

CAD/CAM

international magazine of digital dentistry

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ce article

Aesthetic replacement
of maxillary premolar

case report

Adaptation of traditional working methods
to the creation of Cr-Co ceramic restoration
with CAD/CAM technology

cone beam supplement

Localized ridge augmentation utilising
titanium mesh with CPS morsels
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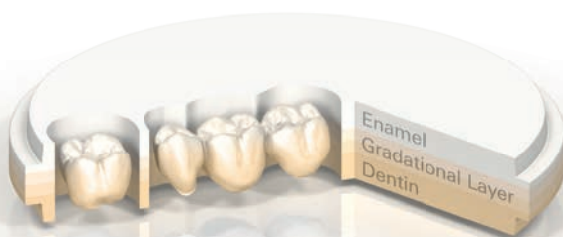
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Dear Reader,

synergy /ˈsɪnərdʒi/—the interaction or cooperation of two or more organisations, substances, or other agents to produce a combined effect greater than the sum of their separate effects.

The explosion of 'digital dentistry' has expanded the clinician's ability to treat patients with an array of different protocols, devices, materials, and software applications. It is an exciting time to practise dentistry no matter where in the world you happen to be. However, just because we are now embracing the term 'digital' does not mean that we truly understand the power that this technology represents. In my opinion that power rests not on the technology itself, but the synergy between various component of both the analog and digital world.

When a patient presents needing dental implants, we may rush to take a panoramic radiograph or even a 3-D cone beam CT scan. While a panoramic radiograph is an adequate screening modality, it has inherent limitations making definitive diagnosis for implant receptor sites potentially inaccurate. While a CBCT scan can provide excellent information regarding the individual patient's anatomy, alone, it may not be entirely adequate to treatment plan with the highest degree of accuracy.

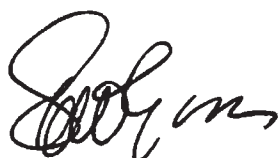
In the ideal world the diagnostic process should begin with an understanding of the desired restorative outcome. Therefore it may be advisable to fabricate a diagnostic wax-up, or a complete denture set-up to determine the functional and aesthetic needs prior to the CBCT scan. A scannographic template can be fabricated to help relate the restorative plan to the existing underlying bone. Additionally, an optical scan or intraoral scan can be completed to create a digitised version of the tooth set-up, along with the opposing occlusion. These digital files can then be combined with the CBCT data creating a total diagnostic foundation to create one or more treatment options for the patient requiring dental implants and/or grafting procedures.

These steps are especially critical when an immediate implant-supported transitional restoration is planned. Immediate loading protocols whether for a single tooth or full arch restoration require excellent pre-surgical prosthetic planning and the fabrication of an accurate transitional restoration. While the temporary restoration can be constructed by either analogue or digital means, it is clear that direct CAD/CAM modalities are the preferred path. CAD/CAM applications are also becoming the preferred method to fabricate the definitive restorative outcome, often based on the morphology of the temporary.

Therefore, the new digital workflow requires **synergy** between various components, including pre-surgical prosthetic planning, diagnostic wax-ups, complete denture set-ups, intraoral and/or optical scanners, interactive treatment planning, and CAD/CAM software applications. As the digital universe continues to expand, it will be more and more important to manage these resources with an open platform to maximise potential synergies. Within the publications of Dental Tribune International, it is our goal to provide guidance for clinicians wishing to learn more about these exciting new protocols.

Respectfully

Dr Scott D. Ganz




Dr Scott D. Ganz



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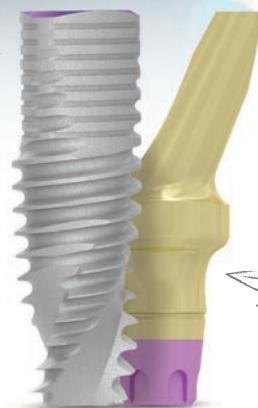
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Bone



Tissue

“I believe that the digital future holds promising prospects”

An interview with Dr João Fonseca from Portugal



Dr João Fonseca

Dr Fonseca was one of the distinguished speakers at the Ivoclar Vivadent International Expert Symposium which this year was held in Madrid, Spain. DTI had the opportunity to speak with him about the benefits and drawbacks of digitisation in dentistry.

DTI: With the ongoing digitisation process, dental professionals now have possibilities that were unthinkable 30 years ago. What are the main impacts—and certainly benefits—of this development on the field of dental aesthetics?

Dr João Fonseca: Computer chips and architecture have evolved enormously over the last few decades. Nevertheless, some predicted leaps in technology have yet to happen, as Moore's Law predictions are right on track. Google announced recently that it is

launching a new processing unit that will enhance our processing capabilities by a factor of three Moore's generations (seven years). Smarter machines with better algorithms that take advantage of billions of transistors and complex chip architecture will be used in the future to better aid the dental team in all phases of the treatment plan. And that will, of course, mean the generation of better proposed treatment based on morphology databases and algorithms, with higher possibilities of success regarding aesthetic integration. In addition, the possibility of immediately printing and snapping on aesthetic mock-ups might be a powerful diagnostic tool in the near future.

Although digital technology can facilitate and increase the efficiency of dental treatment, some human qualities are probably difficult to replace. Yes. Although some enthusiasts in the field of artificial intelligence predicted a technological singularity *[Editorial note: According to the technological singularity hypothesis, accelerating progress in technologies will result in a runaway effect in which artificial intelligence will surpass human cognitive ability.]* during this century, to date, machines are not able to learn or to feel the way we humans do. When you gaze at the stars or watch the sunset on a perfect summer's day, it is this kind of sensation that cannot yet be described in a mathematical formula or decomposed in a way that could be emulated by a computer. There are other aspects in dental prosthodontics and aesthetics for which we could debate whether machines would be able to replace us, but I think human emotion will continue to draw a line for many years to come.

Apart from the new possibilities that digital dentistry offers, what does the increasing automation mean for both the patient and the clinician? Increasing automation means that fewer and faster human-intervening steps will likely relieve the bur-

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den of complicated execution in oral rehabilitation. Clinicians will have more sophisticated tools in every phase of treatment planning and execution. This will allow them to give greater attention to patients' expectations and details that are sometimes compromised, as clinicians focus on the execution barriers often imposed by the workflow. Patients will benefit because automatization has the potential to reduce treatment time, improve the treatment experience, potentially reduce overall cost and increase success rates.

What would be a good combination of the best of both conventional methods and CAD/CAM regarding dental restorations?

In my opinion, with the currently available technology, functional and aesthetic diagnostics in dental medicine should be a human-based, human-executed task. To give an example, although I find digital tools of interest in aiding patient-clinician-technician communication, morphology assessment, discussion and approval should be a process involving real intra-oral prototypes (regardless of the way these are obtained during the diagnostic workflow). Regarding definitive restorations, I think that the future is unpredictable, as bioengineering is advancing at a fast rate. So, it is unlikely that ceramic materials will be cutting-edge in 30 years' time. For now, we can make monolithic restorations with 3-D staining and glazing, combined with mechanical polishing. This

integrates amazingly in many clinical scenarios and is likely to become a trend as materials improve every year. It may be that, in the next ten years, laboratories can print dentine mamelons and inner characterisation effects, which would make handcrafted veneers and crowns a thing of the past.

A recent study in Japan has investigated the possibilities of a robotic device for automatic tooth preparation. Do you think that this is a realistic scenario for the near future?

As Tom Davenport stated early this year, "...smart leaders will realise that augmentation—combining smart humans with smart machines—is a better strategy than automation." Evolution will happen in both directions, as smarter machines will require smarter minds. I believe that the digital future holds promising prospects. Never before have we witnessed so many young talented dentists eager to share their experience and contribution to dental aesthetics. Materials will improve even further in the near future, with better functional performance and chameleon effects. 3-D printing will enable multilayering to be an automated process, reducing human resources spent on minor tasks and allowing professionals to focus on planning and decision-making during fabrication of dental prostheses. Dental aesthetics will become more attractive for the patient, and more clinicians will be able to deliver restorations with a high-quality standard to their patients. _

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