Restorative CAD/CAM Applications with the CEREC 4.2 Software

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The restorative clinical restorative theater demands precision, predictability, and efficiency for the productive dental office. Digital dentistry is becoming a growing trend as a restorative alternative for impressions, bite registration, virtual restoration design, articulation virtual simulation, smile design, and machined restorations fabricated from highly functional and aesthetic materials[1,2].

With the introduction of Sirona's Omnicam, a powder free system, the optical impression is making history for ease in clinical data capturing and setting a new standard for restorative precision. CEREC Software 4.2 provides unique morphological digital restorative design proposals with a variety of new chairside restorative applications. In addition to crowns, inlays, onlays, and veneers, there is now virtual design for permanent bridge, multi-implant abutment and separate crown or solid abutment/implant crown options and the available support materials for in office chairside protocols.

CEREC Software 4.2 still provides the same simplistic design sequencing as in the 4.0 predecessor. There are a few new tool and application assets as they fit within the familiar Model, Design, and Mill Phase Screen sequence.

For implants, the operator can now scan a 3D indexed scan post fitted on the implant similar to a healing cap and have full virtual design control for custom abutment and crown design in the software. Default or customized parameters are provided for implant abutment/crown margin placement, custom abutment design and soft tissue implant/restorative emergence. criteria[3,4] **(Figure 1)**.

Figure 1

Using the crown-down design concept and the virtual gingival mask soft tissue model, the implant restoration can be customized for a solid body screw retained abutment/crown **(Figure 2)** or multi-layer option for separate implant abutment and crown milled with
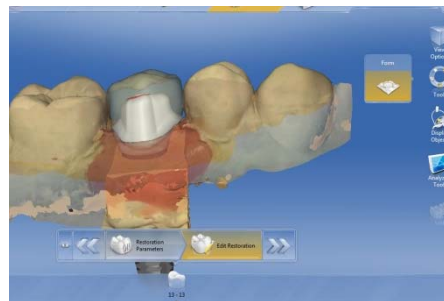

Figure 2

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perfect retrofit qualities from the same virtual design **(Figure 3-5)**.
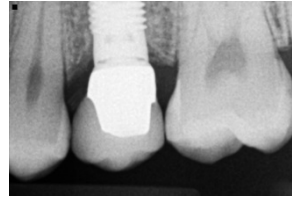

Figure 3

Figure 4

Figure 5

The implant chairside material selection options are inCoris TZ zirconium or e.max implant block option specially designed to precisely fit on a titanium Sirona Ti-Base. The TiBase interface is the mechanical attachment/screw platform compatible for the case specific implant diameter and system.

Smile design and dynamic articulation are the two new plugin features for CEREC Software 4.2. The smile design feature provides virtual design and aesthetic consultation and design option by uploading a 2D portrait picture, rendering a 3D face with the 3D construction data function, providing a realistic 3D smile and face visual preview **(Figure 6)**.

Figure 6

By setting the model axis in the Model Phase Screen using either the lower model, upper preparation model, and/or BioCopy wax-up model, the operator is able to virtually establish the aesthetic virtual smile plane and F-point. The 3D design grid axis is best established with the BioCopy model axis alignment step and will provide the restorative indicated midline, horizontal axis and central incisor F-point for virtual design reference and verifying the critical design elements for the smile design process [5,6,7] **(Figure 7)**. All these design components can be assessed to fit the 3D facial axis and vermilion lower lip position in the Design Phase screen [8,9].

Figure 7

For anterior teeth when using all the design mode options (Biogeneric Individual, BioCopy, Reference), the operator is provided with the Design Incisal Variation Tool **(Figure 8)** that will provide scaled degrees of virtual primary labial contouring and tertiary perikymata surface texturing
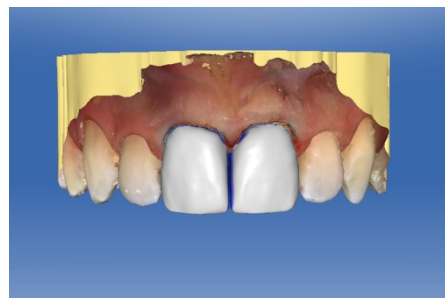

Figure 8

generated by the biogeneric feature of the software. Using the intensity scale coupled with the side panel Group Function in Link Options, the labial characteristics can be applied simultaneously to multiple anterior teeth with one stroke of the track ball **(Figure 9-10)**.

Figure 9

Figure 10

The second CEREC 4.2 plugin feature is dynamic articulation. By scanning to at least the contralateral canine and applied digital buccal bite registration, the anterior guidance of the mounted virtual models will be recognized by the biomechanical dynamic qualities of the software.

Figure 11

The virtual articulator provides virtual facebow mounting and joint guidance assets and can be customized by CBCT measured articulation parameters. The virtual articulator will recognize the virtual maxillary model alignment to the cranial base and temporomandibular joints, anterior guidance and the mandibular excursive side shift and protrusive joint eminence angle[10]. Not to worry, the default CEREC 4.2 software parameters will account for the majority of mandibular restorative virtual excursive needs **(figure 11)**.
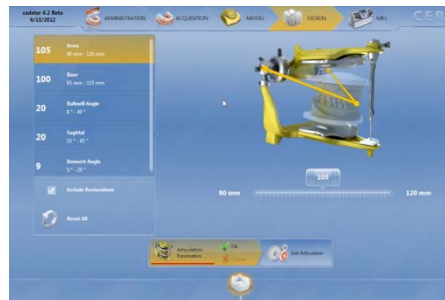
By activating the articulation icon feature in the side panel, the articulation side window will appear with the articulation functions from which to choose. The operator has the ability to view the excursive range of occlusal contact indicated by the colored contact colors or the FGP (Functionally Generated Path) views and simulate the actual 3D dynamic excursive jaw movements of the virtual mounted models.

Within the Contact Tool option, there is a 4th virtual grind option called FGP. This virtual grind option will become responsive when using articulation and activating the FGP virtual grind icon with a mouse click, virtually grinds away the detected excursive occlusal interferences. The author has found the articulation asset of 4.2 to be very accurate micro occlusal management asset.

The bridge design feature has been available for provisional materials in the prior CEREC softwares. There are now permanent materials available for chairside applications. The clinician will be able to use the all zirconium inCoris TZI 55 mm or e.Max 32 mm blocks for permanent material bridge choice for chairside software bridge application.

It has been said that there are unique preparation styles for CEREC restorative digital dentistry. With the refinement in the no powder Omnicam digital optical impression, 4.2 software design tools, and MCXL power milling, the digital dentist is now preparing for the engineering criteria for the chosen restorative material and functional/aesthetic demands of the clinical procedure.

The digital dentist can now apply more conservative preparation styles with the option for shoulder, chamfer, or feather margin design depending on the material choice and aesthetic position of the restoration. The current CEREC system can now effectively manage all these margin styles[11].

Digital dentistry and placing machined restorations has provided an overwhelming sense of freedom and quality control for Omnicam and CEREC 4.2 practitioners. Having the ability to digitally assess the virtual die restorative field and mounted articulated virtual model occlusal contacts provides the needed quality review prior to virtual design to assure an excellent restorative outcome, lowering clinical stress.

Following virtual model assessment, the Omnicam operator is able to refine when needed any noted preparation or tissue retraction zones changes by using the virtual die cutout feature, and in a few seconds re-image the enhanced restorative altered zone back into the virtual die without rescanning the arch and efficiently move on with the digital design process.

 The streamlined virtual design sequence from setting the model axis, drawing preparation(s) margins, virtual design, and the associated CEREC design tools is still the simplistic and intuitive software power house introduced with the 4.0 software. With the added restorative applicable options and supportive material selection, the digital restorative dentist has the full arsenal to accomplished the majority of restorative demands from single to multiple crowns, inlays, onlays and veneers to implant abutment and crown options and permanent bridges.

Dr James Klim is an international speaker, author and instructor on dental technology, practice development and aesthetic dentistry and has taught at several advanced post graduate institutes around the US. He has been awarded fellowships from the Academy of General Dentistry and Academy of Dental-Facial Esthetics and currently has a full time restorative practice in Santa Rosa, California. He is the founder and director of CADStar™, a learning center for advanced CEREC education.

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