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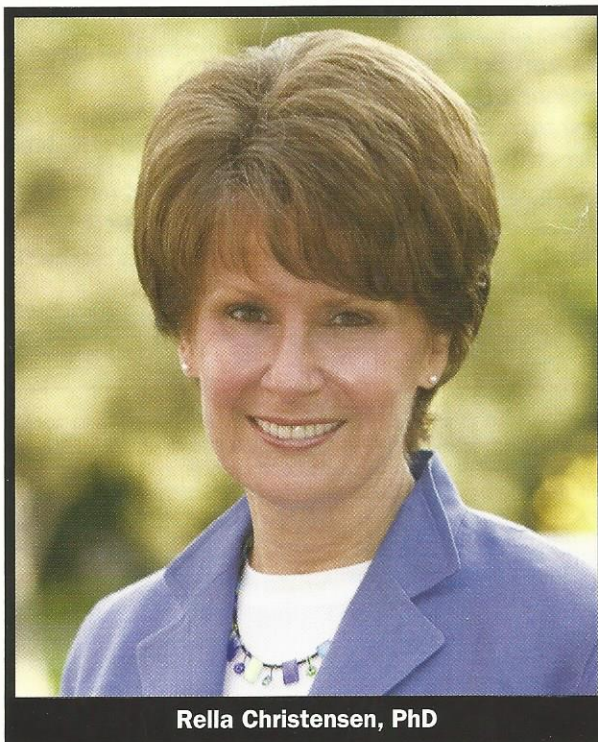
FOCUS ON: Monolithic Crowns

Rella Christensen, PhD, discusses clinical performance of the new monolithic crowns.

Q: What is a monolithic crown?

A: Crowns that are *uniformly one material* are referred to as “monolithic.” Today, these types of crowns are taking over in the United States. Monolithic crowns are not new to dentistry. All-ceramic porcelain jacket crowns have been around a long time, and all-metal alloy crowns date to early beginnings of dentistry. However, for more than 50 years, the multilayered PFM has been the predominant technology used for crowns, providing strong substructures and veneer ceramics with various colors and translucencies. From its beginning, compatibility of the dissimilar materials in the PFM has been a challenge. Chips, breaks, delaminations, and cracks that exposed the dark metal substructure have been common problems. When routine use of pressing and

CAD/CAM entered dentistry, the way opened for tooth-colored materials that were strong enough to dispense with the metal substructure, but these gained variations in color primarily from surface stains placed under glazes. The monolithic leucite-reinforced porcelain crown (such as IPS Empress [Ivoclar Vivadent]) was followed by IPS e.max Press and IPS e.max CAD (Ivoclar Vivadent), which are monolithic lithium disilicate restorations. Most recently the all-zirconia crown (such as BruxZir Solid Zirconia [Glidewell Laboratories]) became available. Today, some major dental laboratories are reporting orders for IPS e.max and BruxZir Solid Zirconia



Rella Christensen, PhD

last 50 years. This amounts to the beginning of a true paradigm shift!

Q: Why are monolithic crowns in such high demand today?

A: The rising demand for IPS e.max and BruxZir Solid Zirconia over PFMs indicates an apparent strong desire in the dental community for a crown that is homogeneously white, strong, affordable, and long lasting. Because they are new, it is not known conclusively if IPS e.max and BruxZir Solid Zirconia meet all 4 of these desires, but they are perceived as doing so by dentists, who are moving their allegiance from PFMs to these monolithic all-ceramic crowns. TRAC Research Laboratory is conducting an interesting clinical study, now entering its third year, that is tracking the performance of BruxZir Solid Zirconia and IPS

e.max compared to a multilayer control crown composed of zirconia substructure with pressed veneer ceramic. This study involves 22 dentists in 13 states and about 100 full crowns on molars. What is noteworthy is that there have been *no* chips, breaks, cracks, wear, or staining observed clinically or by scanning electron microscope over a 2-year period with IPS e.max or BruxZir Solid Zirconia restorations, but almost half the control multilayer crowns have chips or breaks. Furthermore, of 130 tooth-colored materials we have tested in similar clinical studies during the past 35 years, IPS e.max and BruxZir Solid Zirconia are the first to show this lack of

worthy. Also, the more economical cost of the monolithic crowns, at a time when patients are more conservative with their finances, has created an unprecedented demand.

Q: Are there specific indications and contra-indications for all-ceramic monolithic crowns?

A: Yes. BruxZir Solid Zirconia is a very strong all-ceramic at about 1,000 MPa. This makes it particularly well suited for patients with occlusal habits such as bruxing or clenching and ideal when the prep is shallow due to limited space. A preparation for a monolithic zirconia crown can safely have as little as 0.6 mm of occlusal reduction and “featheredge” margins. BruxZir Solid Zirconia can serve well in single units and for 3-unit full partial dentures, while IPS e.max is best suited for areas where aesthetics is a concern and single units are needed. Although its strength is considerably less than BruxZir Solid Zirconia, it is serving in molar full crowns just as well as BruxZir Solid Zirconia, so far. The main negative with both materials is that no one knows their possible failure mode(s) or expected service life.

Q: Have any clinical cautions been noted?

A: Yes, several. (1) It is apparent that the glazes used on both materials will not be long lasting. Interestingly, the glazes are more abrasive to opposing dentition than the unglazed materials, particularly as the glaze degrades and becomes rough. Currently, glazing is used for aesthetic reasons, to seal over characterization stains, and to give a smooth, shiny, multidimensional surface appearance. In the future, surfaces will probably be polished rather than glazed. (2) Cracking during endo access preparations is a caution. In laboratory tests, material thickness was a key factor. Dentists should try to provide about 1.5 to 2 mm of occlusal reduction whenever possible, especially for lithium dis-

ilicate restorations. Preparations for full zirconia can tolerate less reduction. (3) Cutting off these crowns is a challenge. It takes time, eats up burs, and can result in unintended removal of tooth structure when the junction between the crown and the prep is difficult to see in posterior regions. (4) Wear of opposing dentition is an unanswered question. We are monitoring wear facets and have found facets by BruxZir Solid Zirconia are more numerous and larger, but interestingly, opposing enamel and all types of dental materials including resin-based composite are wearing both the IPS e.max and BruxZir Solid Zirconia crowns. Right now, wear facets are small, but this is a point that bears more observation throughout time.

Q: Where are monolithic crowns available and what is their approximate cost?

A: Most labs produce both all-zirconia and all-lithium disilicate crowns. Costs vary according to geographic areas and other factors, but we have seen “specials” for as low as \$45 per crown and regular costs as low as about \$100 per crown. Dentists with CEREC (Sirona Dental) or E4D (D4D Technologies) equipment can currently mill their own lithium disilicate crowns in-office. Soon, they will also be able to mill all-zirconia crowns in-office. Office overhead varies, but it is conceivable that costs for in-office milled monolithic all-ceramic crowns could become very affordable if the office team designs and mills their own restorations.

Q: Is the PFM still needed?

A: Yes. PFM technology is still the best option for long spans, where precision attachments are indicated, and where high strength is essential.

Dr. Christensen leads TRAC Research Laboratory, devoted to clinical research in oral microbiology and dental restorative concepts. TRAC Research is part of the nonprofit educational Clinicians Report Foundation, formerly called CRA, which she directed for 27 years. Throughout her career, she has taught at the undergraduate and postgraduate levels, authored many research abstracts and reports, and received numerous honors. She has worked with hundreds of dentists and their staffs seeking best patient treatments. She can be reached at rella@tracresearch.org.