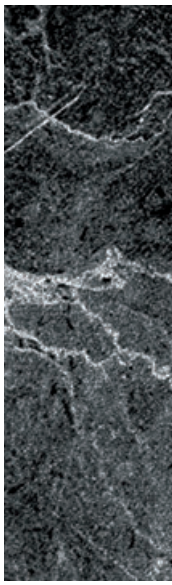

Ask the Experts

MATERIALS FOR ALL-CERAMIC RESTORATIONS

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QUESTION: What are the current options for all-ceramic restorations?

ANSWER: Clinicians are faced with several options in terms of core materials for full-coverage all-ceramic restorations such as crowns and fixed partial denture prostheses (FPDP). These core materials are veneered with the corresponding veneering porcelain to complete restoration anatomy, occlusion, and esthetics. The indications and limitations for some of the various systems are fairly well established by in vitro and clinical studies. However, because these materials are relatively new, such information is relatively limited as compared to metal-ceramic or full-cast restorations. The various all-ceramic materials have different mechanical and optical properties that affect their indications and limitations, as well as their laboratory and clinical manipulation. Additionally, several technologies are used to process these materials, and can affect marginal fit, core/framework design, strength, and longevity.

Leucite-reinforced glass-ceramics (IPS Empress, Ivoclar Vivadent, Amherst, NY, USA; OPC, Pentron Laboratory Technologies, Wallingford, CT, USA) can be fabricated by using either a heat-pressing procedure or via Computer Assisted Design/Computer Assisted Machining (CAD/CAM) technology. These restorations are highly translucent and may be the material of choice when high translucency is required. However, they typically are not recommended for cases where the underlying abutment is discolored and/or opaque. Leucite-reinforced glass-ceramics are highly successful when used for fabricating crowns in the anterior segment.

The *lithium disilicate glass-ceramic* core material (IPS Empress 2, Ivoclar Vivadent) is fabricated with a heat-pressing procedure. It was developed for anterior and posterior crowns and for three-unit FPDP. However, as an FPDP, it is confined to replacing a missing tooth anterior to the second premolar. Recently, lithium disilicate glass-ceramic blocks were introduced for CAD/CAM systems.

The *glass-infiltrated alumina* (In-Ceram Alumina, Vident, Brea, CA, USA) infrastructure was developed for anterior and posterior crown copings, as well as for three-unit anterior FPDP. Infrastructures are fabricated using either the slip-casting technique or CAD/CAM technology. The material is strong but relatively opaque.

Glass-infiltrated magnesium alumina (In-Ceram Spinell, Vident) is twice as translucent as the glass-infiltrated alumina and therefore may be used in clinical scenarios

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where maximum translucency is required. However, these cores are weaker than the conventional glass-infiltrated alumina cores and are thus recommended for use only as anterior crowns.

Glass-infiltrated alumina with partially stabilized zirconia (In-Ceram Zirconia, Vident) combines the use of glass-infiltrated alumina with 35% partially stabilized zirconia as a core for posterior crowns and FPDP. Slip-casting technique or CAD/CAM technology can be used for the infrastructure fabrication. However, the core has high opacity.

Densely sintered high-purity aluminum oxide (Procera AllCeram system, Nobel Biocare, Yorba Linda, CA, USA) is a glass-free, high-strength ceramic core material. It is recommended for anterior and posterior crowns. CAD/CAM technology is used for the fabrication of the ceramic copings.

Yttrium tetragonal zirconia polycrystals is a glass-free, high-strength ceramic material indicated for the fabrication of anterior and posterior crown copings and FPDP frameworks. These are designed using either conventional waxing techniques or CAD technology, while CAM is used for the material's processing. Several systems are available for fabricating infrastructures for full-coverage crowns and FPDP (Cercon, Dentsply Ceramco, York, PA, USA; Lava, 3M ESPE, St. Paul, MN, USA; CEREC InLab, Sirona, Charlotte, NC, USA [with Vita YZ blocks (Vident) or IPS e.max ZirCAD blocks (Ivoclar Vivadent)]; Procera AllZirkon, Nobel Biocare, Yorba Linda, CA, USA; Precident, DCS Dental GmbH, Allschwil, Switzerland); Everest (KaVo Dental Corporation, Lake Zurich, IL with IPS e.max ZirCAD blocks (Ivoclar Vivadent)).

Finally, clinicians must carefully evaluate the properties of these different all-ceramic materials to determine which system would be the appropriate option for a specific clinical case. Such an assessment will increase the esthetics and longevity of such restorations for their patients.

SUGGESTED READING

Kelly JR. Dental ceramics: current thinking and trends. Dent Clin North Am 2004;48:513–30.

Raigrodski AJ. All-ceramic fixed partial dentures-Contemporary materials and technologies. J Prosthet Dent 2004;92:557–62.

Raigrodski AJ. Concepts of material selection for all-ceramic full-coverage restorations. Pract Proced Aesthet Dent 2005;17:249–56.

Editor's Note: If you have a question on any aspect of esthetic dentistry, please direct it to the Associate Editor, Dr. Edward J. Swift, Jr. We will forward questions to appropriate experts and print the answers in this regular feature.

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