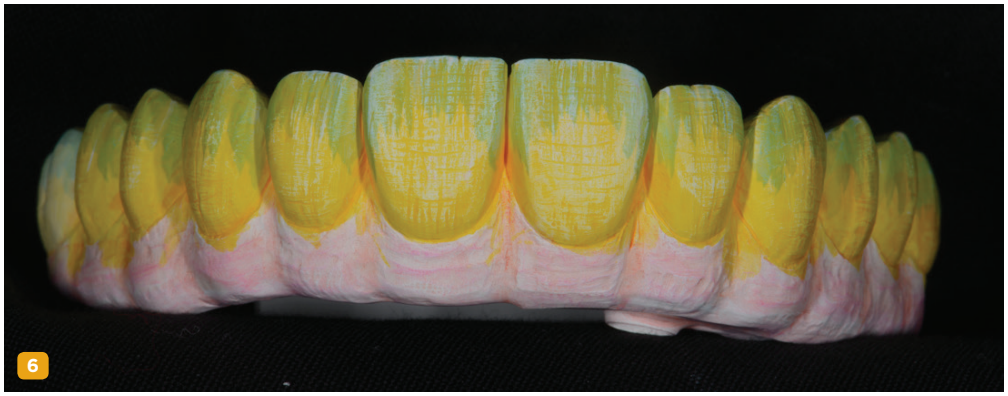

Fig 6. The screw-retained implant restorations are designed and copy milled using CAD/CAM technology and enhanced with the human touch.

Fig 7. The screw-retained zirconia (Prettau Zirconia) implant framework was sintered.

Fig 8. View of the screw-retained monolithic implant bridge with pink ceramic application.

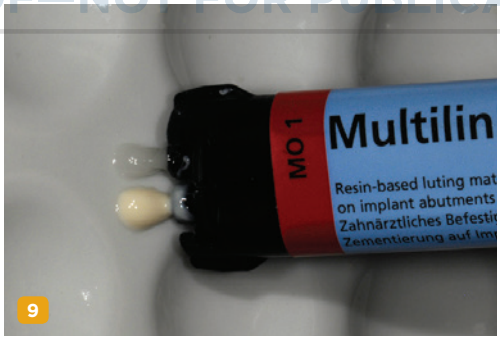

Fig 9 and Fig 10. Cementation of the titanium abutment in the laboratory using a universal resin cement (Multilink Implant Resin Cement, Ivoclar Vivadent, ivoclarvivadent.com).

Fig 11. View of a broken full-contour zirconia restoration that resulted from not following the required processing protocols.

layered with IPS e.max Ceram and then glazed. After manually polishing (Figure 16), the veneers were tried in for the patient's approval and seated according to adhesive protocol (Figures 17). This detailed communication and skilled collaboration resulted in a smile transformation that exceeded the patient's expectations (Figure 18).

Conclusion

With digital solutions today, dentists and ceramists can provide more consistent and efficient restorations that are esthetically pleasing, and all at an excellent value, allowing us to serve more patients. However, it is important to understand that the human touch still makes an epic difference in achieving restorative excellence. Crucial to the ability to meet the expectations of dentist clients and their patients is understanding them. Therefore, we must learn to communicate better. Most of all, we must respect the expertise and skills of our colleagues in our mutual desire to meet the needs and expectation of patients.

Acknowledgments

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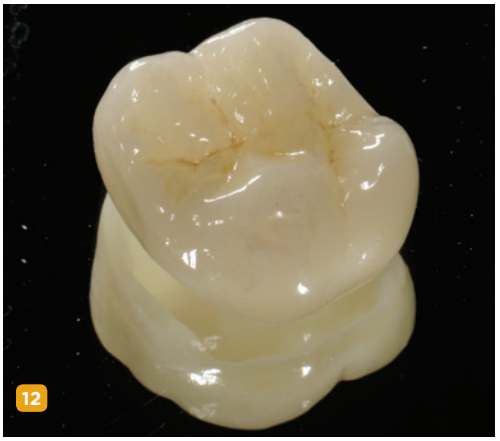

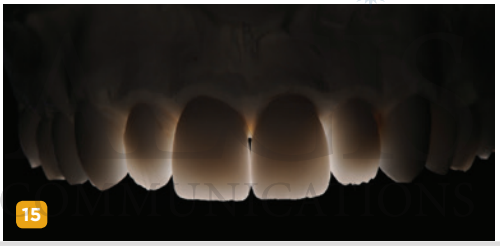

Fig 12. View of a highly esthetic monolithic IPS e.max lithium disilicate crown after staining and glazing.

Fig 13 and Fig 14. Preoperative view of a patient unhappy with the esthetics of his smile.

Fig 15. Pressed IPS e.max lithium disilicate LT BL2 ingot minimally cut back for ceramic application.

Fig 16. View of the restorations after glaze and manual polishing.

Fig 17. View of the lithium disilicate restorations after seating the case with adhesive bonding protocol.

Fig 18. After delivery, the restorations exceeded patient expectations.

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1 Why are zirconia materials a practical option for metal free restorations?
A. They provide ideal light transmission
B. They demonstrate strength when used as a framework
C. They demonstrate longevity when used as a framework
D. All of the above

2 Fixed partial denture frameworks fabricated from all zirconia materials can span up to how many units on a restoration?
A. 8
B. 12
C. 14
D. 16

3 Substrate color, thickness, and type of material are important factors for consideration and manipulation by the:
A. restorative dentist.
B. ceramist.
C. surgeon.
D. CAD/CAM specialist.

4 The fabrication process for an all ceramic restoration with a zirconia core is similar to the process for creating what type of restoration?
A. Porcelain-fused-to metal
B. Full cast gold
C. Pressed all-ceramic full contour crown
D. Zirconia monolithic crown

5 A ceramist must be able to artistically cut back, layer, stain, and understand the post-mill process to create life-like restorations, regardless of how _____ the product may be.
A. translucent
B. costly
C. strong
D. durable

6 What matters most in terms of producing a restoration that meets patient expectations?
A. Whether the restoration matches the proper shade tab
B. How the restoration appears to the ceramist
C. How the restoration appears to the patient
D. How the restoration appears to the restorative dentist

7 Compensating for shrinkage and creating internal color effects during a restoration's green stage are both ways that ceramists can:
A. respect the boundaries and capabilities of zirconia as a material.
B. prepare for patient dissatisfaction.
C. create the strongest restoration possible.
D. circumvent steps in zirconia processing.

8 Once milled, "green state" zirconia is much _____ than other materials.
A. harder
B. softer
C. stronger
D. weaker

9 If inaccurate impressions are used, or a verification jig is not provided prior to cementing an abutment in the laboratory, a zirconia bridge could:
A. be impossible to cement.
B. break.
C. be too opaque.
D. none of the above

10 Why should ceramists and dentists follow processing protocol for the fabrication of large zirconia implant bridges?
A. To avoid confusing the patient
B. To avoid cross-contamination
C. To avoid costly remakes
D. To avoid damaging their equipment

11 What makes lithium disilicate able to be characterized to a patient's esthetic preferences?
A. It can be cut back
B. It can be layered
C. It can be stained and glazed
D. All of the above

12 What is the flexural strength of IPS e.max lithium disilicate?
A. 360-400 MPa
B. 380-410 MPa
C. 400-440 MPa
D. 405-420 MPa

13 What percentage of IPS e.max lithium disilicate is composed of needle-like crystals in a glassy matrix?
A. 60%
B. 70%
C. 80%
D. 90%

14 The author uses Trial Smile not only so that patients can see and feel their proposed new teeth, but also to:
A. work out any issues in the processing of the restorations.
B. allow his staff to practice before making the final restoration.
C. increase his billing potential.
D. serve as a blueprint for definitive restorations.

15 Why must the ceramist who will be fabricating the final restoration also create a highly detailed diagnostic wax-up?
A. So the patient may assess its appearance
B. So the patient may experience its phonetic function
C. So the patient may determine how strong the final restoration may be
D. Both A and B

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