A Cementable, All-Ceramic Restorative System

The drive for superior esthetics and the desire to use nonmetallic restorations has caused an increase in the demand for anterior and posterior all-ceramic crowns. Ceramic dental materials exhibit desirable characteristics such as biocompatibility, color stability, and low thermal conductivity. In addition, fired ceramics resist degradation in the oral cavity and, when used to restore anterior teeth, they can provide esthetic quality comparable to the surrounding natural tooth structure. Because of these favorable characteristics and the desire to use all-ceramic crowns for more indications, researchers are constantly attempting to improve the mechanical properties of ceramic materials.

All-Ceramic System

The Procera® AllCeram® crown was developed by Andersson and Oden and introduced to the North American dental community in 1994. The Procera® AllCeram crown is composed of a coping of densely sintered high-purity aluminum oxide veneered with dental porcelain. The aluminum oxide content in these copings is 99.9% and the strength exhibited by this ceramic material is the highest among all-ceramic restorations used in dentistry. Long-term clinical data supporting the efficacy of Procera® AllCeram crowns has been reported at both 5-year and 10½-year intervals. In this study, the success rate for Procera® crowns was 97.7% at 5 years and 92.2% at 10½ years.

Because standard porcelain-fused-to-metal (PFM) preparation guidelines are used, Procera® is dentist-friendly. The reduction guidelines are 2 mm on the occlusal surface, 1.5 mm of axial, and 1.2 mm in the gingival third. A chamfer finish line is preferred. Many dentists mistakenly think that a shoulder preparation is needed for Procera® restorations, which is a much more difficult margin to prepare and is contraindicated for scanning purposes. Use of a diamond kit made specifically for Procera® (Procera Crown Prep Kit) simplifies the preparation stage as well. As a result of the high strength of the 99.5% aluminum oxide coping, any crown and bridge cement can be used.

Figure 1 shows the cross section of a Procera® AllCeram crown. The aluminum oxide coping and layering ceramic material are clearly visible. Because of the tooth-colored
coping, there are no dark metal margins at cementation or if the patient experiences gingival recession.

Case One
A 44-year-old man presented with crowns on teeth Nos. 8 and 9 that he found esthetically displeasing (Figure 2A). Since the patient had previously experienced gingival recession on these two anterior teeth, the decision was made to fabricate all-ceramic crowns as replacements.

In the postoperative view of the cemented Procera® AllCeram crowns on teeth Nos. 8 and 9, note the improved esthetics when compared to the PFM restorations in the preoperative photo (Figure 2B). If this patient were to experience further gingival recession, there is no dark metal margin that can be exposed.

Case Two
A 25-year-old man presented with two all-ceramic crowns on his maxillary central incisors (Figures 3A and 3B) that showed signs of marginal microleakage circumferentially on both crowns. In this case, cementable all-ceramic crowns were preferable to traditional all-ceramic crowns, which need to be bonded. In addition to the black line that was visible at the facial margin, the gingival inflammation (Figure 3C) at the facial margin was another sign of leakage. Attempts to eliminate this chronic inflammation by repairing the leaking margin can be unsuccessful, necessitating the replacement of the restorations. One of the causes of the microleakage in this case appeared to be contamination of the resin cement with crevicular fluids, which resulted from the subgingival
placement of the margins. The tissue health had returned to normal 2 weeks after the placement of nonleaking provisional restorations (BioTemp™) (Figure 3D).

In a case such as this where the dentist encounters preexisting subgingival margins, he or she must make a decision regarding the choice of the final restoration based on cement type as well as ceramic type. For example, in a case where ideal isolation and moisture control is not possible, yet the esthetic benefits of an all-ceramic material is desired, Procera® AllCeram may be the material of choice. If a dentist chooses to use an all-ceramic crown that requires resin cement, to achieve proper isolation, it may be necessary to place a small retraction cord in the sulcus during cementation in addition to a rubber dam. The patient reported that both teeth had undergone endodontic treatment approximately 1 year after the first crowns were placed. With the amount of microleakage visible in the preoperative photographs and the amount seen inside the existing crowns when they were removed, there appeared to be enough leakage to create the required amount of pulpal insult to necessitate endodontic treatment. Whether or not this leakage would have occurred with conventional cementation is speculation.

Note the esthetic results attained with the Procera® crowns (Figures 3E and 3F) compared with the preexisting bonded all-ceramic crowns. In this case, the author felt confident in the longevity of the Procera® restorations because they were cemented with a modern resin-reinforced glass-ionomer
cement (RelyX™ Luting Cement®). Even with the various advances in esthetic dentistry techniques and materials, certain situations are still difficult to restore. Specifically, some dentists have complained that they haven’t had an esthetic replacement for missing anterior teeth, and as a result, have placed ceramometal bridges that lacked the premium esthetics of an all-ceramic restoration. The Procera® AllCeram bridge now allows a dentist to replace missing teeth with a cementable all-ceramic bridge. Case three demonstrates the use of an anterior and a posterior Procera® AllCeram bridge in addition to five adjacent single Procera® crowns.

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Case Three

A 25-year-old man presented interested in the replacement of two missing teeth and the replacement of some unesthetic anterior PFM restorations with visible metal margins (Figure 4A). Tooth No. 3 and tooth No. 7 were both missing, and the patient was dissatisfied with wearing a stayplate. In addition, teeth Nos. 10 and 11 were both in crossbite, which the author chose to correct as well. It was decided that a Procera® AllCeram bridge would be placed from teeth Nos. 2 to 4 and from teeth Nos. 6 to 8. Single-unit Procera® crowns were placed on teeth Nos. 5 and 9 through 12. Teeth Nos. 8 through 10 had previous endodontic treatment that resulted in dark
tooth preparations. As a result of the tooth-colored copings in the Procera® AllCeram system, concern about the dark preparations showing through the all-ceramic crowns was not an issue.

A study model with a single-unit Procera® crown and a three-unit Procera® AllCeram bridge adjacent to a single-unit PFM crown and a three-unit PFM bridge was shown to the patient. The author allowed the patient to view the restorations and take them off the model to inspect the internal aspects as well as explain the advantages and disadvantages of both restorations.

For restorative cases larger than three units, the author always uses a diagnostic wax-up to analyze functional and esthetic requirements (Figure 4B). The author has the laboratory use white wax for these wax-ups so that the patient is excited by the changes they see. It has been the author’s experience that diagnostic wax-ups with yellow wax fail to inspire patients, many of whom are turned off by yellow wax on a yellow model.

After preparing the necessary teeth with standard PFM techniques (Figure 4C), a centric occlusion bite registration was taken with Capture™ bite registration material. For larger cases, the author prefers to use a clear bite reg-

Case Four

A 27-year-old woman presented with a chief complaint of crooked teeth and central incisors that were too large for her face (Figure 5A). Because of the amount of reduction that would be needed to achieve the patient’s desired esthetic outcomes and the presence of large, failing lingual amalgams on the teeth, Procera® AllCeram crowns were chosen. Teeth Nos. 7 through 10 were prepared following standard PFM preparation dimensions and techniques. Figure 5B shows the cemented Procera® AllCeram crowns cemented in place. Through the manipulation of line angles, marginal ridges, and contact points, the ceramist was able to create a “smaller” looking smile that the patient loved.

Case Five

A 57-year-old woman presented with multiple fractured veneers (Figure 6A and 6B).
The patient also reported thermal sensitivity on two of the teeth. The veneers on teeth Nos. 7 and 8 had broken at the incisal edge and tooth No. 9 had a vertical fracture in the veneer from the incisal edge to the gumline. To provide the patient with stronger restorations that could be cemented, Procera® AllCeram crowns were selected for teeth Nos. 5 to 12. The patient declined to have anterior crown lengthening performed on teeth Nos. 7 through 10 to properly align the gingival crests and zeniths. After removing the existing crowns, standard PFM preparation dimensions and techniques were followed. Figure 6C shows the facial view of the cemented Procera® AllCeram restorations. Figures 6D and 6E show the lateral views of the new smile. The patient reported that the previous sensitivity has disappeared. Before cementation, two coats of Hemaseal and Cide® were placed on the preparations and air evaporated. The crowns were then cemented with RelyX™ Luting Cement.

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References