



19th BDIZ EDI Expert Symposium, Cologne, Part II

Digital dentistry with BDIZ EDI

This second part of our report on the 2024 Expert Symposium on “Digital dentistry—Current possibilities and limits of digital treatment” addresses the surgical, prosthetic and periodontal aspects of this topic. At the end of the symposium, Prof. Jörg Neugebauer, Secretary General of BDIZ EDI, presented the results of the EuCC consensus paper, published in the 1/2024 issue of *EDI Journal*.



Digital procedures in periodontology: Or would you rather do it by hand? Prof. Dr Stefan Fickl

“Perio is still very much analogue,” said Professor Fickl at the start of his online presentation. He sees himself as one of the few people to put on the brakes on digitalisation in periodontology. “We know that periodontology often depends on systemic factors. CBCTs are important for diagnosis and for confirming the success of treatment.” Of course, Fickl continued, digital procedures make life easier in terms of treatment and treatment options. Predictability is especially important for periodontologists. Digital techniques have had

little overall impact on periodontology. However, significant advances have been made in the discipline thanks to a better understanding of biofilm and the aetiology of periodontitis. The focus is on systemic and minimally invasive approaches.

Of course, Fickl concluded, digitalisation helps in diagnosis and in securing treatment outcomes through digital radiography; chairside digital fabrication of dental prostheses has reduced the pressure when providing long-term provisionals.

Digital procedures in prosthetics: whither dental technology?

Prof. Dr Daniel Edelhoff

Prof. Edelhoff believes that the pace of innovation is so fast that it is no longer possible to keep up with studies in the field of digital procedures in dental technology. Only analogue impressions still have an advantage over digital full-arch scans, he explained at the beginning of his presentation. Edelhoff also wanted to give an indication of the impact on materials. The variety and quality of materials would not exist today without the advances made by the digital approach. However, 3D printing is not quite as advanced as Edelhoff, who holds the chair of Dental Prosthetics at the University of Munich, would like it to be. Is there a time advantage? "It was already clear in 2019 that dental technology would benefit the most from digitalisation and digital intra-oral imaging!" Today, digital images of the

dynamic system, i.e., the movements of the mandible offer further advantages, without mechanical limitations—the basis for virtual articulators. For the first time, he said, it is possible to synchronise occlusal examinations thanks to instrumental functional analyses (Kodroß et al., 2020). In Edelhoff's view, with a little routine, this functional examination could be completed within half an hour. From digital support for bite elevation to 3D printing of crowns (lithium disilicate ceramics), the printing of dentin core crowns as an interesting option for the future, printing the enamel in one piece: monolithic-bichromatic—"You won't be able to achieve this with analogue technology now or in the future!" Finally, Edelhoff presented a restorative case he had published (*Dental Dialogue*): Digital one-piece complete



maxillary denture (monolithic polymer) meets multi-layer zirconia with gradient technology.

What does good dentistry look like in 2024?

Prof. Dr Florian Beuer

For Prof. Beuer, the landscape in dentistry is changing completely, "and we don't even realise it, and we're not well prepared!" He backed up this provocative statement in his presentation, which focused on good dentistry in the year 2024. In his view, these changes are: digitalisation and demographics: "When the last baby boomers leave their practices in 15 to 20 years, the current concepts will no longer work."

He sees future prosthodontics, for example, increasingly facing challenges such as dementia and occlusion, as well as sleep apnoea, which will call for a holistic approach. Beuer made it clear that he was concerned with the biological "value" of the patient. Referring a case at the Charité from last year in which he had treated a patient to the patient's full satisfaction, he criticised the fact that he had dramati-

cally reduced the biological value of the 42-year-old periodontal patient by performing an invasive procedure. Beuer believes that microinvasive or minimally invasive dentistry is what the next generation of dentists needs to be taught. He cited a 20-year-old paper on microinvasive dentistry in periodontal surgery by Burkhardt, Lang et al. which showed that "we get significantly better recession coverage and healing when we work with the microscope!" He said there was relatively little data on such restorative procedures—except in endodontics. He advocated the use of magnifying aids: "If magnifying glasses opened up a new world for us, the microscope opens up a new galaxy."

And another concern: dental hard tissue is sacred! He spoke of the "death spiral" of the tooth during full-crown preparation, a view he backed up with a number



of research papers. For Beuer, the goal must be additive dentistry using new technology and without reducing tooth hard tissue.



Digital implant surgery, part 1: What does the robot do? Dr Markus Tröltzsch

What are the advantages of digital technology in implant surgery? Dr Tröltzsch asked ChatGPT about this and got unsurprising answers: better precision, better planning, better communication and better documentation. "I don't think digital technology will replace everything analogue, but rather complement it," he said. Until now, digital implantology has been defined as fully guided, template-based implantology. In science, the fully guided approach, i.e. the template system, is the most precise system compared to the pilot-guided system, where only one drill is guided. He believes that anyone who does freehand drilling—even the most experienced practitioners—will be under pressure to justify it in the event of failure. The next step is dynamic navigation.

The literature shows that dynamic navigation, supported by lenses and cameras, can achieve a high level of precision (Wei et al., 2021). So which is better? An examination of available systematic reviews shows that the deviations are comparable. But actually, other metrics are much more interesting.

Tröltzsch showed the differences between dynamic and fully guided (static) navigation with complementary results using a comparison table from different studies. In his practice, he tries to combine the advantages of both systems with his own "home-made" system. He concluded that digitalisation and navigation technologies could simplify procedures, making them safer and saving manpower.





Digital implant surgery, part 2: What does the robot do? Dr Detlef Hildebrand

Digital implant surgery was also the topic of Dr Hildebrand, who demonstrated digital implant surgery in his Berlin practice. For him, who has been working with

digital systems for over 20 years, navigation aids are essential. Where are we headed? Planning, he said, is the central aspect of our work. It is important that the systems are predictable and can be implemented without a time-consuming learning process: "A technology that turns complex challenges into simple ones."



The heart of the navigation devices, said Hildebrand, is the planning software that is implemented—the heart of any navigation and template technology. For him, a possible future step is an anatomical implant that, generated three-dimensionally based on 3D imaging, is tapped into the socket with minimal trauma. He now has 50 cases in his practice that have been treated using this method.

Digital planning and execution of implant surgery Prof. Dr Hans-Joachim Nickenig, M.Sc.

Prof. Nickenig has been using surgical guides in navigated implantology for 25 years. Nevertheless, freehand implantation is still widespread, accounting for about 90 per cent of cases, he reported. In 931 of his own cases, the follow-up showed the following result: "The deeper the position of the mandibular canal in the posterior region, the more pronounced the lingual undercut. If we find a deep nerve region in the mandibular canal in only two dimensions, we must expect an undercut jaw in 90 per cent of cases." This area in the floor of the mouth cannot be palpated clinically.—The clinical relevance of this finding is obvious. "You can't place a nice long implant with just a panoramic radiograph." Under clinical conditions, guided implants have been

shown to have a positional deviation of 1 mm and an angular deviation of 5 degrees, compared to freehand implant placement with a positional deviation of 3–4 mm and an angular deviation of 15 degrees. What does the clinical evidence say about 3D-based digital procedures and perspectives according to the literature: there is no difference between dynamic and static navigation (Struwe et al., 2023); the accuracy of augmented-reality procedures is almost as good as static navigation (Mai et al., 2023); there is little difference between fully guided and navigated pilot drilling (Schulz et al., 2023); and digital planning with low-dose CBCT has shown promising results (Unger et al., 2023).



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