CEREC News
Biogeneric

Editorial

CEREC Biogeneric – a revolution in occlusal surface design

Imagine you could do without dental databases. For a long time dental databases were considered to be the ultimate restoration approach. Databases have a decisive disadvantage, however: the restoration proposals have to be adapted to the patient’s individual situation. With a single click of the computer mouse, CEREC Biogeneric generates patient-specific occlusal surfaces – for crowns, veneers and anatomically sized bridges. This saves time and delivers outstanding clinical results – results that would convince even the most critical dental technician. In this issue of CEREC News you can find out more about this revolution in occlusal design. In addition, you will discover how you as a user can benefit from CEREC Biogeneric.

Have fun with CEREC Biogeneric.

Kind regards,
The CEREC Team

Contents:

- CEREC Biogeneric
- Interview with Professor Mehl, who developed biogeneric design
- Interview with Dr. Sameer Puri, who tested the CEREC Biogeneric software
- Additional features of the CEREC V 3.80 software
- Availability

1. CEREC Biogeneric
Now for crowns, veneers and anatomical bridges

In 2007 Sirona’s new biogeneric software tool for inlays and onlays marked a major milestone in occlusal surface design. For the first time a mathematical model extrapolated from natural tooth morphologies was deployed in order to generate patient-specific occlusal surfaces on the basis of residual tooth tissue. This significantly simplified the design of functional occlusal surfaces.

The new software version 3.80, available as from May 2010, takes biogeneric modelling a step further. It is now possible to design biogeneric occlusal surfaces for crowns, bridges and veneers. This is the result of pioneering research by Professors Mehl and Blanz, who succeeded in identifying the genetic blueprint of morphology and occlusion and transferring their findings to an algorithmic tooth model. In other words, the computation of the occlusal surfaces is no longer based on the residual tooth tissue. Instead, it is based on the occlusal and lateral surfaces of a morphologically and functionally intact reference tooth in the patient’s mouth – for example, the adjacent tooth, contralateral or antagonist. The software automatically analyzes the features of the reference tooth in comparison with those of an ‘average’ tooth of the same type. The outcome is a patient-specific tooth morphology and occlusal surface design which perfectly match the patient’s other teeth in terms of appearance and function. This eliminates the need for a tooth database containing standardized morphologies, which in many cases necessitate individual adjustment and milling.

CEREC Biogeneric – a revolution in dental morphology and occlusal design.
2. Interview with Prof. Albert Mehl, who developed biogeneric design

Professor Mehl, what does the term "biogeneric occlusal surfaces" actually refer?

The term "biogeneric occlusal surfaces" denotes the mathematical description of natural occlusal morphologies. It is based on the analysis of thousands of intact tooth surfaces and on objective algorithmic principles. This description is independent of specific expert knowledge and encompasses all previously valid occlusal concepts. The main advantage is that it is now possible to define all naturally occurring occlusal surfaces by means of just a few parameters and characteristics. This represents an effective data reduction. It is, in fact, comparable with the millions of different colours that can be described using the primary colours red, green and blue.

Why are patient-specific occlusal surfaces so important?

Occlusal surfaces have different characteristics in terms of cusp position and shape, fissure depth, tooth morphology, length and angular relationship. These features significantly affect the function of the masticatory system. For this reason dentistry has always attached top priority to creating dental restorations with natural occlusal surfaces – best of all occlusal surfaces which are as unique as the patient's fingerprints or DNA.

How did the development of the biogeneric principle come about?

Conventional wax-up and occlusion concepts cannot be transferred to a computer-aided design process due to the lack of the necessary metric data. If 10 dental technicians were asked to produce one and the same crown restoration, they would deliver 10 different occlusal designs. In most cases, with appropriate experience, these designs are clinically flawless, aesthetic and highly functional. But as a scientist I am interested in metric and provable results that one can use with CAD/CAM. After all, nature created only one individual original tooth. Should it not be our aim, that the reconstruction result should correspond as closely as possible to the initial tooth?

What are the implications for practical CAD/CAM dentistry?

It is important that the restoration harmonizes with the overall clinical situation. This goal cannot be achieved by means of a "standard occlusal surface" which does not make allowance for natural diversity. In order to attain a patient-specific outcome the dentist has so far been forced to make numerous manual adjustments – either via the software or during the placement and milling.

What about existing dental databases?

Dental databases were an important step on the way to patient-specific restorations. From a scientific viewpoint, however, the biogeneric principle offers simply more advantages. Regardless of how many teeth a very good dental database contains, it will never reflect nature’s morphological diversity. The selection process of the correct tooth will always be subjective. By contrast, biogeneric is founded on the basis of objectively measurable criteria and takes account of metric parameters. As a result biogeneric is capable of reproducing each clinical tooth situation. It encompasses much more information than even the largest dental database.

How does the biogeneric principle function specifically?

Like a fingerprint each person’s dentition has its own signature, its own DNA. Biogeneric succeeds in identifying the genetic blueprint that determines morphology and occlusion and hence obtains vital information for the reconstruction. In the case of inlays and onlays the CEREC Biogeneric software uses the residual occlusal tissue surrounding the cavity of the prepared tooth. In the case of crowns the user creates digital impressions of the preparation and a further intact tooth, preferably the antagonist, adjacent tooth or contralateral (Fig. 1). On the basis of the intact morphology the CEREC Biogeneric software can generate a matching restoration proposal (Fig. 2). Scientific analyses demonstrate that the restoration proposal closely reproduces the original occlusal surface, individually for each patient (Fig. 3).
3. Interview with Dr. Sameer Puri, who tested CEREC Biogeneric V 3.80

Sameer Puri, DDS, Tarzana, California, USA

Future Hype on Rodeo Drive

As a CEREC user since 2003, Dr. Sameer Puri has his practice in Tarzana, located in the metropolitan district of Los Angeles. As a certified CEREC trainer, he has held lectures and seminars for the American Dental Association, California Dental Association, San Fernando Valley Dental Society, American Academy of Cosmetic Dentistry and the Academy of General Dentistry.

Dr. Puri how many crowns have you made with the CEREC Biogeneric software and what was your impression?
I have made approximately 30 crowns. The software has given users the ability to basically no longer design restorations. Meaning, with a couple of photos, we can have restorations that are a true representation of the adjacent teeth in the arch. The resulting proposals have been very accurate requiring a minimal amount of adjustment by the clinician. These are the most accurate representations of natural teeth I have ever seen.

Do you miss the tooth database?
I thought I would miss it. However, the proposals have been so accurate that actually I enjoy not having to select a database tooth. If I want something different than what is proposed, I can always use the new reference feature of the software and mimic an anatomy that is more to my liking in that particular instance. In a nutshell, I enjoy the automation of having the software give me an ideal proposal that requires a minimal amount of work.

Were your expectations fulfilled?
My expectations were exceeded. The lack of user input that is required is quite phenomenal.

Are automatically produced individual occlusal surfaces important?
I think it is progress because we can mimic the adjacent teeth instead of choosing from a preformed interpretation. This is akin to me buying an off-the-rack suit that now needs to be altered to fit my body, or having a tailor take measurements and custom make an article of clothing that is a perfectly fit.

Did the occlusion fit to the antagonists?
Using buccal bite, I have been astonished at how accurate the occlusion actually has been.

Was a reduction or reshaping of contact point or surfaces necessary?
The adjustment on the contacts was minimal. In fact for virtually all restorations, the only adjustment that was really necessary was a bit of smoothing with the smooth tool.

Do you have ideas for improvements for this CEREC software?
After being a user for close to 7 years, I would like to think that I am fairly knowledgeable about the software. Every time I think that the system can’t get any easier to use, I’m blown away by what the programming team has done. While I can’t imagine more improvements, I’m certain that the next update will be equally impressive.

What would you say to a non-user colleague in favour of CEREC?
I would highly encourage them to use it. Why not use CEREC, save your patient some time and the inconvenience of the second visit? I do not understand how any office can practice without CEREC.

4. Further features of the CEREC software 3.80

Using buccal bite registration

Another important new feature of the software version 3.80 is the ability to register a preparation with the antagonist by means of a buccal impression. Select “Buccal Scan” as the bite registration technique from the “New Restoration” Dialog. When taking the digital impression, the available fields are then “Preparation”, Buccal and “Antagonist”. As all three available impression windows are required for this method, buccal registration is not available with correlation, reference and articulation.

Take the digital impressions of the preparation and antagonist as usual, being sure to include buccal scan information - no gaps in the preview window. Either directly before or after the antagonist scan, take one or two buccal images with closed occlusion from the area of the preparation, making sure the teeth are included in both the preparation and the antagonist images.

Once the impressions are complete, combine the three images to correlate the occlusion. Drag the buccal image to overlap the preparation first. When you drop the image, the software will automatically match buccal bite and preparation. Then drag the buccal image with the attached preparation to the antagonist and drop with a fitting overlap. Once the correlation is complete, you can view the contact strengths by clicking “Toggle Contacts”. Increase pressure optionally using “Settling”.

5. Availability

CEREC Biogeneric is a component part of the CEREC V 3.80 and inLab V 3.80 software and will be released in May 2010. Further information about the scope and features of the new software as well as prices will be published in forthcoming issues of CEREC News. CEREC Club members will qualify for the software upgrade free of charge.

For further information please visit:

www.sirona.com/cerec-biogeneric