

EXPERIENCE REPORT

"As gentle, as perfect, as beautiful and as durable as possible."

A report by Karsten Kamm and Torsten Kamm, owners of the "Zahngesundheit Baden-Baden" practice in Baden Baden/Germany, on their personal experiences with digital tools and methods.

Digitalization affects all aspects in a dental practice

Digitalization is changing dentistry. Intraoral scanning, 3D implant planning and CAD/CAM prostheses have most certainly become an established part of dental practices. In our opinion, the relevance of these methods is undisputed. So where is the special attraction for implantological-prosthetic dental practices? The opportunities are considerable: state-of-the-art dentistry, new and better products, together with improved cost efficiency. This relates especially to the areas of implantology and implant-prosthetics where both esthetic and exceptionally functional restoration is possible. But digitalization does not stop there, it also has major effects on the organization, management and marketing of dental practices. What is important, is to analyze upcoming developments correctly, to enable operators of dental practices to plan sensibly and invest successfully.

Focus on: "Esthetics and implantology"

In our own dental practice, which specializes in surgery and prosthetic restoration, we take a holistic approach in terms of philosophy and concept, and functional diagnostics play a significant role in this context. Full-ceramic prosthetic solutions are a clear favorite. The motto of our dental practice is "As gentle, as perfect, as beautiful and as durable as possible." Our experience with digital technologies goes back to 2001. We addressed the opportunities offered by CAD/CAM technology early on. Meanwhile we have integrated intraoral scanning, DVT, guided surgery and CAD/CAM as an established

part of the workflow in our dental practice. More often than not, intraoral scanning is the starting point for planning and designing conventional as well as implant restorations on the screen.

Digital impressions offer considerable future potential

In future we intend to completely replace the, in our opinion, error-prone and time-consuming process of conventional impression-taking with direct visual acquisition of the tooth and soft tissue situation in our dental practice. We see this as a further step to higher quality and shorter treatment periods. In our opinion, other solid arguments for intraoral scanning include greater patient comfort, improved treatment efficiency, cost-saving potentials, and being able to view the result directly during scanning. Based on these numerous advantages in terms of standardization, quality assurance and patient comfort, we believe that digital impression-taking offers us tremendous potential in the future. The treatment procedure for prosthetic restorations does not differ from current practice up to the point of impression-taking. The new scanner generation – we will be using the iTero™ in our dental practice – offers easy handling and high scanning precision. The technology employed in the iTero™ makes powdering of the tooth surfaces obsolete. Especially in the case of larger restorations, major problems sometimes occur with other systems as the powder must not come into contact with liquids. The iTero™ scan employs laser technology and an optical scanner to digitally record the surfaces and contours of the tooth and gingiva structures, whereby 100,000 laser points are captured at 300 measuring levels at approximate intervals of 50 µm in 0.3 seconds. The result of the preparation can be viewed on the screen immediately and corrected if necessary. Normally this would require making a new impression – with iTero™ further scans are simply added. The new digital







scanning methods also present considerable improvement in treatment comfort for sensitive patients. Choking, a bad taste, and perceived breathing restrictions during impression-taking are a thing of the past – this improves confidence in the operator. After scanning, the individual models can be examined on the screen, both mandible and maxilla separately, or their bite relationship. Newly designed bite constellations can be scanned and presented with the aid of jigs. In the laboratory, the intraoral scan data is imported into the CAD/CAM software and the zirconium framework designed.

Relieves economic strain on the laboratory

We intend our in-house professional laboratory to focus as near to 100% as possible on the optimum utilization of CAD/CAM technology and the esthetics of the prosthetic products. At present we follow two different avenues when making prosthetic restorations. Smaller items, such as inlays or veneers, are generally produced in our own laboratory to ensure a quick and highly esthetic result. Complex restorations designed in our own laboratory are increasingly being transferred to the Straumann industrial milling center. Cooperation with an industrial partner offers considerable economic benefits as this minimizes the financial strain on the laboratory. This form of cooperation is also most likely to ensure that only the latest technology is employed. This applies both to production and the machines required, but especially to the software which is becoming more and more complex, and which needs to meet considerable challenges, especially for major restorations. There are only few major suppliers who can offer the technical know-how required, together with all the compatible components necessary for making complex restorations. Against a background of cooperation with a competent industrial partner this does not make our own dental laboratory redundant, quite the contrary, it provides economic and workload relief by allowing us to focus on planning, design and esthetics.

Full-ceramic zirconium dioxide restorations as a consequent step towards complete biological restorations

To assist us in our ambition of providing holistic dentistry, tooth filling materials and technical dental materials are of prime concern. Following only average to poor results with crowns and bridges made of aluminum oxide ceramics – as these are



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Karsten Kamm ist Mitinhaber der „Praxis Zahngesundheit Baden-Baden“. Neben seinen Arbeitsschwerpunkten in der ganzheitlichen Zahnheilkunde engagiert er sich als Mitgründer des „Institutes für Bioästhetik“ sowie eines zahnärztlichen Qualitätszirkels und im Aufbau eines „Ganzheitlichen Netzwerkes“. Seit 2008 ist er an der Universität Hermannstadt als Gastdozent für ästhetische Zahnheilkunde und Implantologie tätig.



prone to fracturing on implants, we today tend to use quality-assured zirconium dioxide (i.e. zircon™ by Straumann) whenever possible. This high performance ceramic is not only the material of choice for esthetic reasons, but also for reasons of biocompatibility. Full-ceramic restoration is the consequent step towards complete biological restoration. This material is distinguished by its exceptional esthetics and excellent adaptation to soft tissue and have made it the material of choice in our treatment. In our dental practice we increasingly use patient-customized abutments for optimum emergence profiles. When designing the abutments, the crown edge is placed at

the epigingival level. This reduces the risk of lodging residual cement deep in the sulcus during treatment, which, at worst, could lead to peri-implantitis.

Excellent experience with quality-assured zirconium dioxide

In the many years of working with quality-assured zirconium dioxide, the material has proven itself clinically for us on the basis of its excellent mechanical properties. In a comprehensive documentation, the authors have monitored and evaluated 2526 restorations with zirconium dioxide – tooth and implant supported crowns and bridges – over a period of

	Total	Crowns	Bridges
Number of restorations	2526	2051	475
Number of framework fractures	7	2	5
Probability of events	0.3%	0.1%	1.1%
Number of chippings	77	54	23
Probability of events	3.0%	2.6%	4.8%

Long-term stability of framework and veneering

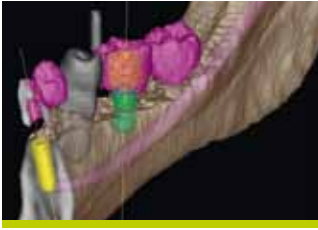
approx. 7 years for events such as fractures and chipping (see table 1). The result was an extremely low rate of complications with a fracture probability of 0.3% and chipping probability of 1.9%. The possible indications for zirconium dioxide materials cover nearly the entire range of fixed dentures. Contraindications include non-compliance with the minimum thickness required for full-ceramics and functional problems. Careful preparation is, however, the most important prerequisite for high success rates, whereby the type of preparation needs to be adapted precisely to the zirconium dioxide material used.

3D planning and implantation system

For larger implant-supported restorations we regularly use a 3D planning and implantation system (coDiagnostiX® by Straumann), which is optimally compatible with the implant hardware. The performance and costs are well accepted. The use of guided surgery covers all important steps for prosthetic-oriented planning. In future, digital images of the current situation will be recorded with iTero™ prior to extractions. The resulting data will then be included in digital prosthetic planning to obtain an optimal result following implantation. Based on the template plan provided by the program, which







includes four parameters for the spatial position of each implant as well as depth information for the drilling sleeve, the drill guide is then produced at the external dental laboratory. The previously generated scan template which the patient wears during radiological examination, can be reworked as a drill template. The totally guided surgical intervention starts with the desired prosthetic result. With the aid of the program, the preferred position of the implant is determined by simultaneous consideration of the bone situation and prosthetic requirements. Determining the final position of the implant prior to the operation provides better predictability of prosthetic requirements. After uncover, an intraoral scan is performed to determine the relation. Digital function recording acts as basis for the wax-up technique. Larger items are sent to the industrial milling center, as described above, where the computer-supported production of the prosthetic work is performed.

Outlook: the digitally networked dental practice

Obtaining optimal results has been a major quality factor, and not only since the digitalization of dentistry. This ensures satisfied patients and a high recommendation rate which in turn contribute considerably to the success of a dental practice. However, the goal of perfect and durable restorations can be achieved far more effectively and quicker when using digital techniques. To benefit long-term from these technological capabilities, one needs to dismiss visions of a largely autonomously operating practice with few external interfaces, which existed during the early days of CAD/CAM-supported dentistry. In fact, one requires complex, compatible solutions with broad support from external partners. Manufacturers and their milling centers play a major role in this context. Within the network of a practice-supported or external laboratory, all the synergies can be utilized to provide the best possible quality and a guaranteed future. The digital future has already begun. Together with strong partners it will prove successful for all parties.



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