

CAD/CAM

international magazine of digital dentistry



special

The battle between
digital and analogue

case report

Fixed or removable?
That is the question.

cone beam supplement

Computer-assisted implant
rehabilitation of tumour patients



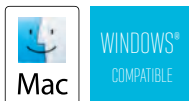
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Dr Scott D. Ganz

Editor-in-Chief



What is next?

As 2018 comes to a close, we should take a moment to appreciate all of the incredible advances in technology and new products that have been introduced during the year. Regardless of which area of dentistry is considered the industry continues to innovate, clinicians continue to push the envelope, and hopefully these advances will translate to improved care for our patients. 2019 will bring us many additional surprises at the upcoming International Dental Show (IDS) in Cologne, Germany, always the focus for new product introductions and the world's premier venue to showcase products related to all phases of dentistry. What is there to look forward to? Plenty.

It has become crystal clear that dentistry has been slowly moving from the analogue to the digital universe. Intraoral radiographs are no longer processed film with chemicals in a darkroom as digital sensors and computer software have provided an interactive medium for quicker access to images with enhanced diagnostic tools. Images that exist on the computer screen can be enlarged, adjusted for clarity, archived easily, printed or e-mailed with a few keystrokes. Each year the sensor technology continues to evolve to become the industry standard, yet digital radiography has not reached 100% saturation with dental offices around the world. What's next?

Digital radiography has further expanded to include cone beam computed tomography which has become an essential diagnostic tool for dental implants, oral surgery, orthodontics, endodontics, and airway analysis. Computers continue to gain faster and faster hardware processors with more powerful graphics cards pushing shrinking pixels on higher-resolution monitors, therefore,

providing clinicians with increased ability to visualise individual patient anatomical presentations.

Additionally, interactive software applications are constantly undergoing upgrades with advanced tools for both clinicians and dental laboratory technicians. However, as we all know the ultimate goal for our patients is to maintain good oral health, function, and aesthetic restorations. To that end, one of the major catalysts for the growth of digital dentistry has been the intraoral scanner. The ability to move from the analogue impression to a digital impression for a tooth preparation or to capture the position of an implant has transformed the restorative protocols and workflows for the present and the future. Virtual teeth can be designed on a tablet computer or a smart phone. Perhaps it is the merging of these technologies that has truly provided new levels of accuracy for the diagnostic, surgical, and restorative phases of dentistry.

A second major catalyst that has caught our industry by storm is the availability of low cost, accurate, 3-D printers that can take our ideas, our virtual designs, our virtual treatment plans, and bring them to a physical model that we can hold in our hands. Our world is changing rapidly... dentistry is forever evolving—and the ultimate beneficiary are the patients we serve. Let's all look forward to "what's next" in the coming year!

Happy Holidays to all!

Dr Scott D. Ganz
Editor-in-Chief



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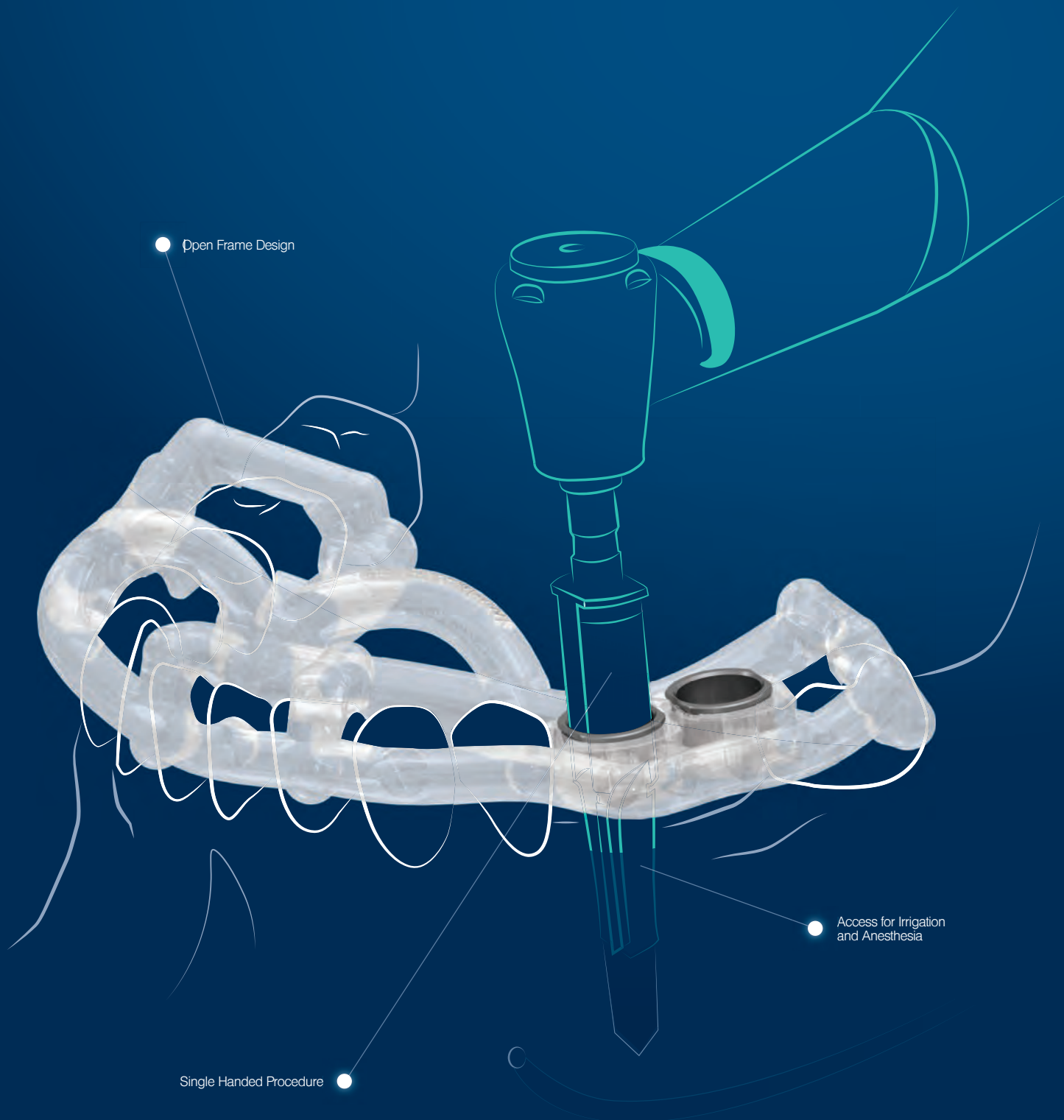
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The battle between digital and analogue

Interview with Dr Galip Gurel, Dr Stefan Koubi & Hilal Kuday



The use of digital technologies in dentistry is on the rise, a fact that clinicians Dr Galip Gurel, Dr Stefan Koubi and dental technician Hilal Kuday are well aware of. They are convinced that the use of modern technologies is a growing trend in all areas and to believe that this will not come to the dental clinic would be a big mistake. Ulyana Vincheva, Managing Director of Dental Tribune Bulgaria and publisher of *Dental Tribune Bulgarian Edition*, had the opportunity to talk with them about their lecture during the 2018 Competence in Esthetics meeting held in Belgrade in Serbia on 10 November and organised by Ivoclar Vivadent. They told her of their fascination for digital dentistry and their vision of the near future, in which they believe virtual reality and artificial intelligence will feature.

You are three of the world's top experts in dentistry and you work together as a team, but you are also good friends, right?

Koubi: Of course! Nicely done teamwork is only possible among people who like each other.

During your lecture you spoke about "the most personalised smile design". What is the point? Do you believe in the individualised approach for every case, and how does it fit in with a fully digitalised workflow?

Gurel: As I explained in our lecture, we have been working like this for years. It provides a personal touch. It depends on your intuition how you approach and evaluate the patient

and his or her smile. Even with this protocol, you should have some trials. Maybe sometimes the result will be superb; sometimes the patient won't like it. Our workflow was already a personalised smile design, but we didn't know it until we started our research. When we started sharing cases with each other, at first, we selected only the best cases, trying to evaluate which part of the smile design goes with which part of the patient. Does it depend on physical appearance, which we can't change, or on personality, how the patient wants to be perceived? We fragmented all these smiles and tried to analyse, for example, on what the tooth axis depends, on what the tooth shape depends. After that, we cross-matched these cases and came out with some results, which we put into a software programme. This software is based on hundreds of algorithms, and most recently, we developed software that is driven by artificial intelligence and suggests smile designs that are appropriate for the patient because they go well with his or her facial appearance and his or her personality. That is how we started using this programme. The first step was the VisagiSmile, which gives us the 2-D design. This programme was amazing for someone who is into aesthetics. If I show the programme to Hilal or to Stefan, they will understand it and transfer it to the patient either as a mock-up or a wax-up, but for majority of the dentists it wasn't an easy task. The main problem was that many dentists couldn't translate it to the patient's mouth. We realised that many of our colleagues don't use mock-ups.

They take an impression, send it to the lab and the lab technician prepares a wax-up. Back then, the lab technicians didn't have much supporting material. They had only a few photographs and a stone model, and they tried to build up the entire case based on that. Nothing was personalised. Everything changed the moment we realised that our IT team could transform 2-D into 3-D. That is how Rebel was born. Thanks to Rebel, we can transform all of this knowledge into a 3-D digital wax-up, which can be sent to the dentist for 3-D printing, then for impressions and back to the patient's mouth. This is the chronology of how personalised smile design became a reality.

As I mentioned in our lecture, when you go into Rebel, there are some mandatory fields you need to fill in, like the facial photographs, the intraoral scanning, the questionnaire, and your or your patient's preferences. For example, if you would like to have a mild surface texture or a strong or smooth one, you need to enter this information into the software. Ninety per cent of the information needed can be entered only by clicking, nothing further. Some of the data needs to be entered as a text, but this is very limited, so definitely I can state that Rebel is extremely user-friendly. From a technical perspective, if you send a case without writing anything, only with the information that has been registered by clicking and selecting one of the given options, you will still have a 100 % digital wax-up. Maybe only 5 % needs to be entered manually by the clinician in order to complete

the smile design. As far as I know, to date, this is the only software that instantly gives you a 100 % digital 3-D wax-up.

A few years ago, you emphasised the importance of proper communication with lab technicians. Does Rebel help in this matter?

Gurel: I think Rebel is an amazing tool for ceramists—and I am not talking only for ceramists like Hilal, who is a superstar and a great professional. For the majority of lab technicians, Rebel represents an amazing tool and opportunity to immediately create a 3-D wax-up that not only is aesthetic in their opinion, but also perfectly suits the patient's facial appearance and personality. At the beginning when starting beta testing of this project and giving lectures to dentists and lab technicians, the lab technicians were the first to embrace the idea because it makes their lives much easier. Instead of spending hours carving and sculpting the wax-up without having all the information and parameters needed, with Rebel they can have an accurate wax-up ready in a split second. Of course, they can make some small changes if they like. In my lecture, you saw how amazingly one can translate all details, like surface texture and tooth shape, into 3-D printing or CAD/CAM milling in order to be tested in the patient's mouth even before one starts prepping the teeth.

Dr Koubi, what are the benefits of digital technology for dentists?



Gurel: Thanks to digital solutions, even more dentists who were previously afraid to work in the aesthetic area will go into aesthetic dentistry. Imagine that every patient who needs an aesthetic smile rehabilitation is like an empty canvas, and it is up to us to create a masterpiece. Digital technology will support us in our artwork, enable us to be even more precise.

Koubi: I would like to briefly address the previous two questions. Generally speaking, you have two realities. One is the patient's expectations. Patients would always prefer a customised smile, not a standardised one. And the second one is the technician's abilities. Most lab technicians have a specific signature, their own style, and they pretty much repeat it with every case. I am talking about the majority of technicians, not the top professionals. The beauty of the software is that you have a digital library and you can include as many tooth shapes and forms as you like. And after that, you can play with the software and make some modifications. The problem is that most dentists are not able to experiment with the software because we don't have the knowledge and ability to do it. That's the main problem with smile design: the dentists are not able to experiment with the software and the lab technicians have one and the same signature. Rebel provides a solution, giving you the advantage of outsourcing the headache of smile design. We have to be realistic: most dentists are not able to use the software or Keynote properly; we are dentists, not fancy speakers, or we just don't have enough time to spend hours in front of the computer. The ceramists don't have the knowledge or ability to create all the different tooth morphologies because there are more than 12,000 different tooth shapes. That is where Rebel comes in; its algorithm supports you in this task. Returning to the question, the benefit for dentists is that it is so user-friendly—you just plug and play! Rebel saves a great deal of time and gives you a quality product, so it meets every dentist's needs!

Mr Kuday, would you like to add something to this topic?

Kuday: As a dental technician, I would like to say that digital workflow is a tool you can always rely on. If you integrate digital technology into your everyday practice, it definitely raises the quality of your work. We dental technicians study anatomy, biology and morphology and are a part of the team, so if dentists don't respect our work as lab technicians and don't send us all information needed to create beautiful, nicely fitting prosthetic restorations, then our hands are tied. Fortunately, I am lucky to work with dental experts like Drs Gurel and Koubi, who appreciate my work in the lab. All of the precious information that they register from the patient's mouth, the questionnaire in Rebel, give us an idea of how to follow nature. At the end of the day, we are a team; we sit down and work together in order to create a beautiful job as partners.

Koubi: With Rebel, we are not talking about replacing the lab technician; we are talking about supporting and assisting him or her. It is very important to keep that in mind. Rebel is a very useful tool to improve the quality of the technician's work in order to create even more beautiful restorations.

Gurel: One other thing: thanks to Rebel, even more dentists who were previously afraid to work in the aesthetic

zone will go into aesthetic dentistry. Imagine that every patient who needs an aesthetic treatment is like an empty canvas. You need to create an artwork there and not every dentist is capable of doing that. Rebel gives you the opportunity to create a masterpiece without worrying about how to use Rebel. All other programmes, as Stefan and Hilal have already said, require detailed computer knowledge in order to create proper smile designs or a great deal of time to work with digital libraries, to position the teeth and to establish a really aesthetic smile. For the dentist to be able to achieve a perfect smile with a single mock-up is a completely different story. That's the beauty and ease of using Rebel. The effect of integrating Rebel into the dental world will not be erasing and replacing all dental technicians. Instead, it will create a huge community of dentists doing aesthetic cases, which will increase the number of veneers, crowns and bridges to be made. As an end result, more dental technicians will be needed to cope with the rising needs.

You have touched on some advantages of digital technology, but what are its limitations?

Gurel: Well, there are always limitations. First of all, it won't work in extremely crowded dentition. We shouldn't expect miracles. Rebel can cope with cases with a reasonable initial situation, for example minor crowding or minor spacing. It is not mandatory for the restorative technique to be additive for every case. That's another great advantage of Rebel, meaning that if a part of a tooth is protruding out of the aesthetic arch, the software doesn't take that into account. It will place the original shape over the ideal arch position, leaving that part outside. The advantage of this is that in a traditional system in order to put the wax-up into the patient's mouth we have to first cut the protruding edge of the tooth and then make the mock-up, which means we have already started prepping the teeth and if the patient is not satisfied, it will be a problem. With Rebel, you can transfer the mock-up into the mouth even with this crowding and then explain to the patient that if he or she doesn't want the dentist to prep this tooth then he or she needs to undergo an orthodontic treatment. The possibility of having this visual information and communicating with the patient enables you to achieve superb outcomes.

Koubi: We need to have a very clear vision regarding the digital technologies because it is a reality already. In order to be good with digital technologies, you need to be a skilful driver and manager of the whole process because, as we have already mentioned, digital technology serves you as a tool. But you and your lab technician need to be well educated. That's the basis of your teamwork. Sometimes, people are confused because they believe digital technologies will provide them with all of the clinical solutions, but that's not true. It only supports us in our work; it speeds it up and improves its quality. We use artificial intelligence to simplify our life, but not to replace the human with his or her mind and knowledge.



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