Technologies such as cone beam computed tomography (CBCT), intra-oral scanners and CAD/CAM techniques have introduced a computer-guided workflow into dentistry, specifically implantology. While a computer-guided approach can make treatment more precise, safe and predictable, it requires a practised, experienced and focused practitioner to implement a digital workflow. Today international spoke with European Association for Osseointegration (AOI) congress presenter Dr Daniel Wismeijer, Professor of Oral Implantology and Prosthodontics at the Academic Centre for Dentistry Amsterdam in the Netherlands, about the problems that implantologists are still facing in using digital technologies and the future of computer-guided implant surgery.

Today international: Prof. Wismeijer, with the emergence of new digital technologies, novel treatment approaches have become available to dentists—particularly in the field of implant dentistry. While some implantologists embrace these new technologies, others are still sceptical of them. Why do you think that is?

Prof. Daniel Wismeijer: Novel technologies do not only affect implantology; they introduce digitisation into other areas of dental practice too. Consider the applications of intra-oral scanners and CEREC (Dentsply Sirona) machines and the use of new technologies in planning and designing customised implant superstructures. While some dentists use quite a lot of these tools, others do not use them at all and leave everything up to the dental technicians. This largely depends on the dentist and his or her attitude towards digital technologies and digitisation in general—be it at home or in the dental practice.

Then, of course, dentists have to invest in this sort of technology, as well as learn it and be prepared to unlearn their current practices. This too depends on the dentist: is he or she ready to use new technologies or would he or she prefer to stick with what he or she had learnt previously? On the one hand, we see many young dentists start working with these new technologies immediately and thereby become very experienced in new treatment approaches. On the other hand, dentists who are more experienced in established treatment protocols are, of course, less inclined to unlearn the old and start learning the new technologies.

In the “Emerging technologies: Head to head” session at the EAO congress, you will be talking about computer-guided implant surgery. What advantages does such surgery offer? Has it already proven itself in research and clinical practice, and what results can it achieve compared with free-hand surgery?

In my opinion, guided surgery helps dentists become increasingly precise in our work. Digital technologies are proving themselves in implant dentistry and I think that they are improving with time. If the practitioner can plan up front where he or she wants to place an implant and what sort of superstructure he or she wants to put on top of that, and if he or she can also place the implant in that exact position and implement a superstructure that fits precisely,
Albert Einstein once said “look deep into nature and then you will understand everything better.”

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that will show that we have come a long way.

However, we are not there yet. There are still certain problems we have to solve with regard to implant positioning, problems in combining all the tools needed for guided implant surgery, and the limitations of these tools. For example, in order to plan the position of an implant and its superstructure exactly, we have to superimpose CBCT scans and intraoral scans using software. Factors such as voxel size and the absence of clear landmarks by which to superimpose the different scans correctly can affect precision and cause deviations between the planned and the realised positions. I am not saying that free-hand surgery is more precise; however, the free-hand surgical approach may in some cases be more rewarding, as at least then the practitioner knows what he or she can expect and what his or her limitations are.

So what can dentists do to better implement a digital workflow in implant treatment?

Dentists have to know that they cannot blindly rely on the computer-guided approach. They still need to get their heads around the technology and that computer-guided surgery will not work 100 per cent the first time it is applied. In my lecture, I will be discussing the variables that influence the precision of the guided surgery workflow and what dentists are able to do to overcome associated problems. Primarily, they have to become comfortable with the different tools and software packages and gain experience in working with them. In the long run—and I think that we are not far away from that—surgery—computer-guided surgery—is a treatment approach that will probably be much more precise than planning and placing implants without any guidance at all.

Osstell symposium: Experts discuss benefits of ISQ diagnostics in daily practice

"Digital technologies are proving themselves in implant dentistry and I think that they are improving with time."

For more than 25 years, Osstell has been manufacturing instruments for analysing dental implant stability that help assess osseointegration through resonance frequency analysis (RFA). The method, developed by Prof. Neil Meredith from Australia and Prof. Peter Cawley from the UK, is currently the only objective and non-invasive means of measuring implant stability. Meredith, one of the speakers at yesterday’s symposium, elaborated on the scientific concept of RFA, the development of ISQ technology over the last 25 years and the advantages of using ISQ measurement to enhance long-term clinical outcomes. “Osstell IQ was the sixth generation of a 25-year-old instrument, and for me as the inventor, the evolution has been dramatic. It is one of the most sophisticated instruments in dentistry, and it is not only about the technology: it is also about the ability to use the data that gives us more and better information regarding the treatment and diagnosis of our patients,” Meredith stated.

Dr Marcus Dagnelid said, “Osstell IQ’s measurement technology for analysing dental implant stability is a dynamic navigation system that provides real-time guidance based on the patient’s CBCT scan. During surgery, the dentist sees the planned implant position on a screen while sensors track the drill and the patient’s jaw and the system provides visual and tactile feedback to ensure that the dentist drills exactly at the planned osteotomy site. Dynamic navigation systems like this one are the next step towards robotic surgery in dental implant dentistry. From there, it will not take much to develop a computer-controlled robot arm that calculates whether the drill is in line with the planning and, supervised and handled by the dentist, drills the osteotomy in various surgical disciplines, for example neurosurgery. Operations are already being performed using robotic technologies, as they are able to perform much more precisely than the human hand alone. It is only a matter of time until these technologies enter dentistry as well.”

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Today, dentists are facing increasing challenges in implant treatment: the continual development of digital technology, a growing number of high-risk patients associated with the pursuit of shorter treatment times, and achieving consistently predictable outcomes. At a scientific symposium, held by Swedish dental manufacturer Osstell as part of the 2016 EAO congress, experienced clinicians discussed how to address these challenges using implant stability quotient (ISQ) technology.

“The aim of our annual symposium is to provide an opportunity for dental professionals to learn about the use of ISQ diagnostics in everyday practice and to interactively discuss the topic with experienced clinicians,” commented Osstell CEO Jonas Ehinger. “At this year’s symposium, four well-known experts demonstrated how to monitor osseointegration in various treatment scenarios in order to optimise treatment time and implant loading and accomplish predictable results.”

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