case report
Treatment with digital planning and guided surgery

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As we approach one of the most attended and important international meetings of the year, EuroPerio9, some thoughts come to mind. Is there a relationship between diagnosis, treatment planning, the use of CBCT, and the final restorative aspect with the long-term maintenance of bone and soft tissue? While there may not be any scientific publication that addresses all of these issues together, one thing that we know for sure is that implants that we place today may be required to stay in function for 20, 30, 40 years and beyond as people are living longer and longer.

Therefore, our profession needs to be constantly searching for the magic formula that will help patients maintain their natural teeth and, if they do lose teeth, maintain implant-supported restorations for their lifespans. Implant restorations require maintenance over time, just like a restoration on a natural tooth. The magic formula may be different for every person, as there are variations in host factors, such as DNA and genetic predispositions, diet, parafunctional habits and environmental issues. However, when teeth are missing, it is important to understand the aetiology before offering future treatment recommendations.

Currently, the use of CBCT provides essential information regarding the individual anatomical presentations and confirms existing bony topography, bone volume, root position within the alveolus, pathological entities, and much more. Combined with computers and interactive treatment planning software, clinicians can now confidently recommend one or more treatment options based on an accurate assessment of the present condition of the oral environment. We can no longer separate the surgical and restorative components of implant reconstruction now that it is possible to merge CBCT data with data sets from intraoral scans or optical scans of an impression or a stone cast. Restoratively driven treatment planning can be achieved when all members of the dental implant team communicate using today’s exciting technology, and whether bone grafting or soft-tissue grafting, whether immediate implants or delayed loading protocols are followed, we owe it to our patients to operate from a position of knowledge. Our goal should be to provide the most appropriate treatment for our patients, to maximise the longevity of such treatment, to avoid surgical or prosthetic complications, and to avoid or manage the potential of peri-implantitis as our patient population ages.

As always, through the pages of this current Dental Tribune International publication, it is our goal to educate our readers by providing state-of-the-art concepts and content from around the globe. It is through education and knowledge that we may find that magic formula for each and every patient we are fortunate enough to treat. We hope that you enjoy the articles contained within, and if attending, enjoy the multi-specialty presentations at EuroPerio9. Keep on learning!

Dr Scott D. Ganz
Editor-in-Chief
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Importance of 3-D printing in dentistry

Prof. Daniel Wismeijer, Netherlands

This article is from an interview with Prof. Wismeijer on understanding 3-D printing in the digital workflow. He spoke to Dental Tribune at the CAD/CAM & Digital Dentistry Conference held on 4 and 5 May in Dubai in the UAE.

We’re here at the 13th CAD/CAM conference in Dubai. This is the second time I’m here; the first time I was here was about three years ago at the tenth edition. The CAD/CAM conference is focusing on the digital workflow in dentistry.

And what is interesting about the digital workflow is, it’s showing us how dentistry is going to be changing in the coming years. What we see is that we’re getting away from the analogue and going full digital. Digital diagnostics let us look at our patients from a virtual perspective. We do the CAD, the planning; we go into CAM; we have the milling; we have the 3-D printing. And then we can execute the total treatment, as we go to the patients ourselves. So, looking around here at this conference, we see a lot of industry that understands the change that we are up against in dentistry. They’re here presenting the technologies that they all have in their portfolios.

One of the problems, however, is that these technologies are all in verticals. The technologies are not horizontally connected together. So, what we’re looking for is a horizontal connection between all these vertical technologies to get the digital workflow to really work for dentists.

Questions are directed to me all the time: “How are we going to do this?” “Could you explain how I can integrate this into my workflow?” But, if you don’t have the proper software and you haven’t learnt how to use it, then you’re going to get into trouble when you try to implement it. So, the credo here is that you have to learn, unlearn and relearn to understand what’s happening in digital dentistry.

Today, I gave a presentation on 3-D printing in dentistry. Some of the questions that were posed to me after my presentation told me that people do not fully understand yet what 3-D printing actually is; they asked me: “Can I use that printer for printing metals?” No, you can’t. “What can I read to learn more about digital dentistry?” Well, my idea would be to get a book on 3-D printing. This could be a very easy and simple book to help you understand the technologies behind 3-D printing. When you understand the technologies, then you can also find a way of implementing these technologies into the workflow. It’s not just plug-and-play; it’s not “here you have a machine and now you can get to work”. No, you have to understand the role the machine plays in the total digital workflow in dentistry. You have to understand which machines you need to make the digital workflow work for you. So, it’s not just about reading up on the end solutions; it’s also reading up on the basics, the technology itself, and learning about subjects that you need to first understand; that is, what digital dentistry is and what 3-D printing is. If you don’t understand the basics, it’s going to be very difficult to understand the final execution of all these technologies in your workflow.

My advice is: be humble, be prepared to learn, be prepared to unlearn everything that you have learnt in the past and relearn the new technologies to be able to function properly in the new digital workflow.
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Whether we like it or not, we are embracing the digital era in our brave new world. Many dental practices are now becoming paper-free – a digital innovation – and even using tablet computers to record patient details and medical histories. We are continually surprised by the rising age of the technologically savvy patient, particularly those of a certain generation who perhaps we assume would be less so than the perceived iPhone generation.

This change in the patient demographic and attitude towards technology is filtering through to us in the dental profession. The nuts and bolts of implant dentistry tends to lend itself more readily to the digital revolution of dentistry in the UK and now globally. Many practitioners opposed to or reluctant to embrace it are actually being influenced by it through shifting workflows in dental laboratories, even where more traditional clinical practices are followed chairside. Quite often, wet impressions are poured and stone models are scanned to produce STL files for laboratories to process during crown and bridge unit manufacturing.

As an implant clinician, one does not have to invest in a CT scanner or chairside intraoral scanner—there are ways that other centers and laboratories can provide these services. However, having these tools at one’s disposal greatly increases one’s efficiency and means one is not reliant on external services for one’s patients.
So how do we begin the implant digital workflow? Successful implant treatment begins with thorough case assessment and planning of the proposed restoration. This is important for all cases, not just what we deem the complex ones. Even the most experienced implant clinician can miss a potential treatment planning hazard, especially during a busy day. Accurate study model casts are an essential part of this; however, we can now use intraoral scans preoperatively to begin the digital workflow. We take a scan rather than impressions to form digital models. Our laboratory can then use these to create digital wax-ups of proposed treatment outcomes.

We are routinely used to 2-D radiographic imaging techniques in dentistry, but with the availability and access to CBCT scanning devices now, we are able to assess bone quantity and quality of proposed implant surgical sites. With ever-reducing doses of 3-D imaging and improving accuracy, we are able to use CBCT scans, combined with clever software packages such as coDiagnostiX (Dental Wings), to plan safe and accurate implant placement and restoration. We are able to preoperatively plan precise implant placement with safe surgical margins away from important anatomical structures, such as the inferior alveolar nerve or maxillary sinus. From this, we are then able to design and either mill or print a surgical guide to use for precise implant placement.

Even with assisted surgery or guided surgery, there are sometimes certain restrictions that prevent us from achieving the most ideal implant placement, such as this case shown where posterior access in the second molar region was reduced, so achieving the perfect parallel was extremely difficult.

There are fully guided systems available that allow for absolutely precise implant placement, but these are fraught with complexities and should be reserved for experienced clinicians. The accuracy of surgical guides should not be used to make up for a lack of surgical competency however.

There are many factors to be considered when using surgical guides, including whether the guide is tooth-, soft tissue- or bone-supported. Tooth-supported allows the greatest degree of accuracy.

- If tooth-supported,
  - are there windows in the guide that direct full seating of the guide?
  - are the teeth that support exact positioning of the guide mobile? Any mobility adds a degree of inaccuracy.
  - is the guide made from a direct intraoral scan or a scan of a study model? If scanning a study model, is this an accurate stone model representation? Otherwise, there is the risk of poor seating and inaccuracy of the guide.

- If soft tissue-supported, mobility completely negates any accuracy of the guide, so it should only be used for a pilot drill and then a more conventional surgical protocol adopted.

“If you fail to plan—then you plan to fail”—Benjamin Franklin

**Fig. 7:** Printed guide and sleeves. **Fig. 8:** Postoperative radiograph of implant placement.

**Fig. 9:** Surgical placement of LL67 implants. **Fig. 10:** Scanbodies in situ. **Fig. 11:** Tissue level implants.
If bone-supported,
· raising of a very large surgical flap is likely.
· it is very difficult to ensure accurate full seating of a bone-supported guide in the precise planned position and this relies upon external fixation.

Once the implants are placed in situ and fully integrated, we then have a choice of conventional wet impression techniques versus digital intraoral scanning. For the majority of cases, intraoral scanning is extremely predictable and reliable—more so than conventional techniques—with milled (and lately printed) models having excellent properties and less accumulation of processing errors. However, deeply placed implants relative to adjacent teeth with deep contact points are very difficult to scan and pick up. Straumann tissue level implants offer a very straightforward restorative platform to scan from.

With greater numbers of implants and fewer teeth to act as reference points, intraoral scanning becomes less reliable—particularly across the arch—so we need to exercise caution and be aware of its limitations. We have used composite flow stuck to the soft tissue to increase reference points for our scanners, increasing their ability to stitch images more accurately together. With this in mind, we cannot assume the scan is accurate and any framework fabricated would be non-passive; therefore, we must use other methods to verify the scan’s accuracy. We have found locking temporary abutments within a composite framework intraorally the easiest and most reproducible way to do this. It then allows us to design and mill a truly passive framework by Createch and a temporary acrylic bridge.

Conclusion

There are many opportunities to opt in and out of using technology regarding the digital implant workflow. For anyone considering capital investment, the most important question to ask is, how will or can this improve the outcomes I provide to my patients, and then determine whether that warrants the expenditure. Too often are we subjected to sales pitches of the next biggest thing by company sales representatives and gadgets and gizmos end up by the wayside.

Acknowledgements to Andy Morton and Ian Murch, the fantastic laboratory technicians at Borough Crown and Bridge that I work closely with.

contact

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Introduction

Edentulism is a worldwide health issue. This case describes how treating a fully edentulous patient with computerised digital planning (coDiagnostiX and Straumann Guided Surgery) can lead to precise 3-D implant positioning and an optimised prosthetic outcome.

Initial situation

A male patient aged 59 presented with a previously fabricated maxillary overdenture and failing maxillary and mandibular dentition (Fig. 1). The patient requested a conventional removable prosthesis for the maxillary arch and a fixed option to replace his mandibular dentition. His previous maxillary overdenture had poor retention and was planned to be remade. Full-arch extractions were completed three months prior to implant placement. An immediate denture was fabricated and delivered on the day of the extractions.

Treatment plan

The treatment plan involved the placement of five Straumann mandibular implants to support a fixed hybrid prosthesis.
prosthesis. Four of the dental implants were to be used for the provisional fixed prosthesis to attain cross-arch stabilisation during osseointegration. The patient was referred for a CT scan using a dual-scan protocol with coDiagnostiX (Figs. 2–4). The virtual planning strategy was to bypass the mandibular canals and mental foramina and make use of all available bone by using a predictable procedure that was simple and affordable for the patient. Once designed, the guide and prosthesis STL files were imported into a separate CAD programme to design the occlusal fixation guide. Both the surgical guide (Figs. 5–7) and the occlusal fixation
guide (Fig. 8) were fabricated using additive manufacturing techniques.

**Surgical procedure**

Bilateral local anaesthesia was administered. The vertical dimension of occlusion was measured extraorally using a Boley gauge with facial landmarks on the patient’s nose and chin. The occlusal fixation guide was positioned opposing the patient’s maxillary conventional denture and verified with polyvinylsiloxane (PVS) bite registration (Figs. 9–12). While the patient was in centric occlusion, four 1.3 mm diameter osteotomies were created in the labial plate through the alveolar mucosa using the Straumann template fixation drill (Figs. 13 & 14). The surgical guide was removed, and crestal incisions were made bilaterally, extending to the external oblique ridge. Distal releasing incisions and an anterior releasing incision 4 mm to the left of the midline were made (Figs. 15 & 16). After full-thickness flap reflection, the mental foramina and neuromuscular bundles were visualised and isolated (Fig. 17). The surgical placement guide was inserted and...
stabilised using four 1.3 mm diameter Straumann template fixation pins (Fig. 18). Sequential osteotomy preparation was completed to depth through Straumann 5 mm T-sleeves at each site using the Straumann Bone Level Tapered (BLT) fully guided surgical kit (Figs. 19–21). After removal of the surgical placement guide, alveoloplasty of approximately 5 mm was completed (Fig. 22). Restorative space, osteotomy depth and avoidance of vital anatomical structures were verified. Two Straumann BLT SLActive implants (RC, 4.1 mm in diameter, 10 mm in length) were placed at sites #35 and 45. Two Straumann BLT SLActive implants (RC, 4.1 mm in diameter, 12 mm in length) were placed at sites #32 and 42, and a single Straumann BLT SLActive implant (RC, 4.1 mm in diameter, 8 mm in length) was placed at site #31 (Figs. 23 & 24). Straumann angled screw-retained abut-
ments were torqued to 15 Ncm, and sites with thin labial bone around the implant were grafted with autogenous bone as needed. The flaps were repositioned and sutured with 4/0 chromic gut (Figs. 25 & 26).

Restoration procedure

After implant placement, the mandibular complete denture was reinserted with fast-set PVS material placed on the intaglio surface to indicate implant location (Figs. 27–30). Space was made for the temporary copings, the healing caps were removed and Straumann RC temporary copings were placed on implants #35, 32, 42 and 45 (Figs. 31–33). Copings were torqued to 15 Ncm, and the occlusion was adjusted to have uniform contacts in centric relation and balanced occlusion in excursive movements.

The prosthesis was converted from the pre-existing conventional complete denture to an interim fixed detachable prosthesis by reducing the flanges and providing adequate hygiene space (Figs. 34 & 35). Occlusal screws were torqued to 15 Ncm, and the occlusion was adjusted to have uniform contacts in centric relation and balanced occlusion in excursive movements. The screw access holes were filled with extra-light viscosity PVS material (Fig. 36). A postoperative radiograph was taken after delivery of the prosthesis (Fig. 37).

Outcome and conclusion

Utilisation of the template fixation pins was an essential step in transitioning the mucosa-borne occlusal guide to a secure bone-supported guide. The pins are designed to ensure the digitally planned guide is in the correct surgical position to provide a restoratively driven outcome. In this case, the virtual planning models and the actual outcome demonstrated that the Straumann Guided Surgery system provides a high level of precision for the purposes of implant positioning.

about

Dr Phillip Garrett obtained his dental degree from the School of Dentistry at the University of Texas Health Science Center at San Antonio in the US in 2015. After graduation, he remained in San Antonio and immediately began specialty training in the graduate periodontics department. He is currently in his third year and plans to begin working in Phoenix in the US after receiving his certificate in periodontics in May. He is actively involved in clinical research, with a focus on implant surface topography and nanotechnology.

Dr Kyle Trobough is a second-year resident in the graduate periodontics department at the School of Dentistry at the University of Texas Health Science Center at San Antonio. He graduated with a DDS in 2016 and immediately began specialty training in the graduate periodontics department. He received a BS in mechanical engineering from Southern Methodist University in Dallas in the US. His interests include digital implant dentistry and merging CAD/CAM processes with a digital dentistry workflow.

Dr Ryushiro Sugita is a third-year graduate prosthodontics resident at UT Dental in San Antonio. He received his DDS from Tokyo Medical and Dental University. After dental school, he enrolled in the residency programme in the Department of Geriatric Dentistry and gained experience in major reconstructive procedures. After practising for number of years in Japan, he entered the Graduate Prosthodontics Program at UT Dental in San Antonio.

Dr Anna Pitz is a second-year graduate prosthodontics resident at the School of Dentistry at the University of Texas Health Science Center at San Antonio. Prior to residency, she graduated with a DDS in 2016 from Virginia Commonwealth University in Richmond and a BS in biology from Wake Forest University in Winston-Salem, both in the US.
With greater public awareness about cosmetic dental reconstructions, the dentist is often challenged with greater demands from the patient. This increased demand for aesthetic restorative treatment challenges the dentist, laboratory technician and dental manufacturers to develop techniques and materials to satisfy the discerning patient. Utilising digital planning, modern materials and effective techniques, the restorative team can succeed in restoring a smile to proper form, function and health. The case presented in this article demonstrates the significance of a systematic approach to planning, preparation and material selection in full-mouth reconstruction of a patient’s dentition.

Case presentation

A woman in her early forties was referred to my practice by her dental provider because she was dissatisfied with the appearance of her smile. The patient explained that she felt that her existing teeth and restorations were unattractive because of recurrent caries, wear and colour (Fig. 1). Most importantly, she mentioned that she was suffering from tension headaches, grinding and a limited range of function.

Initial diagnostic evaluation at the first appointment consisted of a series of digital images with study casts, a centric relation bite record, a facebow transfer and a full-mouth set of radiographs. In the maxillary arch, the patient had several teeth with worn composite and veneer restorations, as well as abfractions with cervical caries. In the lower arch, several existing composite restorations had worn and exhibited caries on the facial cervical areas. Although there were no restorations present in the mandibular anterior teeth, there was severe wear of the incisal edges, possibly due to grinding and other para-function.

Planning

After reviewing the clinical findings and the mounted models, the patient was diagnosed with a restricted
envelope of function and decreased vertical dimension from continuous wear. In order to develop a treatment plan and determine whether the vertical dimension could be increased, a diagnostic 3-D White Wax-Up (Arrowhead Dental Laboratory) was fabricated (Fig. 4).

In the wax-up, the vertical dimension was increased by 1.5 mm. Also, based on information gathered from the initial consultation and digital images, it was determined that the maxillary central incisors could be lengthened by 1.3 mm to improve the aesthetics. The canines would also be lengthened to restore canine guidance in lateral excursions. Regarding the mandibular anterior teeth, the goal was to correct the length-to-width ratio and create a less worn appearance.

As a result of the information gathered from the diagnostic wax-up, it was determined that aesthetics and function could be enhanced by restoring the entire dentition. The final treatment plan would consist of crown restorations, placing composite cores where needed from teeth #17–27 in the upper arch and teeth #37–46 in the lower arch.

The material of choice for these crown restorations would be Zenostar (Wieland/Ivoclar Vivadent). According to the manufacturer, this translucent zirconia material combines excellent flexural strength with the aesthetics of natural tooth shades.

With full-contour Zenostar restorations, there are two methods of achieving the desired shade: the Zenostar brush infiltration technique or the Zenostar staining technique. Six pre-shaded zirconia blanks—pure, light, medium, intense, sun and sun chroma—form the basis for reproducing the patient’s natural dentition. Owing to their warm, reddish nuance, Zenostar Zr Translucent sun and sun chroma are suitable for restorations with individual colour characterisation and can therefore be used for patients whose own natural dentition deviates from the classical tooth shades.

**Preparation**

Once informed consent had been obtained from the patient, treatment was initiated.

After anaesthetic had been administered, the existing veneer and crown restorations were removed and the teeth cored with composite if there was any indication of recurrent caries remaining in the respective tooth.

Adhese Universal bonding agent (Ivoclar Vivadent) was applied following the manufacturer’s protocol and cured using the Bluephase LED curing light (Ivoclar Vivadent). Using MultiCore Flow Light (Ivoclar Vivadent), build-ups were accomplished on the teeth that required cores. A Clear Reduction Guide (Arrowhead Dental Laboratory) provided with the White Wax-Up was used to ensure adequate reduction for the definitive restorations. Using a coarse-grit chamfer diamond bur (Komet), the entire dentition was prepared for Zenostar crowns, starting from teeth #17–27 and then teeth #37–46.

A full-arch impression was taken using Instant Custom Trays (Good Fit). Made of a proprietary material (PMMA) that becomes mouldable when heated in boiling water, these trays provide a quick, efficient way of capturing a dimensionally accurate impression with uniform thickness of the impression material.

Once moulded and customised to the patient’s maxilla and mandible, full-arch impressions were taken using a heavy and light polyvinylsiloxane impression material (Panasil, Kettenbach).

After the impressions had been completed, a bite relation jig fabricated on the White Wax-Up models was tried in the mouth. Medium-body impression material (Panasil) was placed into the relation jig and seated in the patient’s mouth on to the prepared teeth (Figs. 5 & 6).

The patient was asked to bite into the relation jig until she reached the vertical stops and the material set. Insturuc-
tions for the size shape and colour of the final restorations was forwarded to the dental laboratory (Arrowhead Dental Laboratory), as were the White Wax-Up models. Also, a stump shade (Ivoclar Vivadent) was selected for shade matching of the preparations to assist the laboratory technician in creating natural-looking restorations.

Provisionalisation

Provisional restorations, which would aid in determining the best size, shape, colour and position for the definitive restorations, were made from Sil-Tech (Ivoclar Vivadent) impressions of the White Wax-Ups provided by the dental laboratory.

Using the B1 shade of Visalys Temp (Kettenbach), the Sil-Tech mould was quickly filled and placed on the patient’s prepared dentition. Within minutes, the provisional restorations were fabricated and effortlessly trimmed with trimming burs (Komet). Once the teeth had been desensitised with Systemp.desensitizer (Ivoclar Vivadent) and dried, the provisional restorations were temporarily cemented using Temp-Bond Clear (Kerr). The patient was instructed about their care and use in eating, speaking and biting.

A few weeks later, the patient returned for evaluation of aesthetics, phonetics and bite. Already, she exhibited excitement about and confidence with her provisional restorations, commenting that all her co-workers had remarked that she looked younger and happier.

Most importantly, the patient said that she no longer experienced discomfort in her temporomandibular joint and that her bite had never felt better. Since no adjustment or modification of the temporary was needed, the dental laboratory was instructed to replicate the White Wax-Up when fabricating the definitive restorations.

Laboratory considerations

The White Wax-Ups, colour photographs, impressions and bite relations were forwarded to the dental laboratory (Arrowhead Dental Laboratory). A scan of the White Wax-Ups was used to select an appropriate arch form, tooth size and occlusion from the library of teeth available in the 3Shape software (Fig. 7).

Using 3Shape Communicate, images of the proposed reconstruction were forwarded to my office by e-mail. Any minor adjustments in tooth shape and contour were communicated with the technical adviser to achieve the most ideal aesthetics. Once approved, the milling process was begun (Fig. 8).

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Cementation

Before try-in of the definitive restorations, the provisional restorations were removed using the Easy Pneumatic Crown and Bridge Remover (Dent Corp) and any remaining provisional cement was cleaned off the prepared teeth. The maxillary and mandibular zirconia restorations were tried to verify fit, form and shade. After the patient had been shown the retracted view for acceptance, the cementation process was initiated.

riva luting plus (SDI), a resin-modified, self-curing glass ionomer luting cement, was used for the cementation of these zirconia restorations because it can be used without special preparation using cleaning agents, nor does it require any bonding agent (Fig. 9).

According to the manufacturer, riva luting plus utilises SDI’s proprietary ionglass filler. Ionglass is a radiopaque, high-ion-releasing reactive glass used in SDI’s range of dental cements. riva luting plus releases substantially higher levels of fluoride to assist with remineralisation of the natural dentition. This higher level of fluoride has a proven antimicrobial activity against three cariogenic bacteria: Streptococcus mutans, Streptococcus sobrinus and Lactobacillus. In addition, riva luting plus has low solubility in the oral environment, increasing the material’s ability to resist degradation and wear at the margins caused by oral acidity.

The preparations were washed and dried to the extent that they were still slightly moist. At this time, the cement capsules were depressed consecutively to activate and placed in the ultramat 2 (SDI) amalgamator for only ten seconds for trituration.

Using the applicator dispenser (SDI), the cement was loaded into the restorations (Fig. 8), starting from the mid-line and working distally. With a very low film thickness and creamy consistency, riva luting plus cement was dispensed into the restorations with easy insertion and seating.

Removal of excess cement was cleaned up in about two minutes at the gel phase. After the cement was fully set at five minutes, the occlusion was verified and adjusted. The overall health and structure of the soft tissue and restorations were very good. The patient was extremely satisfied with the definitive results (Figs. 10–12).

The occlusion was checked and verified with T-Scan (Tekscan) to make sure that all of the proper points of contact were in their ideal positions to ensure longevity of the reconstruction. The patient no longer experienced pain and was very pleased with her new enhanced smile (Fig. 10).

Conclusion

In conclusion, having a systematic method for treatment planning, material selection, tooth preparation and cementation, the dental provider will be able to address the needs of the patient more effectively and efficiently. Because of this and more, the final outcome will be much more predictable aesthetically and functionally.

Acknowledgement

Special thanks to Chris Barnes and his staff at Arrowhead Dental Laboratory for the fabrication of the restorations depicted in this case.

about

Dr Ara Nazarian maintains a private practice in Troy in the US with an emphasis on comprehensive and restorative care. He is a diplomate of the International Congress of Oral Implantologists and Director of the Ascend Dental Academy. He has conducted lectures and hands-on workshops on aesthetic materials, grafting and dental implants throughout the US, Europe, New Zealand and Australia.
Immediate implantation with CAD/CAM and functional restoration in the aesthetic zone

Drs Feng Liu, Xiaorui Shi & Miaozhen Wang, China

The aesthetics are always a significant challenge during implant restoration, especially in the aesthetic zone, in addition to the full consideration required regarding function. In this article, we present a case of multiple tooth fractures due to trauma. After tooth extraction, immediate implantation and guided bone regeneration (GBR) were performed. During the prosthetic procedure, the design and transfer of the emergence profile of the soft tissue, functional design and occlusal adjustment, as well as the CAD/CAM process, were satisfactorily realised to achieve the aesthetic and functional goals.

Case report

Dental history

A 40-year-old female patient had sustained trauma to her anterior teeth caused by accidental syncope three
weeks before. The clinical examination found that tooth #11 had been luxated; the crowns of teeth #12 and 21 had fractured, with the residual margin extending 3–5 mm below the gingiva and the teeth affected by Grade III mobility; and the crown of tooth #22 had fractured, with the residual margin at gingival level. There were no obvious abnormalities in the remaining teeth (Figs. 1–4). After excluding major systemic diseases, it was decided that she required fixed implant restoration with high demands regarding aesthetics and function.

Fig. 7: Frontal view of the anterior teeth three months post-op. Fig. 8: Occlusal view of the anterior teeth three months post-op. Fig. 9: Patient smiling three months post-op. Fig. 10: The overjet and overbite between the implants and the mandibular anterior teeth. Fig. 11: The emergence profile three months post-op. Fig. 12: Two impression copings connected for the implant level impression.

Fig. 7 Fig. 8 Fig. 9
Fig. 10 Fig. 11 Fig. 12
Fig. 13 Fig. 14 Fig. 15
Fig. 16 Fig. 17 Fig. 18

Fig. 13: Reshaping of the artificial gingival contour on the model in order to obtain a good gingival aesthetic effect (performed by dental technician Samuel Chou). Fig. 14: Provisional restoration on the model. Fig. 15: Insertion of provisional abutments. Fig. 16: Modification of the gingival contour under the pontic. Fig. 17: Finishing of the reshaping of the gingiva. Fig. 18: Frontal view of the provisional restoration just after delivery.
Treatment procedure

Teeth #12, 21 and 22 were extracted. Tooth #11 underwent early implantation and tooth #22 immediate implantation with GBR (Figs. 5 & 6). After three months of healing, osseointegration had taken place. An implant level impression was taken for fabricating a provisional bridge supported by temporary abutments for teeth #12–22. The technician modified the shape of the artificial gingiva on the model in order to form the proper gingival curve and emergence profile, then finished the provisional bridge, while the dentist modified the gingival shape using an olive-shaped bur intraorally (Figs. 7–18).

The aesthetic and functional outcomes of the provisional restoration were checked. The tip of tooth #13 was too low to achieve a good smile line. When checking the intercuspal position (ICP) and lateral excursion using 80 µm occluding paper, tooth #13 was found to be out of contact. After reshaping the labial contour and filling the lingual surface with resin, tooth #13 had good contact and guidance during ICP and lateral excursion (Figs. 19–23).

Once the aesthetic and functional outcomes had been confirmed, the anterior guidance of the provisional restoration was recorded on an articulator (Artex, Amann Girrbach) and its individual incisal guide table (Figs. 24–27). Next, the emergence profile of the provisional restoration was transferred and the cast model was made and mounted on the articulator (Figs. 28–33).

The cast model was scanned step by step to obtain a digital model and this was integrated with a virtual articulator. The anterior guidance of the virtual articulator was set according to the data from the provisional restoration. Next, the design was completed on computer and the titanium-based zirconia abutment and fixed zirconia bridge produced via CAM. After staining and glazing, the final restoration was completed (Figs. 34–41). The final restoration demonstrated a good outcome, both aesthetically and functionally (Figs. 42–50).
This patient came to the clinic just after the trauma, and according to the intraoral condition, immediate implantation could have been carried out. However, owing to the unexplained accidental syncope, diseases of the central neural system were to be excluded first, so delayed dental treatment was suggested.
Three weeks later, after a general physical check-up, implantation was begun. Usually, operation within 48 hours after tooth extraction is considered as immediate implantation, while operation within the first six weeks after tooth extraction is considered as early implantation. Therefore, in this case, implant #11 was early implantation and implant #22 immediate implantation. The pre-operative CT analysis showed that the labial side of the alveolar ridge of teeth #12, 11 and 22 was deficient; thus, GBR was needed in order to obtain sufficient bone quantity.

After three months of healing, both hard and soft tissue around the implants had been well maintained, providing a sufficient foundation for the maxillary restoration. In order to form a good gingival shape, either the provisional restoration can be adjusted step by step or the shape of the soft tissue can be designed first, the provisional restoration manufactured to meet the aesthetic demand directly, then the soft tissue intraorally adjusted and reshaped.

In this case, we followed the second option. After using an olive-shaped bur to adjust the form of the gingiva under the pontic, making it match the provisional restoration, which had already been well designed and manufactured, a perfect soft-tissue outcome was achieved.

By means of regular methods to transfer the emergence profile, it was copied to the final restoration, which is the foundation for the good soft-tissue effect of the final prosthesis.

**Fig. 42**: The titanium-based zirconia abutment. **Fig. 43**: Frontal view of the anterior teeth just after delivery. **Fig. 44**: ICP occlusal contact (12 µm occluding paper, red). **Fig. 45**: Protrusive contact just after delivery: only tooth #11 achieved contact (12 µm occluding paper, black). **Fig. 46**: After occlusal adjustment, the protrusive contact was even on the restoration (12 µm occluding paper, black). **Fig. 47**: Protrusion just after delivery.
It was also very important to obtain the proper anterior guidance during the maxillary incisal implant restoration procedure. We carried out the adjustment of the anterior guidance during the provisional restoration procedure. Once the patient had adapted, we set the individual incisal guide table according to the provisional restoration, cross-mounted the cast model with the provisional restoration model and used the same data to form the anterior guidance of the final restoration.

When manufacturing the final restoration, a CAD/CAM system was used. Digital models, ICP relationship and data on anterior guidance were integrated into the virtual articulation system. In the process of CAD, the precise design of both aesthetic and functional aspects could be realised.

In this case, a titanium-based zirconia abutment and zirconia bridge were used. The zirconia material used on the titanium base was a special zirconia with extremely high strength, which can guarantee excellent strength and durability of the restoration even if very thinly applied. The zirconia material used for the bridge restoration was a kind of CAD/CAM zirconia with a high translucency and 3-D multilayer colour. Without any ceramic veneer, only with a little staining and glazing, an excellent colour and translucent effect can be achieved.

This was a difficult implant-supported aesthetic restoration case. With the great efforts of the surgeons, prosthodontists and technicians, a satisfactory result was achieved.

The surgeons in this case were Drs Feng Liu and Miaozenh Wang and the prosthodontists were Drs Feng Liu and Xiaorui Shi. The restoration was completed by dental technicians Samuel Chou and Chunyu Duan.

Dr Feng Liu is a clinical professor at and director of the clinical division aesthetic dentistry training centre at Peking University Hospital of Stomatology in Beijing in China. He is a certified member and China chairperson of the European Society of Cosmetic Dentistry, a certified international trainer of the International Society of Computerized Dentistry, Chairman of the Chinese Society of Digitized Dental Industry, and a standing committee member of the Chinese Society of Esthetic Dentistry.

Dr Xiaorui Shi is an attending doctor at the Peking University Hospital of Stomatology. She is a member of the European Society of Cosmetic Dentistry and a youth committee member of the Chinese Society of Esthetic Dentistry. Her focus is on aesthetic and functional reconstruction of complex cases.

Dr Miaozenh Wang is an attending doctor at the Peking University Hospital of Stomatology. She is a member of the European Society of Cosmetic Dentistry and European Association for Osseointegration. Her focus is on implant surgery, digital implantation and aesthetic reconstruction of soft and hard tissue.
**Aesthetic Digital Smile Design: 2-D-/3-D-assisted communication and software design**

Dr Antonello Demartis, Luca Borro & Dr Valerio Bini, Italy

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**Introduction**

The communication between dentist and patient is important, especially in cases of partial or complete aesthetic restoration in the anterior (smile makeover). Nowadays, it is important not only to treat oral pathology, but also to request an aesthetic evaluation of the patient’s smile to obtain results that respect the patient’s aesthetic expectation. The smile is our business card and represents the first thing that distinguishes us in human relationships, in work and in social life. It is necessary to know that a smile can appear unpleasant even if there are no evident issues or pathology, influencing people/patients’ psychologically. The clinician should understand the psychological needs of desire, perception and personality to explain in a better way the necessary therapeutics and/or aesthetic choices. When a smile is being designed, these parameters are fundamental and dependent on the communication with the patient and they should be considered in the evaluation of a 360° clinical approach. It often happens that patients are not able to identify their expectations, so dentists must be able to consider whether their exigencies can be satisfied.

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What does the clinician need to plan an aesthetic dentistry treatment? What is needed to plan a smile that is integrated into the face? The diagnostic history of each clinical case must include anamnesis, analogue and digital clinical models, radiographic examination, intraoral and extraoral photographs, functional analysis, aesthetic dentofacial analysis, intraoral diagnosis, static
and dynamic extraoral diagnosis, the psychological approach to the patient and informed consent.

Of benefit for the clinician, regarding the patient, is to employ intuitive language in taking a subtle approach to the patient, and he or she must subject himself or herself to the expertise of aesthetic dentistry to become the real protagonist of aesthetic dentistry. As patients’ requests mainly relate to aesthetics, we must depend on the definition of “aesthetic smile” to know how to apply it appropriately. Is there a concept of “beauty” achievable in aesthetic dentistry? In our opinion, a smile cannot lose its meaning, attraction and personality; therefore, it has psychological, sociological and communicative involvement. Only through effective communication can we answer to the needs of the evolution of the past 50 years. Today, it is easy and possible to communicate regarding aesthetics, owing to the instant availability of the digital image and since the image is a universal language, easy, immediate and decoded.

With the progress of technology and the introduction of digital photography, programme and protocols have been introduced to facilitate communication increasingly through the preview of the treatment result that the patient will receive (smile design or oral design). More generally, Digital Smile Design (developed by Dr Christian Coachman) allows the use of presentation software (Keynote, Apple, or PowerPoint, Microsoft) or software specifically dedicated to dentistry. In addition to these, regarding 2-D aesthetic pre-visualisation, it is possible to use image editing software, such as Photoshop Smile Design as described by Dr Edward McLaren and Aesthetic Digital Smile Design (ADSD) by Dr Valerio Bini.

A detailed smile analysis and its design are fundamental parts of this method and indispensable for the formulation of the treatment plan for the clinical case. The first step involves the acquisition of images and video (static and dynamic dentofacial) on the basis of the ADSD protocol (Figs. 1–3). The import of these important elements into the aesthetic digital file of the patient is complementary to the anamnesis because they are integral to the objective intra- and extraoral examination.
The second step involves the aesthetic analysis according to the main guidelines. Dynamic smile analysis and dentolabial phonetic analysis are identified in their characteristics through recording images caught during sleep, speaking and smiling, allowing better understanding of the variation of the soft perioral tissue.

Nowadays, digital technology is a successful reality and a confirmed part of daily life in wider society; consequently, the digital workflow in dentistry has become suitable for all professionals.

Aesthetic Digital Smile Design

The dentist must communicate and explain to the patient how the smile can be improved and personalised; therefore, it is necessary pre-visualise the outcome of an ideal aesthetic treatment to show it to the patient using images.

In order to satisfy the exigencies of both the patient and the team in a clinical case, the methodology of ADSD allows the clinician to analyse and provide an indication of the dimensional and morphological aesthetics of the tooth volume, starting from the acquisition of 2-D elements useful to the aesthetic analysis through photographs, an instrument we can all have in our clinic. The smile design digitally realised in 2-D offers the ability to obtain new and predictable compositions of aesthetic tooth design using images in 2-D with visual perception in 3-D (picture-in-picture). Digi-
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tal processing of the images can be done in different ways according to the exigencies of the smile designer; currently ADSD can be executed using the well-known graphics editing programme Adobe Photoshop CC (Adobe Systems).

ADSD uses a particular set-up dedicated to the smile designer, through which it is possible to use this well-designed software in a simple way by the dental team. The ADSD method provides a photographic result that as far as possible reflects the clinical reality. Forms, colours, disposition and aesthetic dental composition are inseparable from the aesthetic facial composition. They perform a primary role through the 3-D visual perception that the digital dental image editing yields. Once the images have been imported into the work area of the software, the frontal and lateral photographs (digital orthogonal projection planning) are aligned to develop the dentofacial mapping related to all its main components (ADSD digital face mapping; Figs. 4 & 5).

Through the visual information provided, the smile design or oral design is a useful way to communicate to the patient the envisioned aesthetic dental composition of the smile, synonymous with predictability. This offers a great instrument for communication in a 360° clinical approach, especially with the dental team. The modelling and placement confer the aspect and the visual 3-D perception of the tooth morphology that the dental team will copy in the CAD modelling phase (Fig. 6).

3-D modelling

In aesthetic dentistry, the role of 3-D has begun to assume greater importance both in the optimisation of the clinical workflow and as an important improvement to the efficiency in communication between dentist and patient. 3-D modelling is a technical discipline that provides the virtual reconstruction in 3-D of an object in the real world. This discipline, which has its origins in architecture and design, is used in unusual contexts, such...
as biomedical field. Dentistry was the first discipline to use 3-D modelling as an instrument perfectly integrated into the work process. Other medical disciplines followed and now this technique is frequently used in clinical and research contexts.

Because of this, smile design could be defined as dental specialisation that can certainly use 3-D as a significant instrument of support for a large part of clinical and diagnostic activity. 3-D in smile design overcomes all of the limits of 2-D technology. Currently, 3-D permits the user to select teeth from a 3-D library, available in commercial software, or to realise a personal database starting from an intraoral scan (Figs. 7a & b).

The advantage that 3-D technology certainly can offer is relevant: it allows the design of patient-specific teeth directly in 3-D, allowing quick access to all production systems, including rapid prototyping. There are many software programmes available that facilitate working in 3-D, and among these, there is one that is appreciated for a series of characteristics that are different from the others, such as its ease of use, being entirely free of charge and its infinite versatility. The factotum software is called Meshmixer and is from Autodesk, a leader in 3-D software. It allows the designer to work at 360° on the mesh, generating an infinite series of modification (Figs. 8a–e).

3-D prototype

An important improvement to the workflow of smile design is the printing of prototypes with the new 3-D printers, facilitating an increase in the efficiency in the modality of communication between dentist and patient. From a clinical point of view, dentistry, more than the others, is a discipline that permits a very concrete and realistic use of 3-D printing. There are different printing technologies now available, but in dentistry, the technologies mainly used are stereolithography (SLA) and PolyJet (Stratasys).

SLA is a printing technology that uses photosensitive resin to produce physical objects thorough the use of laser light. This photosensitive resin contains photo-activators, such particular molecules that polymerise if exposed to a luminous ray of a certain wavelength. A subgroup of SLA is digital light processing (DLP), a technology that uses light to polymerise resins as well, but the luminous source is the beam emitted from a projector in LED (not laser).
PolyJet technology ejects drops of resin from nozzles on to the build tray and the resin is polymerised by a diffused light of a determinate wavelength. Unlike SLA technology, PolyJet makes use of high-cost machinery without providing added value considering that the same is obtainable with some low-cost technologies. Owing to our experience, we prefer to utilise an SLA printer to realise a 3-D resin model, and based on this, a silicone key (negative reproduction) is fabricated, then we place the acrylic resin into the silicone key and thereafter insert it into the patient’s mouth and wait until it solidifies. In the meantime, we remove any excess material from the silicone key. After polymerisation, we remove the silicone key and finish the resin plate as best we can. Once these steps have been completed, we show to the patient our vision of the aesthetics of his or her smile, based on our earlier analysis with digital analysis of photographs and successively prototyped in 3-D simulated in his or her mouth, and we evaluate with him or her the envisioned final result (Figs. 9a–d).

Discussion

In our opinion, photography provides the ideal morphological indication of the new smile that should be communicated to the patient. With ADSD 2-D methodology, we obtain some indication useful also for the team that can develop, through 3-D modelling, a prototype silicone key to test in the mouth with resin. The purpose of aesthetic pre-visualisation with ADSD is to demonstrate to the patient what we can obtain from the aesthetic analysis of photographs and the possible treatment plan (Figs. 10a–i). The problem today, in this communication with 3-D, is the absence of a texture that looks similar to that of the natural dentition, so when the model is shown to the patient, it may evoke a negative reaction owing to what may appear to be a very poor integration. Such visualisation of a natural texture can at present be obtained only with photography (Fig. 11a & b).

Conclusion

A series of technical procedures have been proposed that involve digital smile design, ranging from 2-D to 3-D. This article has described an alternative method for a 3-D model that is cost-effective and reproducible to obtain a prototype from a digital photograph of the smile. Meshmixer software for 3-D design has the advantage of being open source and using it requires minimal learning. Moreover, with Meshmixer, one can create in an easy way a personal digital dental database complementary to the 2-D library. The database can be modified following the rules of smile design that has as its purpose 3-D printing of a model in resin characterised by high accuracy of details.

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about

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Dynamic navigation
by innovative registration

Dr Ricardo Henriques, Portugal

Background

3-D implant planning and mapping that plan to the real surgical environment are two important steps in implant rehabilitation. Misplaced implants can create difficult aesthetics, functional and biological problems and can result in implant loss.

There are three ways to transfer a planned implant’s position into the real patient’s jawbone:
1. mental navigation, so-called freehand navigation,
2. static navigation using surgical templates, and
3. dynamic navigation using a stereoscopic camera.

The freehand approach is totally dependent on the surgeons’ experience, skills and mindset during treatment and creates the highest deviations compared to the other approaches.

The usage of surgical templates provides a higher accuracy compared to freehand surgery, but has a few limitations, such as the inability to modify the plan once the surgical template has been manufactured. Surgical templates require longer drills which can make their use quite difficult or even impossible. Other concerns are irrigation issues and incompatibility with advanced surgical protocols.
Dynamic navigation is, at present, the most effective way to transfer the planned implant’s position to the real patient as it guides the surgeons’ motions using real-time feedback. It is especially useful to reduce flapped procedures with the advantage of improved soft-tissue healing, patient comfort and reduced bone resorption. Dynamic navigation allows planning modifications at any time, even during treatment, and can be used in cases with limited mouth opening or in combination with osseodensification drills.

The dynamic navigation concept using trace registration

In this approach, the patient’s jaw and the surgical drill’s location are being tracked by the navigation system’s tracking camera, using special tags affixed to them. To correspond between the physical patient’s jaw and its on-screen cone beam computed tomography (CBCT) scan representation, the tag installed on the patient’s jaw must be mapped with the CBCT scan. The mapping of the trackable jaw tag to the CBCT scan is called registration. Traditionally, the patient would have to be CT-scanned with an artificial radiographic marker, also known as “fiducial”, which has to be later identified in the CT images by the navigation system’s software in order to enable the registration. The innovative trace registration method (Navident, ClaroNav) eliminates the need for this artificial fiducial body to be present in the image, by replacing it with natural high-contrast surfaces, such as tooth crowns or abutments already present in the image. Therefore, it eliminates the need for patient exposure to a new dedicated CT scan with a fiducial. The level of radiation is an important issue in diagnosis. This new method also eliminates the need to have a special stent prepared to couple the fiducial or trackable tag to the jaw in a highly stable and repeatable manner, which was previously essential for the performance of accurate navigation.

To treat the maxilla, a pattern tag, or Head-Tracker, is positioned on the patient’s head like glasses with contact points that don’t move with patient muscle contractions or lower jaw movement (Fig. 1). This ensures that the Head-Tracker maintains a stable relationship with the skull, and thus the maxilla. For the mandible, another pattern tag, called Jaw-Tracker, is temporarily connected to one to two teeth using dual-cure composite resin (without etching the teeth to allow for easy removal; Fig. 2). This Jaw-Tracker can also be used for the maxilla instead of the Head-Tracker.
The surgeon chooses four to six identifiable landmarks on structures which are rigidly attached to the jawbone (teeth, abutments) and are easily visible in the CBCT scan. In the next step, the surgeon traces a path on the surface of each one of the marked structures with a tracer tool, also tracked by the camera (Fig. 3). The system collects 100 points on each one of the traced structures, and optimally matches them to the CT image data to register the Head-Tracker or Jaw-Tracker, with the patient’s maxillary or mandibular CBCT scan, respectively.

Advantages of trace registration
The most important advantages of the trace based over the fiducial/stent-based registration method are:
1. No need to design and fabricate a stent or guide in advance, eliminating the associated preparation time and effort, as well as the potential risk for inaccuracy due to improper seating of the stent during the scan or procedure.
2. An existing CBCT scan can be used, there is no need for a special scan with stent and fiducial(s). The scan may be taken in full occlusion resulting in easier digital prosthetic planning.
3. No stent or guide is in the patients’ mouth during treatment, allowing the same access space in the oral cavity during surgery as with a freehand approach.

Possible limitations
1. At least four high-contrast structures fixed to the jaw bone must be available and accessible for tracing. These can be teeth, abutments, bone screws, orthodontic brackets and wires, or similar structures. With fully edentulous patients, regions of the jaw bone itself may be exposed and used as landmark regions.
2. Each of the traced regions should not have changed in appearance or location relative to the jaw bone since the scan was taken. If guidance is critical and changes to the jaw such as changes in teeth position are a concern, a fresh scan prior to surgery is advised.

Case presentation
The treated patient was a 54-year-old female with a removable prosthesis, who wished to have a fixed solution. The patient was a non-smoker without medical problems. Intraoral examination revealed the absence of tooth #24 and bone resorption where the teeth had been extracted.

Planning procedure
A CBCT scan was taken without any radiographic marker (Fig. 4). The images were taken with a Carestream 8100 3D (Henry Schein). The field of view used was 80 x 90 mm and a voxel size of 150 µm. The exposition parameters were 84 kV and 4 mA.

The images were analysed and converted into DICOM files and then converted into a 3-D virtual model by the Navident software. A virtual crown and implant were planned to have 2 mm of buccal bone and a restorative space at the centre of the crown (Fig. 5). The virtual
Implant planning was then modified creating an angulation of six degrees in vestibular direction, so the surgeon would be guided to initiate bone preparation with a six-degree vestibular angulation (Fig. 6).

Surgical procedure
Local anaesthesia was performed in region #24 and aseptic and sterile conditions were applied to prevent infections. The Head-Tracker was positioned and inspected for stability. Trace registration was performed by marking four landmarks on teeth using a panoramic 3-D presentation of the jaw, then tracing the landmark regions with the tracer tool while the camera and software collected 100 points on each tooth (Fig. 7). Navident automatically registered the Head-Tracker with the patient’s maxillary CBCT scan based on the collected points.

In the next step, drill calibration and accuracy check were performed before the use of each drill. A small incision for a reduced flap was made. All osteotomies were performed at 800 rpm. The virtual implant angulation was pre-surgically modified six degrees in vestibular direction, so the osteotomy could be initiated on that angle.

Next, the virtual implant was repositioned intraoperatively on the Navident software and the rest of the site preparation was carried out according to the final angulation with osseodensification drills (Fig. 8). The osteotomies were made with two angulations and tracked in real time and the same procedure was applied for the implant insertion. A cover screw was attached before the surgical area was sutured. The patient reported no discomfort during the surgery.

Postoperative evaluation
The patient reported no pain or swelling. Radiographic and clinical images were taken with a direction indicator screwed onto the implant. The postoperative evaluation showed that the position of the implant exactly corresponded to the virtual planning made beforehand (Figs. 9–14).

Conclusion
The patient benefited from a treatment with a reduced flap and precise implant placement using dynamic navigation technology with an innovative trace registration method.

Trace registration in combination with dynamic navigation proved to be a valid technology for osteotomy preparations and implant placement. It does not require a dedicated CT with a radiographic marker nor the fabrication of a stent or clip.

When clips or stents are difficult or impossible to use, or even in every dental patient case, trace registration can be the best solution for dynamic navigation implant placement.

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Patient preference fuelling transition in US$1.6 billion American and European overdenture market

Graeme Fell & Jeffrey Wong, Canada

The transition to fixed-hybrid restorations from removable options is driving sales growth in the US and European overdenture market. While the removable overdenture market is still growing, an increasing number of people are opting for fixed-hybrid restorations. This is a result of patient preference and awareness about the benefits of fixed full-arch restorations, as well as demographic factors. While the shift is occurring across both the US and Europe, some of the more mature markets in each region are seeing lower growth rates.

Trends in total overdenture market

The US and European market for overdentures and implant-supported bridges is poised to experience mid-single-digit growth by 2024, reaching approximately US$2 billion as reported by iData Research.1 This analysis includes the markets for overdentures (implant-supported, removable implant-supported bar-retained and fixed-hybrid overdentures) and implant-supported bridges (cemented and screw-retained). Market growth is expected to result from the transition to premium fixed-hybrid restorations, which have higher average selling prices than do alternatives. While competitive price cuts and inexpensive solutions are limiting potential market growth, these factors are primarily offset by high unit growth. Market growth is expected to be higher in the US, whereas the more mature European market will experience lower single-digit growth.

Increased marketing and patient awareness fuelling US market

In 2017, the US overdenture market grew notably, largely owing to increasing patient awareness with regard to implant-supported overdentures. Several entities, such as ClearChoice Dental Implant Centers, have widely advertised their services across the US, attracting more patients not only to their companies, but also towards implant-supported restorations in general. Furthermore, laboratory consolidation is occurring throughout the country, absorbing small-scale laboratories that lack the financial means to invest in new technology. With various corporate entities competing for market share in dental implants through advertising, patient awareness is expected to continue increasing.

Demographic factors are also driving the market in the US. In 2017, over 49 million people in the country were estimated to be over 65 years old, accounting for 15.2% of the population. By 2024, this demographic is expected to exceed 17%, reaching 20% by 2050.2 This age group represents the largest demographic of edentulous patients. Consequently, the growth of the elderly population will result in more potential patients seeking implant-supported full-arch restorations. Furthermore, the rising wealth of retirees, relative to that of previous generations, will increase interest in new technologies and premium products, further pushing this market forward.

Maturing removable implant-supported bar-retained overdenture market in Europe

The European market for implant dentistry is considerably more mature than that of the
US, but will still see growth as a result of demographic factors, economic recovery and the mentioned transition to fixed-hybrid restorations. The European market, particularly in the northern regions, has in the past consisted of a larger share of removable implant-supported bar-retained overdentures than in the US. However, this market is maturing considerably, with removable implant-supported bar-retained overdentures being cannibalised by both implant-supported and fixed-hybrid restorations. This transition has been brought about by both patient and dentist preference.

Further contributing to the maturing market is the decline in the number of fully edentulous patients. While single-unit implant-supported restorations are increasing the demand for crowns, they are concurrently taking market share away from bridges. In turn, partial restorations are taking market share away from full-arch implant-supported restorations. Improvements in dental health will mean fewer and fewer teeth will require replacement. Conversely, Europe is experiencing a marked demographic shift: low birth rates and higher life expectancies are dramatically changing the shape of the population. In 2017, people aged 65 and over were an estimated 19.2% of the overall population, an increase of 0.3% compared with the previous year and an increase of 2.4% compared with ten years earlier. This trend will continue throughout the forecast period. While these two market factors oppose each other, the growth of the elderly population will ultimately result in more potential patients seeking implant-supported full-arch restorations.

Most of the European economies are starting to experience growth after a slow recovery from the European debt crisis. This trend is especially prevalent in western Europe, where Germany, France and the UK saw high gross domestic product growth in 2017. Rising spending habits and patient preference for permanent fixed teeth have driven demand for premium-priced fixed-hybrid restorations. The average selling price for fixed-hybrid overdentures is the highest of all segments, owing to the high number of fixtures required and the more expensive fixed prosthesis. Consequently, increased market penetration of these restorations will buoy the average selling prices of the total market in the face of price competition, driving up market value.

**Increasingly competitive implant-supported bar market despite Nobel Biocare’s leading position**

Among CAD/CAM manufacturers, Nobel Biocare maintained its leading market share in 2017, despite increased competition across the market. The increasing affordability of CAD/CAM systems has allowed laboratories to enter the CAD/CAM implant-supported bar market in a significant way. This, combined with other competitors expanding their milling capabilities, has resulted in a highly competitive market in the US and Europe. Amidst market consolidation and technological development, attractive pricing and unique solutions will allow competitors to maintain market share.

Editorial note: This article is based on iData Research’s 2018 US market report suite for overdentures and European market report suite for overdentures, which were both published in May. Reference list is available from the publisher.

**About**

**Graeme Fell** is a Research Analyst at iData Research and was the lead researcher for the 2018 US and Europe market report suites for overdentures and implant-supported bridges. His work has included a number of other research projects in other dental and medical device segments.

**Jeffrey Wong** is the Strategic Analyst Manager at iData Research. He has been involved in numerous dental market research projects over many years and now leads a team involved in that market and many others.

**iData Research** is an international market research and consulting firm focused on providing market intelligence for the medical device, dental and pharmaceutical industries. More information about the company’s research can be found at https://idataresearch.com/.

![Implant Bar Market Competitive Landscape for CAD/CAM manufacturers in US and Europe (2017)](image-url)

*Fig. 2: Implant bar market competitive landscape for CAD/CAM manufacturers in US and Europe (2017).*
Digital integration from beginning to end

Breaking down boundaries between clinician and technician

By DTI

Nobel Biocare recently introduced an expanded CAD/CAM portfolio, designed to enhance flexibility and connectivity between treatment partners. This new offering is made possible through the company’s close collaboration with KaVo. Bringing complementary areas of expertise to the partnership, these two leading dental innovators are now developing fully integrated digital equipment and software solutions designed to bring about seamless beginning-to-end treatment workflows for clinics and laboratories. New KaVo imaging equipment and DTX Studio software are part and parcel of the two companies’ joint efforts.

Nobel Biocare is expanding its CAD/CAM offering with new flexibility and connectivity.

New imaging device

The KaVo LS 3 desktop scanner starts the digital journey for the clinician and laboratory technician with speed, colour and precision. Designed to enhance efficiency, it seamlessly connects to DTX Studio design software for fast restoration planning. Even when working on the most complex cases, dental technicians can save time without compromising quality: a complete jaw scan...
can be performed in under 60 seconds with an accuracy of up to 4 µm, according to the ISO 12836 standard for assessment.

The scanner is equipped with an advanced optical system that captures the fine textures and colours of the dental model for true visualisation; and scans can be managed directly on the scanner itself, using its intuitive 5 in. touch-screen interface. Designed with an awareness of the virtue of mechanical simplicity, its spacious, open measurement field provides easy access to the case and makes it possible to mount a full articulator, thus further increasing efficiency at the dental laboratory.

**Connectivity for everyone**

The DTX Studio suite offers exciting new solutions to connect the dental professional with the entire treatment team at each stage of dental implant treatment. It integrates the very latest technologies and equipment, from patient imaging acquisition to post-treatment follow-up—including diagnostics, treatment planning, implant surgery and restoration design.

Furthermore, it is now possible to manage 2-D and 3-D data from radiographic and optical sources in a single software application throughout the practice. DTX Studio for clinics processes data in dentistry-relevant workspaces and is geared towards daily use in both Windows and macOS environments. It provides users with tools for ease and efficiency, such as online collaboration between NobelClinician and DTX Studio for laboratories, allowing the production of a TempShell provisional restoration in-house for same-day, immediate screw-retained provisional restorations.

For dental laboratories, the DTX Studio suite provides a new opportunity to become the go-to laboratory of the future, facilitating flexibility in the choice of workflow and business model. The design software will accept intraoral scan files from systems such as TRIOS (3Shape), iTero (Align Technology), True Definition Scanner (3M) and CS 3600 (Carestream Dental), as well as files from other desktop scanners. Furthermore, laboratory owners will benefit from the best of two worlds: direct access to premium NobelProcera centrally manufactured products, including bars; and open output with the option to produce cement-retained restorations in-house.

**Authentic restorations made for precision fit**

Using the new KaVo LS 3 in combination with DTX Studio, dental technicians can access the full portfolio of NobelProcera restorations. With the resulting smooth, fast workflows, they can choose to produce authentic, precise-fitting NobelProcera CAD/CAM solutions outsourced to state-of-the-art facilities in Mahwah in the US and Chiba in Japan.

Prostheses are manufactured in accordance with an ISO 13485-compliant quality management system and cleared by the U.S. Food and Drug Administration where required, and the output quality of each is monitored. This results in products demonstrating a high degree of precision fit, mechanical stability, and years of safe and reliable performance. When assistance is needed, direct local support is available from Nobel Biocare specialists fully trained on the workflow.

**Digital production on demand**

NobelProcera Scan and Design Services help laboratories consistently meet increasing demands for high-quality implant-based restorations without requiring substantial investments in new equipment and staff training. The dental professional can send a case from any one of the 25 approved scanners to NobelProcera Scan and Design Services and then receive precision-fit bars, abutments and implant crowns, or a 3-D printed model. Whether using an intraoral or desktop scanner, the process is simple, and within a matter of days, the precisely manufactured restoration is shipped to the laboratory with a material authenticity certificate and a five-year product warranty.
Laboratory scanning with Maestro MDS 500

Dr Terence Whitty, Australia

The digital dental workflow has three components: scanning or acquiring data, computer-aided design (CAD) and computer-aided manufacture (CAM). All components are very important, but just as in the analogue world, the acquisition of data, namely scanning, is arguably the most important.

The introduction of accurate intraoral scanners has really increased the popularity of digital dental data acquisition; however, these devices are still expensive and some come with outrageous compulsory annual fees for both the dental surgery and the dental laboratory, just about holding them to ransom just to use the device. The alternative has been used for years and that is the humble laboratory scanner.

Laboratory scanners were traditionally only for upmarket laboratories, as these devices were originally pricey. They were also often inaccurate, especially when used for implant-retained prostheses. The dental model was poured and the dies sectioned and then these were scanned separately and recombined in software as a virtual model. Impression scanning was only a wish with the early scanners and some tried, but had poor results.

A great deal has changed in only a few years, and with the introduction of the fifth-generation scanner from Maestro 3D, it is apparent that the laboratory scanner has definitely come of age with an accurate, reliable, fully programmable scanner. With this new release, there is an emphasis on major improvements in scanning in general and especially
impression scanning, with the MDS 500 scanner able to scan any type of impression, be it of polyvinylsiloxane or of various rubbers or alginate, most without any scanning spray. The scanning software instantly inverts the scan, ready for export to any dental CAD software, including Maestro 3D’s own comprehensive Dental Studio package.

The technology behind the MDS 500 is an advanced variant of structured light, or striped light as it is commonly known, and this is the technology Maestro 3D has always adopted, as it has always been superior to laser stripe scanners. It is interesting to note that other companies are just catching up in adopting this technology.

The scanner is a closed-case-type scanner, contrary to popular designs at the moment, and this has been purposely done to achieve the highest standard of accuracy, precision, resolution and repeatability that only this type of design can offer. This is especially true in light of the high-precision demands for implant-retained prostheses.

There is a conjecture by some companies about the colour of the light that needs to be projected by a structured light scanner and they assure their customers that blue light is superior. The facts are that scanner cameras are monochrome greyscale; therefore, the only effect that blue light brings is a lower contrast of the image. If the goal to be pursued is the highest precision, accuracy and resolution 3-D scan, white light is better than blue light.

The MDS 500 is a well-thought-out, affordable scanner capable of incredible accuracy. Furthermore, it, of course, saves files in industry standard STL and various other formats. My advice is to check it out today.

**contact**

Dr Terence Whitty is a well-known dental technology key opinion leader and lectures nationally and internationally on a wide variety of dental technology and materials science subjects. He is the founder and owner of Fabdent, a busy dental laboratory in Sydney in Australia specialising in high-tech dental supply and manufacture. Using the latest advances in intra- and extraoral scanning and CAD/CAM, including milling, grinding and 3-D printing technologies, most applications are covered, including orthodontics, fixed and removable prostheses, computer implant planning and guidance, temporomandibular joint dysfunction syndrome, as well as oral and maxillofacial, sleep and paediatric dentistry. He has published articles in various international journals. He can be contacted on +61 2 93137971 or via www.fabdent.com.au.
Dentsply Sirona offers dental professionals different workflow options

By DTI

Opened almost two years ago, the Digital Dental Academy (DDA) is one of the most modern training centres for dental professionals in Europe and the world’s largest CEREC training institute. The DDA, with its advanced laboratories and high-tech devices, offers individual training programmes for every level of knowledge on CEREC, guided implantology, 3-D planning and diagnostics.

This March, at the Digital Implant Workflow Press Forum, an event devoted to the promotion of knowledge on digital processes in dentistry and organised at the DDA by Dentsply Sirona, Dental Tribune International (DTI) had the opportunity to speak to Dr Volker Winter, Product Manager for CAD/CAM at Dentsply Sirona, about digital technology and its benefits for implant dentistry.

There is a wide range of systems for digital implant workflows available on the market. What advantage does Dentsply Sirona offer dental professionals?

Dentsply Sirona covers every single step, from the diagnosis with imaging systems to treatment planning and execution and prosthetic restorations. What sets us apart from our competitors is that Dentsply Sirona offers dental professionals different workflow options. Some may, for instance, focus fully on chairside treatments. This means that dentists carry out the entire treatment process and even produce their restorations in their own practices.

Another option is what we refer to as the clinic-to-laboratory workflow. It involves working with external partners and dental laboratories. Dentsply Sirona also offers services for this workflow. Each workflow has its own distinct advantages and the choice, ultimately, depends on the particular benefits that users—whether dentists or dental technicians—regard as more advantageous. Besides the two flagship workflows, there are many more options on how to combine elements of each, offering dentists the freedom to adjust their workflow according to their individual situation.

In a chairside workflow, the first step is to plan a prosthetic proposal with CEREC. The basis for implant planning is a 3-D radiographic image. This image is matched with the CEREC Omnicam scan and the prosthetic proposal, allowing all the important information, such as vital anatomical structures, bone quality and prosthetic requirements, to be seen at a glance so that the implant can be positioned ideally. To achieve the best possible implementation of the planning, dental professionals can design and produce the surgical guide (CEREC Guide 2) for the implant placement themselves. The final prosthetic restoration can also be designed and manufactured with CEREC. The CEREC MC XL enables the placement of customised abutments or screw-retained crowns in a single visit.

In the clinic-to-laboratory workflow, the dentist sends out the 3-D imaging data to Dentsply Sirona’s mySimplant Planning Service to receive a plan based on the patient’s individual situation. The dentist can also order a patient-specific Simplant Guide through mySimplant Planning Service for guided surgery. For the design and man-

Dr Volker Winter

interview
ufacture of the final restoration, the digital file from the intraoral scan is sent to a dental laboratory via Sirona Connect. Alternatively, the order can be initiated automatically in Atlantis WebOrder, also via Sirona Connect.

The great advantage of the digital implant workflow is its flexibility: dental professionals can decide freely on those parts of the workflow that they want to keep in-house, those where they would like external support and those that should be outsourced completely. The ability to implement all these processes with a strong and experienced partner—Dentsply Sirona—is unique in the market. Dental professionals can rely on proven protocols and thus gain surety in their treatment planning.

Dentsply Sirona offers integrated workflows with a complete product portfolio in which all components work together seamlessly. Owing to their high degree of standardisation, our digital workflows improve the predictability of a treatment outcome and allow for fewer sessions, increasing clinical safety and patient comfort. Dentsply Sirona products are based on a solid foundation of research and development, as well as years of experience and documentation.

How can CAD/CAM technology improve the quality of the workflow for implant specialists in particular?

The advantage of CAD/CAM technology is that it standardises processes, making them safer and faster. This starts with radiographic images, which offer the third dimension required for digital implant planning. The planning works digitally as well. The special feature of virtual treatment planning is the ability to produce a custom-made surgical guide, which has been proven to increase the safety of the surgical procedure.

For prosthetic restorations, digital workflows are especially useful owing to their high precision and time-savings. As already mentioned, this creates more comfort for the patient and possibly fewer sessions at the dentist.

In November 2017, Dentsply Sirona received an honourable mention for CEREC Guide 2 for the third Innovation (Innovation) Award. What makes this surgical guide so special and to what extent does it enhance the digital implantology workflow?

We were delighted to have received this award. It is a tribute to our concept of providing sophisticated solutions for everything from diagnosis to planning to final patient care. The surgical guide not only supports the surgical procedure itself but also the exact implementation of the planned prosthetic situation.

The surgical guide improves implantation and achieves a precision during the surgical procedure that is hardly possible freehand. This safety benefits the treatment and thus the patient. It is extraordinary that as a dentist, one can produce this surgical guide directly within one’s
practice—quickly and inexpensively. This is only possible through digitisation.

How have dentists responded to the trend of digital dentistry? Do you think that the majority of practices and laboratories will soon be using or considering using digital technologies?

When we talk about digitisation in general, the question is no longer whether dentists and dental technicians are increasingly digitising their practices and dental laboratories, but how they are doing it. This has become very clear at international dental congresses and fairs. It is important that these technologies bring tangible benefits, such as better image quality, treatment safety or time-savings. Digital technologies simplify the work of dentists and dental technicians and even introduce new treatment options. I am convinced that this will become standard everywhere in the long term.

Dentsply Sirona is the market leader in the field of CAD/CAM systems for the dental practice and among the leading providers in digital imaging. As digitisation becomes more prominent, it is becoming increasingly important to avoid isolated solutions—the controllability and the overview are lost. We make every effort to combine the individual components into customer-oriented solutions. Our customers appreciate that it is not required of them to become an IT or engineering specialist in order to use them. Instead, they can concentrate on their actual work, the treatment of their patient. This also includes training our customers to properly implement our workflows.

Dentsply Sirona invests a great deal in CAD/CAM education and offers courses and individual training—the DDA is an excellent example of that. How has this service been received so far?

I have to say that the DDA is not a Dentsply Sirona facility, but was founded by CEREC enthusiasts involved in the Deutsche Gesellschaft für computergestützte Zahnheilkunde [German society for computer-aided dentistry]. Dentsply Sirona CAD/CAM supported the spacious course facilities with 20 CEREC units, five treatment centres (Teneo), a radiographic device, and eight inLab workstations with dental laboratory scanners, milling units and sintering ovens. Dental professionals can also familiarise themselves with the new CEREC Zirconia workflow, with which full-contour zirconia restorations can be produced in just one session. All areas are part of a fully digital network, from the radiographic device to the treatment centre.

The first year of the DDA was already a great success, with about 140 courses attended by some 1,000 participants, according to Dr. Klaus Wiedhahn, one of the co-founders. The concept of relocating an important pillar of qualified CEREC training to the DDA, in addition to offering basic seminars in medical practices, has proven a complete success.

Thank you very much for the interview.
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MIS introduces new CONNECT abutment system

By DTI

Screw-retained solutions, known for their predictable retrievability, represent a secure and easy means of prosthetic restoration. MIS Implants Technologies offers a wide variety of abutments for screw-retained restorations, available for all MIS implant platforms (narrow, standard and wide). This past February, at the fourth Global Conference, held in the Bahamas, MIS announced the release of its CONNECT system in the coming months. Dental Tribune International (DTI) spoke with Dr Shelly Akazary, Implants Product Manager at MIS, about the features and clinical advantages of this new solution.

In your opinion, what are the challenges that dentists practising implantology are faced with today?

Beyond the core challenge faced in the field of implantology of attempting to replicate nature by creating a physiological alternative using a prosthesis, patients are also demanding shorter treatment times while not wanting to compromise on high-level aesthetic results. Dentists need to overcome these challenges while having to face various cases and rarely ideal conditions, both from the perspective of anatomical limitations and the habits and expectations of patients.

How can the right abutment improve the clinician’s comfort while working and influence the outcome of implant treatment?

The abutment is actually the component that connects the implant concealed within the bone and the outside world, since it creates the interface with the soft tissue/gingiva. In other words, it ultimately creates the connection between the surgical result and the aesthetic one. The better and healthier the peri-implant anatomy enabled by the abutment, the longer the surgical result will be maintained, as well as the aesthetic one in terms of gingiva.

Could you describe the new CONNECT abutment system?

The CONNECT system features an intra-gingival, narrow and modular abutment and is designed with a low profile, providing a tissue level solution for various gingival heights. Actually, its modularity enables the connection or interface with the soft tissue that I mentioned. This ver-
satility enables choosing the most suitable component for any situation or clinical indication, in order to maximise the result in terms of soft tissue.

What are the clinical indications for this new screw-retained solution?

Because of its versatility, the CONNECT may be used in multiple- or single-unit restorations, for both digital and conventional procedures. It may also be used for provisional or final prosthetic restorations.

What are the main characteristics that distinguish the CONNECT system?

The CONNECT is a one-time abutment, meaning that it does not need to be removed during the rehabilitation workflow. This enables a prosthetic procedure above the connective tissue level, as opposed to at implant level, and this facilitates bone preservation. The system allows for a broader range of screw-retained prostheses in the aesthetic zone owing to its narrow, low-profile internal connection, may be used in one- or two-stage procedures, and supports long-term biological stability by increasing the distance from the bone. Additionally, in CAD/CAM restoration planning, the abutment may be scanned and is incorporated into a partial or fully digitally guided procedure.
Raising awareness of the importance of keeping gingivae healthy throughout a whole lifetime, particularly among people aged over 60, is one of the priorities of the European Federation of Periodontology (EFP), the leading global organisation on periodontal science and practice. Other aims include strengthening the leadership of the EFP around the world and promoting the status of periodontology among dentists and other health professionals.

More than 75 experts and officers from 30 national scientific societies specialising in periodontal health and implant dentistry gathered in Vienna in Austria on 17 March to celebrate the EFP’s annual general assembly and to discuss future projects. Highlights of the meeting included the appointment of Prof. Anton Sculean as new EFP President, the launch of the EFP mobile app, the international dissemination of the Perio and Caries project, and reports on the final preparations for European Gum Health Day 2018 in May and the EuroPerio9 congress.

Sculean, chair of the department of periodontology and executive director of the School of Dental Medicine at the University of Bern in Switzerland, has taken over the helm as EFP President from Prof. Gernot Wimmer, Senior Scientist and Privatdozent at the Medical University of Graz in Austria. Other major appointments by the assembly included Prof. Lior Shapira (Israel) as new executive committee officer and coordinator of European Gum Health Day 2019, and Prof. Filippo Graziani (Italy) as President-elect. In addition, Prof. Nicola West (UK) and Dr Monique Danser (the Netherlands) will join the EFP’s executive committee in 2019 as secretary general and treasurer, respectively.

The EFP’s general assembly included the official announcement of European Gum Health Day 2018, which was celebrated on 12 May to raise public awareness across Europe of the importance of keeping gingivae healthy throughout life. “Health begins with healthy gums” is the slogan chosen by the EFP to remind authorities and the public that gingival health is an achievable and cost-effective way to improve general health, public health and quality of life.

By joining European Gum Health Day 2018, more than 39 national societies of periodontology organised at the national level a wide range of public events, conferences, communication projects, periodontal check-ups and other activities, under the coordination of Dr Xavier Struillou.

EuroPerio9—The world-leading congress
Participants of the Vienna general assembly were informed of the latest preparations for EuroPerio9, which will take place in Amsterdam in the Netherlands between 20 and 23 June and is widely regarded as the world’s leading congress in periodontology and implant dentistry. The scientific programme features innovative session formats, and more than 100 presentations will be deliv-
ered by world-class speakers, supported by a record number of more than 1,700 abstracts, which will be presented via oral presentations, poster discussions and e-posters. Furthermore, the EFP officially launched the phase of international dissemination of its Perio and Caries project, supported by Colgate, which allows all EFP-affiliated societies to take advantage of a wide array of scientific and educational content, including brochures, reports, infographics, videos and other material.

The Perio and Caries awareness project builds on the knowledge extracted from Perio Workshop 2016, the top-level scientific conference organised by the EFP jointly with the European Organisation for Caries Research in November 2016 in La Granja in Spain. EFP-affiliated societies are offered all Perio and Caries publications free and encouraged to disseminate, edit or translate them if they wish. This process has proved successful with a similar initiative previously developed by the EFP, the Oral Health and Pregnancy project, supported by Oral-B, which is now being disseminated by 20 national member societies in their respective languages and countries.

EFP Graduate Research Prizes in Periodontology

The first prize of the EFP Graduate Research Prizes in Periodontology, which is given to the best research from EFP-accredited graduate perio programmes, was awarded to the study “At least three phenotypes exist among periodontitis patients”, authored by Dr Chryssa Delatola, Prof. Bruno Loos, Dr Evgeni Levin and Dr Marja Laine from the Netherlands. The second prize was given to research titled “Reduced platelet hyper-reactivity and platelet-leukocyte aggregation after periodontal therapy”, a paper written by Dr Efthymios Arvanitidis, Dr Sergio Bizzarro, Dr Elena Álvarez Rodríguez, Prof. Bruno Loos and Dr Elena Nicu, also from the Netherlands. The third prize went to the study “Oral health in relation to all-cause mortality: The IPC cohort study” by Dr Nicolas Danchin from France, Prof. David Batty from the UK and Prof. Philippe Bouchard from France. Concerning personal recognition, Prof. Jan Wennström received the EFP Distinguished Scientist Award, and Prof. Stefan Renvert the EFP Distinguished Service Award.

Strengthening the message

“As the EFP reinforces its leadership and its role as the world benchmark in gingival health and periodontal disease, it is time for us to strengthen the message that gingival health brings not only oral health but also overall health, well-being and quality of life throughout a whole lifetime, and particularly among the population aged over 60,” highlighted Sculean. “I am deeply happy and honoured to lead this exciting time for the EFP and for periodontology in Europe, as we’ll keep working on promoting its acknowledgement as a recognised dental specialty in all EFP countries, and on turning it into an area of interest for dentists, dental students and patients across Europe.”

Wimmer said, “I am proud that this 2018 general assembly has brought together here in Vienna many of the most brilliant periodontal scientists, clinicians and teachers in the world, to review progress made over the last year and to prepare future action with the aim of tackling the hidden epidemic of periodontal disease. Now I’m ready to continue to contribute to the success of exciting forthcoming EFP projects, starting with EuroPerio9 next June.”

Other major outcomes of the Vienna general assembly were the launch of the EFP app for accessing key EFP content via smartphones and tablets, recognition of the Lithuanian periodontology society as a full-member society and the decision to hold Perio Master Clinic 2019 in Hong Kong next year.

EFP—The global benchmark in periodontology

The EFP is the driving force behind EuroPerio—the world’s leading congress in periodontology and implant dentistry—and Perio Workshop, a globally leading meeting on periodontal science. It is an umbrella non-profit organisation that brings together 30 national scientific societies of periodontology in Europe, northern Africa and the Middle East, which together comprise about 14,000 specialist dentists, researchers and other members of the dental team focused on improving periodontal science and practice. The EFP also edits the Journal of Clinical Periodontology, one of the most authoritative scientific publications in this field.

More information can be obtained at www.efp.org.
This year’s EuroPerio, the world’s leading congress in periodontology and implant dentistry, is expected to attract up to 10,000 periodontists and members of the dental team to learn about the latest in periodontal research and clinical practice, in June in Amsterdam in the Netherlands. In this interview, Prof. Søren Jepsen, past President of the European Federation of Periodontology (EFP) and Scientific Chair of EuroPerio9, outlines the event’s scientific programme, which features more than 100 top-level speakers and many innovations. The detailed programme is available at www.efp.org/europerio9/programme/scientific/index.html.

Why should a dentist or a hygienist consider attending EuroPerio9? Because EuroPerio9 is their opportunity to obtain the best insight on periodontology and implant dentistry available in the world until 2021—when EuroPerio10 takes place. EuroPerio9 has gathered the best pool of talented speakers from Europe and around the world for an audience that is increasingly global too. We’ll enjoy a great venue in a city as attractive and well-connected as Amsterdam. And then there are the events of the networking programme, the fact that all happens in only four days and the choice between four parallel tracks of presentations according to the attendee’s interests. All in all, attending EuroPerio9 is the most enjoyable and cost-effective way to be fully updated on the best in periodontology and implant dentistry available today.

Will EuroPerio9 be similar to EuroPerio8 (London, UK, 2015) and EuroPerio7 (Vienna, Austria, 2012)? It will be definitely unique! We have created the Team Session track, which is more inclusive than the previous separate track for dental hygienists. We have added more sessions on the afternoon of Wednesday, 20 June, to take better advantage of the time before the official opening ceremony. We have arranged sessions in such a way that many more dental professionals will be able to present their short oral presentations and posters for discussion. We have included the well-established stars in the specialty and have more women speakers and young speakers than ever before. We have built on the best of our successful experiences and we have added a number of new formats.

What are those new formats? We have designed eight new formats. First, on the opening day, we will have a special double session with the Japanese Society of Periodontology, one on biofilm and anti-infective therapy, the other on regenerative periodontal and implant therapy. Second, the Perio Talks will offer fresh, TED Talk-style presentations given at the first EFP Alumni Symposium. Third is a lively debate about the use of antibiotics, led by Profs. Andrea Mombelli and David Herrera, in which attendees will be able to use their smartphones as voting devices. Fourth, for the first time, a live surgery session will take place at a EuroPerio congress. A new, rarely performed procedure with implants will be carried out by Prof. Giovanni Zucchelli and Dr Martina Stefanini at the Academisch Centrum Tandheelkunde Amsterdam dental school and broadcast in real time. The fifth major innovation is the interdisciplinary treatment planning session, in which cases will be shown and the audience will choose between different options for treatment. Sixth is a 3-D session with Dr Pierpaolo Cortellini and Prof. Stefan Renvert on reconstructive surgery on teeth and implants, in a large auditorium. Seventh is the EFP Perio Contest, for which presentations are being judged not only by an expert panel but also by social media voting in the days before EuroPerio9. The three final contestants will be invited to present their work on stage on the last day of the congress. Eighth is the Nightmare Session, in which Drs Mario Roccuzzo, Giulio Rasperini, Jean-Louis Giovannoli and Caroline Fouque will explore treatments that went badly.

Being Scientific Chair of EuroPerio9 sounds like quite a challenge. How has the experience been? It is, indeed, an incredible challenge, but also an opportunity to work with a wonderful team of periodontists and professional organisers. Together, we have worked hard to put together a high-quality programme with the latest research in the field, the best professionals and the new formats I mentioned. I hope that EuroPerio9 will provide attendees with a fruitful and unforgettable experience!
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**Panelists**

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- Professor Wim Teughels (Belgium)
- Dr. Christopher Ho (Australia)
- Dr. Chong-meng Tay (Singapore)
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- Dr. Edmond Pow (Hong Kong)
- Dr. Terence Jee (Singapore)
- Dr. Alfred Lau (Hong Kong)
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**Questions?**

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