INNOVATIVE SCANBODY SYSTEM FOR A FULL ARCH IMPLANT-SUPPORTED RESTORATION

Recently, a new scanbody system 'CAPS' was released by Dynamic Abutment Solutions for a full digital strategy with an intraoral scanner. Dr. Philippe Nuytens (Belgium) is co-developer and integrated a digital occlusal record technique. CAPS or 'Complete Arch Pillar System' consists of a 3-part toolset for intraoral scanning on implants in a fully edentulous arch. Using reference scanbodies, peek pins and CAPS pillars, all necessary information for a full arch implant-supported restoration can be recorded. Only one single prosthetic visit is required with two clinical steps.

Intraoral scanning in the edentulous implant arch is challenging. This article describes a new scanbody system to face this challenge.

In full digital workflow for full arch implant-supported restorations, there are two stumbling blocks: "accuracy" and "occlusal records". As a dentist, our job is to control both. The first challenge, intraoral scanning of multiple implants, involves several factors. Among these, interimplant distance, scanbody system and scanning strategy are highly important.

Most software programs in dental laboratory offer procedures for alignment of various digital scans. The fabrication of an 'implant master model' and subsequent 'virtual tooth setup' are the first steps for the fabrication of a full arch implant supported restoration. For this, scanbodies must be scanned accurately by the dentist and the subsequent matching must be done correctly by the dental technician. Since there are few fixed anatomical reference points in the mucosal interimplant area, sequential stitching of scan images remains difficult with IOS.

Techniques for connecting or splinting scan bodies to improve scan accuracy have recently been published. Some clinical strategies use dental floss, orthodontic wire, (flowable) composite or polymethylmethacrylate resin to splint scanbodies.

A second stumbling block in digital prosthetic workflow for a full arch implant-supported restoration is "occlusal recording". However, in edentulous patients there is no tooth-borne occlusal vertical dimension (OVD) and centric relationship (CR). Techniques to record the maxillo-mandibular relationship have been proposed in literature, including the use of a surgical guides, a full denture or a temporary implant-supported restoration. Unfortunately, these are no 'full digital' solutions for IOS.

In this clinical case report, a novel scanbody protocol with IOS is presented to overcome these stumbling blocks (Fig. 1).

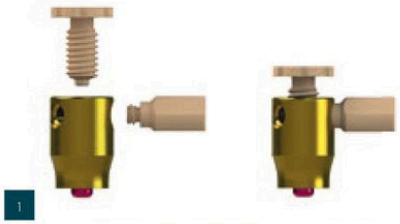


Figure 1: The 3-part toolset of the CAPS system: reference scanbody, peek pin and CAPS pillar.

STEP 1: INTRAORAL SCAN

To control the first challenge of large spans between scanbodies in an edentulous arch, reference scanbodies with mounted 'side arms' or 'peek pins' were used (Fig. 2a). Consequently, a smooth 'stitching' along a 'fixed trajectory' was realized. It is important to mount the peek pins onto the reference scanbodies in advance and place them on multi-unit abutments with a torque value of 10 Ncm (Fig. 2b). The reference scanbodies can be efficiently scanned with an IOS in an edentulous arch (Fig. 3). Peek pins exist in 3 different lengths: 6 mm, 9 mm and 13 mm. An intraoral scan of the antagonist was obtained at the end.

STEP 2: DIGITAL OCCLUSAL RECORDING

To obtain occlusal records in a full edentulous implant arch, the Dawson technique (1974) is applied using CAPS pillars. The Dawson technique is a method for recording the maxillo-mandibular centric relationship (CR). This technique uses a bimanual manipulation of the mandible in a patient in supine position. Since there are no interfering (anterior) tooth contacts in the edentulous jaw, muscle action or tissue changes within the temporomandibular joint is minimal. With the appropriate practice one can find the CR point at a predetermined OVD. Since only reference scanbodies are present in the edentulous maxilla, we opt for placement of CAPS pillars at reference scanbody positions 14 and 24. Here, the patient is not affected by a wax rim or occlusal device (Fig. 4).

Figure 2: Peek pins are available in 3 different lengths: 6 mm, 9 mm and 13 mm. Intraoral scanning of large spans between scanbodies is made more efficiently.

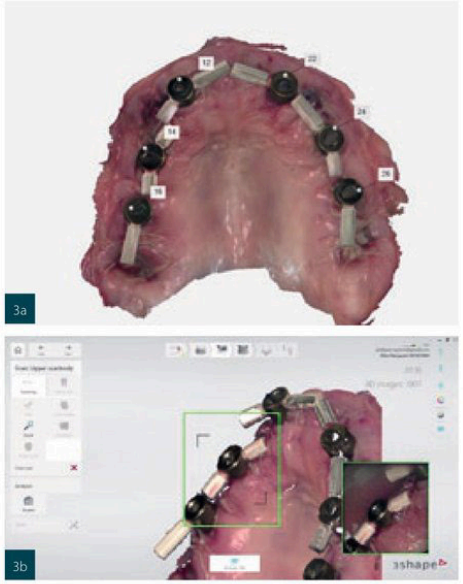


Figure 3: Reference scanbodies with mounted "side arms" or "peek pins" on multi-unit abutments in the edentulous maxilla (3a), and scanned with an IOS (3b).

CAPS pillars are inserted into the screw channel of reference scanbodies. By screwing them into or out of the screw channel, the OVD can be adjusted (Fig. 5). CAPS pillars are available in 3 different heights: 3.8 mm, 6 mm and 8 mm. A major advantage of occlusal registration with IOS is the ability to record the position of the CR very accurately and within seconds.

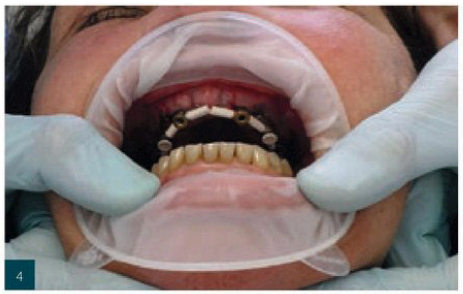


Figure 4: CAPS occlusal recording with bimanual manipulation of the mandible in a patient in supine position (Dawson technique). CAPS pillars were placed at reference scanbody positions 14 and 24.

Figure 5: CAPS pillars were placed at reference scanbody positions 14 and 24.

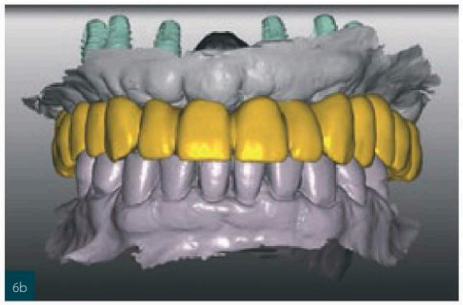
A digital caliper may be used to define the OVD extraorally. For this purpose, a pen or pencil is used to make small dots on the tip of the nose and chin. The maxillo-mandibular distance could be measured at pre-surgical visit with residual dentition or with a temporary denture.

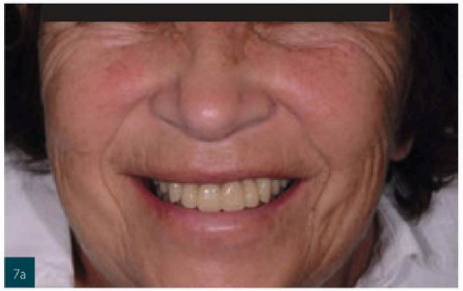
FULL ARCH IMPLANT-SUPPORTED RESTORATION

Following a 2-step clinical visit, the intraoral scans are transferred to the dental laboratory to proceed the CAD design (Fig. 6a, b). A prototype implant-supported restoration was fabricated using a milling machine.

A PMMA block was used and no titanium connectors were used. Instead, special 'green screws' were used to connect a PMMA implant-supported restoration directly to the multi-unit abutments (Fig. 6c, d). This provides a strong connection of an initial prototype version of the implant-supported restoration, placed quickly and easily (Fig. 7).

Figure 6: Following the dental technician's design, a trial version of the implant bridge is fabricated using a milling machine.





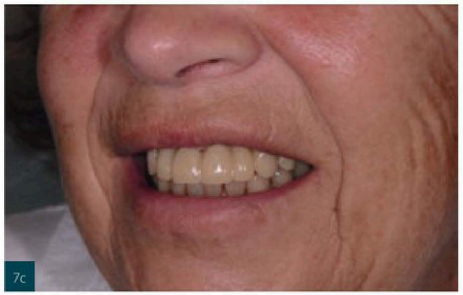


Figure 7: Simply and quickly we make a first trial version of the implant bridge in the edentulous maxilla.

SUMMARY

CAPS or 'Complete Arch Pillar System' has a number of advantages compared to traditional methods for fabrication of full arch implant supported restorations:

- The system is simple, fast and accurate. It requires no additional materials, such as impression trays, impression material or a wax rim. It reduces the risk of errors, such as distortion of implant positions, displacement of jaw position or loss of information.
- The system is compatible with 360 implant brands and can be used with current intraoral scanners.
- The system is cost-effective for rapid fabrication of an initial prototype version of an implant-supported restoration at a desired occlusal vertical dimension.

Philippe Nuytens' PhD at Ghent University focuses on research on clinical tools for the virtual prosthetic workflow in the edentulous implant jaw. He is the inventor of the 'scanbody-pillar concept' for digital occlusal recording on multiple implants.

He is an active member of Digital Dentistry Society (DDS) and has already published several articles in international journals.

He works in 2 private practices in Belgium as prosthetic dentist.