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 stop 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, gives 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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Kuday: I would like to talk through it from a human perspective. If we retain the human factor in the technology, then everything will be alright. Nowadays, we are talking about self-driving cars replacing drivers. Sooner or later, it is going to happen. But if we would like to do something as a team, we need to integrate the human factor to control the whole process. From an ethical point of view, human touch is mandatory during the digital workflow. The operator needs to be either the dental technician or the dentist, not the engineer. The human, not the technology, has to be the creator and leader. The new digital technologies are developing very, very rapidly. For example, if you buy an iPad today, tomorrow it will be out of date. This is dictated by today’s economic situation.

Do we need major reforms in dentistry? If so, what might those be with regard to digital technology?

Koubi: We need many reforms in dentistry. I will speak also on behalf of my friends and colleagues. In France, two types of dentistry have been established for years: mass dentistry and elite, boutique dentistry. Digital dentistry is very useful for mass dentistry because it makes aesthetic treatment faster and more affordable, but we have to keep in mind that we work in the medical field, not in economics, for example, and we are treating patients. We have to take responsibility for all our actions. Digital technologies will improve the average quality of our work, but will never be better than an exceptionally good dentist. It is the same in other medical fields: surgical robots perform better than an average surgeon, but robots will never be more skilled than an experienced and well-trained surgeon. Most dentists cut too much tooth structure. If you examined 1,000 impressions, you would see that most teeth are over-prepped. Thus, the risk of complications rises. Thanks to robots, we can standardise quality. Is it the best quality? No, it is not, but that’s not the purpose. So it needs to be clear that digital dentistry is certainly our future, but I don’t believe everything will become digital. We need to implement also the human touch in order to exploit all advantages that digital technologies provide, but at the same time to avoid their weaknesses.

What does the future hold for dentistry in your opinion? How do you see the dental world in 20 years?

Koubi: Our future is digital for sure! We will have less useless stuff; the impression trays and impression materials will be forgotten. Everything in the dental office will be clean, white and clear as it is now in our clinic. My wish and hope for the future is that dental students will receive better training and be better prepared for the digital workflow. The digital process needs to be better integrated into university curricula. Universities all over the world have to make a significant shift and to implement digital education in every
dental specialty so that students graduate already prepared to work with digital technologies because nowadays they have to learn how to do it after graduation by attending additional courses and lectures. Education, not only university education but also continuing education, will become more and more relevant and it will be key to success.

**Gurel:** My short-term project is to see our robot DIGICUTO working. Five years ago, nobody believed that the iPhone would be so small and able to multitask so quickly. Now, it is a reality: your phone, your computer, your camera, everything is becoming even smarter. Our idea has already been born. When we will realise it depends on two things: technical issues, which in my opinion will be solved soon, and patient acceptance—people usually ask me not how it will be done technically, but how patients will allow a robot to prep their teeth instead of a dentist. In the near future, cars will be driven without drivers by artificial intelligence. Our concept is the same; it is even safer. I think the near future will look like that. I hope, as Stefan said, that digital technology will enable us to offer even more affordable treatment plans. I hope that new 3-D printable materials like ceramics will speed up treatment and once again make it cheaper so that more people worldwide will have access to high-quality dental care instead of what they are getting now. Everybody deserves to be treated in a precise and predictable manner.

**Kuday:** Regarding future development, I think “affordable” is definitely the key word. Everybody deserves to have unique restorations, not only wealthy people. I would like to emphasise that, if the quality of 3-D printed restorations is high enough, then I will accept it.

**What do you think the role of leading brands will be in the future?**

**Gurel:** We are all professionals with many years of experience, working with big companies. In my opinion, the companies should not sell materials only, but should sell complete storylines, and by that, I mean things connected with each other, so that if somebody starts working with some system he or she should not even think about leaving it. Just like Apple. Once you buy an iPhone, then you buy an iPad, then a MacBook Pro, so you always stay in the family. Why? Because they are very nicely connected with one another. Many people nowadays are afraid of the word “digital”. They are concerned that they don’t have advanced computer skills, and don’t know how to use the software or how to shape the teeth digitally. Working in a digital workflow doesn’t require all of this. A digital protocol should be very user-friendly and intuitive so that once you start using it, you will feel the urge to dive even deeper into it and to also try a scanner, for example. And if it is easy to work with, then you won’t even think about buying a device from another company.

**Koubi:** The aim of artificial intelligence is to simplify our life, not to replace the human with his or her mind and knowledge. Digital technologies will improve the average quality of our work, but will never be better than an exceptionally good dentist. It is the same in other medical fields: surgical robots perform better than an average surgeon, but robots will never be more skilled than an experienced and well-trained surgeon.
If you follow the Ivoclar storyline and you are satisfied with all of its products, then you won’t buy another brand’s porcelain blocks, for example, because you are sure that quality of the end result is guaranteed only if you stay in the family. And if the brand you are satisfied with also offers you a robot to prep the teeth, it will complete the whole storyline and you won’t look for different solutions. Getting a milling machine from one company, porcelain from another and a scanner from a third will create a higher risk of mistakes and complications, so adopting one brand is more convenient for everybody.

Koubi: Dentists want to buy solutions, not ingredients. If you go to an Italian restaurant, you order a whole plate, not the pasta itself, and you are sure that it will be cooked al dente. It is similar to some of the brands on the market: they stress the qualities of some ingredients, some materials, but customers are looking for integrated solutions. This is important for producers to keep in mind and for them to develop and improve their sale strategy according to it.

Kuday: At the beginning of the congress, Ivoclar Vivadent launched IvoSmile, an application for smile design that gives you the final outcome after aesthetic rehabilitation of the smile. Anybody can download it from Ivoclar Vivadent’s website; even patients can download it and give it a try. This means companies are thinking ahead and they are already trying to establish and improve the connection with each other.

Gurel: When a company delivers a product to patients or to dentists, it should be connected in a clear workflow. If the patient sees the smile design and approves it, the dentist shouldn’t have any fear or uncertainty regarding how to achieve it. In my opinion, dentists won’t even try it because they might be afraid of how to proceed, how to create such a smile design. That is the reason why I am saying we should have a well-established workflow and every new product launched on the market needs to be connected with the rest. When a patient wants a particular smile design, the dentist needs to be certain which 3-D design programme to use. I believe defining a very clear treatment process lies in the near future of companies.

Thank you very much for this interesting conversation! It has been a pleasure having all three of you!

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