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CAD/CAM

the international C.E. magazine of digital dentistry

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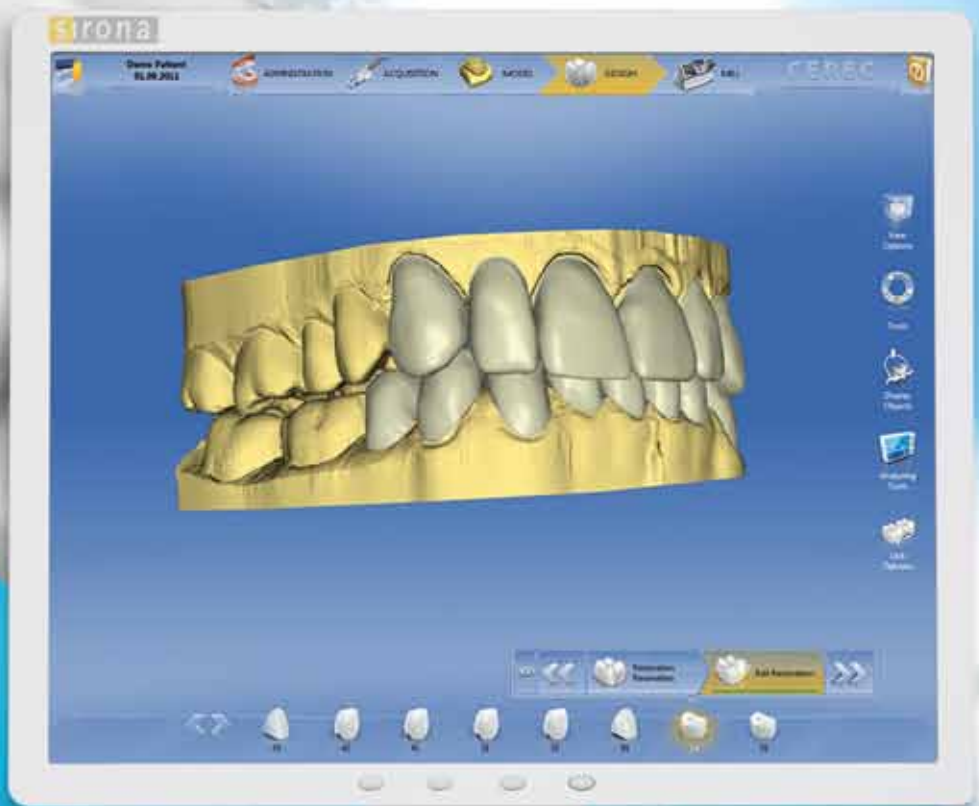

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The digitized occlusion: Using something old with something new

_clinical

The next generation of chairside CAD/CAM: CEREC Software 4.0

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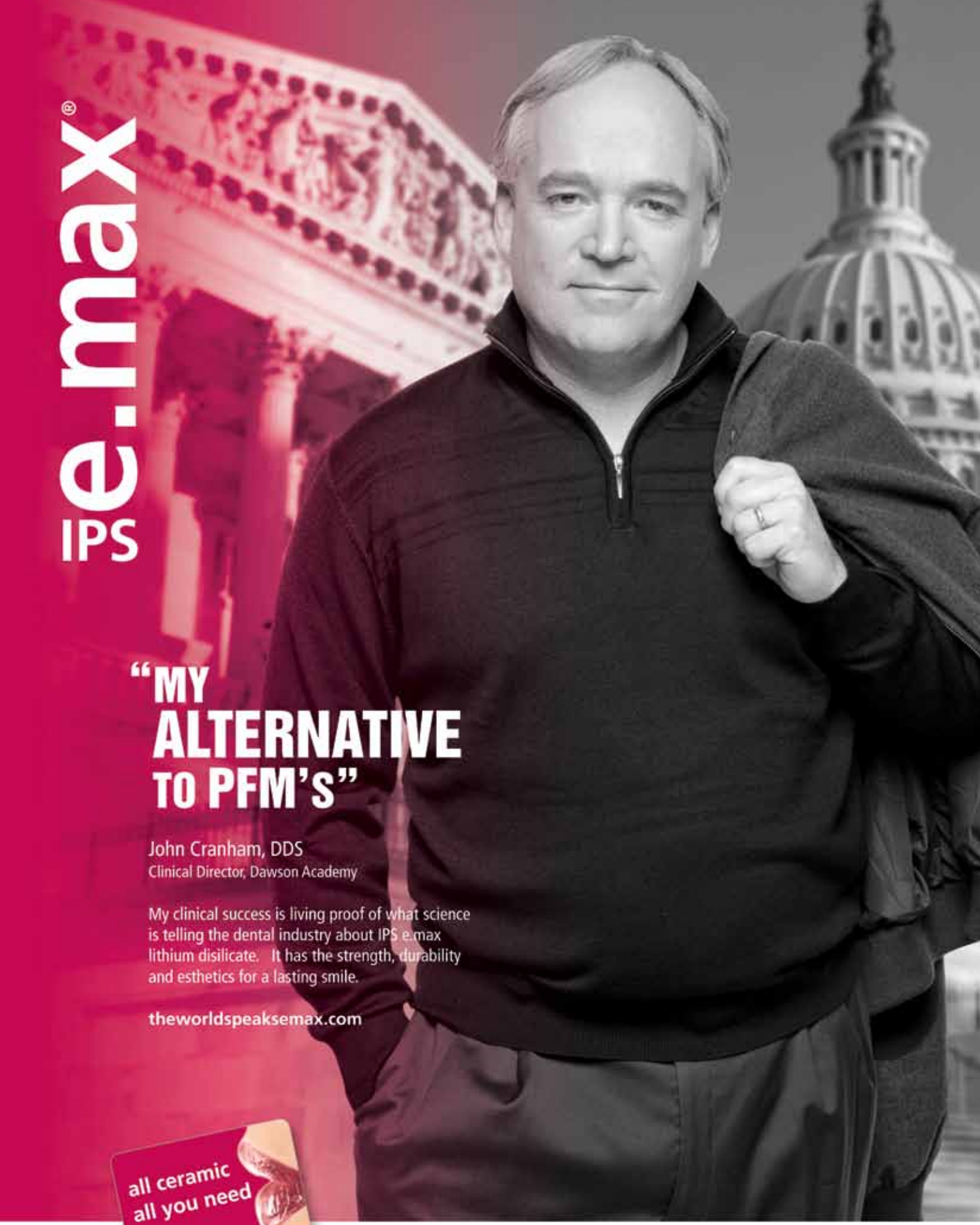
Using lab-fab and chairside lithium disilicate to satisfy different case requirements



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The launch of CEREC SW 4.0

James Klim, DDS, FAGD, FADFE, PC

_We live in an exciting time of innovation and creativity in the dental field. Now, more than ever, it is important to keep up with all the fast-developing trends and technologies, especially in the world of digital dentistry.

Sirona Dental Systems has once again set the stage for the next generation of digital virtual restorative dentistry. Having pioneered and perfected the dental virtual theater for the past 26 years, Sirona is eager to introduce its most current CEREC Software 4.0 release.

CEREC SW 4.0 is designed to streamline the optical impression and design process. The software has an intuitive workflow with self-explanatory icons and photorealistic graphics. The noted Biogeneric tooth and bridge software design features are now accompanied with dual-arch digital capturing, creating the option for multiple restorative tooth designs on opposing arches. The digital optical bite registration provides occlusal mastery precision, setting a new standard in dentistry.

The design tool wheel presents some new Biogeneric morphing design assets, facilitating efficient and smooth virtual design modification to satisfy the morphological and occlusal desires of the user. The customized crown, inlay/onlay and veneer parameters provide the refinement to translate virtual reality to restorative fit perfection. CEREC SW 4.0 takes the dental professional to a new level of visual expression on-screen, which in turn will be seen in the clinical theater with even more amazing final restorations than in the past.

For the dental practice, the launch of CEREC SW 4.0 represents a complete CAD/CAM picture where the magic digital dentistry combination is CEREC AC powered by CEREC Bluecam with CEREC SW 4.0. In this convenient package, you will find the ability to create chairside, durable, highly esthetic all-ceramic bridges, crowns, inlays/onlays and veneers using materials such as IPS e.max CAD and IPS Empress CAD. When combined with Galileos 3-D imaging, CEREC can further enhance the dental practice with the ability for surgical and prosthetic implant planning.

Welcome CEREC Software 4.0, introducing the next generation of digital dentistry!

Sincerely,

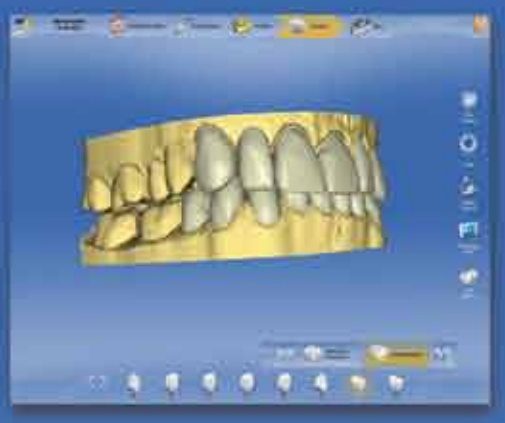
James Klim, DDS, FAGD, FADFE, PC
Private Practice in San Francisco, and Director of CADStar™

CEREC® Software 4.0
Features & Benefits Overview

Intuitive Workflow

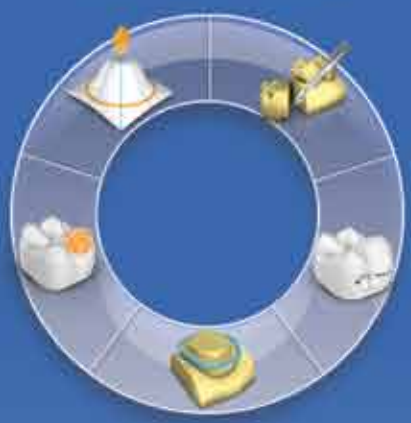
- It's always clear where you are in the process and what step comes next
- Allows jumping from one design step to the next without the linear approach of "Next" and "Undo"
- Going back to a different design step(s) does not undo the work you've already done

Multiple Restoration Design



- Work on as many different restorations as you wish (even in different quadrants/arches)
- Restorations do not have to be designed in the same design mode, allowing complete freedom to choose the ideal design mode for each restoration

Work Direct on the Tooth



- Adjust and refine your restorations by executing design tools direct on the tooth, such as adding or removing material, rotating or positioning, or expanding or reducing tooth size
- Provides greater control and adds an intuitive "hands-on" feel to the design process

Streamlined Restoration Design

- At the bottom of the design window, each step is clearly defined, showing you the current step as well as what step came before and what comes next
- Can move backward and forward without undoing previous design steps

CEREC 4.0

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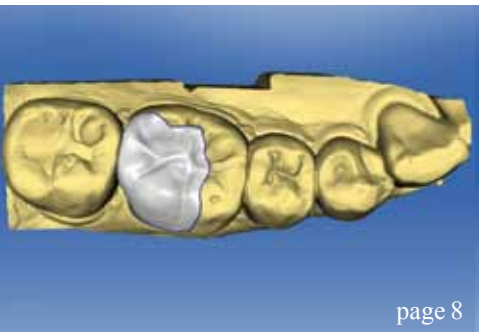
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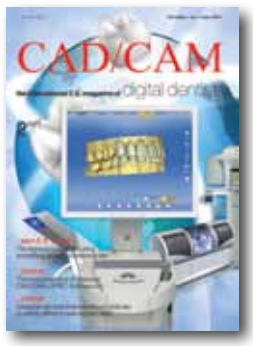

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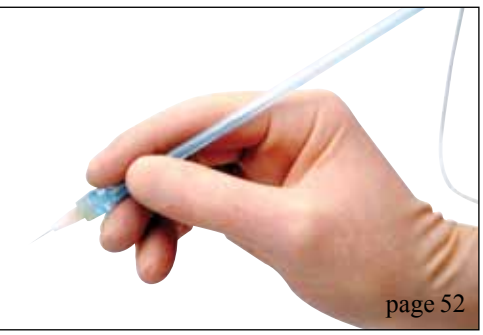
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The digitized occlusion: Using something old with something new

Author_Todd Ehrlich, DDS, FAGD

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This article qualifies for C.E. credit. To take the C.E. quiz, log on to *www.dtstudyclub.com*.

_There is an envelope of occlusal function that we are constantly mastering for our patients. Many times it is exceptionally easy to find a position or shape of a tooth that fits within the patient's comfort and functional zones. However, there are many instances where it can be quite challenging. Using something old with something new can be of great assistance to achieving a restorative shape that the patient will immediately find comfortable.

_Using something new

Computerized dental anatomies have greatly evolved over the years. There was a time during CAD/CAM computer design where only limited anatomies were available, and these patterns had to be manipulated greatly by the clinician to fit the clinical situation. This made for a longer design time and, most importantly, made the restoration appear more natural.[1] Today, there are more advanced mathematical calculations for dental anatomy.

Modern tooth-modeling software uses a database detailing the measurements of several thousand naturally occurring tooth samples. Common structures such as cusp tips, cusp slopes, marginal ridges and fissures give the blueprint for computer determination of the "average tooth." The differences between this average tooth and the scanned referenced teeth make up the core for the mathematical calculation, much like with facial recognition software used by government intelligence agencies. Analysis reveals that only 20 data location points are

Fig. 1_Tooth #30 being designed in the CEREC Software 4.0. (Photos/ Provided by Dr. Todd Ehrlich)

Fig. 2_The Biogeneric calculation evaluates adjacent teeth or user-defined teeth.

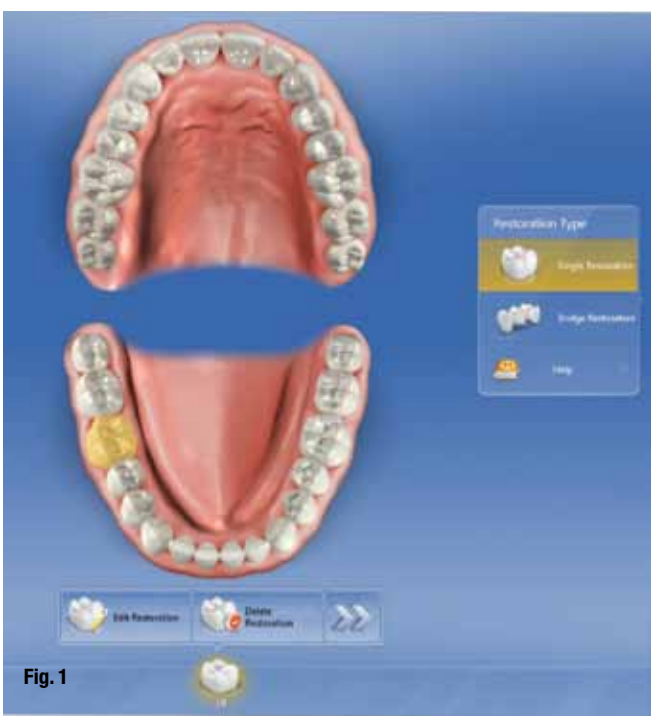

Fig. 1

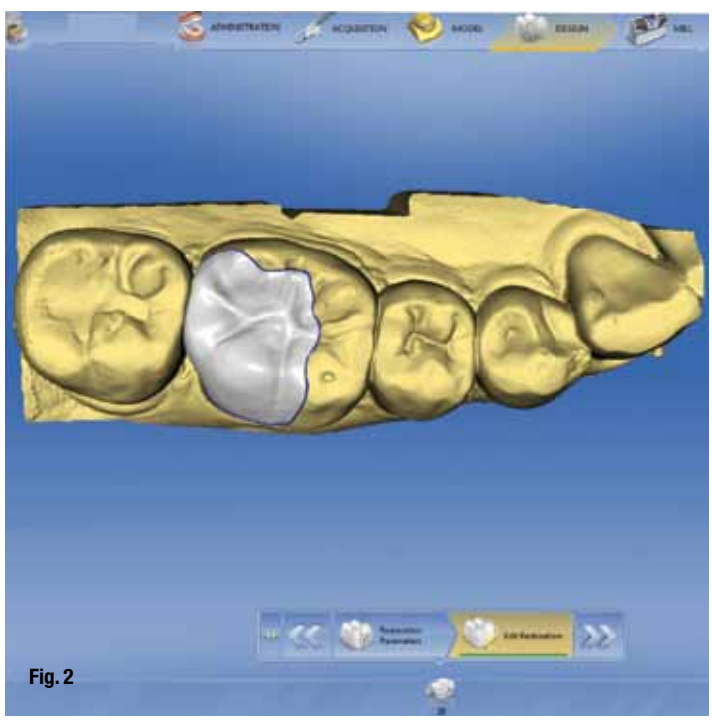

Fig. 2

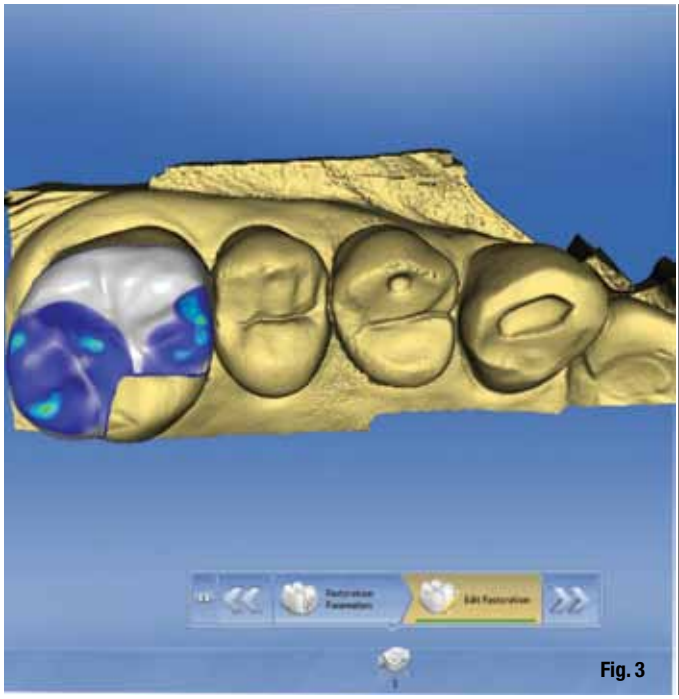
Fig. 3

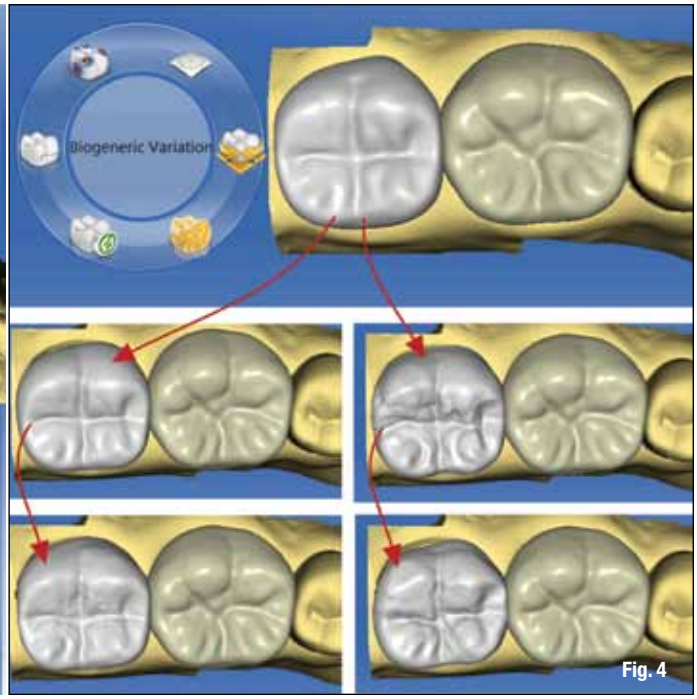

Fig. 4

necessary to describe 83 percent of the variability in naturally occurring tooth surfaces.[2, 3, 4, 5] This mathematical calculation for tooth morphology therefore predicts the virgin state of the tooth. It has been shown to have a digitally proposed surface within 156 µ of the original surface.[1] Because the described process obtains its results through data derived from naturally occurring teeth, the method is referred to as Biogeneric tooth modeling.[2, 3]

This mathematical calculation of dental anatomy starts with designating the tooth number to be designed. This establishes which database of dental anatomies that it will use to determine the calculations. In other words, the true tooth number needs to be selected for the calculation, or a different tooth number anatomy will be generated (Fig. 1).

The next step for the calculation is to show the computer a tooth that it can use for guidance on the proposed design. This can be done a couple of ways. Primarily, a tooth within the prepared quadrant (not the prepared tooth) will be analyzed automatically by the computer and is typically the distal neighbor of the prepared tooth (Fig. 2). If the clinician knows of a better tooth to reference, this can easily be selected within the prepared arch, within another area of the dentition or even off a model. This referenced dataset will trigger the computer to search the entire database, which may contain hundreds of different virgin anatomies for that particular tooth number.[2, 3, 4]

The computer proposal will morph into various shapes as it is going through the calculation. It also looks for ratios of tooth size and position within the arch. This is a great advantage because these digital dental anatomies are not limited by size but can fit within any range of tooth dimensions.

The finalized digital anatomy is a reflection of what the computer discovered through its analysis of the reference tooth. It also places the three-dimensional shape in contact with the opposing teeth (Fig. 3). If the clinician would like to see variations of the Biogeneric calculation, a slider allows that to happen. This tool is referred to as Biogeneric Variation. If images have to be re-taken, Biogeneric Variation is the new name (Fig. 4). The slider travels through anatomies within the Biogeneric database and reveals them through morphing of the proposal. This allows for a truly customized shape for the clinical situation and within function.

_Digital scanning

During the course of treatment, the upper and lower arches or quadrants are scanned into the computer using the CEREC Bluecam digital scanning camera. The CEREC system can have multiple preparations within the same arch or in opposing arches. Each arch is saved in its corresponding library of images within the software and evaluated for quality of margin integrity, path of draw, preparation geometry, etc. (Fig. 5). The major advantage of digital impressions is that the physical impression is eliminated from the process. This allows for immediate feedback to the clinician if the information is correct, rather than waiting to evaluate the inverse of the physical impression many minutes later. There are never any tears or bubbles with digital impressions. They also never distort. Therefore, they have tremendous value to the clinician and the patient, especially because the images are taken so easily and within a minute.

Fig. 3_Occlusal and interproximal contacts are also taken into consideration.

Fig. 4_The clinician has control of the Biogeneric Shape by scrolling through its database of teeth.