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MAGAZINE Q2 | 2009

Alone? ... Not Really

A message from Co-editors **Drs. Mark Fleming** and **Darren Greenhalgh**

CEREC Connect

Improving your practice with ever changing dental technology **Dr. Armen Mirzayan**

OVERCOME YOUR OCCLUSION CHALLENGES

Dr. Michael J. Melkers

The Melding of Technologies

Dr. Mark Colonna describes the advantages of the Er:YAG Laser

Dr. Gordon J. Christensen Tells All

The leading clinician's thoughts on dentistry's digital trend **Dr. Sameer Puri**

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FROM THE EDITORS

Alone? … Not Really

MARK FLEMING, DDS & DARREN GREENHALGH, DDS

John Donne wrote, "No man is an island."
According to American Dental Association statistics, 75% of private practitioners practice solo. There are many times that dentists may feel like they are an island practicing alone.

We at *CERECdoctors.com The Magazine* do not want you to experience the feeling of isolation. In our goal to help CEREC users get the most out of their CEREC experience, we publish this dedicated CEREC resource journal containing articles and interviews highlighting successful practitioners and researchers.

This month we feature an interview with noted clinician Dr. Gordon J. Christensen. In 1976, Dr. Christensen and his wife, Dr. Rella Christensen, founded Clinical Research Associates (CRA). Today it is known as CR Foundation. This organization supports dentists by testing new and promising dental products and disseminating the results throughout the world. Dentists no longer have to feel isolated in making decisions regarding products and implementing change.

In this issue, Dr. Christensen shares his thoughts concerning the digital revolution in dentistry. With the recent introduction of the CEREC Bluecam, CEREC has become a major player in this development. This interview will help you expand your knowledge about this innovative side of dentistry.

"Early in our CEREC careers, we felt alone on our own island. **Oh, how things have changed!** Now there are over 24,000 CEREC users worldwide."

Dentists do not practice alone. One of their valuable partners is the dental laboratory. We can remember hearing, during the infancy stages of the chairside CAD/CAM revolution in the 1980's, a noted dental lecturer make an interesting comment concerning dental laboratories. He said that it would be wise to divest from dental laboratories because they would soon be a thing of the past.

We believe that through the digital revolution, dentists can have a strong relationship with their lab. Using CEREC Connect, a CEREC user can image preparations with the CEREC Connect software, image the opposing dentition and image a bite registration material to articulate models. This month, Dr. Armen Mirzayan shares a case utilizing this new and exciting technology. We believe that dental laboratories will continue to be a valuable partner to dentists, creating excellent restorations for our patients in an efficient manner.

We can remember early in our CEREC careers, we felt alone on our own island. There were few users, few ways of disseminating information on CEREC, and few training opportunities. Oh, how things have changed! Now there are over 24,000 CEREC users worldwide, with close to 10,000 of these users in the United States.

Need information? Just jump on the web. Drs. Puri and Mirzayan have created a dynamic CEREC website called CERECdoctors.com. Housing hundreds of the latest online educational videos and a highly active discussion board, this website can answer any CEREC question quickly.

Need training? In addition to Patterson's training facilities, there are over 20 intermediate and advanced training centers across the United States. Exceptional CEREC training courses are delivered by Drs. Puri, Mirzayan and Brady, exclusively at the world-class learning facility, Scottsdale Center for Dentistry.

Again, there are many times that we may feel alone, but we truly are not. *CERECdoctors.com The Magazine* promises to continually provide you with the latest techniques, tools and technology to perfect your skills and make the most of your CEREC experience.

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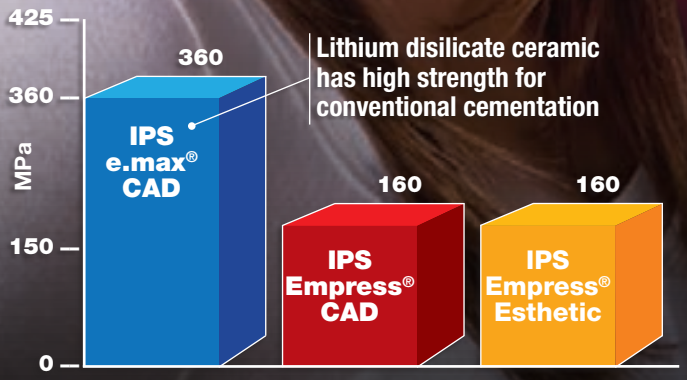

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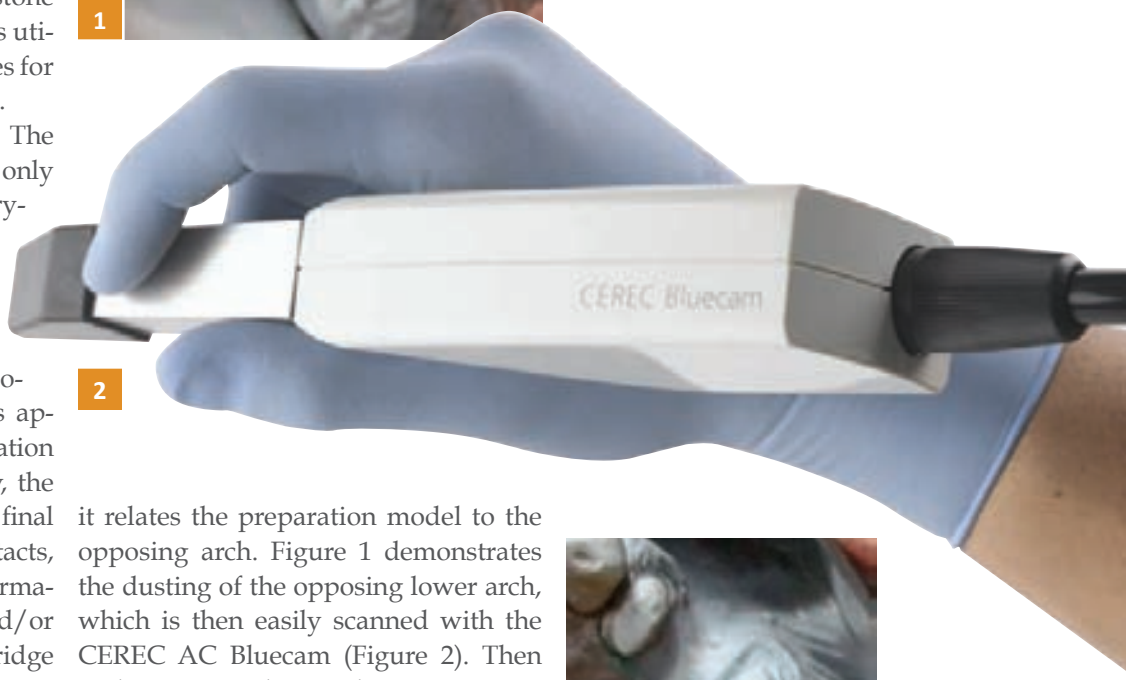
AN OVERVIEW OF THE PROCESS

Unleashing the True Power of the CEREC® Acquisition Center

ARMEN MIRZAYAN, MA, DDS

The promise of replacing the age-old impression taking has arrived! Numerous industries failed to appreciate the pace with which analog systems would be overtaken with digitization. The same process has finally arrived in dentistry, and our profession has duly taken notice! Although traces of this dramatic change have been evident for over two decades, the approach to digitization has been piece meal at best. Some systems only fabricated restorations chairside, while others sent the digitized information through an internet portal for fabrication of models. These models essentially replaced stone models, whereas the lab technicians utilized the same traditional techniques for the fabrication of these restorations.

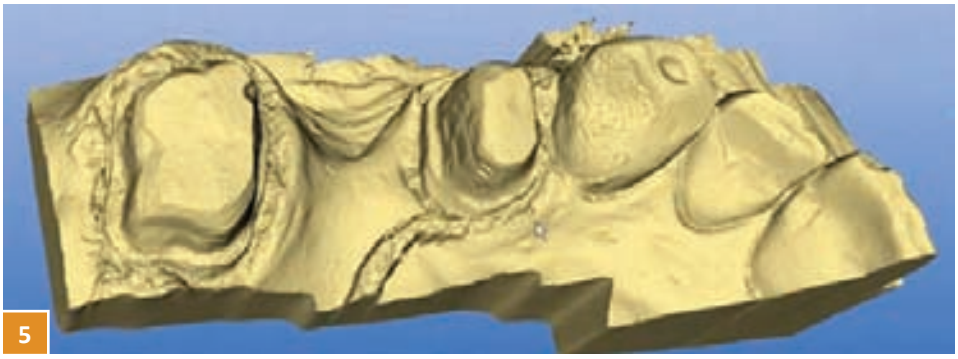


» Fig. 1: Powdered Opposing arch
» Fig. 2: Acquisition Center's Bluecam
» Fig. 3: Imaging of Powdered Arch

Launched in January of 2009, The CEREC Acquisition Center is the only system that encompasses all the varying types of technology that digitized the restoration fabrication process. The practitioner can mill a restoration chairside or elect to send the digital information to a laboratory for fabrication. The latter is appealing, particularly when a restoration requires a substructure! Essentially, the laboratory requires a model for its final processing of contours and contacts, while utilizing the same digital information for milling the substructure and/or full contour wax-up. A three-unit bridge can be fabricated in this manner.

Unlike the chairside version of the software, CEREC Connect captures the optical impressions of the opposing arch, and with the aid of a "partial bite," it relates the preparation model to the opposing arch. Figure 1 demonstrates the dusting of the opposing lower arch, which is then easily scanned with the CEREC AC Bluecam (Figure 2). Then with proper isolation, the preparations of the abutment teeth are covered with an opaquing medium (Figure 3) and are also captured.

The software requires the prepara-

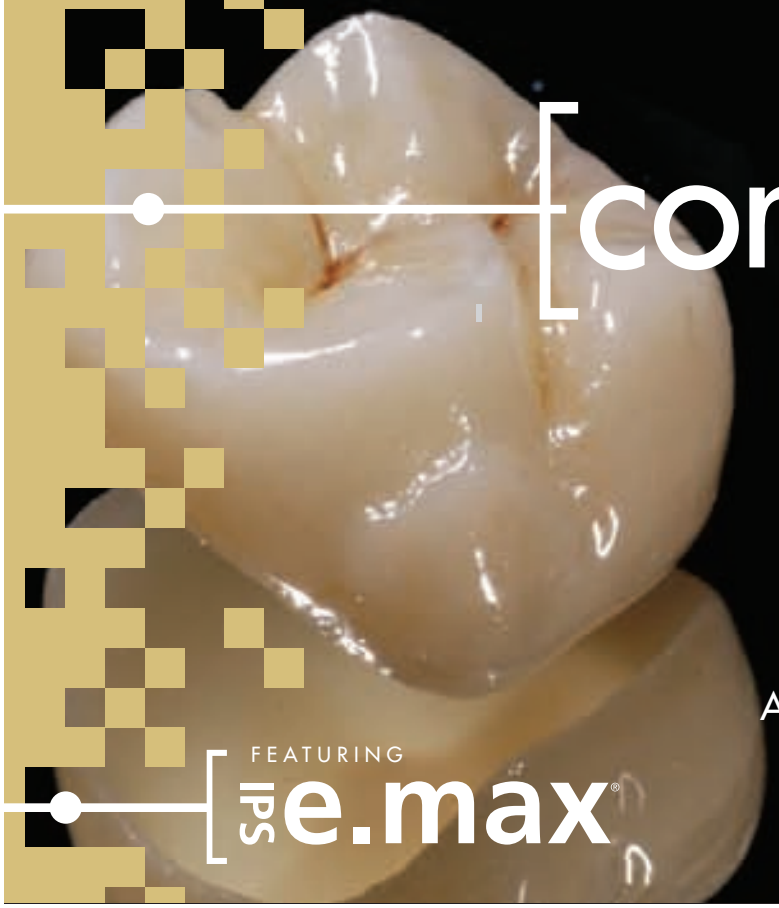


» Fig. 4: The necessary virtual models for processing case
» Fig. 5: The CEREC Connect software screenshot where the preparations are marginated and the file is submitted through a web portal
» Fig. 6: The sectioned model used for margination
» Fig. 7: The articulated Stereo Lithography model
» Fig. 8: The seat final porcelain fused to metal bridge

tion images, the partial bite images, and the opposing arch images to process the information (Figure 4). These images are then assembled into a virtual model that interdigitates the arches and renders the true working model of the prepared arch (Figure 5). The digital impression is then sent through CEREC Connect (see article on page 11, *CEREC Connect, The Process*) for the fabrication of the Stereo Lithography model (Figure 6). The articulated arch (Figure 7) is then delivered to the laboratory, where the technician can start the fabrication of the restorations. The final prosthesis is then delivered to the dentist for insertion (Figure 8).

For the first time in the history of the CEREC system, a cohesive network of laboratory technicians and dentists has been established through CEREC Connect. This platform will undoubtedly unwrap a wealth of opportunities that will ultimately aid the delivery of care for patients, eliminating many traditional steps that delayed the efficiency with which that care was delivered! The elimination of traditional Impression will have a profound impact on our profession and ultimately restructure the traditional landscape of dentistry.

Blending Science, Technology & Art



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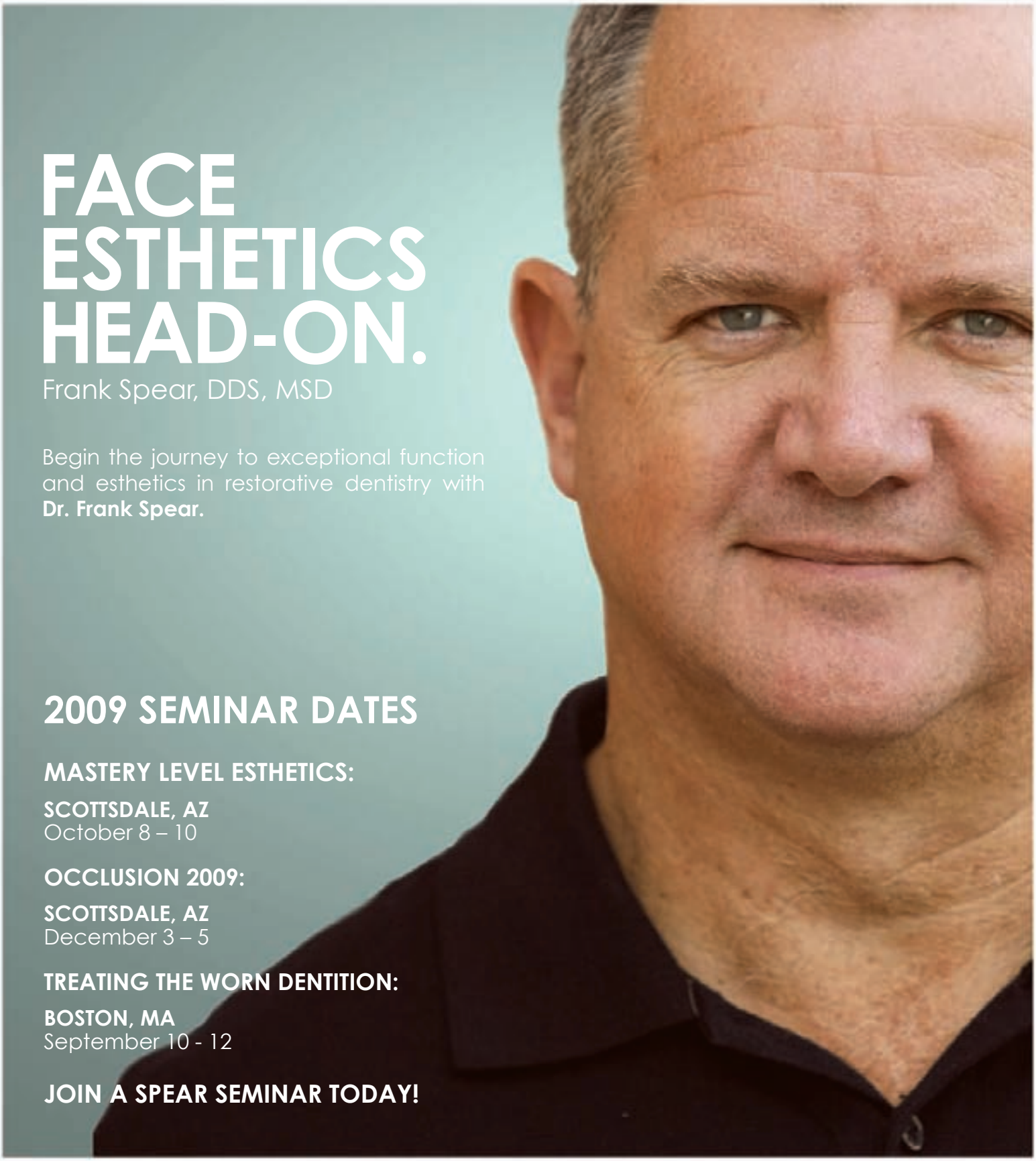

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LATEST & GREATEST

CEREC® Connect, The Process

ARMEN MIRZAYAN, MA, DDS

CEREC Connect was officially launched at the Chicago Midwinter Meeting in February of 2008. The initial phase only fabricated full contour all ceramic restorations and did not work with models that were generated from the optical impressions. Starting in May of 2009, CEREC Connect is now a fully functional software that can give the end user the option to produce models so that they can fabricate any material a dentist wants to utilize.

The dentist must first register with the CEREC Connect webportal at www.cerecconnect.com (Fig. 1). The navigation through the site is user-friendly and the doctor can register from a list of CEREC inLab users, who number well over 900 in the United States.

> **"The CEREC Connect software** allows users to produce models so they can fabricate any material they wish."

1

Once registered, the software is delivered to the dental practice and installed on the CEREC machine for current and new users. An internet connection from the machine is desirable, but not mandatory, as the files can be easily transferred to another machine that has access to the internet. Once installed, that dentist will launch the program, proceed through the platform, and image the preparations, the partial bite, and the antagonist (Fig. 2).

Unlike the chairside software, the antagonist optical impressions are of the opposing arch itself, not of the bite registration! A partial bite is also taken to help relate the preparation model to the opposing arch (Fig. 3). It is essential for the practitioner to capture enough landmarks mesial to the preparation so that the software can relate the models.

Once the articulation of the models is confirmed, the next steps involve the digital trimming (Fig. 4) and margination (Fig. 5) of the preparation. The steps must be repeated for multi-unit cases. Once this is complete, the CEREC Connect icon is activated from the left panel and the username and password of the dentist is entered (Fig. 6).

A new dialog box is launched that is a digitized lab prescription form, where the fields are appropriately addressed.

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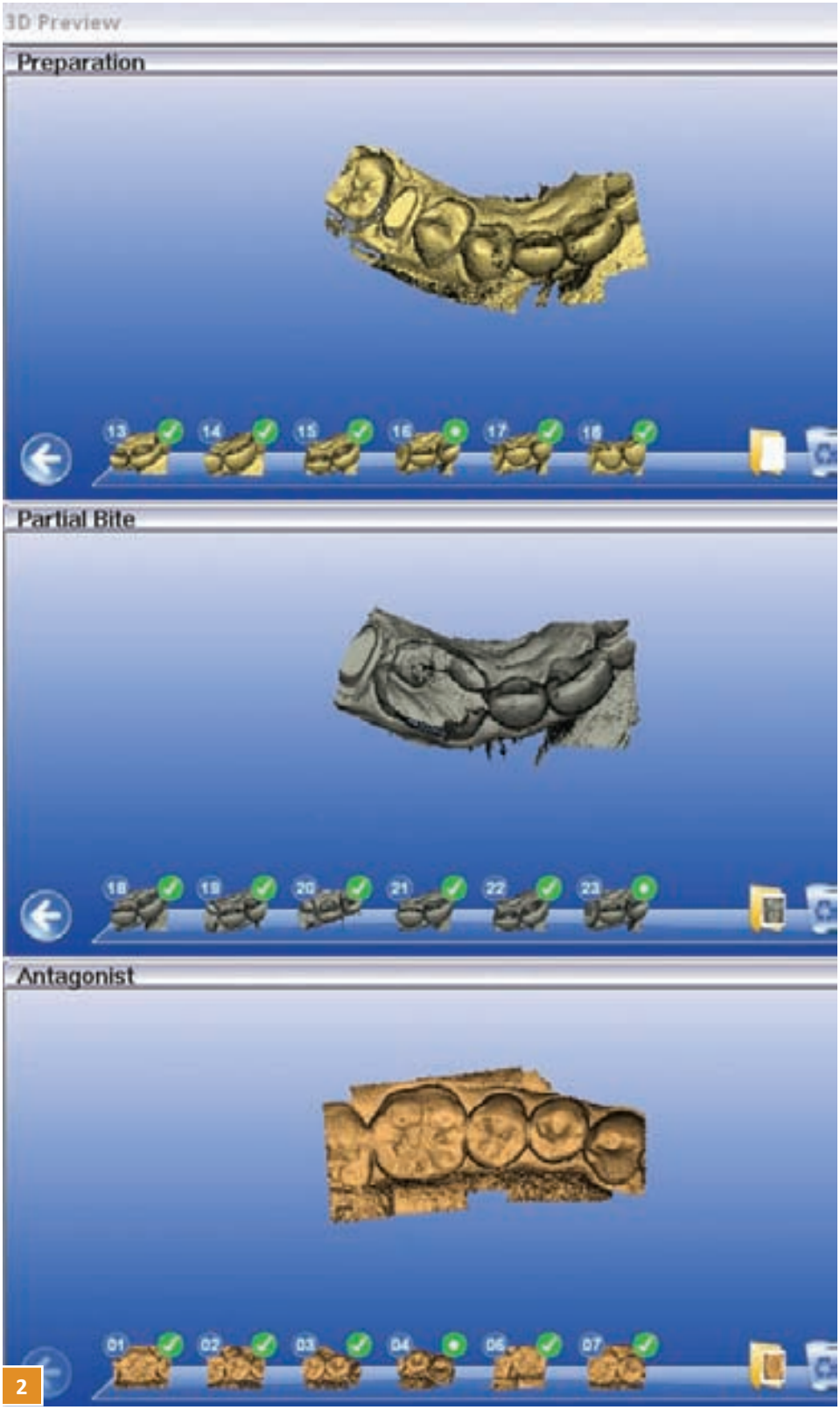

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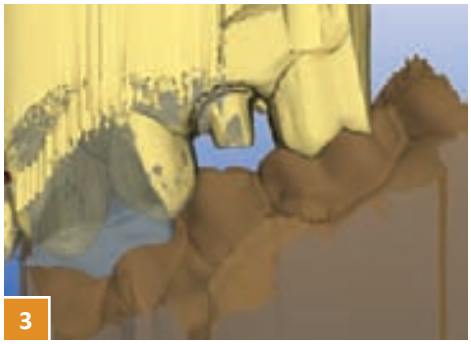
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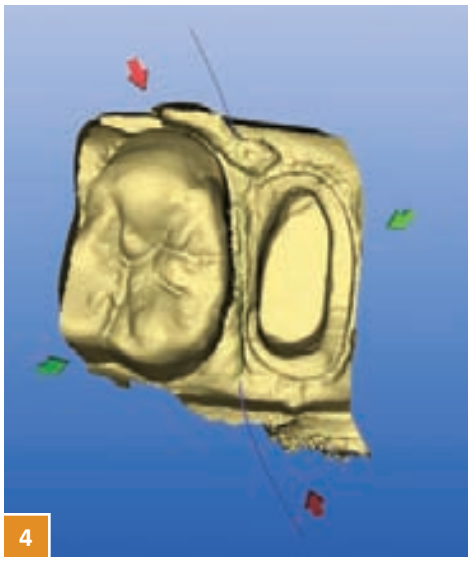
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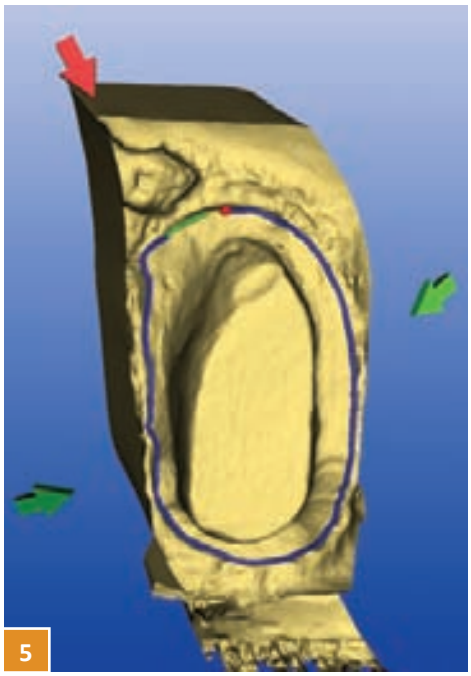
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internet portal access
Login
User name
Password
Registration
OK
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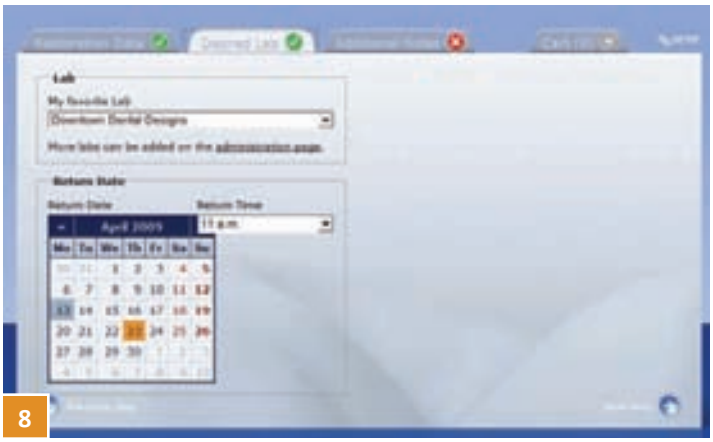
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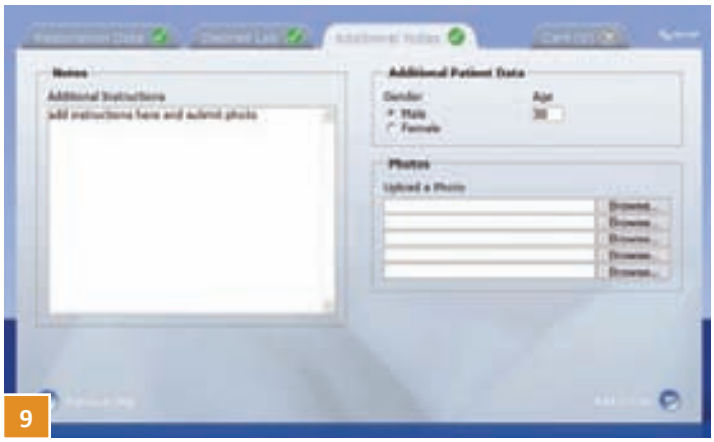
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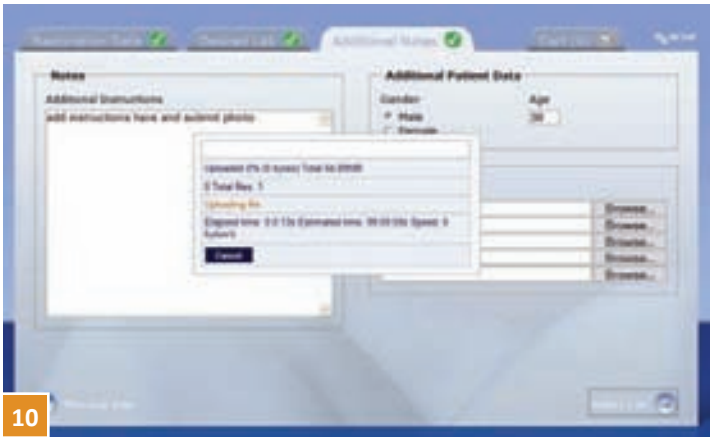
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The patient's name is automatically entered, and the practitioner must choose the restoration that is clinically appropriate for the selected case (Fig. 7). If the practitioner chooses an all ceramic restoration, the lab technician can opt to fabricate without the need for models. If the restoration requires a substructure, the lab technician can have a model fabricated, utilizing stereolythographic models.

The rest of the prescription form is filled to completion, including the stump shade and the desired final shade. The next steps within the software require the selection of the desired laboratory (Fig. 8) and any other pertinent information required for the case. There is also an option for attaching digital still images to the prescription form (Fig. 9). The case is then uploaded to the cart (Fig. 10) and then ultimately submitted to the desired laboratory (Fig. 11).

Once the technician has analyzed the submitted case, he or she can order the fabrication of a model (Fig. 12, above) if they so desire. Generally the model is used for finishing the case and optimizing contacts and contours. From the same digital file, the technician can begin the process of milling the zirconia substructure (Fig. 13) and the full contour wax up that will be fused to it (Fig. 14). The whole complex can then be inspected for accuracy on the model, once it arrives to the technician's office (Fig. 15), and then pressed to completion.

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AN INTERVIEW WITH DR. GORDON J. CHRISTENSEN

Thoughts on Dentistry's Digital Revolution

SAMEER PURI, DDS

As part of our continuing series of conversations with clinicians on the CEREC® system, it's once again my pleasure to speak with one of the most famous dentists in the world. Dr. Gordon J. Christensen has been involved in dentistry for decades, and when Dr. Christensen speaks, dentists listen.

His influence spans continents and he is admired and sought after for advice by thousands upon thousands of clinicians worldwide. It was about 18 months ago when I heard him speak about digital impressions and how this trend was taking over dentistry. It certainly seemed fitting to hear his take on the CEREC Bluecam which, as you know by now, is not only capable of imaging inside the mouth and milling a restoration in about 5-7 minutes, but it is also capable of taking a digital impression and sending that impression to the laboratory for model fabrication of virtually any type of restoration that the doctor chooses.

I would like to thank Dr. Christensen for his time; when he is not serving as the Senior Academic Advisor at Scottsdale Center for Dentistry, he is at his center in Provo, Utah, where he conducts research and creates educational DVDs for dentists. In his spare time, he manages to practice dentistry all over the world.

I hope you enjoy my interview with Dr. Christensen.

Q: ***Today, more and more companies are getting involved in digital dentistry, whether it is a digital impression system or digital impression and chairside milling. What has led to the growth of this technology?***

Doctors Gordon J. Christensen (left) and Sameer Puri.

A: Dentistry has been involved in the concept for many years, and the advent of CEREC 3, its new programs, and now the CEREC AC, have stimulated the profession to see the clinical and financial feasibility of CAD/CAM in the profession. It will continue to grow until it is fully integrated into the profession.

Q: ***With digital impressions such as those done with the CEREC Bluecam, the doctor can have any material fabricated by sending the digital scan to their laboratory. Why is this important?***

A: Some dentists do not want to use all-ceramic restorations, especially on molars. Those dentists can now have PFM restorations or all-metal restorations made as needed or desired. Additionally, some practitioners are not interested in the "lab" components of the procedure and the digital impression-only concept omits those procedures.

Q: ***How do the materials milled chairside by the CEREC system, compare to the ones that are fabricated by the laboratory?***

A: In *Clinicians Report*™ (previously named *CRA*), the group showed that the manufacturer-made materials were superior to conventional laboratory restorative materials. This finding is undoubtedly related to the fact that the CEREC materials are produced in the manufacturer's facility with close control and ideal conditions, whereas this is not typical in a dental laboratory.

Left: Doctors Gordon J. Christensen (left) and Sameer Puri.

Facing page: Doctors Puri and Christensen with students in the Scottsdale Center lab with the CEREC Bluecam.

Q: ***What are some of the most significant improvements in chairside CAD/CAM?***

A: Originally, 15 to 20 years ago, CAD/CAM dentistry was slow, unpredictable, and laborious, requiring significant hands-on work. Currently, the CEREC AC device is almost self-operating. The self-focus concept, auto anatomy, exact contact areas, occlusion, and simple software make the new device faster and simpler to use.

Q: ***What type of practice should look into chairside CAD/CAM?***

A: Practices using staff to an optimum degree usually have little challenge incorporating CAD/CAM. At least half of the procedure can be a staff function. Practices accomplishing many units of indirect restorations in a conventional manner will find that many of those restorations can now be made efficiently and effectively with CAD/CAM.

Q: ***What type of practice should look into a digital impression device only?***

A: If a dentist does not like the lab portion of the indirect restoration procedure, that dentist might only prefer the digital impression part of the system. Also, the lower cost of the impression concept allows those with less financial ability to get into the concept.

In addition, those practices performing a significant amount of indirect restorations, especially singles and 3-unit FPDs, are prime candidates for chairside digital impressions. The patient comfort and lack of mess are major advantages of chairside digital impressions.

Q: ***Many doctors are worried about the cost of chairside impression systems and chairside CAD/CAM systems. How can doctors recoup their investments?***

A: We have calculated the financial feasibility of CAD/CAM in-office milling many times. If the practice is performing only 13-15 indirect CAD/CAM restorations per month, the cost of CAD/CAM versus conventional lab work is about the same since the lab cost for making the 13-15 restorations equals the monthly cost of the device. Any restorations over that number per month are made only at the cost of the milling block and supplies.

Digital impression devices are also cost effective if one considers the savings made by eliminating impression materials, trays, temporary material, temporary cements and chairtime. However, the recoup time is directly related to the type of indirect impression procedure that the dentist was previously using and the cost and time involved in that procedure.

Q: ***What features would you like to see incorporated into chairside CAD/CAM?***

A: I would like to see a smaller device, perhaps one built into the operatory cabinetry. Although powder is not a major impediment, its elimination would be desirable.

Q: ***You have been a user of the CEREC Bluecam for a number of months now. How does it compare to the previous generation of CEREC?***

A: The current generation of CEREC is unbelievably faster and better than previous models. We have played with CAD/CAM for at least 18 years, and earlier models were not easy to use. We only considered them for research projects. The current CEREC Bluecam is simple and predictable. It is user friendly and adaptable to almost any practice performing indirect restorations.

Q: ***The laboratory can get physical models fabricated from the CEREC scans. How do these models compare with regards to accuracy with traditional stone models?***

A: It has been proven that the models are accurate and very adequate.

Q: ***What do you see as the future of digital dentistry?***

A: Although several years will be required to continue the development of the CAD/CAM concept, there is no doubt that digital dentistry is the future. I advise young dentists just graduating from school to purchase the digital de-

vices as soon as they can afford it.

Q: ***For an office integrating CAD/CAM, what changes can they expect to make to ease the transition?***

A: For the staff and dentist's knowledge, training is essential to the acceptance of the concept and understanding of the devices and techniques. Staff involvement in the clinical procedure is essential. Patient education on the advantages of the concept is mandatory for acceptance, and larger operatories are desirable to facilitate space for the devices. Multi-patient scheduling is essential for the dentists to use the milling time effectively.

Q: ***Would you say that CAD/CAM dentistry is now mainstream?***

A: It is definitely becoming mainstream. Several years of continued penetration into the profession will make the concept a significant portion of everyday practice.

Q: ***For a doctor, how important is training in regards to becoming proficient with chairside CAD/CAM?***

A: Training on the use of CAD/CAM and maintaining the devices is essential. Furthermore, continual use is necessary to become competent with the concept.

Q: ***You were very involved in launching the Scottsdale Center for Dentistry. What is your relationship with the Center today and how are things going there?***

"Scottsdale Center for Dentistry is the **most up-to-date and technologically advanced** continuing education facility in dentistry."

— DR. GORDON J. CHRISTENSEN

A: Just about two years ago it was my pleasure to assist in the grand opening of the Scottsdale Center for Dentistry, which is the most up-to-date and technologically advanced continuing education facility in dentistry. I am currently Senior Academic Advisor for the Center, and it continues to be my privilege to provide frequent hands-on and seminar courses in Scottsdale, including courses on the CEREC concept. The Scottsdale Center provides an optimum opportunity for continuing education in an excellent environment from some of the finest and most respected instructors in dentistry. Those selected faculty members are enjoying success as the Center continues to grow and mature. I see a very positive potential for the Scottsdale Center to continue to fill a major role as a provider of high quality continuing education for the profession.

Q: ***You have spent decades serving the dentistry profession. What does the future hold for Dr. Gordon Christensen?***

A: Retirement is for old, sick, tired, trembling, broken down dentists. Since I am none of these, I will continue doing exactly what I love to do with whom I prefer to associate including dentistry, family, my excellent staff, church, community and my many hobbies being motorcycles, fast cars, horses, fishing, ATV's, mountains, speaking and associating with my beloved friends and associates in the profession.

A SCREENING TOOL FOR SECOND MOLAR CHALLENGES

Nuts & Bolts Occlusion Solutions

MICHAEL J. MELKERS, DDS, FAGD

When discussions arise regarding dental materials and their applications, second molars are frequently at the forefront of the conversation. Every clinician has their own story of the second molars that challenged them and strained their lab and patient relationships. Reduction copings were requested from the lab, when we knew that we had reduced enough, and we had received patient phone messages stating that "a little piece of something seems to have come off the new crown that was done last week." Second molars have been and continue to be a frustration. Stop gap solutions of better, stronger materials, metal occlusal porcelain, fused metal restorations, and even full cast gold crowns, still experience wear and material failure while perhaps increasing material longevity.

It is critical to realize that it is not the materials that are the primary reason for failure, but the forces that are applied to them. Second molars are frequently at the center of discussion on material failure, as they are subject to the greatest amount of occluding and parafunctional forces. This is due to their having the greatest proximity to the vertical load forces of the masseters and temporalis during parafunctional activity. These muscles can be thought of as the "clencher-destroyers of dentistry" for complex restorative practitioners. As these muscles are active during destructive parafunction, they contract posterior to the second molars and the condyle may become elevated to a superior position. This seating can cause the entire parafunctional load to transfer to exclusive second molar contacts, resulting in natural tooth or restorative material wear and fracture.

» Figs. 1 & 2: PFM and FCG restorations under 5 years old exhibiting material failure.

The following case demonstrates the utilization of a screening tool to help anticipate second molar case challenges and how they may be overcome.

CLINICAL PRESENTATION

A patient presented with complaints of a fractured second molar with related temperature sensitivity, as well as irritation to her tongue from the rough nature and location of the fracture. She reported a history of having the tooth in question fixed several times over the years and that it just seems to be a problem.

From the initial presentation, we can see a history of restorative care on the second molar including composite resin and amalgam restorations (Figure 3). We can also note additional restorative care of a full coverage crown on the first molar, as well as signs of attrition on the opposing second molar. Clench Scene Investigation (CSI) would tend to support not only forces applied to the tooth in question, but also a history of material (natural and restorative) challenges and failures. As we approach the case, what can we do differently to minimize or delay these material failures as much as possible?

LEAF GAUGE SCREENING METHOD

To prevent replicating the occlusal scenario that contributed to the frac-

» Fig. 3: Second molar with fractured mesial-lingual cusp.
» Fig. 4: Leaf gauge screen with no posterior contacts.
» Figs. 5 & 6: First contact verified during mimicked parafunctional activity.
» Fig. 7: Depth guide reduction with 2mm tip diameter bur.
» Fig. 8: 1.5mm reduction guide cannot pass freely.

ture, we can screen for parafunctionally applied forces prior to restorative treatment. This will allow us to see if the second molar has been, and will continue to carry the brunt of the parafunctional load. We will also see whether we can modify that distribution.

A leaf gauge is inserted between the central incisors and the patient is instructed to close on their back teeth. Sufficient leaves should be added until there is no posterior tooth contact during this activity. Then of course, the patient will not be able to bite on their back teeth. What they will do is mimic the superior repositioning on the condyle, as would occur during clenching in parafunction. In Figure 4, sufficient leaves are added until the 12 micron articulating paper can be removed from the posterior teeth, during a clench, without resistance.

Next, the leaves are taken away one at a time until a first posterior contact can be identified in a clench with the articulating medium.

The first contact (Figures 5 & 6), as verified with this screening method, is at the point of fracture on the mesial-lingual cusp. It can also be noted that an additional first or near first contact also exists at the enamel-resin interface on the distal-buccal cusp, and that this area is showing stress fracturing.

IS THE PAST A PROLOGUE TO FUTURE FAILURE?

The question is what do we do with this information? Will this information affect my reduction needs? Will there be a required alteration in my CEREC design approach? Is there anything else that can be done to minimize future failure? These are all important questions as we incorporate this valuable tool into our restorative practices.

INCREASED OCCLUSAL REDUCTION NEEDS

As the number of leaves increases to determine the point of first contact, the likelihood exists that removing that contact during preparation will alter the occluding relationship. The greater the number of leaves, the greater amount of reduction will be required until all or as many teeth can meet to distribute occluding-parafunctional forces following restorative care.

To demonstrate this change, a large diamond bur with a 2mm tip diameter was used for initial depth gauge reduction (Figure 7). This reduction was continued across the entire occlusal surface for restorative material convenience.

Following the initial occlusal reduction, clearance was tested with a rigid reduction loop. Even though the initial depth cuts provided a uniform reduction of 2mm from the occlusal surface, a 1.5mm reduction test loop could not be inserted between the preparation and the opposing second molar (Figure 8).

Unfortunately, every restorative practitioner has likely experienced this frus-

tration, frequently after the case has been milled or returned from the lab. Costly and frustrating adjustments, re-preparations and even material failures can try the clinician, patient and technician alike.

Utilizing the leaf gauge screening and the reduction loop, we can anticipate the additional reduction needs. In this case, we were able to provide additional occlusal reduction to allow a 2mm reduction guide loop to easily pass (Figures 9 & 10).

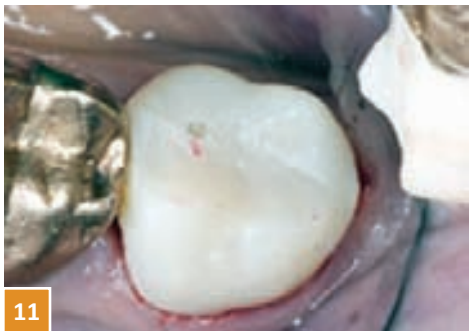
Now of course, the increased number of leaves will increase the challenge of the clinician's ability to anticipate what will hit next and whether we can manage the restorative force distribution without mounted models for evaluation. Each practitioner will need to determine the number of leaves that is within their comfort zone to manage, based on their experience level and the unique aspects of each case. This is especially true if additional equilibration of the surrounding dentition is required to facilitate force distribution.

In this case, we were able to provide distributed occluding contacts in cusp, fossa and marginal ridge areas which coincided with parafunctional seating of the condyle and maximum intercuspation position. The case is now appropriately designed, prepared and verified for predictable restorative care with CEREC or traditional restorative methods.

ALTERATIONS IN THE CEREC DESIGN APPROACH

While correlation is likely the most frequent single unit design approach, it is in these types of cases that we can encounter challenges and rapid material failures. If the preoperative image captured for use in correlation mode includes the first contact area(s) that led to the fracture in parafunction, the contact will be replicated in the final restoration and failure may soon follow.

In the above case, this replication of the offending contact can be seen in the bisacryl temporary crown prior to any adjustment. Note that the screened contact continues to exist at the juncture of the remaining tooth and restorative structure and the replaced fractured cusp (Figure 11).



» Figs. 9 & 10: The anticipated addition and verified reduction allows for the reduction guide to pass freely.

» Fig. 11: Caution should be taken not to replicate the offending contact.

In these situations, it would be advisable to equilibrate the occluding contacts to an acceptable scheme, prior to preoperative imaging, which will be used in correlation. Also, using an antagonist method of design, following preparation and occluding refinements is advised.

ON TO RESTORATIVE PREDICTABILITY

I hope that the above protocol will help your predictability and reduce stress with your CEREC and all of your restorative procedures. Please realize that occluding force distribution and refinement is intended to minimize, not eliminate, parafunctional destructive forces. Protective appliance therapy is frequently indicated and can be the best "dental insurance" for our restorative care, regardless of the material.

Dr. Melkers is the founder of the Nuts & Bolts Occlusion program. He balances his time between private practice teaching, researching, and publishing. Dr. Melkers enjoys sharing real world challenges as well as solutions in his interactive learning experiences. To contact him or learn more information about his programs, please visit www.MichaelMelkers.com.

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The Melding of Technologies

Minimally Invasive CEREC® Crown Preparation using the Er:YAG Laser

MARK COLONNA, DDS

Today's technology allows us to do certain things with patient care that years ago seemed unfathomable. We used to perform multiple appointment endodontics and multiple appointment crown restorations with a laboratory, while using valuable chairtime to our disadvantage.

Today we can actually perform all of these procedures in one appointment within a couple of hours, using the proper magnification, illumination, CAD/CAM, and laser technologies.

Not only has this enhanced the profitability of these procedures but, more importantly, the *quality*, predictability and timeliness of the treatment outcome, ultimately benefiting the patient. We thought this only existed in our mind's eye years ago, but the following case shows how this actually works today using advanced technology.

One last note: at no time was a rotary instrument used in this case, neither at high nor low speed. All procedures were performed exclusively with the ER:YAG Laser. The only hard implements that came into contact with the tooth were the root canal hand files used to extirpate and enlarge the root canal space prior to obturation.

» Figs. 1-2: irreversible pulpitis.
» Fig. 3: Opaquing of pre-op.
» Fig. 4: Imaging of pre-op.


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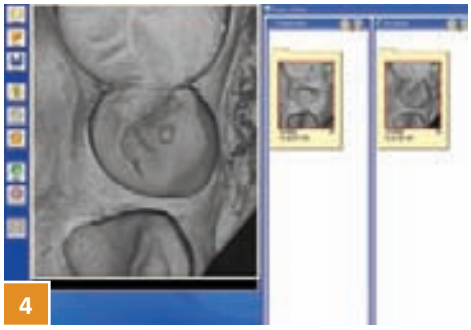
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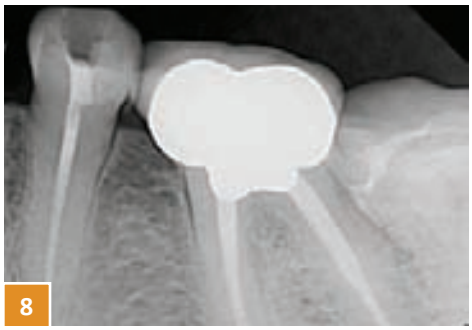
PATIENT HISTORY

Our patient, a 58-year-old male who was visiting my city but works in Los Angeles, was experiencing a "toothache." Upon radiographic examination of tooth number 21, we discovered a small disto-occlusal alloy with recurrent decay underneath, leading to an irreversible pulpitis (Figs. 1-2).

The patient's health history was unremarkable and we proceeded to place the Isolite and take our preliminary correlation pictures with our CEREC CAD/CAM computer (Figs. 3-4). We also used the Global G6 microscope to further examine the tooth under various magnifications, as to assess what



» Fig. 5: "Naked eye" pre-op.
» Fig. 6: 5.5x magnified.
» Fig. 7: Exposed nerotic tissue.
» Fig. 8: Final obturation.

type of damage and wear the tooth had, and to help us determine what type of crown design and porcelain to use for our final coverage post endodontics.

I cannot emphasize enough the need for proper magnification in practicing dentistry, especially using lasers. It is critical that the operator be able to see what is happening when the laser is interacting with the oral tissues (Figs. 5-6).

Notice with the "naked eye," which is not magnified, very little detail is seen. At 4.5x or more magnification, the clinician will be able to really see what is happening for diagnostics and treatment. Note that we will be treating the wear facet on the buccal area of the tooth.

After we had taken our correlation images, we proceeded to place the rubber dam for complete isolation to perform the laser root canal procedure.

Now, there are actually a couple of ways to proceed here. One way is to perform the crown preparation and mill the restoration while we perform the endodontics. The other way is more conventional, and this is what we decided to proceed with.

We performed the endodontics, placed our buildup material, and then prepared the tooth for our CEREC restorations. Here's how it went.

LASER ENDODONTICS

Using the Er:YAG Laser (Lares/Fotona Powerlase AT), and utilizing a "tipless" hand piece, I was able to create access into the root canal chamber and expose the nerotic tissue (Fig. 7). We performed the minimally invasive endodontics utilizing hand instruments and subsequent disinfection with the Er: YAG Laser.

We then obturated according to the endodontic standard of care (Fig. 8), and then placed our build up restoration. Again, no rotary instrumentation was used at any time.

» Figs. 9-10: The peripheral rim of enamel.
» Fig. 11-12: The reduction taking place axially and forming the shoulder margin concurrently.
» Fig. 13: A pulse from the tipless hand piece.
» Fig. 14: Tipped hand piece with quartz tip.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RESTORATIVE PROCEDURE WITH ER:YAG LASER AND CEREC

Once the endodontics was completed, we were ready to begin the restorative phase using the Er:YAG Laser and CEREC.

Using the tipless hand piece, I first removed the occlusal surface to expose the peripheral rim of enamel (Figs. 9-10). By exposing the DEJ, one can direct laser energy down the axial walls and create a very smooth and predictable crown preparation.

The laser energy is easily controlled and directed by aiming the beam directly where you would like to ablate the tooth. There are also controls on the laser itself which can be used to set the amount of laser energy, air and water that one would like to use to prepare the tooth.

The preparation parameters are the same ones taught by most CEREC instructors as far as size of margin, type of margin and how much overall tooth reduction one must have for adequate porcelain thickness. My reference to CERECdoctors.com has helped me to understand how much tooth to prepare with the laser.

Figs. 11 and 12 show the reduction taking place axially and forming the shoulder margin concurrently. The laser has variable hz (pulse repetition) rates, as well as variable pulse duration settings. When understood, these rates can facilitate how smooth or coarse, and how quickly one can prepare a tooth for a porcelain restoration. The Lares/Fotona laser can actually prepare a tooth as fast as, and in some cases faster than, a high speed drill with all the different settings at my disposal. This is especially true for smaller premolar preparations restored with the minimally invasive CEREC 3D. Even margin type is not an issue, as I have prepared both chamfer and butt margins quite easily with the laser.

Fig. 13 demonstrates a single pulse from the tipless hand piece which is 900 microns in diameter, almost 1 mm,

With today's available technologies, namely the Er:YAG Laser, CEREC 3D CAD/CAM and the dental microscope, **the ability to perform endodontics and full prosthetic coverage in a single appointment** and without rotary instrumentation, is now a reality.

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for the perfect size butt margin placement. After "roughing in" the margin with this hand piece, I used the tipped hand piece (Fig. 14) with an 800 micron quartz tip and a very high hz, creating a very smooth margin for our final image with the CEREC camera. This tip can be used in contact with the tooth as well, affording the operator some tactile sensation like one would have when using a high speed rotary hand piece.

One final step, and a nice advantage to using a laser, is soft tissue management. Along the distal of the preparation, the margin went just slightly below tissue level. I was able to use a special tip to "trough" the tissue and expose the margin. Note that the field remains bloodless for proper image reading with the CEREC 3D camera (Fig. 15).

At this stage, we were able to image the preparation with the CEREC 3D camera and design our restoration. Following are the photos of the final preparation, all achieved using the Er:YAG Laser and without any rotary instrumentation. The margins were very sharp and readable by the CEREC 3D camera (Figs. 16-17). We then proceeded to design the restoration in Correlation (Figs. 18-22).

We designed the crown using a Vita Block and milled in "endo" mode. Milling took approximately 12 minutes and the patient got the opportunity to watch his crown manufactured. We like to show the patient how their restorations are being made, and in addition to the laser, and microscope, the "wow" factor really kicks in as they see that their tooth was never really touched by anything other than laser energy. We also like to show them the final restoration itself, during try-in and cementation (Figs. 23-25).

We finalized the "fit" by staining and glazing chairside and then placing the crowns in our Ivoclar oven to bake the crown to its final luster.


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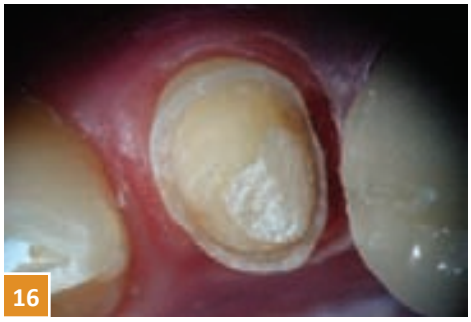
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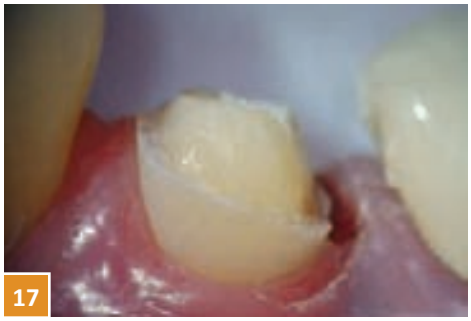
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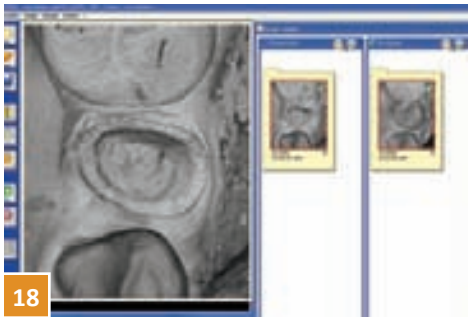
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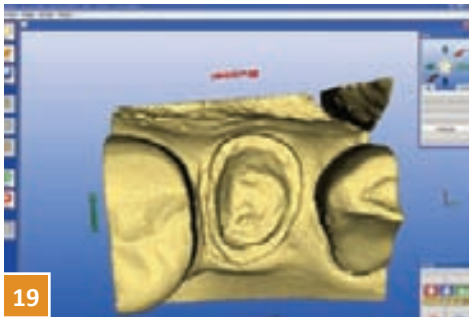
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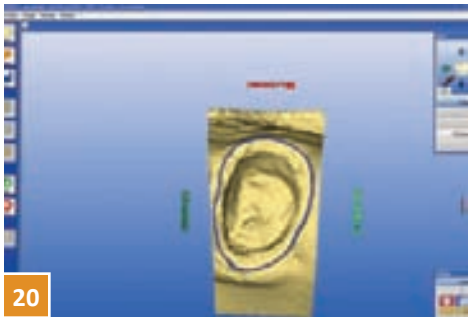
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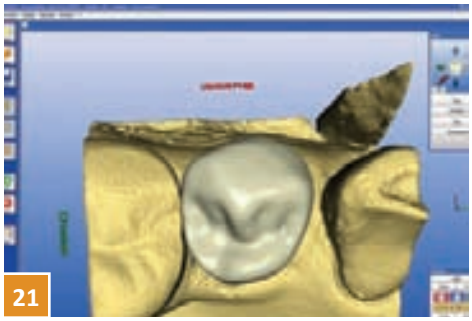
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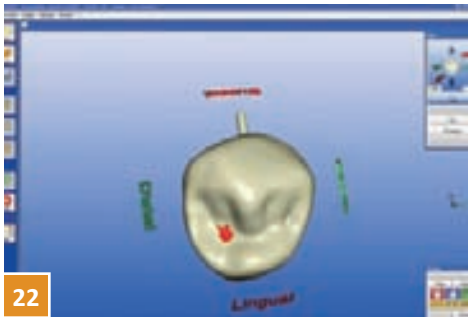
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CONCLUSION

With today's available technologies, namely the Er:YAG Laser, CEREC 3D CAD/CAM and the dental microscope, the ability to perform endodontics and

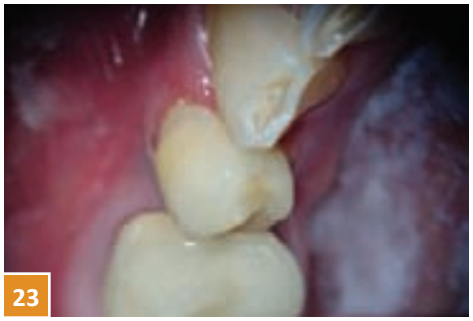
» Fig. 15: Exposed margin.
» Fig. 16: Occlusal view.
» Fig. 17: Buccal view.
» Fig. 18: Optial image of preparation.
» Fig. 19: Preparation model.
» Fig. 20: Defining the margin.
» Fig. 21: Proposal.
» Fig. 22: Final restoration ready for milling.

full prosthetic coverage in a single appointment and without rotary instrumentation, is now a reality.

With the exception of an endodontic file, the tooth in this case presentation was never touched by an instrument throughout the entire treatment process. Years ago, this seemed like a myth but today is a reality with the fine technological instrumentation available.

Patients appreciate the minimally invasive nature, and conservation of their tooth structure along with how these procedures are performed.

We must continue to strive to "think outside the box" when it comes to technology and its purposes. After all, we too are patients and I would like to think that we also want to have the best treatment modalities available for ourselves. This kind of advancement in dentistry will only serve to make our patients more trusting and willing to give themselves the appropriate treatment, and value its worth!



» Fig. 23 (far left): Try-in.
» Fig. 24 (above): Final restoration immediately after cementation.
» Fig. 25 (left): Close up of margin.

CEREC® EFFICIENCY

Efficient & Predictable Preparations

TARUN AGARWAL, DDS

By now, all CEREC owners are familiar with the phrase "Prep, Powder, Picture" and its importance to the overall CEREC procedure. In our neverending quest for ultimate CEREC efficiency, we often spend much of our time focusing on the software and materials used in everyday CEREC.

I would like to take a closer look at the first tenant of the 3 P's of CEREC to search for greater efficiency and results.

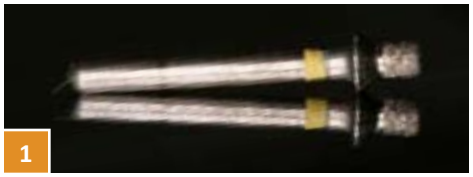
While it sounds childish to discuss such a basic principle of restorative dentistry, I can assure you that time spent in honing your skills and techniques in the proper preparation of CEREC crowns, will greatly reduce your procedure time and result in longer lasting restorations.

HOW PREPARATION AFFECTS THE RESULT

Do you ever find yourself hunting for margins in the software? Did you realize that one of the main causes of porcelain fracture is inadequate material thickness? The more time spent preparing the tooth also increases the risk of pulpal injury and endodontic therapy. The preparation protocol outlined in this article will ensure adequate material thickness, reduce preparation time, produce well-defined smooth margins, and thus improve your overall CEREC efficiency.

PREPARATION FOR CEREC CROWNS

Whether you are using Empress CAD, CEREC Blocs, Vita Mark II, or e.MAX CAD, the requirements are all nearly the same. The manufacturer calls for a minimum of 1.5mm (preferably 2.0mm) of occlusal reduction, 1.0mm (preferably 1.5mm) of axial reduction, and a 1.0mm well-defined modified shoulder or heavy chamfer margin.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Ultimately our preparation procedure should always guarantee these minimums in a timely manner.

THE TECHNIQUE

In an effort to meet the manufacturer requirements, reduce time spent on preparation, and simplify inventory, I found myself following a "connect the dots" approach to crown preparation and creating an assembly line procedure. The entire crown preparation is completed with three burs and the result is an ideal, ultra smooth preparation.

The first bur used is a 2.0mm Occlusal Reduction bur (Fig. 1). This specialized bur has a stop which allows exactly 2.0mm of reduction and is used only for occlusal depth reduction.

> "In an effort to ... reduce time spent on preparation, I found myself **following a 'connect the dots' approach** to crown preparation and creating an assembly line procedure."
>
> — TARUN AGARWAL, DDS

The second bur is an 856-016 coarse diamond (Fig. 2). This bur is a tapered diamond with a tip diameter of 1.6mm

and is used for gross occlusal reduction, interproximal reduction, facial depth cuts, and gross axial reduction.

The final bur is an 856-021 fine diamond (Fig. 3). This bur is a tapered diamond with a 2.1mm tip and is used to create a smooth finish and create your final margin.

Precise 2.0mm deep cuts are made along the occlusal surface through all cusps to ensure adequate occlusal thickness using the occlusal depth reduction bur (Fig. 4).

As demonstrated in Fig. 5, interproximal reduction is accomplished on both mesial and distal carefully, using the 856-016. Occlusal reduction is then completed, using the 856-016 by connecting the 2.0mm depth channels (Fig. 6).

A photograph of the completed occlusal and interproximal reduction is shown in Fig. 7.

Axial reduction is accomplished by taking the 856-016 and creating facial and lingual channels nearly the thickness of the entire bur on the distofacial, direct facial, and mesiofacial (Fig. 8).

The rough preparation is completed by connecting these channels using the 856-016 diamond bur (Fig. 9).

The preparation is smoothed and the margin defined using the 856-021 fine diamond. Since the diamond has a tip of 2.1mm, a 1.0mm heavy chamfer margin is created by taking half the thickness of the bur at the margin (Fig. 10).


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AN INTERVIEW WITH GLENN C. HANF, DMD, FAGD, PC

At Home in Scottsdale and with CEREC®

Q: *How long have you been in practice?*

A: After graduating from the University of Medicine and Dentistry of New Jersey (UMDNJ), I opened a practice in 1976 in the beautiful country town of Vernon in Northwestern, N.J. I spent the next 23 years there growing my practice and raising my three sons and two daughters. I spent many of these years teaching Oral Diagnosis at UMDNJ, one day per week. In 2000, it was time for a change. I sold my practice in New Jersey and relocated with my wife, Louise, to Scottsdale, Arizona. After a short venture into "corporate dentistry," I realized that solo private practice was my passion, and I acquired McDowell Mountain Ranch Dentistry in Scottsdale. Since then, I have been immersed in keeping up with electronic record-keeping, digital radiology, digital photography, Invisalign, intra-oral cameras, lasers, DIAGNOdent, and most recently, CAD/CAM and CEREC 3D.

Q: ***What is the size of your practice?***

A: I think that all too often, we get tied up in the belief that the "size" of your practice equates to the success you experience in our profession. Many believe that our colleagues with the "biggest" practices are the most successful. I don't share that belief…my practice is small. I have one assistant, one hygienist and one office manager. Our patient base is about 2,000 and although we certainly accept new patients, this size practice allows me to spend the time with my patients that is necessary to develop relationships and provide the best service without compromise.

Q: ***How many operatories do you have?***

A: Although my office is over 2,600 square feet, we only have three operatories. One is dedicated for hygiene and the other two are identically equipped for me. There is one additional area dedicated to CEREC, where our milling chamber, block inventory, staining and glazing center, and glazing oven are located. We have found that patients are very interested in the milling, staining and glazing processes. It is nice to have a separate area for them to watch as their CEREC restorations are created. We are also equipped with plumbing and wiring for three additional operatories if we need to expand in the future.

Q: ***What type of dentistry do you perform?***

A: I am an avid supporter of the general practice. The diversity of the diagnoses and treatment that we can provide as general dentists is what makes going to the office everyday, a pleasure and a challenge. I enjoy all the disciplines in dentistry and I consider my practice to be well rounded. Generally, the vast majority of the patients that we see here in Scottsdale lead very healthy lifestyles. They exercise, eat right, don't smoke and are interested in maintaining a trim and youthful appearance. Almost all of the restorative dentistry we perform has a cosmetic component, and we are very diligent in providing aesthetic results. Our patients appreciate this and seek us out because looking good is important in our society.

Q: ***What factors made CEREC your CAD/CAM choice?***

A: If I had to answer this question with only a few words, it would be Dental Town! Through the Dental Town website and the Townie Meeting, I am privileged to have met and learned from the leaders in CAD/CAM technology in dentistry. I was first exposed to CEREC and Sirona at the Townie Meeting in Las Vegas, a number of years ago. The enthusiasm, knowledge and thoroughness of Drs. Puri, Mirzayan, Fleming, Greenhalgh and others, coupled with the research and 20+ year development history of

The reception area at McDowell Mountain Ranch Dentistry in Scottsdale.

the Sirona Company, made my decision very simple. An added benefit for me is that Scottsdale Center for Dentistry, the premier continuing education center in CEREC technology, is located about five miles from my office. The training, support and education that I have received there are beyond compare.

Q: ***How does this technology fit into your office philosophy?***

A: CEREC and CAD/CAM technology fit seamlessly into our office philosophy. I have always had a gnawing dislike for cutting down perfectly good tooth structure so that I may restore the remaining tooth or adjacent teeth. Like most dentists, full coverage crowns were a mainstay in my practice. For years I did very few partial coverage restorations. Now, with CEREC and the ability to create partial coverage restorations in one appointment, eliminating the annoying problems with impressioning and temporizing, we are able to expand the repertoire of restorations we offer to include more conservative indirect partial coverage. I've done more onlays and ¾ crowns in the last year, than I've done in the last 20 years, and it feels good to retain as much healthy tooth structure as possible.

Although I do not consider myself by any means, a "holistic" dentist, my practice is 95% metal free. One exception is the occasional full gold restoration or PFM. Through CEREC, we are able to provide exceptional, aesthetic restorations in one appointment and still maintain our "metal-free" philosophy. Patients truly appreciate that.

Q: ***How has CEREC impacted your practice?***

A: I think the importance of CEREC and CAD/CAM technology as a marketing tool and practice enhancement is greatly underestimated. In the last couple of decades, our society has become increasingly technology crazed and time starved. Patients are fascinated with the effect that 21st century technology has had on our profession. They smile when I pick up the DIAGNOdent rather than that "sharp hookie thing" to check for decay. Digital imaging and intra-oral photography make it easier for them to understand proposed treatment.

Patients are astounded when they learn about CEREC and the fact that we can provide indirect restorations without "temporaries" and "gooey" impressions. Everyday we hear horror stories about the problems with multiple impression taking and temporaries that come off at the most inappropriate times. Patients love that we can eliminate those potential problems, but almost more importantly, they truly appreciate the fact that we are sensitive to the use of their time. They appreciate not having to return for those "seat" appointments, being numbed again and losing hours out of their day. None of this is even possible without CEREC.

We all understand the importance of marketing. CEREC is probably the most effective internal marketing tool I have ever seen. People talk about it and they share with their neighbors, how

"high tech" it is. It has created a "buzz" around our practice on which I can't place a value.

Q: ***What is your favorite CEREC procedure?***

A: Not too long ago, endodontic therapy, a build-up and a crown would involve three, four or even five appointments. I still find it hard to believe that with advances in endodontic technique and CEREC, we have the ability to do endo, a build-up AND a crown in one appointment. It takes a bit of restructuring of time and sequencing, but CEREC makes it all possible.

Q: ***What is your most unique CEREC procedure?***

A: Admittedly, I have only done a few hundred CERECs, but the most "unique" one I've done was on a first primary molar. The Pedodontist had told a mother that her daughter was in need of an SSC. She brought the child to me because, while at the bus stop, she heard that I do ceramic crowns in one appointment, and she wanted to know if I could do that for her 8 year old daughter. The little girl was a great patient, and an hour later her new CEREC tooth was bonded into place. Both the mother and daughter loved the fact that her tooth still looked like a tooth. It was actually FUN to do!

Q: ***If someone were to take your CEREC away, what would you do?***

A: After I threw a temper tantrum, I would pout and grovel to get it back …

Q: ***Anything else you would like to add?***

A: No question about it, there is a bit of a learning curve associated with CEREC. It's a different paradigm in restorative dentistry that takes some time to appreciate and understand. Nonetheless, I truly feel that CAD/CAM and CEREC technology is the future of restorative dentistry. My hope is that dental educators recognize this and incorporate CAD/CAM and CEREC into their curriculum for the next generation of dentists.

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CEREC® at the Chicago Midwinter Meeting

CerecDoctors.com members have access to the world's premier online CEREC resource. They train with the best in the business. They share practical knowledge on discussion forums, and watch videos of actual cases.

And of course, they know how to party.

Together with Sirona and others, CerecDoctors.com co-hosted CEREC AC Bluecam's launch party held at the Chicago House of Blues in late February. With over two thousand attendees, the gala was the hottest ticket in town at the annual Chicago Midwinter Dental Meeting. Guests were adorned in blue costumes, shiny blue wigs, and painted blue faces to celebrate the arrival of the new AC Bluecam unit. The House of Blues was jam-packed with every shade of blue, and the atmosphere was festive.

With drinks, dancing, and Bluecam – the evening was a complete success!

We'll see you in October for the 2nd Annual CEREC Owners Symposium at Scottsdale Center!

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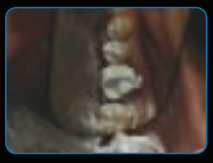
1. 27 year old occlusal, buccal amalgam with recurrent decay.

2. Preparation with cord retraction.

3. Application of Futar Scan onto the prepared tooth only.

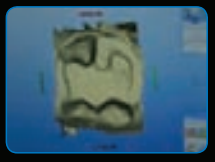
4. Patient occludes for 45 second intraoral set.

5. Futar Scan bite record indicates occluding dentition.



6. Scanning of the occlusion (antagonist) is done without opaquing agent.

7. Application of an opaquing agent provides the most precise & efficient digital impression of the preparation.



8. View and verify marginal integrity of the CAD image.

9. The Futar Scan CAD image is ready to create the optimal occlusal scheme.

10. The final preparation design showing the occlusal contact points. The restoration is ready for milling.

11. The final restoration is bonded into place and the occlusal interferences marked with articulating paper.

12. Minor occlusal adjustments and polishing complete this CEREC® restoration.

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Conservation of Tooth Structure With CAD/CAM Dentistry

SAMEER PURI, DDS

G.V. Black has had a profound impact on the way dentists shape and prepare teeth for restorative treatment. Proper retention and resistance form has been taught to allow mechanical retention to hold our restorations in place.

Even though the preparations imparted a significant cost to the tooth structure, these aggressive preparations were the only way to keep our restorations from falling off teeth. G.V. Black passed on to the great dental clinic in the sky many years ago, and through the evolution of adhesive bonding, the philosophy of mechanical retention and resistance form to retain our restorations is also officially dead.

While shaping teeth to retain restorations mechanically works well when placing cast metal restorations, there are inherent disadvantages to unnecessarily cutting away tooth structure simply to retain our restorations. Increased pulpal trauma, post-operative sensitivity and possibility of root canal therapy are all possibilities when we remove tooth structure unnecessarily.

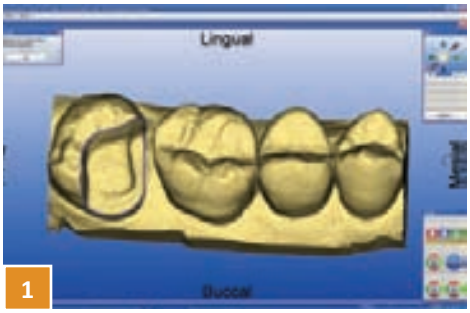
Tooth structure removal when preparing a tooth to receive our restorative material is no doubt an unnecessary evil. However, with today's technology, should we not do all we can to minimize unnecessary reduction and use adhesive techniques to retain our restorations whenever possible? Don't we owe it to our patients to cause as little harm as possible to their oral health with conservative, minimally invasive techniques? The answer is a resounding yes!

When bonding a restoration to the remaining dentin and enamel, the only tooth structure that requires removal or modification is that tooth structure that is inherently defective, such as fractured areas of a tooth or areas of decay. Additional reduction is unnecessary as the bonding of porcelain to dentin and enamel is a viable technique that has withstood the test of time and has proven successful in countless research and clinical procedures. Our bonding techniques are so reliable that if you take two pieces of tooth structure and bond them together, chances are that in fatigue testing, the pieces of dentin and enamel will fracture before the bond between the two fails.

While adhesive techniques are predictable, prior to the emergence of chairside CAD/CAM restorations, such as those made by the CEREC® technology, the full benefits of these techniques were unable to be realized. Even though our tooth preparation was minimized because we could use adhesive bonding instead of mechanical retention to retain our restorations, there still was the issue of keeping our provisional restoration in place for the 2-3 weeks that it took to receive the restoration from the laboratory. To avoid an upset patient with a constantly loose provisional, some mechanical retention, and as a result unnecessary reduction to the tooth, was invariably incorporated into our preparation designs.

Don't we owe it to our patients to cause as little harm as possible to their oral health with conservative, minimally invasive techniques?

With the emergence of CEREC technology, the full advantage of adhesive bonding can now be utilized. No longer do we have to worry about loose temporary restorations because the definitive restoration is placed the very same day, typically in about an hour. The technique is kinder to the pulp because the adhesive process completely seals our exposed dentinal tubules at the same visit the tooth is prepared,



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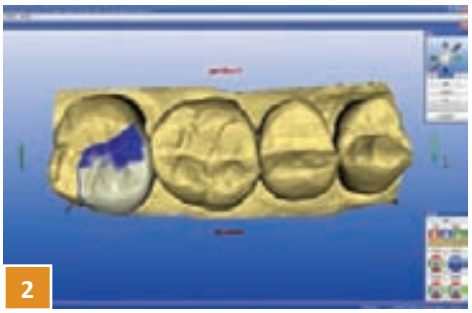
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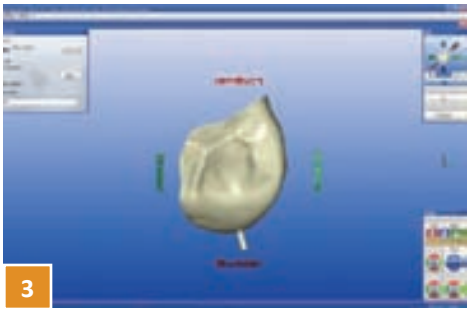
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resulting in a minimal amount of post-operative discomfort as well as a reduction in pulpal trauma and the possibility of postpreparation endodontics.

The CEREC procedure involves taking a digital scan of the prepared tooth to create a virtual model that will be utilized to design the final restoration (Figure 1). The margin is marked on the preparation and the software fabricates a restoration (Figure 2).

A number of tools are available to modify the restoration as needed, and the occlusion, contacts and contours can all be adjusted virtually. The final restoration is previewed, allowing the determination of the proper thickness of porcelain before final milling (Figure 3).

Porcelain blocks made from different materials are available in all the traditional shades to allow for the most ideal color match of the porcelain to the tooth structure. The final restoration is sent wirelessly to a milling chamber that is placed in the office and the final restoration is milled in approximately 5-7 minutes.

The final restoration can either be polished chairside or a stain and glaze process can be utilized for the most ideal esthetics. The total time required to complete the final restoration from anesthesia to patient dismissal is less than one hour.

There are inherent advantages to performing dentistry with a chair side CAD/CAM system, especially with regards to minimally invasive dentistry.

First, because there is no requirement to retain a provisional or use mechanical retention to maintain the definitive restoration, a more conservative preparation can be utilized where axial reduction is limited to those areas where it is only needed for esthetic reasons and to incorporate decay or defects in the preparation (Figure 4).

CEREC users inherently minimize the reduction of axial tooth structure and maximize the amount of enamel available for bonding. By minimizing tooth structure reduction, clinicians are able to provide a more conservative preparation, minimizing the trauma to the pulpal tissues.

Another advantage to the CEREC technique is to immediately seal the dentin and prepared tooth structure with the definitive restoration in a single visit. Many times the discomfort to a patient is elevated during the provisional phase. With CEREC, because there are no provisionals, this provisional phase is completely avoided.

CLINICAL CASE:

A patient presented to the office with the chief complaint of a fractured tooth (Figure 5). A preoperative x-ray revealed no pulpal trauma and no other pathology. A one-visit CEREC onlay was diagnosed for the patient.

The patient was anesthetized with septocaine anesthesia through local infiltration and the remaining amalgam restoration was removed. The tooth was definitively prepared taking care to only remove tooth structure that was absolutely necessary (Figure 6).

CONTINUED ON PAGE 45

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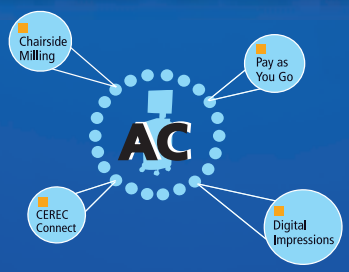

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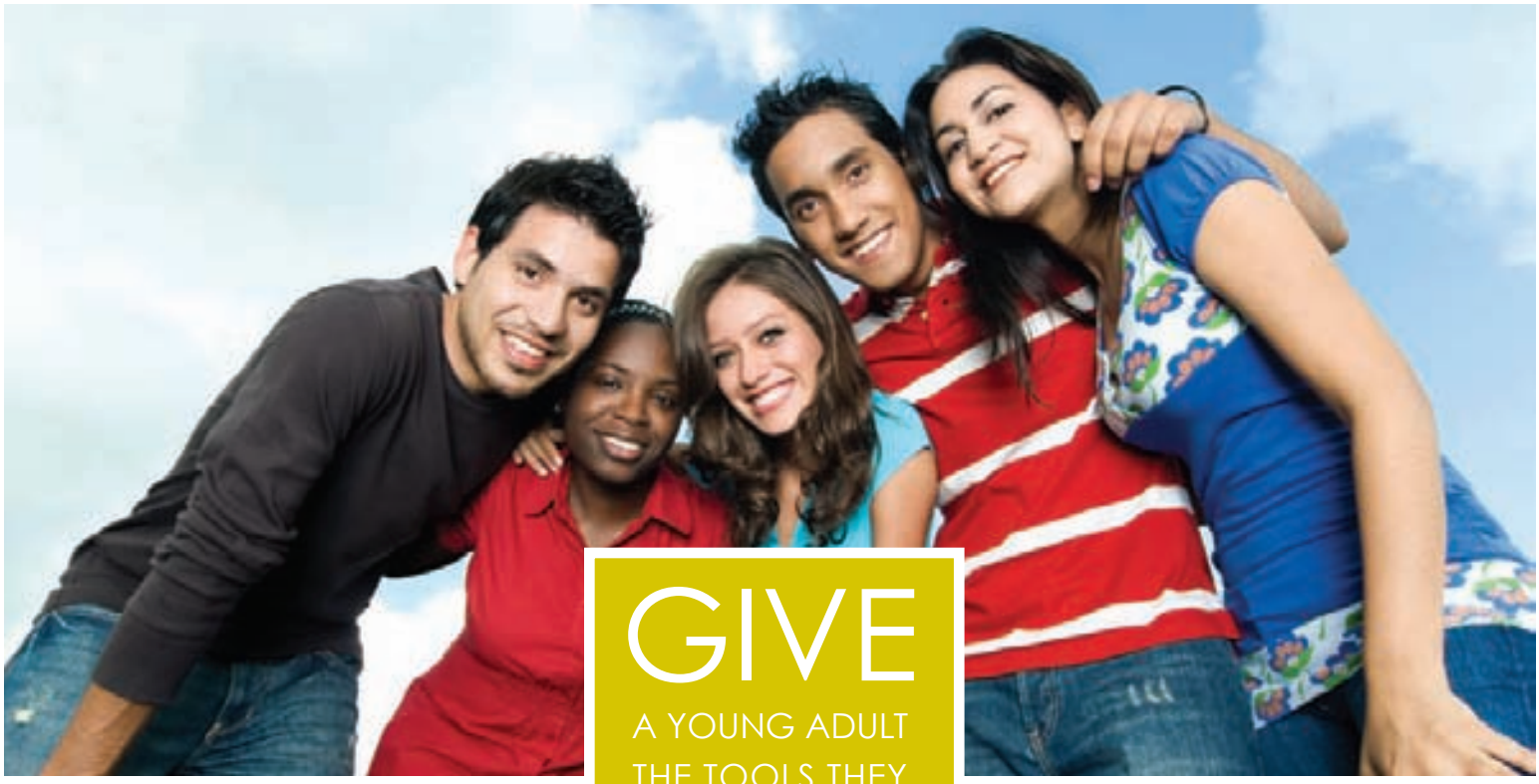

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An opaquing powder (Optispray from Sirona Dental Systems) was placed on the preparation and the adjacent teeth and optical scans were taken with the CEREC system (Figure 7).

A bite registration was placed, opaqued and captured to help determine the occlusion of the final restoration (Figure 8).

After designing the restoration utilizing the CEREC software, the final restoration was milled in the milling chamber and verified for fit (Figure 9).

Staining and glazing was incorporated to give the restoration the final esthetics, and the restoration was bonded in utilizing a resin bonding agent and a dual cure resin cement (Figure 10).

The definitive restoration was checked for occlusal accuracy and the patient was dismissed with a minimal amount of trauma to the dental tissues.

There is no doubt with today's technology and advancements in adhesive dentistry that we can utilize this knowledge and conserve tooth structure. By removing only tooth structure that is absolutely needed and maintaining the rest, CEREC can provide esthetic and functional restorations that will withstand the test of time as well as the test of real world use by thousands upon thousands of clinicians worldwide.

The concepts of G.V. Black served us well in the 20th century. However, in the 21st century it behooves us to offer conservative treatment to our patients and minimize the reduction and destruction of unnecessary tooth structure.


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THE FINAL WORD

A CAD/CAM picture is worth a thousand words

SAMEER PURI, DDS

Sometime this summer, the number of CEREC® users will exceed 10,000 in the United States and over 24,000 worldwide. While this is still a relatively small percentage of the dental population overall, it's fascinating to see how much this number has grown, especially in recent years.

Many long time CEREC 1 and CEREC 2 owners practicing in the trenches have persevered through the early versions of the system and should be commended for helping to bring CEREC where it is today. With the earlier CEREC versions, making a crown wasn't so easy. Occlusion was more difficult to accurately gauge, and the ability to achieve proper anatomical shape and form was more of a dream than a reality.

Obviously with each new version, the CEREC process became more simplified and precise. With the recent introduction of the Bluecam, single and multiple restorations have become routine. With the ability to take digital impressions, CEREC users have the best of both worlds; the ability to mill restorations chairside or digitally send them to a lab for the fabrication of their restoration with any material that they choose. It's come to a point where the question for today's doctor is not *whether* they will invest in digital CAD/CAM, but *when*.

It's quite refreshing how the tide has turned for CAD/CAM dentistry in recent years. In the past, I was involved in countless discussions where CEREC users were constantly defending the margins, esthetics, occlusion, and basically the entire use of the CEREC concept in a dental practice. Today, all these points of discussion are frankly a non-issue.

Conversations about the validity of the CEREC process are not dissimilar to the way digital photography emerged in popularity amongst amateur and professional photographers. When digital photography was first introduced, in the not too distant past, hardcore photographers perceived it in the same way that many dentists viewed CEREC in the past. Basically, dentists viewed CEREC as a gimmick; an inferior product that gave inferior results compared to the traditional way of taking and making photos.

"There is no way that these new digital cameras could match the quality of photographs produced by the tried and true method of film," the skeptics argued. They claimed that digital photos lacked the "grain" of film cameras. They lacked the ability to capture skin tone, and the colors were never quite the same with digital as they were with film. Film lovers balked at the supposed ease and convenience of the digital process and argued that quality images were just not possible, while digital fans vehemently defended their new way of capturing photographs. Professional and amateur photographers alike spent hours arguing the nuances of the two techniques and why one was better than the other.

This sounds eerily familiar to the discussions dentists engage in with regards to CAD/CAM restorations and those fabricated by the traditional laboratory method. Substitute the words *grain, skin tone* and *proper color rendition*, with the words *margins, esthetics* and *occlusion,* and you will see the dental world involved in many of the same arguments.

One only needs to look into their personal bag of gadgets to see which method of photography won that battle. Today, how many reading this article are routinely shooting photos with a film camera (traditional dentistry) instead of photos with a digital camera (CAD/CAM)?

Today, how many of you are having your photos developed in a dark room with your developing studio (laboratory crowns) versus printing your pictures with an inkjet printer (milling unit crown fabrication)?

The fact is that the validity of CEREC and digital impressions, in general, is inarguable today. Just as advances in dig-

"The question for today's doctor
is not whether they will invest in digital CAD/CAM, but when.
... There are plenty of things dentists can argue about,
but the validity of CEREC restorations
is not one of them."

ital photography have made film photography inconvenient for the photographer, so too has chairside CAD/CAM made sending many of the restorations we currently send to the lab, inconvenient for both the doctor and patient.

When doctors approach me and want to argue margins, esthetics and occlusal accuracy with CEREC, it's a discussion that is just not worth wasting a good argument over. Surely there are plenty of things dentists can spend time discussing and arguing about, but the validity of CEREC restorations is not one of them.

The entire world woke up one morning and realized the benefits of digital with their photos. Just like that, photo developing huts went out of business. How many drive-thru photo shops are still in your neighborhood?

Scores of dentists are also waking up and realizing the value of digital data, not only for their chairside restorations, but also the value of sending that digital data to their laboratory partners. In the very near future, taking a physical impression and sending it to a lab will be as foreign to future generations of dentists as it is to taking a copper band impression to today's dentists. I know some of you are reading this and thinking "But wait, copper band impressions gave a great result." Of course they did! Just as film gave us great photos, labs gave us great crowns. However, technology has allowed us to do these things easier, faster and better.

This discussion, similar to the discussion over film vs. digital photography, has been won by digital CAD/CAM dentistry. Crowns, onlays, inlays, and veneers are already being done. Millions upon millions have been fabricated with the CEREC technology. And what is coming down the pipeline is truly exciting. Just as photographers have been able to take digital photos and use programs such as Photoshop® and other picture editing programs to manipulate and share them online and through other media, we can only imagine what the modern dentist will be able to do with the digital data of patients' teeth. Chairside milling is just the beginning. Orthodontic analysis, Invisalign impressions, implant planning and restorative care, are just a few of the possibilities in the near future. What the future holds exactly is anyone's guess, but there is no doubt that digital and CAD/CAM is here to stay.

Next year CEREC celebrates its 25th year and 24,000+ owners. The first 25 years have brought innovations and progress that are truly remarkable. I look forward to the next 25 years and welcome you along for the ride.

Whether you are a current CEREC owner or one who is about to get on the digital dental bandwagon, visit www.cerecdoctors.com and learn about the possibilities of CEREC.

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