practice management
Digitising your implant practice

case report
Digital assisted precise planning and manufacturing of a fixed dental restoration

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European dental imaging equipment market in a state of change
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To print or *not* to print?

The *lost-wax method*, has been largely replaced with the advent of computer-aided design and computer-aided manufacturing (CAD/CAM) for the fabrication of everyday crown and bridge dentistry, implant superstructures, bar overdentures, and much more. Additionally, the continued development of new and improved materials have created strong, aesthetic, long lasting restorations fabricated by a subtractive process facilitated by large lab-based milling machines. Smaller in-office milling machines, combined with highly accurate intraoral scanners have helped to bring the process directly to the clinician’s private office providing the state-of-the-art digital workflow for faster design and fabrication of patient-specific restorations.

For most clinicians, the term ‘rapid prototyping’ is a concept that applies more to big industry rather than dentistry. However, many clinicians involved with implant dentistry and guided surgery applications are familiar in some way with the term ‘stereolithography’. As defined by the Oxford Dictionary, stereolithography is ‘a technique or process for creating three-dimensional objects, in which a computer-controlled moving laser beam is used to build up the required structure, layer by layer, from a liquid polymer that hardens on contact with laser light.’ This modality is therefore an ‘additive’ process, differing from the ‘subtractive’ process required for milling, and until recently was not practical or cost-effective for the routine dental practice.

The proliferation of low-cost 3-D printers during the past few years has ignited tremendous interest in rapid prototyping using additive fabrication modalities. Many dental laboratories, single and group practitioners around the globe have taken the digital workflow to new levels by printing models for orthodontics, oral surgery, restorative dentistry, night guards, occlusal orthotic devices, surgical templates, and much more. 3-D printing has become the new catalyst, helping to bring diagnostic and manufacturing control to the dentist, and a new fabrication process to the dental laboratory.

It must be stated that there is a significant difference in printing a word processing document from your computer to a laser printer – going from the virtual to a physical piece of paper you can hold in your hand. 3-D printing is not quite that simple. Regardless of the type or cost of a 3-D printer, in order to ‘print’ a file, there needs to be three-dimensional data. This data can come from an intraoral scanner, a desktop optical scanner, cone beam computed tomography, singularly or in combination. The data needs to be managed using appropriate software to produce the desired outcome. This takes knowledge and time to get it right. So as we continue to move from the analogue to the digital workflow, it may be time to evaluate the state-of-the-art and ask the question: ‘To print or not to print?’

The answers to this and many other questions can be found among the pages of this publication representing some of the best clinical minds of our time. We hope that you will enjoy the current issue!

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Editor in Chief
editorial

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Digitising your implant practice

Author: Dr Ross Cutts, UK

Undoubtedly, digital dentistry is the current topic. Over the last five years, the entire digital workflow has progressed in leaps and bounds. There are so many different digital applications that it is sometimes difficult to keep up with all the advances. Many dentists are excited about the advantages of new technologies, but there are an equal number who doubt that the improved clinical workflow justifies the expense.

I have many times heard the argument that there is no need to try to fix something that is not broken. It is so true that impressions have their place and there are certainly limitations to the digital workflow that anyone using the technology should be aware of. For me, however, the benefits of digital far outweigh the disadvantages. In fact, the disadvantages are the same as with conventional techniques.

Chairside CAD/CAM single-visit restorations have been possible for over 20 years, but it was only recently that we became able to mill chairside implant crown restorations after the release of Variobase (Straumann) and similar abutments. I made my first CEREC crown (Dentsply Sirona) back in 2003 with a powdered scanner, and the difference from what I remember then to how we can make IPS e.max stained and glazed restorations (Ivoclar Vivadent) now is amazing.

An investment not an expense

The results of a survey regarding the use of CAD/CAM technology were published online in the British Dental Journal on 18 November 2016. Over a thousand dentists were approached online to take part in the survey and the 385 who replied gave very interesting
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- Increase your success rate with a 75μm resolution
- Focus on the region of interest with a wide range of fields of view
- Simplify implant planning with only one software
- Provide more accurate diagnosis thanks to high-detail imaging
- Obtain a full and illustrated report in less than one minute
- Bring a safer therapeutic implementation, less traumatic and less stressful
- Reduce complications related to implant placement
- Allow your patient to visualize the therapeutic recommendation
- Control the dose of X-ray emitted
practice management digitalisation in dentistry

responses. The majority did not use CAD/CAM technology, and the main barriers were initial cost and a lack of perceived advantage over conventional methods.

Thirty per cent of the respondents reported being concerned about the quality of the chairside CAD/CAM restorations. This is a valid point. We must not let ourselves lose focus that our aim should always be to provide the best level of dentistry possible. For me, digital dentistry is not about a quick fix; it is about raising our performance and improving predictability levels by reducing human error.

In the survey, 89 per cent also said they believed CAD/CAM technology had a major role to play in the future of dentistry. I really cannot imagine that once a dentist has begun using digital processes that he or she would revert to conventional techniques.

What is digital implant dentistry?

Many implant clinicians have probably been using CAD/CAM workflows without even realising it, as many laboratories were early adopters, substituting the lost-wax technique and the expense of gold for fully customised cobalt-chromium milled abutments (Fig. 1).

One of my most important goals in seeking to be a successful implantologist is to provide a dental implant solution that is durable. We have seen a massive rise in the incidence of peri-implantitis and have found that a large proportion of these cases can be attributed to cement inclusion from poorly designed cement-retained restorations (Fig. 2). Even well-designed fully customised abutments and crowns can have cement inclusion if the restoration is not carefully fitted (Fig. 3). This has led to a massive rise in

![Fig. 6](image1.png) ![Fig. 7](image2.png) ![Fig. 8](image3.png) ![Fig. 9](image4.png)

![Fig. 10](image5.png) ![Fig. 11](image6.png) ![Fig. 12](image7.png) ![Fig. 13](image8.png)

![Fig. 14](image9.png)
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retrievability of implant restorations, with screw-retained crowns and bridges now being the goal. However, making screw-retained prostheses places even greater emphasis on treatment planning and correct implant angulation.

With laboratories as early adopters, we have been milling titanium or zirconia customised abutments for over ten years (Fig. 4). What has changed recently in the digital revolution is the rise of the intraoral scanner. We now have a workflow in which we can take a preoperative intraoral scan and combine this with a CT scan using coDiagnostiX (Dental Wings) in order to plan an implant placement accurately and safely. We can also create a surgical guide to aid in accurate implant placement, have a temporary crown prefabricated for the planned implant position and then take a final scan of the precise implant position for the final prosthesis.

Accuracy of intraoral scanners

Figures 4 to 13 show the workflow for preoperative scanning, which includes the implant design, guide fabrication and surgical placement of two fixtures. Intraoral scanners have improved over the last few years, and their accuracy and speed provide a viable alternative to conventional impression taking. The digital scan image comes up in real time and you can evaluate your preparation and quality of the scan on the screen immediately. Seeing the preparation blown up in size no doubt improves the technical quality of your tooth preparations. The scan can then be sent directly to the laboratory for processing.

While we do not think of intraoral scanners as being any more accurate than good-quality conventional impressions, there are many benefits of scanning, such as no more postage to be paid for impressions, vastly
reduced cost of impression materials, almost zero re-impression rates and absolute predictability.

Of course, there are steep learning curves with the techniques, but once a clinician has learnt the workflow, there really is no looking back.

We have three different scanners in the practice: the iTero (Align Technology), the CEREC Omnicam (Dentsply Sirona) and the Straumann CARES Intraoral Scanner (Dental Wings; Fig. 14). The CEREC Omnicam is fantastic for simple chairside CAD/CAM restorations, such as IPS e.max all-ceramic restorations on Variobase abutments. For truly aesthetic results, we, of course, still have a very close working relationship with our laboratory, but, undoubtedly, patients love the option of restoration in a day. Being able to scan an implant abutment and then an hour later (to allow for staining and glazing) fitting the definitive restoration is a game changer. Patients also love watching the production process as they see their tooth being milled from an IPS e.max block.

Figures 15–19 show the production process, including the exposure of the implant, the abutment seating, the scan flag on top of the abutment, the healing abutment during fabrication and the delivery of the final prosthesis. However, for more than single units or aesthetic single-unit cases, we use the iTero and Straumann scanners. The latter we have only had at our disposal since February. While it is a powdered system at the moment, this is due to change this month. Particularly with implant restorations, the need to apply a scanning powder is a limitation, owing to a lack of moisture control contaminating the powder. The technology, however, is superb, as is the openness of the system, which provides the advantage of being able to export files into planning software. A colleague of mine even uses it for his orthodontic cases now instead of wet impressions.

We invested in the iTero scanner five years ago and have used it for everything, from simple conventional crowns and bridges to scanning for full-mouth rehabilitations. When fabricating definitive bridgework, we use Createch Medical frameworks for screw-retained CAD/CAM-milled titanium and cobalt–chromium frameworks. Even though intraoral scanning appears extremely reproducible and accurate, I still use verification jigs where needed to ensure our frameworks are as accurate as possible. There are many intricacies that we consider and tips and techniques that we employ to make the scans more accurate that we have developed over time. The closer the scanbodies are together, the more accurate the scan is. Also, the more anatomical detail, such as palatal rugae or mucosal folds, the better the scans can be stitched together.

Figure 20 shows a CBCT volume to aid in planning for mandibular implant placement (Fig. 21) and realising the implant placement. We exposed the fixtures and placed Straumann Mono Scanbodies (Fig. 22). Then, we took an iTero scan of the fixtures in situ (Fig. 23) and made a verification jig from this (Fig. 24) to ensure passive implant positioning. The iTero models were made (Fig. 25) and a Createch titanium framework was used to support porcelain in a screw-retained design (Fig. 26). The last two figures show the excellent outcome and accurate framework seating (Figs. 27 & 28).

Choosing your workflow

There are many different systems on the market now, each offering a one-stop shop. If you are considering investing in a digital scanner, then take some advice from colleagues. One of the most important things is to ensure the system you opt for is an open one that allows you to extract the digital impression data into different software. We extract our files into CT planning software, model production software, chairside milling for stents, temporaries and definitive restorations, and now orthodontic planning software. I am convinced there will be yet more advances with time. The size of the camera is critical—some can be very cumbersome—and it is worth asking the salesperson what developments are underway.

Some companies are more on the cutting edge than others. My favourite at the moment is the Straumann scanner. Its design is light and user-friendly and it synchronises perfectly with implant planning software coDiagnostiX. Furthermore, while it offers a chairside milling unit, it also synchronises perfectly with my laboratory for larger cases.

To conclude, digital implant dentistry is the future and so why not take advantage of it and help improve your clinical outcomes?

contact

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Digital assisted precise planning and manufacturing of a fixed dental restoration

Author: Dr David Guichet, USA

Case report

A 66-year-old female patient presented to our clinic with diverse dental problems in the maxilla. The initial examination revealed several teeth with caries and defective fillings. The panoramic radiograph also showed severely decayed, fractured, and supraerupted teeth (Figs. 1 & 2).

The posterior maxillary teeth were subsequently extracted, and socket preservation grafting was performed. Following a three-month healing period (Fig. 3), a cone beam computerised tomographic (CBCT) scan was performed and imported into Simplant software.

Careful analysis of the clinical situation resulted in a treatment plan for placing two 4.8 mm OsseoSpeed EV implants in the molar region. These were distally angled by 30 degrees to support first molar occlusion. Two 4.2 mm OsseoSpeed EV implants were also placed in the first premolar positions. A 3.6 mm OsseoSpeed EV implant was planned for the maxillary right lateral incisor position. The Simplant software was used to plan the most suitable positions for the implants (Fig. 4).

A Simplant Guide was ordered and used for the first drilling steps (Fig. 5). All implants were placed by hand with the guide removed. HealDesign EV was used during the healing phase (Fig. 6). After three months, Implant Pick-Ups EV were connected to the implants.
digital technology in fixed implant prosthodontics case report

Fig. 5: Simplant Guide for the first drilling steps. – Fig. 6: Colour-coded HealDesign EV in place. – Fig. 7: Implant Pick-Ups EV in position. – Fig. 8: After impression taking, the interfaces of the impression posts were revealed in the impression. – Fig. 9: Colour-coded Implant Replicas EV are assembled to the Implant Pick-Ups EV in the impression. – Fig. 10: Online Atlantis WebOrder showing the patient-specific abutments with a digital wax-up transparent overlay. – Fig. 11: Occlusal view of the full-contour digital wax-up prior to digital cutback. – Fig. 12: Patient-specific Atlantis abutments with corresponding screws. – Fig. 13: Full-contour CAD/CAM PMMA provisional restorations. – Fig. 14: Healthy and clean implant sulcus evident at all of the sites to be restored. – Fig. 15: Atlantis patient-specific abutments installed. – Fig. 16: Clinical situation on the day of final restoration.
Following impression taking, the Implant Replicas EV were assembled to the Implant Pick-Ups EV in the impression (Figs. 8 & 9).

After the final impression, the master cast was scanned. A fully anatomical digital wax-up was merged over the master cast and uploaded. Atlantis abutments were designed using the Atlantis VAD software (Fig. 10).

Atlantis abutments were machined and scanned, and a final digital wax-up was performed (Fig. 11). The corresponding colour-coded abutment screws were included (Fig. 12). Full CAD/CAM PMMA provisional restorations were manufactured and assembled with the Atlantis abutments. The distal angulation of the molar implants is shown in Figure 13.

A healthy and clean implant sulcus was evident at all of the sites to be restored (Fig. 14). The Atlantis abutments were delivered, installed, and tightened to 25 Ncm with the provisional restorations to assist in shaping the implant sulci (Fig. 15). Following a one-month provisionalisation period, the patient was scheduled for delivery of the final restorations (Fig. 16).

The restorative design called for all interproximal and occlusal contacts to incorporate high-strength zirconia. A digital cutback of precisely 0.8 mm was used for the veneering porcelain in the areas where stresses are low and aesthetic demands are high. Treatment of this patient utilised digital processes and multiple merged data sets to make planning and treatment more accurate and efficient. In addition, it enabled the creation of fixed dental restorations that are supported by dental implants and natural teeth. Figures 17 to 21 show the clinical and radiographic views of the final restorations and the highly aesthetic outcome.

Thank you to Debra Wasky, Dental Technician. Dentsply Sirona Implants products used: Astra Tech Implant System, Atlantis, Simplant.

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Years of research, opinions and wishes of users as well as mutual cooperation have led to the creation of the efficient CAD/CAM solutions. Simple application, excellent technology and fine materials are backed by professional support, which is available throughout the process, i.e. from your desire and idea of a purchase to the training and fast solutions to any problems you may encounter during use.

Zr DISCS
- CC Disk Zr
- CC Disk Zr coloured
- CC Disk Zr HT
- CC Disk Zr HT coloured
- CC Disk Zr Smile
- CC Disk Multicolour

CoCr DISCS
- For all metal ceramics
- CTE 13.9 - 14.0 x 10^-6 K^-1
- Contains very little oxides

Ti DISCS
- Ti2; for crowns, bridges and simple implant substructures.
- Ti5; for crowns, bigger bridges and complex implant substructures.

PMMA DISCS
- CC Disk PMMA
- CC Disk PMMA Transparent
- CC Disk PMMA Pink
- CC Disk PMMA X-ray Opaque
Immediate implant placement in aesthetic zone, followed by final restoration using CARES Digital Solutions

Initial Situation

A 21-year-old male patient presented to the Clinic Beleza do Sorriso in São Paulo, Brazil, with a fractured element in tooth 21. He was dissatisfied with the aesthetics in the anterior segment of the maxilla and had multiple active carious lesions in the interproximal regions of teeth 11, 12 and 22 (Figs. 1 & 2).

Treatment planning

The aim of planning is to set out a path to ensure the best possible outcome for a specific goal. In high performance dentistry, diagnosis and treatment planning are key elements of success. The first step in this case was to evaluate the patient’s medical history and to confirm that he was in good general health. When starting any aesthetic rehabilitation treatment, a number of aspects must be considered: bone architecture, periodontal biotype, interproximal bone crest level, and smile line. Plaster study models were then created, which, along with photographic documentation and imaging examinations, helped to identify the root fracture on tooth 21 and slight buccal bone loss. We used the concept Digital Reverse Planning (DRP), which allows full virtual planning, from the bone defect arising from the tooth extraction up to the final outcome of the ideal three-dimensional positioning of the implant in order to obtain the desired aesthetic result.

We opted for the extraction of tooth 21 and immediate implant placement. All the necessary information obtained through tomography was transferred to the software and a virtual guide was accurately designed. The customised guide was milled without metal washers and based on precise measurements to ensure precision placement of the Bone Level Roxolid SLActive 3.3 x 14 mm implant (Figs. 3–5).

After placement, the implant was immediately temporary; the adjacent decayed teeth were properly cleaned and prepared for ceramic fragments in order to correct dental rotations and enhance the aesthetics of the anterior region.
Surgical procedure

The planning of the immediate implant enables us to reduce treatment time, leading to greater patient satisfaction and less bone resorption, as well as optimising function and aesthetics from the very first surgical step. In order to achieve successful implant treatments, a review of the literature shows that minimally traumatic surgery is essential, thus preserving the alveolar architecture and surrounding soft tissue. After probing the proximal bone crests, we performed the extraction of tooth 21 and careful socket curettage. The customised surgical guide was adapted and stabilised (Fig. 6); the placement followed the predetermined position and recommended torque for the Bone Level Roxolid SLActive implant, selected for the combination of Roxolid material and the SLActive surface that increases the resistance for small diameter implants. This provides greater confidence and peace of mind for the resolution of anatomically challenging cases. The occlusal adjustment is a crucial step for a predictable case outcome, to ensure that forces are not transmitted to the implant sooner than expected, thus compromising the final result of the procedure. The patient must receive proper instruction in hygiene and postoperative care (Figs. 7–9).
Unexpected situation

Unexpectedly, 18 days after the implant placement, the patient had a cut-contusion lesion with loss of substance of the lower lip. He reported having undergone direct physical assault with a blunt object. The examination showed considerable mobility of the provisional implant prosthesis, albeit without signs of inflammation in the region.

The provisional prosthesis was removed and, to our pleasant surprise, it was found that implant stability had been maintained and only the prosthesis screw had loosened due to the trauma suffered. Immediately, in a single step, we proceeded with the preparation of the ceramic prosthetic parts and the impression of the whole region, including the implant, as described below (Figs. 10 & 11).

Prosthetic procedure

The excellent treatment surface of the Roxolid SLActive implant allows definitive implant activation to be initiated within 21 days. In this case, however, due to the circumstances, the rehabilitation procedures began at 18 days.
Ceramic fragments were prepared for teeth 12, 11 and 21 with diamond drills and ultrasonic tips; tissue control was carried out in the region and the impression post was installed on the implant and customised, so that the surrounding soft tissue could be accurately reproduced (Figs. 12 & 13). The CAD/CAM system technology allows amazing accuracy, providing better functional and economic benefits to patients. The implant prosthesis was made following the CARES approach on the Straumann Variobase abutment, which allows exact engagement of the coping to the Straumann Variobase abutment with its four engaging grooves. For scanning and modelling of the case, the Dental Wings platform was used to design the implant prosthesis and the ceramic for the adjacent teeth (Figs. 14 & 15). The milling was done in zirconia for later application of ceramic coverage, characterisation and customisation of the elements. The parts were tested in the mouth and, after adjustment, were properly etched and cemented (Figs. 16–21).

Final result

At four months' follow-up, the surrounding tissues and occlusion were stable. The patient was satisfied and the radiographic appearance was satisfactory (Figs. 22–25).

Conclusion

Despite the complications in this case, resulting in the need to activate the implant on the 18th day post-placement, the Bone Level Roxolid SLActive provided a very satisfactory outcome, demonstrating its stability, superior strength and surface treatment, even under extreme circumstances._

about

Dr Andrê Callegari is a specialist in dental prosthetics, currently studying for his PhD in Dentistry. He is a founding partner of the Clinic Beleza do Sorriso in São Paulo, Brazil, and coordinator and author of the books “Especialidade em foco” vol. 1 and 2 Ed. Napoleão.
Using CAD/CAM for a combination approach to full mouth reconstruction

Author: Dr Ara Nazarian, USA

Introduction

Now more than ever, it behoves dentists and laboratories to work together as part of an interdisciplinary and collaborative team to coordinate treatment, select ideal restorative material(s), and plan cases, particularly those involving full-mouth reconstructions. Fortunately, a number of digitally based technologies can be incorporated into the treatment thorough diagnostic and treatment planning processes, as well as used for fabricating various components of treatments. When used in combination with a systematic and collaborative plan for preparing and executing treatment, these tools can enable the team to achieve success when restoring a patient’s smile to proper form, function, and health.

Simultaneously, other advances in technology and material science have provided dentists and laboratories with restorative zirconia options that can be cost-effective and aesthetic alternatives when full-mouth rehabilitations are needed. In fact, computer-aided design/computer-assisted manufacturing (CAD/CAM) make it possible for laboratories to collaborate with dentists to deliver monolithic zirconia restorations with individual characterisations that demonstrate high flexural strength and excellent long-term stability (e.g. Zenostar, Wieland, Ivoclar Vivadent).
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Because this material can be milled at the laboratory from single blocks using CAD/CAM technology, laboratories and their dentists can collaborate directly regarding the aesthetic and functional characteristics required. The ceramist can then complete the restorations using stains, glazes, and colours to finalise the restorations.

Overall, the foundations of this collaborative process are the digital CAD/CAM and communication technologies (e.g. digital photographs, digital radiographs, intraoral scans, 3-D restoration design software) that enable laboratory technicians to virtually design the zirconia restorations. These same technologies also facilitate the workflow by powering the milling of monolithic blocks into crowns and bridges, with subsequent sintering and stain characterisation requiring less time.7, 8

Case report

A woman in her mid-60s was referred to the dentist because she was dissatisfied with the appearance of her smile (Fig. 1). The initial diagnostic evaluation during the first appointment included a series of digital images with study casts, centric relation bite record, face bow transfer and a CBCT using CS 8100 3D (Carestream Dental; Fig. 2).

The examination revealed several maxillary teeth with worn composite restorations, cracked or leaking amalgam restorations, recurrent decay at the margins of existing restorations, and abfractions with cervical decay. Tooth #12 had a periapical lesion due to a failing root canal and periodontal disease with class II mobility. Existing crown restorations on teeth #20 and #28 had recurrent decay on the facial aspects, with recession. Teeth #21 and #29 had large amalgam restorations with deteriorating margins, as well as cracks present. Although no restorations were present in the anterior mandibular teeth, there was severe incisal edge wear due to possible grinding and parafunction.

Treatment planning

After reviewing the clinical findings and mounted models, the patient was diagnosed with a restricted envelope of function and decreased vertical dimension from continuous wear.9 To develop a treatment plan and determine if the vertical dimension could be increased, the laboratory fabricated a diagnostic 3-D White Wax-Up, along with a preparation guide and temporisation fabrication template, based on all of the analogue and digital records that were transferred from the dentist.

It was determined that the maxillary central incisors could be lengthened by 1.2 mm to improve the aesthetics, and the canines would also be lengthened to restore canine guidance in lateral excursions. Overall, vertical dimension would be increased by 1.5 mm.10 For the lower anterior, the goal was to correct the length-to-width ratio and create a less worn appearance.11 It was further determined from the diagnostic wax-up that aesthetics and function could be enhanced by restoring the remaining dentition. Since tooth #12 required an extraction, replacement options were discussed with the patient.

Further evaluation determined that the patient would require block grafts in the areas of teeth #18 and #19, as well as #30 and #31, to enable implant placement. In the maxillary arch, placing implants in the molar regions would require sinus augmentation, but implants could be placed in the #4 and #13 positions without major bone grafting procedures.12, 13

The ultimate treatment agreed to by the patient consisted of splinted monolithic zirconia (Zenostar, Wieland, Ivoclar Vivadent) crown restorations from #5 to #12, with #12 being a distal cantilever pontic. In the areas of teeth #4 and #13, dental implants would be placed, followed by their corresponding custom abutments and crown restorations. In the lower arch, the teeth would be segmentally connected with splinted crowns: premolars, separate canines, and then incisors.

According to the manufacturer, the selected zirconia material combines excellent flexural strength with the aesthetics of natural tooth shades. In this particular case, the patient desired a 040 bleach shade (Ivoclar Vivadent Chromascop). Zenostar is especially suitable for making monolithic restorations, but can also be used as an aesthetic framework material for a layered technique.4-8
Surgery and provisionalisation

A tooth-supported surgical guide (3D Diagnostix) and Guided Surgery Kit (OCO Biomedical) was used during the osteotomies (Figs. 3 & 4) followed by dental implant placement of dental implants (Engage, OCO Biomedical; Fig. 5).

Tooth #12 was atraumatically extracted using Physics Forceps from GoldenDent and the socket grafted with a putty blend of cortical mineralised and demineralised bone grafting material, followed by a pericardium membrane and primary closure by suturing the tissue with 3.0 mm silk sutures; and the remaining teeth prepared for crown restorations. Any old amalgam restorations or indications of recurrent decay were removed and cored, and any necessary endodontic therapy was performed (Fig. 6).

At the time, the laboratory provided the 3-D White Wax-Up, a clear reduction guide was also delivered and then used to ensure adequate reduction for the definitive zirconia crown restorations. Full arch impressions were taken (Fig. 7) using polyvinylsiloxane impression material (Panasil, Kettenbach), along with a bite relation using a jig fabricated on the 3-D White Wax-Up models. A shade was also taken, photographed, and later transferred to the laboratory.

Then, using a matrix impression (Sil-Tech, Ivoclar Vivadent) of the 3-D White Wax-Up, a provisional restoration, which would aid in determining the best size, shape, colour, and position for the definitive restorations, was made using a bleach shade of temporary material (Fig. 8). After the patient returned a few weeks later for evaluation of aesthetics, phonetics, and bite, the dental laboratory was instructed to replicate the 3-D White Wax-Up when fabricating the definitive restorations.

Laboratory design and manufacturing

The 3-D White Wax-Ups, colour photographs, impressions, and bite relations were forwarded to the dental lab (Arrowhead Dental Lab), along with specific instructions regarding the size, shape, and colour of the restorations. The laboratory technician scanned the 3-D White Wax-Ups in order to select the appropriate arch form, tooth size, and occlusion from the digital options available in the treatment planning software.
Once a virtual model was created, the full-contour restorations were digitally designed, and virtual images of the proposed reconstruction were forwarded through 3Shape Communicate to the dentist’s e-mail for review and approval (Fig. 9). Any minor adjustments in tooth shape and contour were sent back to the dental technician so that the most ideal aesthetic and form could be achieved.

Once the final design and adjustments to the zirconia restorations were completed, the appropriate monolithic zirconia block(s) were selected and milled. After milling, minor adjustments were made while the restorations were in the green state, using only grinding instruments. Little or no pressure was applied during this process, but water was used to prevent excessive frictional heat from fracturing the zirconia.

The internal aspects of the restorations were sandblasted with 50 μm alumina at 50 psi to enhance adhesion and cementation, after which contaminants were removed using steam or ultrasonic cleaning for 15 minutes. Zirconia surfaces must be free of dirt, milling dust/residue, and oily-greasy elements.

After the restorations’ surfaces were cleaned, they were sintered appropriately, and then any characterisation with stains and glazes was performed. The restorations were hand polished, evaluated (Fig. 10), and returned to the dentist for cementation (Fig. 11).

**Abutments and remaining crown restorations**

Four months later, the healing caps were removed from the implants in the #4 and #13 areas (Fig. 12) and ISQ values tested using the Osstell unit. Since the readings were very favourable (Fig. 13), impression posts were inserted (Fig. 14) and full arch impressions captured for use by the laboratory in fabricating the final crown restorations and custom abutments. The laboratory was able to scan the impressions, use digital file splitting to simultaneously design the custom abutments and crowns, and then precisely mill each component to the required parameters (Fig. 15).

Ultimately, the custom abutments were placed and torqued two weeks later and the crown restorations were seated to complete the case (Fig. 16).

**Conclusion**

A systematic method for treatment planning, material selection, tooth preparation, and cementation enables dentists and laboratories to effectively and efficiently address patient needs. In the case described here, the patient was very pleased with her smile rehabilitation, in addition to being able to receive all of the necessary treatment procedures at the same practice. With a technology-driven and digitally supported collaborative relationship, laboratories and dentists can achieve such outcomes more routinely, predictably, aesthetically, and functionally.

Special thanks to Chris Barnes and his team at Arrowhead Dental Lab for the abutments and restorations and 3DDX for the implant planning and surgical guide.

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

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CAD-CAM THREADED ATTACHMENTS

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It appears that there is still a great divide between those who utilise 3-D technology for dental implant planning and surgical placement of dental implants and those who do not. Clearly, decisions as to how to diagnose and treatment plan our patients may be the difference between success and failure. Recently an internet advertisement promoting an educational programme stated that 'Implant surgery is not complicated, easier than most other dentistry, and every dentist has the skills to surgically place implants. If you can take teeth out, you can put a dental implant in! You don’t need expensive equipment for brain-guided surgery, you can learn it with no initial investment!' Implant dentistry has become one of the most predictable and successful treatment modalities in all of dentistry. If the only imaging modality utilised is a two-dimensional panoramic or periapical radiograph how can a clinician really know if a procedure will be complicated?

Figure 1 represents a beautifully rendered 3-D maxilla and mandible with the cross-sectional imaging showing the existing teeth and roots in both arches as processed within the interactive treatment planning software (NobelClinician, Nobel Biocare). This vital information allows for a complete understanding that each patient’s anatomy is individual and unique, and that each patient’s bony anatomy, root positions within the bone, and tooth trajectories may not coincide with the alveolar process. Therefore without this information, the placement of implants may be compromised, resulting in complications. Therefore it is imperative that clinicians utilise the most up-to-date 3-D CBCT imaging and interactive treatment planning software to fully appreciate the individual nature of each patient’s unique anatomy.

When evaluating potential implant receptor sites, it is not just the available bone that should be considered, as our patients are in need of teeth, not implants. Clinicians must learn to practice ‘restoratively driven implant reconstruction’—knowing where the tooth position should be in relation to the bone and potential implant. This process can be accomplished with greater accuracy with the use of 3-D imaging and software applications that have the tools to provide clinicians with this valuable diagnostic information.
There are advertisements that promote concepts such as: ‘Brain-guided surgery vs cone beam-guided surgery—which works better’, leading clinicians to believe that it is the computer that makes the decisions, and not the clinicians who use the technology properly to improve their diagnostic abilities.

The diagnostic and treatment planning process using CBCT imaging provides for a variety of views including the axial, cross-sectional, panoramic, 3-D reconstructed volume (Fig. 2), and much more afforded with the use of interactive software as an aid to evaluating the thickness of the buccal plate, to assess the bone density, to visualise the trajectory of the tooth vs the bone, and then if a receptor site is found to be appropriate the clinician can position the implant to best support the desired restoration (Fig. 3).

Therefore it is the clinician who will decide on the available treatment options based on the enhanced diagnostic information provided by the technology, 3-D imaging technologies help clinicians diagnose more accurately and more consistently, than any two-dimensional modality—there is just no comparison. Diagnosis is the key element of implant success, and should not be minimised. To diagnose properly, clinicians need to use our brains—it is not the computer that makes the decisions.

Case presentation

A 74-year-old male presented to the clinic with a chief complaint of pain in the edentulous lower jaw, especially on the right side when trying to masticate using an existing complete denture (Fig. 4). The denture had little or no retention due to the resorbed condition of the mandibular arch, and was almost impossible to wear without denture adhesive applied many times during the day. The patient had been seen by a local dentist with the concept of managing his mandible with the placement of dental implants.

The initial treatment options that could be considered for this patient included:

- Four/five standard diameter implants supporting a fixed hybrid restoration.
- Immediate loading of implants with a fixed restoration.
- Two standard diameter implants supporting an overdenture.
- Four standard diameter implants supporting an overdenture.
- Narrow-diameter implants supporting an overdenture.
- Flapless surgical approach or a flap procedure to expose the underlying bone.
The original treatment plan conceived by the original treating dentist was to place four narrow-diameter implants in the anterior mandible to support the existing complete denture with overdenture attachments, due mostly to financial limitations of the patient. A flapless surgical protocol was chosen, and the initial implant site located by the panoramic radiograph. The panoramic reconstructed view of the edentulous mandible may provide the clinician with some information regarding the bony anatomy, but it is not sufficient to plan for implants in the majority of case presentations. It is essential to precisely locate the bilateral anatomical sites where the inferior alveolar nerve exits the mandible, and the panoramic radiography cannot provide this information accurately. To plan for the placement of implants, it would be important to understand the available bone anatomy to determine the number of implants that could be placed, and the diameter and lengths required. The 2-D panoramic radiograph cannot predict the width, trajectory, or density of the bone, as well as the thickness of the overlying soft tissue. Therefore, it can be difficult for a clinician to make truly educated decisions based on two-dimensional imaging modalities.

Upon drilling the initial pilot osteotomy preparation directly through the soft tissue, the drill immediately broke ‘in the bone’. A periapical radiograph confirmed that the drill was broken, and deemed to be ‘in the bone’. The subsequent paper print-out of the digital radiograph can be seen in Figure 6. The clinician reported what happened to the patient, and decided to abort the entire procedure and send the patient to a nearby oral and maxillofacial surgeon. The surgeon examined the patient and decided to let the area heal, and follow-up later for a new plan of treatment. At this time a CBCT was performed by the oral surgeon to better assess the situation. The patient was not
pleased, lost confidence in the clinician, and sought another opinion.

The initial review of the CBCT data was remarkable in the depiction of the thin, sharp, knife-edged alveolar ridge (Fig. 7). The 3-D volumetric reconstruction also reveals the position of the bilateral mental foramina and inferior alveolar nerves (seen in orange).

Contrary to the 2-D view of the panoramic radiograph, 3-D imaging and interactive treatment planning software allow clinicians to truly understand the patient’s existing anatomy. For the example of the fully edentulous mandible, the CBCT scan revealed that the underlying bony ridge was quite sharp and uneven at the crest. This presentation would certainly not be favourable to place implants with a flapless surgical approach. In fact, to facilitate the placement of implants, and facilitate the restorative phase, it would be beneficial to flatten the irregular ridge to gain the appropriate and desired width at the alveolar crest (Fig. 8).

The CBCT data provides us with much more information and clinicians should consider ALL of the views afforded by the CBCT scan data and use the tools of the planning software to simulate the positioning of the implants, such as the axial and cross-sectional views. In fact, to facilitate the placement of implants, and facilitate the restorative phase, it would be beneficial to flatten the irregular ridge to gain the appropriate and desired width at the alveolar crest (Fig. 8).

The hollows in the anterior symphysis area of the mandible are seen in a ‘clipping’ view with simulated implants, slicing through the 3-D volumetric reconstruction (Figs. 11a & b). This anatomical variation could not be determined with 2-D imaging modalities. Once this was known, the planning of implants could proceed with the knowledge of the individual patient’s anatomical presentation. The patient was informed of the issues related to the anatomy as shown on the 3-D simulation from the CBCT scan. These images are invaluable to educate the patient and improve case acceptance, and extremely invaluable for the diagnostic process in determining the best surgical approach. Proper diagnosis and treatment planning through 3-D imaging and simulation software revealed that the narrow ridge would have been a significant obstacle using a flapless approach, and the hollows in the bone may have caused signific-

Fig. 17: Each of the four implants was measured for implant stability with the implant specific SmartPeg.
Figs. 18a & b: A resorbable calcium apatite bone grafting material was used to fill voids and cover the implant—followed by applications of platelet-rich fibrin (PRF).
Figs. 19a–c: Healed site at three months (a). Uncovering of the integrated implants, healing collars and SmartPeg to measure ISQ values postoperatively (b). SmartPeg measuring ISQ values at uncovering (c).
Fig. 20: Four overdenture attachments to support a complete mandibular denture.
Case Report: Guided Implant Reconstruction

In the placement and ability to stabilize the four implants that were eventually placed, based on the CBCT data and interactive treatment planning simulations, it was elected to complete the surgical placement of four implants in the anterior symphysis in a ‘diagnostic-freehand’ manner. The anatomical landmarks were clear and allowed accuracy of implant positioning. The knife-edged ridge required a full flap surgical approach (Fig. 13).

The broken drill was immediately located lingual to the alveolar crest embedded in the soft tissue. Apparently the drill deflected off the sharp ridge into the floor of the mouth, and the torque caused the drill to break. Fortunately, the drill did not cause any immediate complications as the floor of the mouth contains many vessels, which if perforated, could have resulted in a sublingual hematoma. The remaining broken drill as seen in Figure 14 was easily retrieved.

Once the offending element was removed, the plan was to reduce the knife-edged ridge to gain appropriate width for implant placement. The reduction was accomplished in a free-hand method based upon the position and location of the mental foramen on either side of the symphysis. Based upon a thorough review of the CBCT scan data the expected hollow area of bone in the anterior symphysis was exposed (Fig. 15).

Prior to implant placement, the soft tissue in the anterior symphysis was carefully removed with serrated curettes and serrated round burs. Following the simulated plan, osteotomies were prepared for four implants to support an overdenture. The two middle implants were 4.0 mm diameter by 13 mm in length, and the two distal implants were 3.5 mm by 13 mm in length approximately 1–2 mm below the bone crest as per manufacturer’s protocol (AnyRidge, MegaGen Implants). Each implant was well fixated due to three factors: (1) the anticipated thickness of the buccal and lingual cortical plates; (2) the apical length of the implants engaging native bone; and (3) the thread design of the implant type (Figs. 16a & b).

Each implant was tested by resonance frequency analysis (RFA) to document implant stability with an implant-specific SmartPeg to record an implant stability quotient (ISQ) value (IDx Osstell). Clinicians might consider the importance of assessing implant stability for every implant placed using a non-destructive and objective protocol well-documented in the scientific literature. Additionally significant and differing entirely from insertion torque values is that ISQ values can monitored over time which is especially important when a two-stage surgical approach is anticipated as in this case example.

To fill the voids around the implants and over the alveolar crest, a small particle sized synthetic resorbable calcium apatite grafting material was used (OsteoGen, Implant Ltd.; Fig. 18a). The implants were then buried under layers of platelet-rich fibrin (PRF), and the soft tissue approximated to cover the site with tension-free closure (Fig. 18b). Post-operative healing was unremarkable.

After the site was allowed to mature for three months, a midline incision carefully split the narrow band of keratinised tissue to uncover the grafted site and the underlying four implants, which were all covered with a small layer of immature bone. Once fully exposed, each implant was once again fitted with a SmartPeg to assess an ISQ value, which was then compared with the initial values to determine the progress of osseointegration and to confirm implant stability (Figs. 19a & b). The ability to measure stability over time provides invaluable information for the clinician about the health of each implant. A favourable ISQ value imparts a level of confidence and knowledge of when an implant can be loaded and restored. Healing collars were positioned to allow for the soft tissue to be approximated and sutured.

The patient’s initial desire was to help relieve the pain associated with a denture that was not retentive due to the topography of the arch and proximity of the mental nerve to the alveolar crestal bone. The restorative phase continued with the impression phase, and placement of overdenture abutments to secure...
the denture and prevent pressure on the nerve. The limitation of available keratinised tissue was initially managed to the comfort and cleansability for the patient.

At the time of implant placement, the RFA/ISQ values were recorded. The initial values were actually acceptable if immediate loading was desired (over 70), based upon the excellent stability afforded by the thread design of the implant engaging the buccal and lingual cortex, and apical length into native bone. A two-stage approach was elected due to the large hollow areas in the symphysis, which were grafted and covered with PRF. At three months, the implants were found to be covered with a thin layer of immaturity bone, and the intermedullary area seemed solid. A second series of measurements were recorded to reflect the status of integration. All values increased significantly, verifying that the process of osseointegration was progressing positively, and loading was appropriate. Overdenture abutments (Meg-Rhein) were secured to each implant, and stainless steel housings with retentive caps were embedded into the denture.

Discussion

As technology becomes more available to clinicians worldwide, our ability to diagnose and plan with improved accuracy and consistency can only be seen as a huge benefit. The use of 3-D printing has now become an affordable option for both group practices and single practitioners, therefore making it possible to produce accuracy biomedical models that greatly enhance the diagnostic and treatment planning phase. DICOM data can be exported to standard files that can be managed in software that drives 3-D printers to fabricate models of the mandible or the maxilla. The CBCT dataset from the case presentation contained within this article was exported as a standard triangulation language (STL) file and imported into the 3-D printer software (Preform Formlabs; Fig. 21).

The importance of having an actual model in-hand cannot be underestimated. For this particular case presentation, the 3-D printed model was fabricated using a process known as stereolithography by an in-office 3-D printer, the Form 2 (Formlabs). The surface detail is excellent, and provides not just an excellent diagnostic aid, but a method to educate our patients on the recommended treatment plan based on a physical model that can be viewed and touched. It has been demonstrated that these models can be successfully used for guided surgery applications, and for other bone grafting guides such as a ‘sinus-lift’ or ‘harvest’ guide. The virtual 3-D reconstructed surface model can be seen in Figure 22a, and the 3-D printed model in Figure 22b. The position of the bilateral mental foramina can be clearly seen, as well as the intramedullary bone within the ramus, and the anterior symphysis where the hollow areas were noted. These models can also be utilised to simulate the actual surgical approach to validate the procedure and for surgical guide fabrication.

This singular case illustrates many important aspects about treatment planning for dental implants. To minimise the diagnosis phase, and to suggest that clinicians do not need to use ‘expensive’ equipment as an aid to implant planning is not appropriate in today’s world of the digital workflow where we need to avoid complications to insure that we offer our patients the correct treatment. Some have suggested that technology is used in place of sound thinking, or that the computer makes the decisions for the positioning of the implants. To suggest that when we use computers to help plan the case that we are not using our brains, or that computers are making the decisions about where implants are placed is an incorrect assessment of the state-of-the-art.

Technology, when used properly, expands our brain power by providing clinicians with the necessary information to make educated decisions for our patients. To negate the use of technology due to perceived ‘increased costs’ or that 2-D radiography is sufficient for implant planning is a potentially dangerous approach—relying on 2-D imaging requires guesswork, and there is no place for guessing when drilling into bone. Whether clinicians use ‘guided’ surgery, use surgical templates, or place implants totally ‘freehand’, it is important that our minimal standards be to use 3-D imaging and interactive treatment planning software applications to provide a ‘blueprint for success’, to avoid complications, reduce morbidity, with the ultimate goal to help facilitate the restorative phase that provide patients what they want, teeth. Remember: ‘It’s not the Scan, it’s the Plan’!

<table>
<thead>
<tr>
<th>Implant Site</th>
<th>At Placement</th>
<th>3 months</th>
<th>6 months</th>
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<tbody>
<tr>
<td>RFA / ISQ Values Over Time</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>1</td>
<td>78</td>
<td>74</td>
<td>74</td>
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<tr>
<td>3 months</td>
<td>85</td>
<td>80</td>
<td>80</td>
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<tr>
<td>6 months</td>
<td>85</td>
<td>82</td>
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Table 1: RFA/ISQ values over time.

Dr Scott D. Ganz maintains a private practice for prosthodontics, maxillofacial prosthetics and implant dentistry in Fort Lee, New Jersey, USA. Co-Director of Advanced Implant Education (AIE). He has served as President of the New Jersey Section of the American College of Prosthodontists and of the Computer Aided Implantology Academy.

Dr Ganz delivers presentations worldwide on both the surgical and restorative phases of implant dentistry, and has published extensively on these topics. He is considered one of America’s leading experts in the evolution of computer utilisation and interactive software for diagnostic and treatment planning applications using CT and newer-generation CBCT imaging modalities.
Introduction

There are several reasons not to use dental restorations made of metal. Possible disadvantages of metal are, for instance, the potential allergenicity (type IV allergy) and weight, density, as well as the long processing time. Furthermore, the colour of metals differs visibly from gingiva and teeth. Metal has in fact a great strength, but it is, however, much harder than the natural tooth. Metals are very good thermal conductors and isolate from temperature much worse than teeth. Every patient with deep fillings or cast gold inlays probably knows about these properties.

For the named reasons, the problematic aesthetics of metals and their alloys as well as their mechanical properties, the search for other materials has not ended yet. Furthermore, allergological and biological concerns of patients and doctors have gained more importance in the last years.

TRINIA was developed to provide dentists with CAD/CAM-milled metal-free restorations.

Material properties

TRINIA CAD/CAM discs and blocks (Fig. 1) are composed of multidirectional interlacings of fibreglass and resin in several layers. In addition to the advantage of being a lightweight, TRINIA has great flexural
strength and a flexural modulus of elasticity similar to dentin.

The flexural strength is determined by means of the loading device in the classical three-point bending test (Fig. 2). The tested material—in this case TRINIA—bends under load. As long as the material does not deform under load i.e. returns to its original form when the force declines, it remains within the elastic range. If the acting force exceeds the load limit, the material deforms (plastic range) and breaks in the end. The range when that happens to TRINIA is similar to that of dentin. In other words: The flexural modulus of elasticity of TRINIA is 18.8 GPa, compared to that of dentin being 12–14 GPa² and of titanium being 102–118 GPa², ³, ⁴.

As TRINIA features a flexural modulus of elasticity that is comparable to dentin, it will behave similarly. TRINIA is an American product for permanent restorations approved by the FDA. Fibre-reinforced composites (FRC) by TRINIA are composed of 40 per cent of epoxy resin and 60 per cent of fibreglass. Its most outstanding characteristics are the great elasticity featuring a flexural strength of 390 MPa (N/mm²) and very low water adsorption of 0.03 per cent. Because of the high level of resilience of TRINIA material, every construction or bridge construction features the so-called buffering, comparable to the effect of Sharpey’s fibres. The bond of TRINIA and abutments is very stable and reaches 18 MPa with 3M RelyX Unicem 2 Automix and 18.6 MPa with Cera Resin Bond (SHOFU).⁵, ⁶

**TRINIA CAD/CAM**

The relatively simple design and manufacture of prosthetic constructions using CAD techniques is a good alternative to conventional methods (Fig. 3). TRINIA can be machined with customary wet- or dry-milling machine systems using nano-diamond burs (Figs. 4a & b, 5). TRINIA is suitable for making copings, substructures or frameworks for permanent and transitional anterior or posterior crowns, bridge-work, and substructures on natural teeth or implants. TRINIA constructions can be used either with cemented or uncemented restorations as well as with screwed or telescopic restorations (Figs. 6 & 7). The versatility of TRINIA material permits the use for permanent supply with e.g. inlays, onlays, crowns, bridges, veneers or partials. The material is supplied in ivory and in pink (Fig. 8).
Flexural rigidity and compression strength of TRINIA are high despite the minimal CAD/CAM processing time. TRINIA can be processed extraorally as well as intraorally. Its wearing comfort is excellent thanks to its light weight.

Case presentations

The cases described in the following represent only a small portion of the possibilities for this material. Figure 9 shows a panoramic radiograph of a 59-year-old female patient with extreme mandibular atrophy class VI according to Cawood and Howell after the insertion of four 4.0 x 5.0 mm short Bicon implants. After an integration time of three months, the appropriate model can be prepared after exposure and dental imprint (Fig. 10). Then, the ten-piece prosthesis can be manufactured applying the CAD/CAM method (Figs. 11–13). The corresponding implant shafts are found by means of the abutment temporarily fixed with Vaseline in the prosthesis (Fig. 14) and then the abutments are tapped via the prosthesis (Fig. 15). Then, the individual abutments are tapped again to fix them in the implants (Fig. 16). Because the abutment is end-tapered by 1.5 degrees towards the inner shaft, so-called cold welding happens. The panoramic radiograph after the insertion of the cemented bridge illustrates the crown-implant ratio (CIR) of more than 5 : 1 (Fig. 17) and the lateral cephalometric radiography shows pseudo-progenia due to the severely atrophic maxilla (Fig. 18). The crown-implant ratio of 1:1 does not apply to the short Bicon implants anymore.

The 59-year-old female patient presented in the following also suffers from distinct mandibular atrophy class VI (Fig. 21). In that case, the four 4.0 x 5.0 mm short Bicon implants were tilted too far in the labial direction (Fig. 22), so that the prosthesis could be fixed only by means of screwed abutments to be placed in front of the mandibular anterior teeth. This resulted in very long cantilever segments on the distal side of the posterior implants. Despite the extremely heavy load of the TRINIA material, it did not break yet even after 64 months of wearing (Figs. 23 & 24).

With our first ten patients with mandibular atrophy class VI, we measured a ratio of 4.3 : 1 from bridge span to implant span for 40 short 4.0 x 5.0 mm Bicon implants (Fig. 25). With 16 patients treated for atrophic mandibles class VI wearing four 4.0 x 5.0 mm short Bicon implants, we have lost one implant in the observation period of up to 5.6 years. This corresponds to a survival rate of 98.4 per cent. The patient had lost the left middle implant seven days after the initial treatment, which correlates to implant loss due to lacking osseointegration. Since then, she has been putting the load on the remaining three implants of her prosthesis for 47 months.
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Therefore, the statistics of mandibular prosthetics show 100 per cent success for these 16 patients.

The next 69-year-old patient suffers from extreme maxillary atrophy class VI. In such extreme cases, they used to perform Horseshoe Le Fort I osteotomy using interpositional bone grafts from the iliac crest—a very complex surgery under endotracheal anaesthesia. We, in contrast, inserted two 4.0 x 5.0 mm short and two 3.0 x 8.0 mm Bicon implants in a very brief procedure under local anaesthesia (Fig. 26). Twelve-piece TRINIA prostheses were integrated in the maxilla too (Fig. 27). To position the abutments easier, you can use a positioning splint made of light-cure GC plastic, on which the dental technician indicates the most favourable insertion sequence for the abutments (Fig. 28). The patients enjoy prosthetics that leave the palate free (Fig. 29). The prosthesis is either cemented, screwed or telescoped via the four abutments. The follow-up after 39 months resulted
in very satisfying radiological and clinical results (Figs. 30 & 31).

The CAD/CAM planning and milling technology facilitate the manufacture of cemented, screwed (Figs. 32 & 33) or standardised copings with two different frictions (retentive or passive, Fig. 34). Meanwhile we supplied 20 patients suffering from atrophic maxilla class VI with 80 implants. We have lost three implants in an observation period of up to 3.2 years. The implant survival rate fell from 98.6 per cent in year one to 93.5 per cent in year three. As these three patients have worn their prosthesis on three implants until the fourth implant was replaced, these again are 100 per cent of prosthetic success.

The following patient demonstration shows the CAD/CAM procedure to manufacture the retentive TRINIA telescopic prosthesis. After the first step comprising the set-up and clinical evaluation, including the wax fitting (Fig. 35), you need to choose the adequate angular difference of two to three degrees to ensure sufficient friction (Fig. 36). A positioning splint made of light-cure GC plastic helps positioning the abutment (Fig. 37). Three retentive copings suffice for sufficient friction of the telescopic prosthesis (Fig. 38). The next step is the CAD design (Fig. 39). After having manufactured the TRINIA framework in the CAM milling procedure, it is positioned between the telescopic copings and the synthetic teeth (Fig. 40) and then the framework is bonded to the teeth (Fig. 41). Figures 42 and 43 show the finished 12-piece telescopic prosthesis.

In the meantime, we have installed either multipart bridges or complete prostheses made of TRINIA material in altogether 101 patients. In the observation period of 64 months, the material did not chip yet and only one broke.

**Conclusion**

The observation period of 64 months for 101 TRINIA bridges and prostheses allows the conclusion that this is a method comparable to metal ceramic restorations._

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

**TRINIA is a registered trademark of Bicon USA.**

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The purpose of this article is to show an example of the implant-retained bar overdenture planning and manufacturing process. The 48-year-old male patient presented at Dr. Giudice’s dental practice. The patient had several dental problems. The dentist decided to
proceed with the extraction of all teeth and insert a full temporary denture. After the healing period, it was decided to perform a radiographic examination to evaluate the possible insertion of implants. After the CBCT analysis, the clinician decided to intervene with four AZ implants and a milled bar with three Rhein 83 attachments.

Fig. 8: Check-up of the available spaces.
Fig. 9: Positioning of the attachment on the bar.
Fig. 10: Finished and polished bar after laser melting.
Fig. 11: The bar, palatal view.
Fig. 12: The bar, mucosa view.
Fig. 13: Scan of the bar on the model.
Fig. 14: Design of the counter-bar.
Fig. 15: Vertical section of the work.
Fig. 16: Check-up of the available space.
Fig. 17: Vertical section of the attachment.
Fig. 18: Check-up of the available space.
Fig. 19: Internal view of the counter-bar in CAD programme. – Fig. 20: The bar and counter-bar in CAD programme. – Fig. 21: The counter-bar after laser melting. – Fig. 22: The counter-bar after laser welding of the metal housings. – Fig. 23: Insertion of the counter-bar. – Fig. 24: The counter-bar fully seated. – Fig. 25: Top view of the counter-bar on the model. – Fig. 26: Palatal view of the counter-bar on the model. – Fig. 27: Prosthesis finished and polished on the master model BN. – Fig. 28: Finished prosthesis.
The impression was taken in the conventional way. Once the master model was produced, the wax rims were fabricated and the passivation of the bar was carried out. After the repositioning the analogues that were out of position on the master model, the teeth set-up and consequently the aesthetic test was performed.

With the correct teeth relationship and aesthetics, the master model scanning was done, followed by the CAD drawing of the bar with screw holes for the threaded attachments.

It was decided to put three threaded attachments with two OT Equator and one OT Cap micro. Once the bar delivered by the milling centre, it was refined with a two degree bur and polished.

The sleeves of the threaded attachments were cemented and the bar scanned with the metal housing in order to correctly design the counter-bar. The counter-bar, in laser melting, was checked for spaces between the bar, counter-bar and the teeth set-up.

The metal housings for the retentive caps were laser welded inside the counter-bar and waxed, and the teeth set-up for the last aesthetic try-in was carried out.

As the excellent result was achieved, the prosthesis was cured and polished.

On the day of delivery, the dentist screwed and tightened the bar. He also checked that the insertion of the counter bar was suitable, as well as the occlusion and retention of the attachments. Once those tests had carefully been performed, the patient stated a good satisfaction and comfort with the prosthesis.

**contact**

Laboratory Venti 07 – Santa Maria di Sala (VE), Italy

Fig. 29: Finished bar and prosthesis.
Fig. 30: Internal view of the prosthesis.
Fig. 31: Side view of the bar.
Fig. 32: The bar screwed into the patient’s mouth.
Figs. 33 & 34: Final prosthesis in patient’s mouth.
Growth is the trend in the dental implant market, and there is little sign of it slowing in the years ahead.1

As a result, dental laboratories that can provide high-quality abutments, implant crowns and implant bars will be increasingly in demand. However, ramping up production of either component can require significant investments in equipment, time and staff training that many labs simply cannot afford. That is where NobelProcera Scan and Design Services can help.

Send a case, receive precision-fit abutments and implant crowns

Previously only available for ordering implant bars, labs can now streamline their workload and expand their offering of abutments and implant crowns by outsourcing scan, design and production to NobelProcera. The process is simple. Using the online form, the lab uploads a 3Shape or NobelProcera digital scan file, enters their design specifications and sends their request in a click.

Just about any requirement can be met. Not only can labs create abutments and crowns for all Nobel Biocare implants, but for other major implant systems too. The choice is there for titanium or zirconia in different shades, abutments with cement-retained copings or a screw-retained approach for direct veneering, as well as innovative solutions such as the angulated screw channel abutment available in zirconia for conical connection implants*.

With the order sent directly to the expert NobelProcera production facility, a team of skilled CAD designers creates a design and shares a 3-D visualisation for the lab to approve. When the lab is happy, the precision-fit abutments and implant crowns are precision-manufactured, quality checked and dispatched back to the lab.

Send a model, receive unrivalled bars

Already an established feature of the service, labs can order market-leading NobelProcera Implant Bars by preparing the case materials as normal, noting the details of the case on a short accompanying form, before sending it to be scanned and designed by NobelProcera’s team of skilled technicians.

The Scan and Design Service covers an extensive range of over 170 implant platforms*. And, as NobelProcera produces implant bars only from solid blocks of titanium alloy for surgical applications2, potential weaknesses relating to soldering or laser welding are avoided.
High-precision production just a click away

NobelProcera CAD/CAM prosthetics are produced at a state-of-the-art facility in Mahwah, USA. Manufactured in accordance with the ISO 13485 and 21 CFR Part 820 quality management systems, the output quality of every prosthetic is monitored. This results in products demonstrating high precision of fit, mechanical stability and years of safe and reliable performance.

The Nobel Biocare interface is also designed for a precise fit between abutment and implant. Although not always visible to the naked eye, use of third-party components not designed and tested for the system can result in uncontrolled forces, and may cause individual components or even the entire system to fail. Choosing implant restorations that are designed, tested and proven as a complete system can avoid future complications.

Outsource means opportunity

In a matter of days, the precisely manufactured abutment or implant bar is shipped to the lab with a material authenticity certificate and a five-year product warranty. By offering unrivaled results and removing the need for expensive investments, NobelProcera’s Scan and Design Service lets labs take requests for high-quality abutments and implant bars that they might otherwise be unable to process. In other words, it gives labs the flexibility to take opportunities that they cannot afford to miss.

Fig. 3: Use a simple online order form to send your abutment scan files to NobelProcera’s skilled CAD designers. – Figs. 4a & b: NobelProcera’s centralised milling systems (a) consistently provide precision-fit implant crowns in monolithic zirconia and abutments in titanium as well as passive-fitting implant bars (b).

*Some products may not be regulatory cleared/released for sale in all markets. Please contact the local Nobel Biocare sales office for current product assortment and availability.
European dental imaging equipment market in a state of change

Authors: Sasha Stephanian & Jeffrey Wong, USA

The market for dental imaging equipment in Europe is quite saturated and has not experienced any significant growth over the past several years. However, in recent years cone beam computed tomography (CBCT) scanners have increasingly begun incorporating 2-D capabilities into their systems, as well as offering a broad range of fields of view to provide greater flexibility. Clinical applications of CBCT systems include implant planning, root configuration, sinus augmentation, root-canal procedures and bony defect detection. As several of these applications are expected to increase in number, the demand and need for CBCT scanners will continue to grow considerably throughout Europe over the next decade.

Intraoral X-ray imaging device market in transition

Although the split between PSP systems and digital sensors is quite even, the PSP market has shown strong signs of growth, particularly in countries that were traditionally dominated by sensors, such as Spain, and will continue to be one of the main drivers in a rather stagnant market for imaging equipment as a whole. Part of this trend can be attributed to the fact that the thickness and rigidity of sensors are a greater nuisance when it comes to patient comfort, as well as the frailness of these sensors compared to PSP scanners. Furthermore, digital sensors are much more expensive than PSP scanners, and include parts that are prone to wear, such as cords that can be easily damaged, which further argues the case to switch to PSP systems.

Intraoral X-ray imaging device market breakdown, Europe, 2023.

Fig. 1: Intraoral X-ray system market breakdown, Europe, 2023.

Extraoral X-ray imaging vs 3-D CBCT scanners

Extraoral X-ray imaging systems are predominantly used for viewing a patient’s teeth relative to his or her jaw and skull. They aid in monitoring impacted teeth, temporomandibular joint disorder, and possible tumours in and around the intraoral cavity. These specific uses of extraoral X-ray systems are limited to procedures performed by orthodontists, prosthodontists and oral surgeons, resulting in a relatively small market. Most professionals prefer working with a CBCT scanner, which has 3-D imaging capabilities and can perform at a much greater capacity than traditional 2-D extraoral imaging systems, but are limited by the high acquisition cost of these systems. Recently, however, not only have prices of CBCT scanners dropped significantly, but it is now standard for...
these systems to also incorporate both panoramic and cephalometric capabilities, resulting in so-called ‘combo-units’, which has resulted in a drastic change in the market. The popularity of these CBCT ‘combo-units’ has increased significantly in recent years and is expected to continue outpacing all other market segments in terms of growth.

Consequently, the outlook of the extraoral X-ray system market in Europe is negative. Already being a replacement market without much innovation, the demand for traditional 2-D systems is on the decline as consumers continue to opt for technologically superior CBCT scanners. Manufacturers have also recognised this, and as such have shifted their focus to capitalise on this trend, investing in producing combo 2-D and 3-D units with the option for future upgrades, greatly improving the marketability of these systems.

Analysis of the current situation of CBCT scanners

CBCT scanners are extremely efficient machines that are capable of performing a quick and non-invasive scan, resulting in a high level of patient comfort. It is also possible to instantly show the patients a 3-D image of their jaw and teeth structure, making it easier for dental professionals using these scanners to convince patients regarding necessary treatments. However, the biggest advantage of CBCT scanners is their low cost relative to traditional CT systems found in hospitals. While CBCT scanners are quite a bit more expensive than other dental imaging equipment, they are a much more affordable alternative for capturing 3-D images of a patient’s jaw compared to past methods.

In the European market, sales of CBCT systems have increased considerably, with growth rates surpassing that of nearly all other dental imaging devices. This will most likely continue to be the case throughout the next several years as the technology is constantly improving and prices are dropping. Although most units now offer a variety of field of views (FOVs), the most popular choice continues to be 8 cm x 8 cm, as this size is sufficient to capture the complete maxilla or mandible in one image. Anything above this size has a much more niche usage and typically comes at a greater cost, thus dentists opting to purchase a CBCT scanner are less likely to be persuaded by anything larger, as it is more of a luxury than a necessity. As such, all of the major competitors, including Carestream, Planmeca, Sirona, Danaher Group, Vatech, and Cefla Group, have multiple systems with this size already incorporated into their product line. Today, smaller FOV (sizes smaller than 8 x 8) scanners have essentially all been consolidated with medium FOV scanners, and large FOV scanners are extremely expensive and represent only a very minor percentage of the market.

Final thoughts

All in all, the market for dental imaging equipment in Europe is relatively static in terms of growth, but it is in a state of transition. Companies are continuously improving the technology in their products, and the stiff competition is placing intense pressures on prices. Consequently, a growing demand for CBCT scanners is neutered by these falling prices, and in the end, the companies that will be the most successful are the ones who provide the greatest value with their products. The intraoral X-ray imaging sector has almost completely transitioned into a digital market, but is now split between digital sensors and PSP scanners. With new entrants in various segments of the market, the future of this market seems promising and exciting, with many new opportunities on the horizon. _

about


Jeffrey Wong is the strategic analyst manager at iData Research and has been heavily involved with the company’s dental division throughout his tenure. As a research analyst, he led several research projects on the global dental markets, including dental prosthetics, digital dentistry, CAD/CAM materials, dental implants, bone graft substitutes, hygiene, dental imaging and dental lasers.
Optimal treatment planning for perfect aesthetic and functional results—case report

Author: Dr Cosmin Dima, Romania

Introduction

When the patient first presented to my clinic, she was 16 years old, came with a major dental trauma caused by a bicycle accident a few years before. As a result of the accident, she lost one of the central incisors and the other one was fractured.

The patient was desperate about her smile, she wanted it back and she had very high aesthetic expectations, I knew then that this case would be a challenge. I thought to myself: ‘Am I capable to give her back her beautiful smile? And more than this, am I capable to give her beautiful smile back for the rest of her life?’ This means maybe for the next 60 to 70 or even more years.

As dental professionals, we want to give to our patients’ long-life and predictable results of the treatment; however it is very hard with young patients who are still growing. Therefore, I decided to postpone the surgery until she was at least 18 years old, and we decided to proceed with a temporary aesthetic restoration and to keep the patient under constant dental control over the next two years.

Finally, we decided to make a permanent prosthetic restoration; taking into consideration the high aesthetic requirements of the patient and her young age, I chose implant treatment.

Treatment planning

After a clinical examination, a cone beam computerised tomographic (CBCT) scan was performed (VGievo, NewTom).

Nowadays, inserting an implant without using a CBCT is like driving to an unknown destination without GPS, but still hoping to arrive at the right place only because you are a good driver. You could succeed by mistake or being lucky, but a risk of a failure is too high.

During a clinical examination, I observed a horizontal and vertical bone defect (Figs. 1a–c) but did not expect any complications.

In many cases, the crest looks fine during the clinical examination, but after raising the flap it appears that the bone is much thinner than expected because...
the width was given by the gingiva, not by the bone. This was one of these cases, but fortunately I realised it before the surgery.

The analysis of the CT scan showed that the bone width of the crest was only 2 mm (Figs. 2a & b). It was obvious that the bone regeneration was needed.

Taking into account the high aesthetic expectations of the patient and dimensions of the bone defect, I didn’t want to risk one stage surgery (which I planned initially, before I saw the CT scan). I decided to do a bone augmentation first and insert the implant after a few months of healing. I planned to regenerate the bone horizontal and a little bit vertical, with BioOss and BioGide (Geistlich) mixed with autologous bone harvested from the nasal spine.

**Surgical procedure**

I am not exaggerating when I say I have seen thousands of patients before surgery, many of them were very nervous, and anxious about what was going to happen. Therefore, I was astonished seeing this young patient calm even when I was explaining to her the steps of the surgical procedure. Moreover, she wanted to know everything about guided bone regeneration, xenograft, allograft, palatal bone augmentation, implant insertion and gingival graft.

Truly surprised, I asked her why she wanted to hear all the details—was she afraid? But then she said: ‘How could I be afraid? I’ve been waiting for more than four years! I’m here to take back what I lost a long time ago, so let’s do it!’
During the first surgery (Figs. 3a–d), we observed a large amount of the augmentation material that was used, which is hard to predict how much of it will become real bone.

After 4 months, another CBCT scan was performed to evaluate bone regeneration level (Figs. 4a & b). The regeneration was not perfect but I was satisfied with the result (Fig. 5). I have noticed that the nasopalatine foramen was exactly where the implant placement was planned. This was another very important information provided by CBCT scan. With this new information I was able to better plan the steps of the implant insertion.
I also decided to augment the nasopalatine area to insert the implant in the correct three-dimensional position from the prosthetic point of view. I choose the V3 implant (MIS Implant Technologies), which is very conservative for the bone and has a switching platform to better stabilise the tissues around it.

The second surgery went well; after the procedure we took one more CBCT scan, to check if the implant had enough ‘bone’ around it. The scan showed the large amount of augmentation material around the implant (Figs. 6a & b).

The healing process was completed after six months; however, I was not satisfied with the gingival contour and therefore I decided to perform a free gingival graft (FGG) to increase the gingiva volume.

The FGG was harvested from the palatal area of teeth 26 and 27 (Figs. 7a–c). A tunnel was created in the area to be augmented and the gingival graft was very well stabilised with non-resorbable Coreflon sutures (Fig. 8b). I have used also an individualised healing cap to push the tissue more buccally for the perfect final shape of the gingiva (Fig. 8d).

Prosthetic procedure

After gingival maturation an impression was performed and the final crown was made. Complicated cases like this one need a very well planned prosthetic plan and a skilful dental technician. The gingival contour could be (re)modelated by a crown with an appropriate shape.

The shape of the crown can help or destroy the surgery results so it is very important to have correct planning before starting the prosthetic work (Figs. 9a & b). The area under the gingiva must be concave to allow the tissue to grow and have a proper thickness, but there are some areas where we need also a convex part of the crown that can push the gingiva to the ideal contour. Only taking care of all these details can give satisfactory results, when implant restorations can look naturally (Figs. 10a & b).

Conclusion

At eight months’ follow-up, the patient was very happy with the final result, and so was I; the implant and surrounding tissue were stable.

Monitoring difficult cases with CBCT is mandatory to avoid unexpected complications, as we know that raising a flap on an augmented area means lost bone and nobody wants that. Moreover, CBCT scans assure better diagnostic, treatment planning and predictable results._

contact

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The use of CBCT and CAD/CAM techniques in complex implant-supported rehabilitation of maxilla—Part II

Author: Dr Tomasz Śmigiel, Poland

In the first part of this article (published in CAD/CAM 1/2017) the different phases of diagnostics, planning and implantological treatment were presented. In the process of planning, the necessity of creating temporary restorations in order to increase the patient’s comfort was taken into consideration, keeping in mind the fact that augmentative procedures must be performed.

Once the implants—located at lateral sections of the maxilla both on the right- and left-hand side—had integrated, it was possible to proceed to the process of designing and building the final construction of the prosthetic restoration. The integration period took considerably longer than in the case of frontal sections of the maxilla because of the necessity of performing a sinus lift procedure.

The patient was very well protected as he had been using a skeletal prosthesis based on four telescopic abutments at the frontal section. Benefits arising from such a solution consisted not only in the feeling of comfort, but also in the fact that the frontal implants were subject to functional loading immediately after the period of initial integration, which has resulted in the surrounding bone being subjected to the process of condensing thanks to regular training. Another advantage was the fact that there was no need to disassemble the telescopic abutments on the implants at the frontal section as the abutments had primary telescopic crowns, while the secondary ones had been prepared as a second set for placing within the final construction.

The final prosthetic restoration included a bridge attached to four implants, and on four telescopic abutments based on a TRINIA framework, which was created by means of CAD/CAM techniques, onto which zirconia based porcelain crowns were glued. The remaining part of the structure was veneered by means of a pink composite material in order to imitate the gum.
In order to prepare the bridge, a model was scanned and transferred onto a computer using software to design the bar (Fig. 1). The bar was designed by using special software in such a way that the whole design was transparent in the first phase so that the location of abutments and the position of the telescopic abutments at the frontal section could be visible (Fig. 2).

Having planned the proper shape and location of pillars for the porcelain crowns, the transparency was switched off (Fig. 3).

The next phase involved the planning of the size and shape of the final teeth, which, as porcelain crowns, will be glued onto the construction (Fig. 4). For that purpose, it is very helpful if on the design of the bar, a scan of the patient’s temporary model prosthesis can be planted.

The patient must first approve the wax-up, in aesthetic and functional terms (Fig. 4). A computer programme for designing such constructions provides us with the possibility of viewing and designing the bar.

Fig. 5: Design of the framework visible from the palatal side. Visible abutments prior to the placement of telescopic crowns at the frontal section with abutments to be attached by means of screws at the lateral section. — Fig. 6: Design of the telescopic crowns placed onto the abutments at the frontal section. — Fig. 7: Project of the construction with transparency mode on. — Fig. 8: Ready-made construction on a virtual model. — Fig. 9: A planted scan of a temporary prosthesis (blue colour) on the construction design. — Fig. 10: Ready-made project of the supra-structure visible from the intragingival side.

Fig. 11: Suprastructure cut out and transferred onto the model.
Fig. 12: Test of the construction within the oral cavity—visible opening for screws.
Fig. 13: Porcelain crowns prepared for testing. – Fig. 14: Porcelain crowns based on a model prior to veneering by means of a pink composite.

Fig. 15: Test of the construction together with crowns and the mouth slightly open. – Fig. 16: Maximum smile of the patient with crowns. – Fig. 17: Maximum smile of the patient without crowns. – Fig. 18: Preparation of the structure for gum modelling. (Photo: courtesy of Inter-dent laboratory) – Fig. 19: A model with a gingival mask. – Fig. 20: Prosthetic work based on a model where veneering of the gum was started and with crowns.
from all angles. Figures 5 to 9 show some exemplary prints of the views visible from the occlusal surface. Having finished the designing process, the bar should be visually inspected from the intragingival side (Fig. 10).

After this has been done, the next step consists in testing the almost ready-made crowns before the final glazing and before attaching it onto the model. As a result it is possible to make corrections, should they be necessary. Of course, one should check the proper match-up and the aesthetics on the model (Figs. 13 & 14).

After the model was analysed, we proceeded to analyse the fitting and the aesthetics in the mouth of the patient. Carrying out such a test makes a lot of sense, especially in a dynamic way, and by asking the patient to make various facial movements, such as smiles and grimaces, we can assess the properties of the course of the border line of the zenith of the teeth and the transition into a gingival garland. It is of real importance as at this stage that we can plan the process of covering the construction with pink porcelain or composite (Figs. 15–17).

After the test, we sent the construction to a prosthetic laboratory with detailed guidelines for veneering. To achieve the proper location of the pink veneering it was necessary to place the porcelain crowns onto the bar and model the border line for the gingival garland

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**Fig. 21**: Openings for screws are located before placing the crowns.  
**Fig. 22**: Comparison of the pattern, that is, the temporary prosthesis and the final prosthetic work.  
**Fig. 23**: Final restoration prior to handover and the placing of crowns.  
**Fig. 24**: Final restoration—frontal view.  
**Fig. 25**: Magnification showing precision in the making of the crowns and in veneering by means of pink composite.

**Fig. 26**: Transparency of the final restoration.
Due to the fact that the prosthesis constituted the ideal shape of the teeth, it was worth comparing it with the final prosthetic work and assessing the details of the whole work process before the patient sits comfortably in the dental chair (Figs. 21–25).

If the quality of the work satisfies our expectations, we may proceed to the handing-over stage and perform the functional and aesthetic analysis, both intra- and extraorally. A perfect conclusion to the treatment process is the receipt of a complete set of OPG X-rays taken before, during and following treatment (Figs. 29–32).

**Conclusion**

The performance of prosthetic reconstruction always requires a detailed plan. At present, when planning implantological treatment, the use of advantages that CBCT-based imaging has to offer has become obligatory. As a result of that, one can avoid certain complications that result from improper recognition of anatomical conditions. Planning prosthetic restorations based on implants requires even more precision than restorations based on own teeth due to the necessity of acquiring passivity in the construction’s adhesion to implants. Due to the fact that patients prefer fixed prosthetic restorations, the author recommends making bridges or prosthesis that enable disassembly for maintenance purposes. In such situations, these restorations are based on telescopic or screw-retained abutments.

**contact**

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Work completed in cooperation with Inter-Dent laboratory in Warsaw, Poland.

Editorial note: This article is the second part of a two-part series. Part I was published in CAD/CAM 1/2017.
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Robotic guidance system could be game changer for implant dentistry

Implant dentistry is about to make a leap in development, at least if things go the way US company Neocis predicts. After introducing YOMI, the first robotic system developed for dental implant placement, and receiving Food and Drug Administration (FDA) 510(k) clearance to market its pioneering surgical assistance system, the company has now announced the completion of the first sale of its device.

The dental implant and prosthetic market is one of the fastest-growing markets in the US. Equally thriving is the surgical robotics market, which is estimated to reach $20 billion across several medical markets by 2021. Combining both medical fields is YOMI, which is intended to provide assistance in both the planning (preoperative) and the surgical (intraoperative) phases of dental implant surgery.

Commenting on receiving FDA clearance in March, Neocis CEO and co-founder Dr Alon Mozes said, “We are excited to achieve this important milestone for YOMI. We look forward to further demonstrating the benefits of YOMI to the surgeon’s practice and their patients and to bringing the system to select key opinion leaders in the United States.”

According to Neocis, YOMI is engineered to eliminate dentists’ dependence on plastic drill guides, which can impede the site of surgery and block proper irrigation and visibility. The computerised navigational system delivers physical guidance through the use of haptic robotic technology, which provides sensory feedback and constrains the drill in position, orientation and depth. Notwithstanding its digital guidance, the surgeon remains in control and can dynamically change the plan during the procedure, the company emphasised.

Neocis further noted that it is committed to ensuring that dentists who choose to use YOMI in their practice undergo sufficient training on the use of the software and the workflow of the system.

The first clinic to use YOMI in daily practice will be the South Florida Center for Periodontics & Implant Dentistry in Boca Raton, Florida, Neocis stated in a press release. The system has been installed, and Drs Jeffrey Ganeles, Frederic Norkin and Liliana Aranguren have completed training.

“We are excited to incorporate YOMI into our practice,” Ganeles stated. “Adopting state-of-the-art technology is part of our commitment to providing the very best care for our patients. YOMI ensures that the procedure goes precisely as planned. There is nothing else like it, and I believe it will be a game changer for our practice.”

By DTI

MIS launched new digital model analog

MIS Implants Technologies has revealed its new fully digital solution from “scan to crown”.

With the release of the new digital analog for a 3-D printed model, the digital process is now complete. The analog may be used together with intraoral scanning as part of a seamless digital process. The new model analog was designed with a geometry which provides optimal precision and ensures exact positioning in a 3-D printed model.

This ensures a most accurate restoration planning and simulation. This efficient solution also removes inaccuracies in the process of traditional impressions and stone models.

The MIS digital analog has been integrated in the 3Shape and exocad libraries for convenience and ease of use.

www.mis-implants.com
MIS releases new EZ-Base abutment

MIS Implants Technologies has announced the release of a new Ti-Base abutment that offers a solution for anterior screw-retained restorations. According to the implant manufacturer, restoration placement has never been simpler than with the EZ-Base system. The new abutment is designed for extreme angulation and offers safe handling within its screw channel. In addition, more angle options allow for greater comfort for the clinician performing anterior and posterior restorations with convenient handling and placement.

“It’s critical to keep our R & D in direct correlation with the market’s needs,” commented Dr Shelly Akazany, Implants Product Manager at MIS, on the launch. “Both screw-retained solutions and CAD/CAM technologies are in accelerated growth. The EZ-Base belongs to both worlds.”

The EZ-Base screwdriver features a unique tip that allows safe and reliable access from multiple angles, as well as gripping, tightening and loosening within the angulated screw channel with the convenience and at a torque similar to that of a straight screw channel.

According to the company, the system provides an entire range of possibilities for prosthetic restorations in the aesthetic zone. Whereas screw-retained restorations may not have been an option for many anterior cases in the past, the EZ-Base system now provides a solution. It may be used in a digitally planned procedure incorporating CAD/CAM technologies or using conventional methods.

Akazany explained: “It’s important for us, in the Products Division, to offer a broad range of prosthetic options in order to make the clinician’s life simpler, by having the most appropriate solution for each specific case without having to compromise. The EZ-Base system enables more freedom of choice and the ability to perform screw-retained restorations in cases that would have been previously ruled out.”

The EZ-Base system is available for narrow, standard and wide platforms and in both conical and internal hex connections. EZ-Base is also offered in both fixed gingival heights and adjustable options for optimal customisation and convenience.

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precision-milled bridges

Predictable quality and fast results with the new NobelProcera Implant Bridge

Nobel Biocare, swiss based implants and prosthetic solutions manufacturer, has announced that the precision-milled NobelProcera Implant Bridge in high-translucency multilayered zirconia represents the latest in restorative innovation from the company.

With the angulated screw channel (ASC) innovation and completely cement-free adapters, the NobelProcera Implant Bridge offers a fast, predictable and cost-efficient solution for both dental laboratory and clinic.

The ASC option, combined with the pick-up functionality of the unique Omnigrip tooling, revolutionises screw-retained restorations. It makes it possible to reposition the screw access hole in cases where it would otherwise be on the facial or incisal edge, or when occlusal space is limited, while also improving retrievability and reducing the risk of residual cement.

The benefits of ASC are possible thanks to the associated Omnigrip tooling—an innovation from Nobel Biocare’s product development team. The unique tip of the Omnigrip Screwdriver allows the screw to be tightened and loosened within the angulated channel with easy accessibility, as well as easy handling from multiple angles, even in the posterior.

The pick-up ability of the special tip is also an outstanding feature. The Omnigrip Screwdriver delivers a strong hold for full insertion torque—even at an angle—to offer convenience and, most importantly, safety. The Omnigrip is designed to hold the screw firmly when it matters most—when the clinician is working in the patient’s mouth.

The recent NobelProcera launches do not stop there, with precision-milled bridges in the same high-translucency multilayered full-contour zirconia now available. Following the recent introduction of the NobelProcera Crown in the same material, these products harmonise the NobelProcera offering. Each solution in the range efficiently combines high-strength with aesthetics and a time-saving workflow. Thanks to the full-contour nature and excellent occlusal detail, the dental technician need only apply subtle staining, if desired, before polishing and glazing.

www.nobelbiocare.com
4th MIS Global Conference—Paradise Island Bahamas

The next MIS Global Conference will be held from 8 to 11 February 2018 in the beautiful Atlantis Resort in the Bahamas. Following the success of last year’s conference in Barcelona, Spain, with its rich scientific programme, high-level lectures and fabulous entertainment, organisers of the next global conference promise to deliver an intense and unforgettable experience in every aspect.

With the official launch of the V3 in the US currently underway, MIS is devoted to bringing the dental world the latest innovations and is committed to making all possible efforts which will help clinicians improve patient care. At the conference, various workshops will provide an opportunity for meaningful learning in an intimate environment, with accomplished experts in specific areas of interest. The two-day main programme will feature world-renowned speakers, presenting their expertise and ‘know-how’, which may potentially be translated into everyday practice for optimising doctors’ skills for the sake of their patients. Some of the key topics on the schedule include: evolution and horizons in implant therapy, biological principles and predictable aesthetics, long-term forecast for implant therapy and going digital: where, when and how.

Call for clinical cases

As part of its commitment to promoting young clinicians, MIS is continuing the tradition of holding a clinical case competition during the global conference, with this year’s focus on ‘Modern Technologies and Techniques in Clinical Practice’. The best 15 clinical cases will be presented as posters at the conference venue, with prizes awarded to the three winning cases.

Breathtaking views and spectacular entertainment

As in past events, this conference is expected to provide an extraordinary experience of knowledge sharing and the opportunity to meet with colleagues from the international dental community. This year, however, conference guests will also enjoy one of the most beautiful and exotic locations in the Atlantic Ocean, the Atlantis Resort on Paradise Island. When they are not engaged in the workshops and lectures, guests will be able to take in the marine habitat, sports activities, culture and colours of the Bahamas. And lastly, the MIS Global Conference entertainment programme is always full of impressive and fun events that leave guests with fond memories and looking forward to the next gathering._

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Inspiring speakers with a world of experience

The scientific committee, headed by Prof. Lior Shapira, has undertaken the mission of making next year's conference even better than before. “We are making every effort to address contemporary treatment possibilities, and provide insight into the present and future of dental implants as part of clinical dentistry,” commented Prof. Shapira and promises that “The podium will be occupied by high-quality clinicians, researchers, and educators—who will share with you their extraordinary experience and clinical excellence.”
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Questions?

Magda Wojtkiewicz (Managing Editor)
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