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Lithium Disilicate: Esthetics and Predicability

By Andre Michel and Jeffery Barrera, DDS

In the past, laboratory ceramists have been faced with the challenge of identifying an esthetic restorative material that simultaneously demonstrates a combination of high strength and fabrication efficiency. The recently introduced lithium disilicate glass ceramic, which is patented by Ivoclar Vivadent and sold under the brand name IPS e.max lithium disilicate, is a unique metal-free restorative that enables laboratory ceramists to create predictable esthetic restorations with enhanced productivity.

Glass ceramics have traditionally been categorized based on their chemical composition or application. The IPS e.max lithium disilicate is composed of quartz, lithium dioxide, phosphor oxide, alumina, potassium oxide and other components. As a result of the low thermal expansion that occurs when it is processed, the composition generally yields a highly thermal, shock resistant ceramic that can be made into restorations using either lost-wax hot pressing techniques or CAD/CAD milling procedures. This ceramic material is easy to work with, demonstrating the strength and esthetics for anterior bridges that will allow for a conservative preparation design **(Figure 1)**.

In the case presented here, a female patient presented with failing metal-based Maryland bridges that replaced teeth Nos. 7 and 10 and a desire to improve the overall esthetics of teeth No. 6 through No. 11 **(Figure 2)**. A treatment plan was developed that consisted of creating two three-unit bridges for teeth No. 6 through No. 8 and No. 9 through No. 11. Because of it's properties, it was decided that IPS e.max Press was well suited for this case and would facilitate a seamless blend of the restorations with the adjacent natural dentition.

Pressable lithium disilicate is manufactured according to a unique bulk casting production process that

creates the ingots. This involves a continuous glass manufacturing technology incorporating melting, cooling, simultaneous nucleation of two different crystals and growth of crystals. The process is modified as needed in order to prevent defects such as pores or pigment irregularities.

Figure 2

Figure 3

It is available in four different ingot opacities (high opacity, medium opacity, lower translucency and higher translucency), which enables dental laboratory ceramists to fulfill a variety of esthetic restorative demands. However, in order to impart desired characterization effects, ceramists can still use stain and glaze techniques or hybrid layering techniques when appropriate.

During the initial phases of treatment, a diagnostic wax-up was created to determine the proper length and contours of the three-unit bridge restorations **(Figure 3)**. In order to create the wax-up, the laboratory required accurate polyvinyl siloxane impressions with good tissue capture; a bite record; the use of a Kois facial analyzer to accurately capture the horizontal plane and ensure that models could be articulated properly; and photographs. In this case, the photographs included a frontal portrait of the top of the head to the chin in natural smile; retracted 1:2 frontal views; right and left lateral incisor views; and a profile view in repose.

Figure 4

Figure 5

Providing such detailed communication enabled the ceramist/dentist team to transfer the wax-up precisely to the tooth preparations through the creation and use of a silicone matrix. Also, this would be used to create provisional restorations for evaluation and approval prior to fabricating the definitive restorations. The provisionals were evaluated by the patient for function and esthetics during a two-week period. When the patient was satisfied and all functional issues were worked out, an accurate impression of the provisionals was made and sent to the ceramist.

Figure 6

On the master model, the stone was contoured to ensure that the tips of the pontics would push into the tissue, mimicking the appearance of a natural emergence profile **(Figure 4)**. A full-contour wax-up was performed, after which the dies were trimmed and the margins perfected.

After pressing, the full-contour pressings were fitted to the solid model and an incisal edge matrix was used to verify length **(Figure 5)**. In order to mimic the optical effects observed in natural dentition, the restorations were vertically reduced .5mm **(Figure 6)**. The facial taper was created by reducing .3mm at the incisal edge, then tapering down to the mid-facial area **(Figure 7)**.

Figure 7

Figure 8

Figure 9

Figure 10

Figure 11

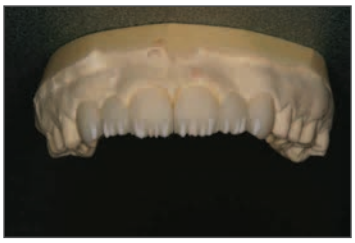

Figure 12

Mesial and distal troughs were then placed to hold low value porcelain, which mimics the translucency that can be observed in natural dentition **(Figure 8)**. The

mammelon structures were then developed **(Figure 9)**.

A blue/gray stain was applied to the mesial and distal troughs, after which a salmon stain was applied to one of the middle lobes of the central incisors **(Figure 10)**. After the stains were applied, they were fired and evaluated **(Figure 11)**. The previously developed mammelon structures were filled in using IPS e.max MM Light and OE4 powders **(Figure 12)**. IPS e.max OE1 powder was used to fill in the mesial and distal troughs and the in-betweens. The vertical dimension was brought back to length **(Figure 13)**.

After the restorations were fired, they were carefully evaluated **(Figure 14)**. To bring the restorations to full contour, they were enameled with IPS e.max TI1 enamel, bisque baked and were ready for glazing **(Figure 15)**. Once the final contouring was completed and the contacts perfected, the restorations were rubber wheeled and then polished with a diamond polish while on the solid model.

With the pressed IPS e.max lithium disilicate material, conventional waxing and pressing techniques can be used to create exceptionally esthetic and durable

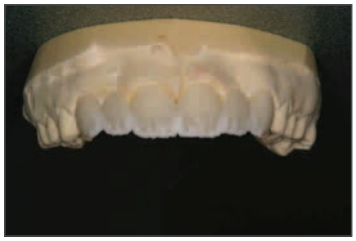

Figure 13

Figure 14

Figure 15

Figure 16

Figure 17

Figure 18

restorations, including full-contour anterior three-unit bridges. This provides laboratories with an efficient and productive means to fabricate today's sought after restorations, without the need for outsourcing a framework. Therefore, delivering this type of restoration becomes more predictable and profitable.

Figure 19

In particular, the IPS e.max Press contours can be perfected in the wax-up, then systematically cut back and built up with a predictable application of internal characteristics to easily achieve nature-mimicking optical effects **(Figure 16)**. Further, IPS e.max Press can be pressed very thin and exhibits exceptional marginal integrity **(Figures 17-20)**.

Figure 20

IPS e.max lithium disilicate is a metal-free restorative that is unlike others available in the dental technology industry. It offers dental technicians and dentists the ability to provide predictable esthetic restorations while enhancing productivity.

References

1. Denry IL. Recent advances in ceramics for dentistry. Crit Rev Oral Biol Med. 1996;7(2):134-143.

About the Authors:

Michel is an accredited member of the American Academy of Cosmetic Dentistry; one of 23 in the world and is also a member of AACD's board of directors. He is a technical instructor for Total Team Advantage Live Patient Seminars. He owns and operates a boutique dental laboratory, Andre's Dental Studio, located in Dana Point, Calif., where he specializes in smile design and complex full mouth cases.

Barrera received his doctor of dental surgery degree from Loma Linda University in 1993. He practices exclusively in Rancho Santa Margarita, Calif., focusing on family and cosmetic dentistry. Barrera continues to take advanced training in various aspects of dentistry which includes: State of the Art Esthetic Dentistry, Occlusion in Clinical Practice, Esthetic Techniques and Materials, and CAD/CAM technology through D4D University for the E4D CAD/CAM system.

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1. What type of ceramic is Lithium Disilicate?

2. How many different ingot opacities are available for this material?

A) 4
B) 2
C) 5
D)3

3 After pressing, what type of model was the full-contour pressings fitted to?

4. Where were the troughs placed to hold the low value porcelain?

5. What type of material was used to polish the finished restorations?

If you wish to claim verifiable CPD please ensure that you add and sign the following declaration when submitting responses by post or by email (email type your full name).

I certify that the answers hereby submitted for these questions are completely and wholly my own work and have not been copied in part, or in whole, or other wise plagiarised from the work of others.

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British Institute
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Technologist

British Institute of Dental & Surgical Technologists

44-46 Wollaton Road,
Beeston,
Nottingham
NG9 2NR

Telephone: +44(0)115 968 3181
Fax: +44(0)115 925 4800
Website: www.bidst.org
Email: secretary@bidst.org