Highly Esthetic CEREC Solutions: Is CAD/CAM Right For You?

**Introduction**

Dentists are constantly faced with decisions about new techniques and technologies, and it sometimes can be difficult to discern their true benefits. Integration and incorporation of these technologies into the normal practice routine also can be challenging. If the benefits are fully understood, however, a correct decision is more easily made. It is the goal of this article to familiarize readers with the technique of computer-aided design/computer-aided manufacture (CAD/CAM). Although CAD/CAM has been in clinical use since CEREC (Sirona Dental Systems; Charolette, NC) was introduced in 1985, many are unaware of the benefits of this relatively “new” technology.

Dentists are constantly faced with decisions about new techniques and technologies, and it sometimes can be difficult to discern their true benefits.

**Common Professional Standards**

Cosmetic dentists have a set of professional standards in common, even though the approaches to their individual endeavors may vary. We all want to:

- provide excellent care to our patients
- do it efficiently
- deliver esthetic, well-fitting restorations
- be profitable
- have complete restorative control
- save time
- save expense.
Patients’ Concerns

Similarly, the patient-centered practice must focus on the concerns and expectations of patients. They have their own list of common needs and desires, and some of them are frequently voiced to the clinician in one way or another:1

- I hate novocaine.
- I don’t like the “goo.”
- You’ll have to pry my mouth open!
- I don’t trust your temporary.
- The temporary came out.
- I have to wait two weeks?
- It’s sensitive to heat and cold!
- I’m afraid the nerve pain will return.
- I want one simple procedure.
- I want modern dentistry.

Traditional Model and CAD/CAM Model

Many of these patient apprehensions and concerns are addressed positively in the chairside CEREC CAD/CAM model. Over the last 20 years, CEREC has gone through a significant evolutionary process.2

A simple comparison between the traditional model of indirect dental care and the chairside CAD/CAM model will help to clarify the process.

The following aspects of the traditional procedure remain basically the same with CAD/CAM:

- anesthesia
- isolation
- preparation
- try-in
- contact and shade verification
- bond restorations
- occlusion adjustment and polish.

With CAD/CAM technology, the following clinical aspects differ from the traditional procedure:

- one visit, not two
- chairside-created restoration
- no crown and bridge impression
- no temporary
- chairside shade matching
- patient pays the dentist, not the laboratory.

The results of these significant changes in the clinical procedure solve a number of the issues that patients identify as being objectionable. Several are actually eliminated, namely extra anesthetic impressions, a two-week waiting period, and the possibility of a loosening temporary restoration. Above all, the patients receive the added benefit of a simple one-visit procedure that is the essence of a straightforward but modern process.

Some objections have been raised, however, about CEREC restorations. These objections center around the time required to complete a procedure, marginal fit and adaptation, esthetic appearance, and the cost of the technology. There is no doubt that chairside CAD/CAM requires a significant change in the thinking and procedures of the offices in which it is adopted, but the benefits for the offices and patients alike can make the required changes well worth the effort. Neither the efficacy nor validity of the CEREC restoration is truly in question.3

CAD/CAM: Delivery of Care Levels

How does the CEREC CAD/CAM process accomplish these things? Let us first understand that there are at least two levels of delivery of care with CAD/CAM. First, there is the basic functional restoration that is monochrome and is finished with a simple hand polish. Second, there is the more esthetic restora-
Figure 3: The optical impression. Timeline = 25 minutes.

Figure 4: Biogeneric® restoration design. Timeline = 30 minutes.

Figure 5: Milled restoration. Timeline = 45 minutes.

Figure 6: Restoration try-in. Timeline = 45 minutes.

Figure 7: Characterization. Timeline = 60 minutes.
tion that resembles the laboratory-produced product. This process is easily mastered by the dentist or the auxiliary staff. Both restorations are functionally acceptable, but the second one carries the extra value of esthetic excellence and does not require much extra time. Either way, patients receive positive answers to their concerns.

THE CAD/CAM PROCESS

DEFINITION OF CHAIRSIDE CAD/CAM

Chairside CAD/CAM can be defined as follows: The provision of esthetic, long-term, restorative dental care; using durable, homogeneously manufactured tooth-colored ceramics or resin; precisely milled and characterized chairside, utilizing computerized CAD/CAM technology and placed during the same visit as the tooth preparation.

RESTORATIVE PROCESS

The actual restorative process is simple and straightforward. The elements in this article are illustrated by combining two separate cases, but the timeline is delineated according to a continuous single case flow.

The patient is prepared in the usual fashion (Fig 1) with local anesthetic. Isolation is obtained with a rubber dam or other suitable means. The tooth is prepared (Fig 2) and then readied for the impression (an optical impression), obtained by means of the application of a white opaqueing material (Fig 3). Various methods of tissue isolation can be used to accomplish adequate visualization of the preparation margins, if the margins are equigingival or subgingival. Supragingival margins, however, are easily identified. The application of the opaqueing material increases the reflectivity of the tooth surface, enhancing the ability of the computer camera to obtain all the data necessary to fabricate the virtual “die model” from a single image.

Following the optical impression, the rubber dam may be removed for patient comfort, if desired. The computer-generated virtual model is then used to place various design elements, as needed. The final result is a three-dimensional rendering of the proposed restoration (Fig 4). Several methods of restoration design are available, depending upon the clinical situation and operator preference. A properly shaded ceramic or resin-based milling blank is then inserted into the milling device to hone the proposed restoration to exacting fit and specifications (Fig 5).

Once the milling process has been completed, the restoration is placed intraorally to evaluate the fit and make any adjustments required (Fig 6). The optional characterization step is completed with the application of porcelain stains and glazes and firing in a non-vacuum porcelain oven (Fig 7), which would traditionally be used to modify contacts or apply custom staining to laboratory-fabricated restorations. (This step can be omitted altogether.)

If the desired result does not require custom characterization, simple hand polishing is used to finalize the restoration. The completed restoration is etched with hydrofluoric acid, silanated, and then inserted, using routine adhesive placement techniques. Any materials that would be used for laboratory-fabricated all-ceramic materials may be used (Figs 8 & 9). The cases described in Figures 1 through 9 demonstrate an acceptable timeline for an onlay restoration, and they display excellent fit and esthetics, easily achievable with the CAD/CAM procedure.
Preparation Styles

There are various other styles of preparations that can be accomplished with chairside CAD/CAM. Virtually every tooth in the maxillary and mandibular arches and almost any of the restoration styles are potential candidates. Restorative options can range from single teeth to full anterior esthetic makeovers to full-mouth reconstructions. Preparing styles can vary considerably from dentist to dentist, and while some details are critical for success, a great deal of flexibility exists in specific designs. The graphics of the maxillary and mandibular arches demonstrate a number of differing styles of preparation that can be accomplished with CAD/CAM and the wide variety of potential applications for these restorations (Figs 10 & 11). The goals of tooth preparation are to create defect-oriented styles to conserve tooth structure, maintain consistency to achieve predictable end results, and provide durability and resistance to fracture to ensure long-term results.

Costs and Savings

A detailed cost analysis should be performed by each practice that is considering the application of CAD/CAM technology. General financial comparisons usually show that there is a break-even point at approximately 12 to 15 restorations per month performed with CAD/CAM, versus the traditional laboratory method. The savings in laboratory costs usually match the expenses associated with CAD/CAM at these points. The savings depend upon the actual per-unit laboratory expenses, general office overhead, and other factors. This makes the equipment and the process well within the grasp of any provider willing to make the paradigm shift to adopt the technology.

Conclusion

A thorough understanding of CAD/CAM technology through practice and training can create the foundation for long-term success. The CEREC CAD/CAM technology can overcome a number of objections that patients have with routine dental care. Chairside fabrication of the restoration can provide an excellent array of benefits for the dental office. Excellence in fit, durability, efficacy, and esthetics are all possible for the provider with CAD/CAM. This combination of factors provides a strong “win-win” incentive to incorporate this amazing technology.

References