CLINICAL ORAL IMPLANTS RESEARCH

Short Communication

Digital implant impressions with the "Individualized Scanbody Technique" for emergence profile support

Tim Joda
Julia-Gabriela Wittneben
Urs Brägger

Authors' affiliations:
Tim Joda, Division of Fixed Prosthodontics, School of Dental Medicine, University of Bern, Bern, Switzerland
Department of Prosthetic Dentistry, Center for Dental and Oral Medicine, University Hospital Hamburg-Eppendorf, Hamburg, Germany
Julia-Gabriela Wittneben, Urs Brägger, Division of Fixed Prosthodontics, School of Dental Medicine, University of Bern, Bern, Switzerland

Corresponding author:
Dr. Tim Joda, DMD, MSc
Division of Fixed Prosthodontics
School of Dental Medicine
University of Bern
Freiburgstr. 7, Bern 3010, Switzerland
Tel.: +41 (0)31 / 632-0910
Fax: +41 (0)31 / 632-4931
e-mail: tim.joda@zmk.unibe.ch

Key words: dental implant, digital impression, emergence profile, esthetics, intraoral optical scan, scanbody

Abstract

Objective: The *Short Communication* presents a clinical case in which a novel procedure – the "Individualized Scanbody Technique" (IST) – was applied, starting with an intraoral digital impression and using CAD/CAM process for fabrication of ceramic reconstructions in bone level implants.

Material and methods: A standardized scanbody was individually modified in accordance with the created emergence profile of the provisional implant-supported restoration. Due to the specific adaptation of the scanbody, the conditioned supra-implant soft tissue complex was stabilized for the intraoral optical scan process. Then, the implant platform position and the supra-implant mucosa outline were transferred into the three-dimensional data set with a digital impression system. Within the technical workflow, the ZrO_2-implant-abutment substructure could be designed virtually with predictable margins of the supra-implant mucosa.

Results: After finalization of the 1-piece screw-retained full ceramic implant crown, the restoration demonstrated an appealing treatment outcome with harmonious soft tissue architecture.

Conclusions: The IST facilitates a simple and fast approach for a supra-implant mucosal outline transfer in the digital workflow. Moreover, the IST closes the interfaces in the full digital pathway.

Digital implant impressions constitute a major role in the development of the full digital workflow for fixed implant prosthetic restorations (Christensen 2009). In addition to the correct three-dimensional detection of the implant platform position, the transference of the individually conditioned supra-implant mucosa architecture is crucial for a successful treatment with a predictable outcome in the esthetic zone (Chee 2003). However, a standardized implant scanbody with a prefabricated circular diameter cannot prevent the supra-implant soft tissue collapse that leads to the loss of the individually conditioned emergence profile during the intraoral scan process. It is a high risk for an uncertain treatment results with a technically anticipated level and curvature of the facial supra-implant mucosa.

Therefore, the aim of the *Short Communication* is to introduce a novel approach for a predictable transfer of the supra-implant soft tissue outline by means of the intraoral digital impression technique based on individualized implant scanbodies in the esthetic relevant region.

Materials and methods

A clinical case, requiring a single-implant restoration for the replacement of tooth 22, was chosen to present step-by-step the "Individualized Scanbody Technique" (IST) for digital impressions of bone level implants and further fabrication of a CAD/CAM ZrO_2-substructure restoration.

To transfer the finalized supra-implant soft tissue structure, which was achieved by conditioning with an implant-supported provisional crown (Neale & Chee 1994), an intraoral optical scan was planned to be taken with a digital impression system (iTero Scanner, Align Technology Inc., San Jose, CA, USA) (Fig. 1).

A standardized scanbody (Straumann AG, Basel, Switzerland) was individualized in accordance with the emergence profile of the provisional implant crown. The modified scanbody was used to digitally transfer the implant platform position while preventing the collapse of the sensitive supra-implant emergence profile. Hereby, the IST symbolized a further development of the individualization

Date:
Accepted 6 November 2012

To cite this article:
Joda T, Wittneben JG, Brägger U. Digital implant impressions with the "Individualized Scanbody Technique" (IST) for emergence profile support.
Clin. Oral Impl. Res. **25**, 2014, 395–397
doi: 10.1111/clr.12099

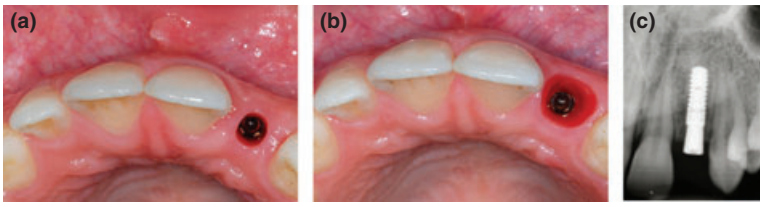

Fig. 1. (a–c) Clinical situation before (a) and after (b) supra-implant soft tissue conditioning to create a natural emergence profile with an implant-supported provisional crown in position 22 as well as the corresponding intraoral radiographic condition (c).

Fig. 2. (a–c)Transfer sequence of the patient-specific emergence profile by modifying a standardized scanbody (a) to generate an individualized scanbody (b); placement *in situ* demonstrating an optimal supra-implant mucosa support for the digital impression (c).

Fig. 3. (a–c) Digital implant impression taken with an intraoral optical scan system from vestibular (a) and palatinal (b) as well as the virtually designed ZrO_2-implant-abutment substructure (c).

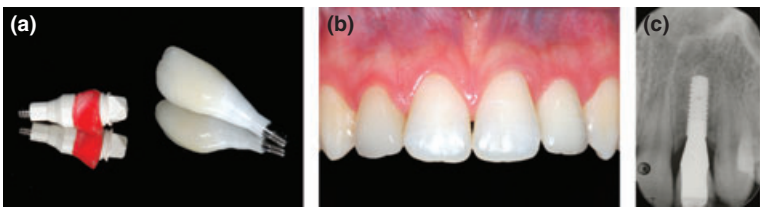

Fig. 4. (a–c) Finalized 1-piece screw-retained ZrO_2 implant crown in comparison with the individualized scanbody (a), the clinical situation with the final restoration in position 22 (b) and the corresponding intraoral radiographic condition (c).

methods of prefabricated implant transfer posts as known from conventional impression-taking procedures (Buskin & Salinas 1998; Elian et al. 2007) (Fig. 2).

The intraoral optical scan was taken with the screw-retained individualized scanbody. The supra-implant soft tissue complex was supported ideally during the intraoral scan. The outline of the conditioned mucosal margin could be detected easily within the CAD software program. Then, a customized ZrO_2-implant-abutment substructure was planned virtually (CARES Digital Solutions, Straumann AG, Basel, Switzerland) (Fig. 3).

The electronic data of the designed substructure were sent to a milling center for the following CAD/CAM manufacturing process. Then, the customized ZrO_2-abutment was completed with veneering material as a 1-piece screw-retained implant crown for the rehabilitation of the missing tooth 22. Finally, a clinical evaluation was performed including the *Pink Esthetic Score* (PES) (Furhauser et al. 2005) (Fig. 4).

Results

The implant-supported single-unit restoration for the rehabilitation of tooth 22 demonstrated a clinically pleasant and harmonious treatment outcome. The evaluation of the soft tissue revealed no discrepancies for the mesial and distal papilla, a symmetric curvature and level of the facial mucosa compared with the natural corresponding tooth 12 and only minor differences to the root convexity. Overall, the treatment result of the *Pink Esthetic Score* (PES) was 9 of 10 (Furhauser et al. 2005).

Discussion

The successful rehabilitation with implant-supported fixed restorations in the esthetic zone remains one of the biggest challenges in implant dentistry (Chee 2003; Belser et al. 2009). One of the advantages of the bone level implant system is that the prosthodontist has the freedom to individually design an emergence profile to mimic the contralateral natural tooth (Priest 2005). Furthermore, the digital workflow allows the manufacturing of customized abutments with ideal soft tissue maintenance in combination with high-performance restoration materials (Patel 2010). But the use of standardized bone level implant scanbodies with a circular diameter characterizes a discrepancy to the individually shaped emergence profile and leads to a collapse of the fragile supra-implant mucosa and, consequently, to a computer-generated misinterpretation of the soft tissue outline. The result would be an under-contoured implant-supported crown with an inadequate soft tissue support and a compromised treatment outcome.

Therefore, the modification of implant scanbodies with an individualized shape, as a contour copy of the provisional crown, seems to be a prerequisite in the field of digital impression technique. Overall, the introduced IST reveals a simple and fast approach with an ideally supported soft tissue complex during the intraoral scan procedure. By the application of this technique, the mucosa outline can be transferred predictably into the process chain of the digital workflow. There is no need for uncertain assumption of the individually created soft tissue margins in the technical fabrication. However, the shape of the entire submucosal part of the collar cannot be captured at this time. Future developments are required for a more precise scanning process of the bottom and the inner surface of the supra-implant emergence profile.

Acknowledgements: The authors thank the dental laboratory Art-Dent AG, Bern, Switzerland, for technical advice and for manufacturing the implant-supported provisional and final restorations.

References

Belser, U.C., Grutter, L., Vailati, F., Bornstein, M.M., Weber, H.P. & Buser, D. (2009) Outcome evaluation of early placed maxillary anterior single-tooth implants using objective esthetic criteria: a cross-sectional, retrospective study in 45 patients with a 2- to 4-year follow-up using pink and white esthetic scores. *Journal of Periodontology* **80**: 140–151.

Buskin, R. & Salinas, T.J. (1998) Transferring emergence profile created from the provisional to the definitive restoration. *Practical Periodontics and Aesthetic Dentistry* **10**: 1171–1179; quiz 1180.

Chee, W.W. (2003) Treatment planning and soft-tissue management for optimal implant esthetics: a prosthodontic perspective. *Journal of the California Dental Association* **31**: 559–563.

Christensen, G.J. (2009) Impressions are changing: deciding on conventional, digital or digital plus in-office milling. *Journal of the American Dental Association* **140**: 1301–1304.

Elian, N., Tabourian, G., Jalbout, Z.N., Classi, A., Cho, S.C., Froum, S. & Tarnow, D.P. (2007) Accurate transfer of peri-implant soft tissue emergence profile from the provisional crown to the final prosthesis using an emergence profile cast. *Journal of Esthetic and Restorative Dentistry* **19**: 306–315.

Furhauser, R., Florescu, D., Benesch, T., Haas, R., Mailath, G. & Watzek, G. (2005) Evaluation of soft tissue around single-tooth implant crowns: the pink esthetic score. *Clinical Oral Implants Research* **16**: 639–644.

Neale, D. & Chee, W.W. (1994) Development of implant soft tissue emergence profile: a technique. *Journal of Prosthetic Dentistry* **71**: 364–368.

Patel, N. (2010) Integrating three-dimensional digital technologies for comprehensive implant dentistry. *Journal of the American Dental Association* **141**(Suppl. 2): 20S–24S.

Priest, G. (2005) Developing optimal tissue profiles implant-level provisional restorations. *Dentistry Today* **24**: 96, 98, 100.