CEREC CAD/CAM — the power of technology in restorative dentistry

Over the past few years, a revolution has quietly occurred in restorative dentistry. What began as a passionate pursuit at the University of Zurich in 1980 by Drs. Werner Mornon and Marco Brandestini has pioneered what is literally the explosive growth of CAD/CAM in dentistry.

The first CEREC patient was treated at the University of Zurich in 1985, and by 2007, CEREC has grown to more than 27,000 users. CEREC technology paved the way for dental CAD/CAM, powered by Sirona’s vision for imaging in dentistry.

Chairside CAD/CAM no longer stands alone — computer-aided design and/or computer-aided machining technologies have infiltrated every aspect of dentistry. Dental laboratories have embraced the technology and have made computerized automation an integral part of fabrication and delivering dental restorations, as exemplified by CEREC InLab’s milled zirconia restorations.

In orthodontics, Invisalign, e-Models, Lingual Care iBraces and Sure-Smile are working examples of the integration of CAD/CAM. The arrival of 3-D cone beam imaging technology is powered by software that allows for not only image manipulation, but also for the production of accurate stereolithographic models and surgical guides.

The list goes on, but the unprecedented nature of this technology’s growth is easily understood by examining the experience of CEREC in dentistry. In the early 1980s through the early 1990s, clinical and laboratory standards of impressions, wax-ups, castings and ceramic buildup of restorations were well accepted by dentists and technicians. That fact, together with the state of computers that were available to the dental profession — costly and slow with poor memory capacity and limited graphic capabilities — made CAD/CAM’s acceptance by dentists and laboratories very slow.

Over the past decade, the exponential improvement of computer technology has changed the entire paradigm. Higher speed and increased computer memory, as well as enhanced graphics at affordable cost, allowed dentists and laboratories to give CAD/CAM serious consideration.

Early CEREC software was two-dimensional — current software is highly intuitive, with three-dimensional displays.

During this same time, dental paradigms have shifted from repair and functionality to a high demand for esthetic restorations. Laboratory costs for dentists are escalating rapidly, partially due to the staffing and cost challenges that commercial dental laboratories are facing.

Dentists and laboratories have been faced with higher production costs, and recent developments have brought to light the trend of laboratories to outsource work to other countries where inexpensive labor becomes the deciding factor.

The explosion of CAD/CAM has come at a time when both the conditions are ripe and the technology is ready. The driving forces are easily understood:

• computers are widely used in dental practices in numerous applications, with increasing numbers of dentists using computers in the operating room;
• learning curves have been dramatically reduced;
• digital camera imaging is commonplace;
• the public is placing a high value on esthetics and is demanding esthetic restorations anteriorly and posteriorly;
• continued controversy regarding amalgam restorations has led to legislation that limits the use of mercury in several states, and the overwhelming public perception is mercury in fillings is not desirable;
• and adhesive technology has matured to the point where restorations can be bonded to teeth rapidly, predictably and with an expectation for long-term viability.

CAD/CAM is filling a void in dentistry today, and CEREC by Sirona has been at the forefront by providing dentists with the ability to deliver optimally fitting, highly esthetic restorations at a significant cost savings within a single appointment visit.

With chairside design and in-office fabrication of restorations, dentists are free to enjoy complete control over the quality of their restorations as well as over the entire laboratory process.

At the heart of the CEREC process is a highly advanced imaging system. The camera takes a 3-D image, either intraorally or indirectly on a model, of a tooth preparation. CEREC’s camera is light, compact and ergonomic. It uses infrared waves, which are directed at the preparation. This information is returned back to the camera and is processed by CEREC’s computer to accurately measure the heights of the tooth structure, the adjacent teeth and the surrounding soft tissue.

Using complex algorithms, the preparations are displayed three-dimensionally on the monitor. A simple set of tools allows for the rapid virtual design of a restoration that will fit with the same degree of accuracy as laboratory castings, with complete control over occlusal morphology and proximal and occlusal contacts.

The benefits of CEREC are numerous to dentists and patients. Cost savings in the production of restorations are high. CEREC ceramic restorations are highly esthetic and made of superior materials. CEREC can create inlay, onlay single unit crowns and veneers, providing a consistently effective approach to conservative dental care.

With CEREC, dentists are able, for the first time, to take full control of esthetic crown, veneer, inlay and onlay restorations in their own offices. Dental laboratories, both large and small, can fully automate their processes, saving time and money while delivering high quality, highly esthetic and long-lasting restorations.

About the author

Dr. Eugene L. Antenucci is a 1985 graduate of New York University College of Dentistry. He was awarded a fellowship in the Academy of General Dentistry, the American College of Dentists and the International College of Dentists. Antenucci maintains a full-time private practice in Huntington, N.Y., and is an attending dentist at Montefiore Hospital and Medical Center. He is a certified CEREC basic and advanced training instructor and has conducted training seminars throughout the United States. Antenucci lectures internationally, conducting seminars in the clinical utilization of advanced technology in dentistry, as well as seminars in cosmetic dentistry and practice management. Antenucci and his wife, an orthodontist, reside in Laurel Hollow, N.Y.