With advances in dental technology, clinicians have a vast number of material choices when deciding what to use for a full-coverage crown. From all-ceramic to metal-ceramic, zirconium based copings to aluminous copings; the choices can leave even the most knowledgeable clinician confused. Not knowing which material to use in a particular clinical situation also can lead to potential clinical failures that can wreak havoc on virtually every single office in existence.

Indirect crowns are the staple of every healthy and well-run dental office. They typically account for a large portion of the office production and properly done can give the patient decades of service. Doctors need to stay current with the various crown materials available so they can provide the best care for their patients. However, no matter how knowledgeable the doctor is, if the patient cannot afford the treatment, the clinical expertise is wasted.

The fee for crowns in many offices can be in the four-figure range, out of reach for many deserving patients. To maintain a level of affordability, I recommend making patient financing available in your office. Every industry in America relies on financing to help afford its service. Dentistry should be no different. Patient financing plans; such as CareCredit, CitiHealth Card, American Financial, etc.; provide many patients the ability to afford dental care. Without financing options and proper financial arrangements, the practice can suffer and not reach its full potential.

While clinical knowledge and treatment affordability are both important factors in a well-run practice, this discussion will mainly focus on the clinical aspect. I hope to eliminate some of the
confusion with the materials. By knowing when to use each material, clinical failures can be minimized, unhappy patients can be avoided and the doctor's stomach lining can be spared.

There is no doubt that the king of all crowns is the cast-gold crown. The cast-gold crown has been in existence longer than any modern indirect restoration. The wear rate, biocompatibility, marginal seal and relatively conservative preparation have contributed to its success. Cast-gold crowns can be made from a virtually endless choice of alloys and used with a multitude of preparation designs; from full-coverage crowns to retentively-retained inlays, onlays and cast-gold three-quarter crowns. In fact, its success is so well documented, that really the only contraindication to its use is esthetics.

Due to patient demand, more and more clinicians are choosing more esthetic alternatives. Television shows such as Extreme Makeover have led the public to be more aware of its teeth. Thus, the demand for whiter, brighter, more natural looking teeth is increasing.

Let's discuss some of the more common materials in use today for tooth-colored crowns and help you navigate the maze of materials available.

All-Ceramic Crowns

With tremendous improvements in adhesive bonding, all-ceramic restorations are gaining popularity to the older metal-ceramic cousins. Usually, there are three ways that all-ceramic restorations can be fabricated: pressed, stacked or milled from a solid block of porcelain. Each technique has its distinct advantages and disadvantages, yet not one of the fabrication techniques are considered the “best.”

Pressed-ceramic restorations are made with the lost wax-casting technique. This technique provides precise anatomic form and margins as well as increased accuracy during veneer fabrication. Because the restorations are waxed-up, invested, and cast from ceramic ingots (similar to gold restorations), any minor modifications can be made in wax before pressing the case into porcelain. The wax-up and subsequent final ceramic restorations will be an exact copy of the provisional restorations. If modifications are required, these modifications are obviously easier to do in wax than they are in porcelain, preventing costly remakes that are frustrating to both patient and dentist.

If no modifications are made to pressed ceramics straight from the oven, esthetics will be poor because the porcelain will appear monochromatic. Once the restorations are pressed, two techniques exist to esthetically enhance them. The restorations can be surface stained or the incisal edges can be cut back and powder porcelain can be stacked on the restoration.

For posterior teeth, simple surface staining is adequate because the esthetic needs are not as high and surface staining prevents alteration of the solid porcelain piece, which preserves the maximum strength and integrity of the restoration. However, for anterior teeth, an incisal cutback is recommended for the most esthetic restoration possible. In this technique, the facial incisal portion of the restoration is cut back and powdered porcelain is added for improved esthetics. This allows the technician to create the incisal halo and translucency. Depending on the type of pressed porcelain, the amount of incisal cutback varies from just a small facial cutback of the incisal edge to a large portion of the facial part of the porcelain.

Stacked Feldspathic Restorations

Another type of all-ceramic crown is the stacked feldspathic crown. There are typically two different ways to fabricate stacked veneers: with a refractory die or the platinum foil technique.

With a refractory die, the veneers are fabricated directly onto a die that is made from the refractory material. Once the porcelain is stacked on the die, both die and porcelain are placed and fired in the oven together. After firing, the refractory material is separated from the veneer with either a bur or sandblasting.

With the platinum foil technique, the individual dies are covered with a foil material, which is then closely adapted to the die. Once the adapted dies are prepared, the powder is stacked directly on top of the foil. Once fabrication of the veneers is complete, the foil is removed from the die with the unbaked powder still on the foil and the entire restoration is placed in the oven for firing. The foil is then removed from the underside of the veneer, which is now ready for finishing procedures.

Appropriate shades and opacities of porcelain powder are used to fabricate the veneers and give the restoration the prescribed color. For a dark substructure, the ceramist may choose to use a more opacious powder, thereby blocking out the underlying tooth structure. However, if the substructure is of a normal color, the porcelain can be made thin and translucent, allowing for maximum esthetics.
**CAD/CAM Technique**

The final technique for fabricating all-ceramic crowns is the use of a CAD/CAM system. The versatility of the system is such that all types of restorations from veneers to full-coverage crowns can be fabricated with the system.

The most popular CAD/CAM system available today is the CEREC system. Approaching 20 years of clinical use, this system is the only available CAD/CAM system that can be used intra- or orally. The system takes an optical impression of the prepared tooth and in less than 10 minutes can fabricate a fully contoured all-ceramic crown.

Adhesively bonded all-ceramic restorations offer many advantages; such as conservative preparations, supragingival margins and biocompatibility. With all-ceramic crowns, you can also do any type of preparation design from a simple veneer to three-quarter crowns, inlays, onlays, full crowns and anything in-between. However, the major disadvantage of this type of restoration is that it must be adhesively bonded in place. Newer cements such as self-etching resin cements, for example Maxcem by Kerr, are changing this protocol and showing tremendous promise. For the most predictable results, adhesive bonding is still the most preferred method until the newer cements have been clinically tested for a number of years.

While all-ceramic crowns can be made for virtually any preparation design, the next category of crowns are basically PFM replacements, in other words, they can only be used for full-coverage preparations.

Zirconium was introduced into the dental practice relatively recently. This material is one of the strongest available for the fabrication of dental crowns. Whereas traditional metal ceramic restorations reach a relative strength of approximately 500 mpa, zirconium copings reach three times that strength. Examples of zirconium products include Cercon and Lava. Consider zirconium-based crowns as simple porcelain-fused-to-metal (PFM) replacements, as the zirconium coping must be covered with a stacked porcelain. This material is not indicated for use in a partial-coverage situation.

Zirconium copings are touted as more esthetic to traditional PFM restorations because no opaque layer is needed to block out the unaesthetic metal underneath. Similar to PFM restorations, zirconium restorations must be cemented traditionally as the zirconium restorations cannot be etched. This allows these restorations to be used where adhesive bonding is not possible.

Another material used for crowns that is also a PFM replacement are alumina-based crowns. Examples of these materials include Procera and Wol-Ceram. Just like zirconium restorations, alumina-based crowns must be traditionally bonded. They are very similar to zirconium restorations in that alumina-based crowns can only be used for full-coverage restorations, are traditionally cemented and are used for a coping material, which needs to be stacked with porcelain to create the final crown. The copings of these materials can be made slightly more translucent than zirconium-based copings resulting in more esthetic restorations. However, all of these materials can be highly esthetic in the hands of a capable technician.

While zirconium- and alumina-based crowns are considered metal free (technically they are not as they contain metal oxides) metal-based crowns are still very popular. One of the most popular materials used for copings is made from a material called Captek. Captek is a high-gold-content restoration that, once again, is used as a coping material onto which porcelain is stacked. Captek has been shown to decrease the amount of plaque build-up in its vicinity when used intraorally. This is one main advantage to its use over traditional crowns.

The majority of the time Captek is used as a coping material, but it can be used in partial coverage situations as well. Captek is traditionally cemented and is ideal in deep areas where its antibacterial properties can be put to use.

This summary is just a small sampling of the numerous amounts of materials available for use in crowns. Proper knowledge of the current materials will prevent frustration in the office and amongst patients. Knowing when to use a traditionally-cemented crown versus a bonded crown will prevent unnecessary and premature leakage. Knowing when to use a metal-based crown instead of a more translucent all ceramic restoration will prevent unsightly show through from occurring.

A well-run dental practice has two components that work in harmony to help the practice grow and thrive. First treatment affordability, including patient financing plans. Second, the clinician must have a thorough knowledge of the different materials available for patient care to keep clinical failures to a minimum and to use the proper material in the appropriate clinical situation.

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