Introduction

Based on studies on the accuracy of the scanning methods employed\textsuperscript{1,2}, as well as the resulting models\textsuperscript{3,4} and restorations\textsuperscript{5-7}, it appears that the combination of intra-oral scans and CAD/CAM-based restorations is today regarded as standard in conventional prosthetics. The question that arises is how this workflow is realised for implant prostheses. The special requirements of implants for intra-oral scanning have led to changes in the information to be transferred and to the principles of the present implant workflow. This needs to be considered when developing a scanning protocol for implant-borne restorations.

Case report

A 48-year-old female patient presented with a gap that had been left untreated for many years after extraction of tooth 46. The adjacent teeth had been restored prosthetically and were free of caries. It was decided to provide restoration with an implant rather than a bridge restoration. Owing to the lack of loading, bone resorption had already commenced in a buccolingual direction. The soft
tissue was healthy and exhibited a broad region of keratinised gingiva.

**Procedure**

*Treatment planning*

An implant-borne full-ceramic single crown cemented on to a titanium abutment was planned to reconstruct the lost tooth. The patient did not wish to undergo augmentation measures in the bone area.

*Surgical procedure*

Implant placement in region 46 was performed with a crestal incision only, while maintaining the papillae in regions 45 and 47. As planned, a Straumann Standard Regular Neck implant (SLActive; D 4.8 mm, L 12 mm) was inserted in a central position. The implant was left submerged for two months to heal and a healing cap was inserted after uncovering the implant and left in situ for four weeks for soft-tissue healing (Fig. 1).

*Prosthetic procedure*

For the intra-oral scan, the healing cap was replaced with an intra-oral Regular Neck Straumann CARES Mono Scanbody (D 4.8 mm, L 10 mm; Fig. 2). Here, the occlusal inclined section was aligned buccally on the implant. The mouth was kept dry with OptraGate (Ivoclar Vivadent) and the
entire area to be scanned was lightly powdered (Fig. 3).

With the aid of the 3M True Definition Scanner (3M ESPE), the mandible could be imaged with the Scanbody, as well as the maxillae (Figs. 4 & 5). For digital bite registration, scanning of habitual intercuspation, the Scanbody was unscrewed again, as the standard height of 10 mm did not allow unimpaired occlusion in this case (Fig. 6).

This was followed by checking of the digital image of the Scanbody in region 46 for complete image capture of all of the surfaces, as well as the approximal areas of the adjacent teeth. The occlusal surfaces, as well as the relationship to the antagonist teeth and bite registration, could then be checked prior to defining the precise reconstruction area in region 46 with appropriate marking of the different data volumes for later transfer (Figs. 7 & 8).

As part of the order to the laboratory, using the 3M True Definition Scanner software, the implant data was described alongside the patient data, including information on the position of the tooth, abutment material (titanium/zirconium dioxide), implant platform (Wide Neck, Regular Neck, Narrow Neck, Regular CrossFit Connection or Narrow CrossFit Connection) and the type of restoration (abutment and/or superstructure).
The dental model was produced by Innovation MediTech after online transfer via Straumann CARES based on the STL files. Then the appropriate repositionable Straumann Regular Neck implant analogue was placed in region 46 (Figs. 9 & 10). In parallel, the planned abutment, customised via Straumann CARES X-Stream, and the corresponding zirconium dioxide coping were fabricated and transferred to the model situation (Figs. 11–13). Veneering of the crown cap was performed using a suitable veneering porcelain (Figs. 14–16).

For integration purposes, the CARES titanium abutment was screwed firmly into the implant. After try-in and adaptation of the peri-implant gingiva, the crown was definitively cemented using RelyX Unicem (3M ESPE; Figs. 17 & 18).

**Conclusion**

The success of implant treatment does not depend on correct implant surgery alone. Prostheses too can contribute to avoiding peri-implantitis and to the long-term success of an implant by creating an optimal emergence profile. In this context, the individual abutment is to be regarded as the basis for successful implant prostheses. The intra-oral scan and consequent dispensing with plaster models ensure that the digital prosthetic workflow is integrated right from the start (Fig. 19).

This leads to significant simplification of the fabrication steps, with increased precision, and avoids sources of error. Individual abutment shapes can thus be designed and fabricated optimally via CAD/CAM together with the corresponding restorations. In addition, this procedure enables reduced changing of screws and manipulation of the implant, which can lead to a reduction in peri-implant bone resorption.8, 9

Dental technicians and prosthodontists should be aware of the importance of an emergence profile at the time of temporary and definitive prostheses. It should therefore be the goal of any fixed implant restoration to come as close to these requirements as possible via customised reconstructions.

Maintaining gingival dimensions and health is a decisive factor for the long-term success of implant reconstructions; after all, a healthy and functional peri-implant gingiva forms a barrier against the penetration of micro-organisms and bacteria. This enables long-term preservation of the peri-implant bone (not considering bone resorption induced by malfunction or overloading).__

Editorial note: A complete list of references is available from the publisher.

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**About the Author**

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He has maintained a practice specialising in periodontology and implant dentistry in Munich in Germany since 2000. He has been an affiliated dentist of the Arabella hospital in Munich since 2002. He is a regular speaker on oral surgery and implantology, as well as fixed prostheses, particularly regarding aesthetics, at national and international conferences, an author on these topics and a member of the editorial board of an implantology journal.

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