Digitalisation of the gold standard of implantology

By Cortex

Over two decades ago, digitalisation started to transform dentistry, but the process has not been accomplished yet. We are currently in a hybrid phase, in which digital and conventional procedures are often combined. In 2018, Cortex’s fully digital system assumed its place in the digital dentistry world. The system provides the clinician with a complete digital workflow, from virtual implant planning to the final restoration.

Virtual implant planning, static guided surgery, dynamic freehand navigation systems and other CAD/CAM technologies have been undergoing a drastic evolution in the last few years.

The decision on whether to use a digital or a conventional procedure is highly dependent on the clinician’s individual preferences, and no recommendations can be made based on the present consensus.

For example, a septum case was solved using a combination of the virtual implant planning software (iShape) and Cortex’s guided surgery kit that helps achieve correct placement of Cortex’s Magix dental implant, the design of which acts as a bone expander and allows for minimum bone drilling.

After clinical and radiographic examination, a virtual diagnostic impression and a CBCT scan were taken. The digital files were imported into computer-guided planning software, perfectly merged. The case was planned remote from the treatment place in the digital laboratory at the Cortex headquarters. After one week, the surgical template was received.

Placement of a Magix implant for the mandibular first molar was virtually planned for the septum site. The ideal position of the implant was virtually planned based on the anatomical architecture and prosthetic considerations. Angulation and vertical position of the implant were determined to minimise axial loading of the implant and create a proper emergence profile. A 3-D printed surgical template from a rapid prototyping machine was designed and fabricated for the surgery. The drilling osteotomy and implant placement process were smooth and precise, and the results were as planned.

As clinical cases in dentistry can vary greatly and have individual nuances, digital implantology allows for pre-diagnosis and pre-prepared optimal surgical workflow planning, avoiding unexpected challenges during the surgical execution.

It offers a number of benefits to the clinician as well as the patient. For some clinicians, it reduces the procedural time and offers more secure implant placement in complex cases. More importantly, it provides a link between the virtual prosthodontically driven treatment plan and the actual surgery by transferring the simulated intervention accurately to the surgical site with the use of an individual surgical template, made specifically for each case. This approach provides the planner with prosthodontically driven planning in order to assure an optimal final restorative result.
Incorporating CAD/CAM solutions for full-mouth dental implant reconstructions

By Dr Ara Nazarian, USA

Patients facing the loss of their natural dentition have more treatment options than ever before. The traditional complete denture, once the standard of care for the fully edentulous patient, is slowly but surely giving way to fixed full-arch implant restorations as their superior stability, function and aesthetics become more well known. Further, prosthetic materials have advanced in leaps and bounds, and monolithic zirconia can now be milled for fixed full-arch indications. By moving beyond acrylic and its vulnerability to wear, chipping, stains and fracture, this adds long-term durability to the qualities that make the fixed full-arch implant prosthesis the ultimate restorative option for fully edentulous cases.

Owing to the versatility of dental CAD/CAM technology and the material properties of monolithic zirconia, high-strength restorations can be fabricated for the fully edentulous patient in various configurations. For example, because of its flexural strength of up to 1,650 MPa, BruxDent® Solid Zirconia (Glidewell Laboratories) can be milled into thin layers and maintain the high level of durability for which the material has become known. This allows for the fabrication of restorations ranging from the monolithic zirconia full-arch implant prosthesis, which resembles a screw-retained hybrid denture in form, to cementable prostheses that attach to custom abutments in the manner of traditional crown and bridge work.

While the screw-retained monolithic zirconia full-arch implant restoration has grown increasingly popular in recent years, the cementable alternative is well suited for many patients. When sufficient hard and soft tissue are present, prostheses can be designed that emerge directly from the gingiva, creating the aesthetics and feel of natural dentition. Additionally, the use of custom abutments to support a cementable full-arch bridge allows for low-profile restorations with minimal faciolingual width. This is appealing to many patients and can indicate a fixed solution in cases of limited vertical clearance.

Cementable monolithic zirconia implant prostheses can be fabricated in various designs as described by Dr Carl Misch’s prosthodontic classifications. While they are most commonly indicated in fixed prosthesis (FP) 1 and 2 cases, in which the prosthetic teeth rise from the gingivae like natural teeth, they can also be used in FP 3 cases, where the monolithic prosthesis includes pink gingival areas in order to reconstitute the soft tissue. Whichever prosthesis type is indicated, the precision of dental CAD/CAM technology and versatility of full-contour zirconia allow the entire restoration to be milled from a single block of the material, adding to the overall strength.

All of these prosthesis types afford bone preservation, improved dental function, psychological benefits and enhanced quality of life associated with fixed implant prostheses, which come the closest to natural dentition of all restorative options. The use of custom abutments for this type of restoration—and all cementable prostheses for that matter—is essential, as it allows for the creation of margins that are gingival or just slightly subgingival, enhancing crown retention, cervical soft-tissue margin and the final emergence profile. The precision and flexibility in prosthetic positioning allowed for by custom abutments also make it easier to achieve a passive fit for the restoration and correct for divergent angulation of implants.

The following case report features a full-mouth reconstruction via cementable full-arch BruxDent bridges over Inclusive Titanium Custom Abutments (Glidewell Laboratories). The treatment protocol for this type of restoration will be illustrated, as well as the general parameters for determining whether this solution is indicated for the individual patient.

Case presentation
A female patient in her mid-fifties presented for treatment with an edentulous maxilla and grossly decayed, hyper-erupted mandibular dentition (Figs. 1 & 2). The patient was heavy smoker, had not seen a dentist in several years, and was not taking proper care of her re-emerging teeth owing to pain and discomfort. The patient’s maxillary denture had become increasingly loose-fitting since losing her teeth nearly a decade prior. Her desire for a restoration that felt and functioned more like natural teeth led her to my practice, where she could undergo the surgical and prosthetic phases of treatment under one roof. Intralatal and
radiographic evaluation indicated sufficient bone volume for full-arch implant therapy.

Treatment options were presented to the patient for her edentulous upper arch and non-restorable mandibular dentition, including various combinations of fixed and removable implant prostheses. This involved a discussion of complete edentulism and its problems, consequences and solutions, the effect of tooth loss on oral health, and the differences in stability and function afforded by each treatment option. Dental financing programmes were explained, which is an important part of treatment presentation, as it helps make implant therapy feasible for patients who cannot cover the entire cost upfront.

The patient strongly desired fixed restorations, as she had grown quite frustrated with her removable maxillary denture over the years. In addition, the patient had a pronounced gag reflex, making the fixed option optimal because it would free up the palate. An FP prosthesis was required for the patient's maxillary arch, which had undergone substantial bone resorption and gingival recession. The tissue contours would require adequate bone width in an ideal occlusal table, properly seat the denture, where bone levelling was recession. The tissue contours would be tilted in a manner that would allow the wall of the socket sites to help maintain proper position toward the lingual aspect. Because of anticipated tissue swelling as a result of the bone levelling procedure, the immediate dentures were soft-relined with Macropore (Kettenbach) to seat over the Hahn Tapered Implant Healing Abutments, the hourglass shape and underrun of which provided a degree of retention that enhanced dental function for the patient during healing (Fig. 10).

Four months later (Figs. 17 & 18), the healing abutments in the maxillary arch were surgically exposed and the tissue appropriately approximated and allowed to heal. Approximately two to three weeks later, Hahn Tapered Implant Impression Copings were seated and closed-tray impressions taken with a polyvinylsiloxane material (Panasil, Kettenbach), as well as a bite registration (Futar, Kettenbach) to aid the reconstruction of the maxillary and mandibular arches.

Dr Araz Nazarian maintains a private practice in Troy in Michigan. In the US with an emphasis on comprehensive and restorative care. He is a diplomate of the International Congress of Oral Implantologists and the Founder and Chief Clinical Officer of the Ascend Dental Academy. He has conducted lectures and hands-on workshops on aesthetic treatment, grafting and dental implants throughout the UK, Europe, New Zealand and Australia.
A retrospective analysis of Ankylos implants placed in a large patient population showed successful long-term clinical results when using a flapless surgical approach.