

CAD/CAM

international magazine of digital dentistry

4²⁰¹⁵



| **opinion**

Data security: How not to become the next Ashley Madison

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Beyond any measure

Dear Reader,

During the last several years, CAD/CAM technology has undergone enormous development and is still one of the most innovative segments in dentistry. This was plainly evident at the beginning of the year at the International Dental Show in Cologne, where dozens of manufacturers presented new systems, as well as CAD/CAM solutions and software.

There is no doubt that digital technology has changed dental offices and laboratories forever. Digital imaging, digital impressions, guided surgery, CAD/CAM-supported manufacturing processes and high-quality materials increase the precision of implant structures and prosthetic restorations, and facilitate better diagnostics and treatment planning.

Digitalisation of dental offices is not limited to the fabrication of dental restorations: a computerised office also means the collection and storage of data. Patient data is increasingly stored in digital format. The more sophisticated the program used, the greater the amount of patient information collected, and it is imperative that this data be stored securely.

In this issue of the **CAD/CAM** magazine, you will find very well-illustrated and documented articles on guided implant surgery, CAD/CAM-supported restorative dentistry, digital denture manufacture, as well as practice management and data security. Lina Craven explains the key role of a treatment coordinator in the dental practice, and highly experienced information technology professional Naz Haque presents his opinion on data protection and the relevant legislation in the UK. Also informative is the interview with Israeli-based dentist Dr Andy Wolff, who has worked as a medical expert in dental malpractice litigation for many years. He explains, among other matters, why patients tend to go to court more often nowadays, and what medical professionals can do to protect themselves against legal disputes.

I hope you will find this issue illuminating and that the knowledge you gain is applicable in your daily practice.

Yours faithfully,



Magda Wojtkiewicz
Managing Editor



Magda Wojtkiewicz
Managing Editor



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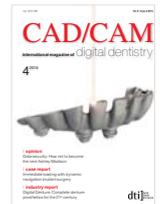
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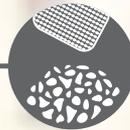
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“Patients tend to go to court more often nowadays”

An interview with Dr Andy Wolff, Israel



Dr Andy Wolff talking to DTI Group Editor Daniel Zimmermann. (© Kristin Hübner/DTI)

_Be it a careless error or a case of misjudgement, even the most experienced practitioner can make a mistake. In fact, statistics indicate that it is likely that every general dentist will be involved in a malpractice suit at some point in his or her career. Israeli-based dentist Dr Andy Wolff has worked as a medical expert in dental malpractice litigation for many years and has seen almost everything, ranging from slight negligence to severe overtreatment. Dental Tribune International had the opportunity to speak with him recently about the steady increase in litigation in the field and simple measures that can help prevent many malpractice incidents in the first place.

_Dental Tribune International: *Dr Wolff, you have been a medical expert in dental malpractice litigation for many years now. Why is it so important to increase awareness of this topic?*

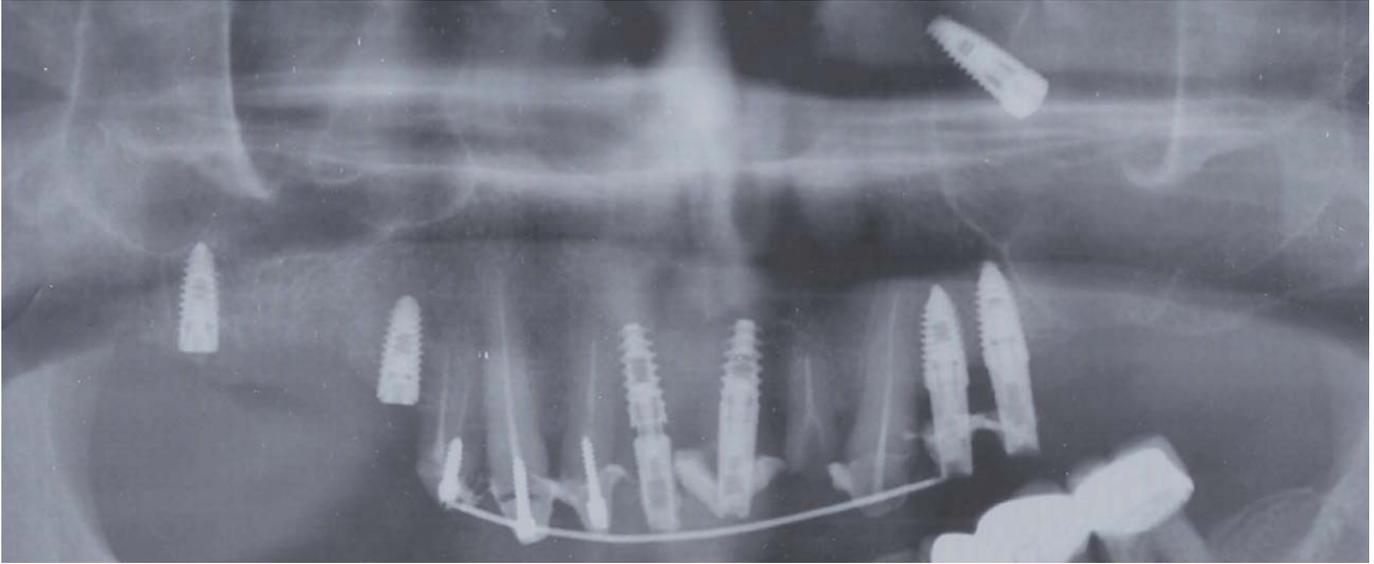
Dr Andy Wolff: So much literature out there tells dentists how to do things—whether it is placing implants or improving efficacy with the newest technology—but there are no books on how not to do things or, more precisely, what can happen when something has gone wrong. This aspect is no less important, both for the patient affected and for the clinician, who might be facing legal consequences.



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Displacement of dental implant into the maxillary sinus of a 70-year-old male patient. (© Dr Andy Wolff)

Many may think that it is not relevant to them, but every smart physician knows that things occasionally go wrong and no one is immune. By documenting dental malpractice incidents and by talking and writing about these, I aim to raise awareness and therefore help prevent future incidents.

_In your experience, what types of malpractice are most common?

There are definitely many cases in the neurological field. As a medical expert, I am confronted with many instances of damaged nerves caused while placing an implant, during tooth extractions or through an injection. It is common and it happens quickly. Typically, it is an inadvertent mistake, because the clinician was either in hurry or impatient. However, the consequences for the patient are mostly very dramatic and often beyond repair.

_Aside from nerve damage, is there an area where mistakes are more likely?

If I had to choose one, I would say it is implants. I recently had a very disconcerting case where an oral surgeon did all the preliminary examination work meticulously, the CT scan, the radiographs, everything. For that reason, he knew for certain that he was working with a bone structure of 11 mm, yet he used an implant that was 13 mm long in the treatment. Maybe he was just mistaken or the assistant handed him the wrong implant and he did not recheck it, but the result was that he hit a nerve.

In this particular case, the dentist was a specialist, an experienced surgeon. Without raising the question of guilt—although the surgeon was without a doubt responsible for the damage—

cases like this show that mistakes really can happen to anybody.

_So expertise does not preclude mistakes, but there are undoubtedly also cases that result from negligence and hubris.

I certainly see many cases in which dentists have carried out a treatment for which they were not qualified. I remember an incident in which a general practitioner injured nerves on both sides of the mouth during an implant treatment. That is truly unbelievable. I have seen many cases over the years, but nothing quite like that.

In another case, a dentist extracted a third molar without the requisite training. He should have referred the patient to a specialist, but he chose to do it himself—possibly because it earned him another US\$200 to 300 (£130 to 190)—with the result that the patient now has to live with chronic pain for the rest of her life.

_Can injured nerves regain normal function eventually?

Mostly, damage is irreversible. There are exceptions, of course, either if the damage was not too severe or if the nerve was inside a canal. Potentially, an injured nerve can regain function over time. However, if it is an exposed nerve, such as the lingual nerve, the damage is generally irreversible, although there are some microsurgery procedures that may improve the situation. Interventions like this, however, carry extremely high risks themselves and might even aggravate the situation.

_With the consequence that patients partially lose sensation in the mouth or face?

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Yes. Another consequential damage, of which I only recently learnt, is loss of sense of smell. Patients whose sinus has been injured often lose their ability to smell. Sometimes, they may not even realise it initially, because the sinus runs on both sides of the face and the unaffected side often functions normally. Imagine losing your sense of smell completely owing to a defective bilateral sinus lift procedure—that would be a fairly serious impairment of a person's quality of life.

been formulated, it is comparatively less bad. Sometimes, even if a patient dies while undergoing therapy, this does not need to involve a distinct fault of the clinician.

_An American dentist was recently charged because his patient died after he extracted 20 teeth in one procedure.

I have performed such extensive treatment in the past; it depends on the need for the treatment and how it is done. Probably, that case in the US



Bilateral mental and labial paraesthesia in a 62-year-old female patient due to bilateral mandibular canal perforation. (© Dr Andy Wolff)

_Have malpractice incidents become more common over the last decades?

I would say so. At least, litigation has increased. Of course, there have always been cases of malpractice, but patients tend to go to court more often nowadays. Perhaps you could call it an "Americanisation" phenomenon: almost every problem is taken to court, with the result that dentists are paying increasingly higher insurance fees because the treatment risks are so high today.

_How common is legal action in dentistry and what is the compensation amount paid compared with other medical disciplines?

It is perhaps comparable to plastic surgery. There are many complaints filed for cases in which the result was not what the patient expected it to be. Compensation payments range from US\$10,000 to 100,000, which is much lower than those in other medical disciplines.

_Do more cases of overtreatment or cases of error on behalf of the dentist end up in court?

These cases have an almost equal occurrence. Of course, overtreatment leaves the dentist in a bad position. It raises the question of why he or she treated the patient unnecessarily in the first place and did so poorly in the second; it leaves him or her doubly guilty. If a mistake occurred after a reasonable treatment plan had

was the result of a combination of many things. For instance, did the dentist act in accordance with state-of-the-art practice? If not, he is at fault. If he did, one has to remember that dentists cannot rise above today's level of knowledge and technology. Let us say an impaired patient files charges for something that happened to him 20 years ago that would have been preventable with the latest medical treatment. He can, of course, make a claim, but the dentist could not be sued for it if he or she treated the patient according to the best knowledge available at that time.

That is a very important aspect when writing expert reports on dental malpractice: did the dentist act to the best of his or her ability and according to the current knowledge or with gross negligence? That is what makes the difference.

_What can medical professionals do to protect themselves against legal disputes arising from high-risk procedures they intend to perform?

Patients should not only be warned of the possible consequences of a certain procedure, but also be advised of the alternatives—and one of those alternatives is not proceeding with treatment at all. In my opinion, the patient should always understand both options: the risks of a particular treatment and what could happen

if nothing is done. Only then should the patient be asked to sign a declaration of consent.

Unfortunately, the reality is often quite different. Patients are often asked to sign declarations of consent on their way into surgery or while already on the dental chair. Even if they had questions then, there would be no time to answer them properly. Although it should be of major concern for every dentist to thoroughly inform the patient of the risks, as well as alternative treatment methods, before he or she is asked to sign a consent form, I am constantly confronted with the opposite.

So, you are saying that consultation should be of similar importance to treatment?

Absolutely. In my opinion, building mutual trust between doctor and patient is key for avoiding malpractice and consequential charges. If patients feel that their condition is being properly treated, and that money is not the dentist's first concern, this alone can prevent litigation in many cases. Of course, if a nerve is damaged, there needs to be a settlement of some kind, but if a bridge fails, for example, instead of filing charges the patient will return for further treatment if there is a solid, trust-based relationship.

Time, communication, trust—what else is important when it comes to preventing malpractice?

One more basic rule every dentist should follow is adhering to evidence-based dentistry. This means not performing a certain treatment just because in the dentist's experience it is considered to be right. External scientific evidence should be implemented. Also, every single finding should be taken into account in determining how to treat the individual patient: diagnosis, radiographs, periodontal analyses, age, health status, literature and so on. Neglecting these related aspects can very likely lead to misconduct.

Do you see basic problems in dentistry that need to change?

Nowadays, we face the problem of "cheap" dentistry. Owing to the amount of competition with the large number of dentists in the market, there are many cases of overtreatment. Cheap dentistry needs to be fast, yet I have documented cases in which patients have returned for retreatment of a simple problem up to 70 times in two years. If you add up the time those patients invest only to have a poor outcome, it is striking. However, it is not possible for there to be elite dental practices solely. For legal purposes, dental treatment does not need to be exquisite, but it has to be reasonable.

Maybe it is a problem of today that patients have increasing expectations regarding the service or technologies their dentist should be using.

That is certainly part of the same problem. Advertising that promises people a new Hollywood smile in 2 hours forms the basis of patients' beliefs or expectations regarding treatment. Dentists should not be tempted to involve themselves in this kind of misguided pressure. Honest communication is key when aiming to avoid disappointing patients.

Measures to prevent malpractice should begin as early as possible, but where should prevention start?

Personally, I think legal regulation should be extended, such as specific laws or by-laws concerning the amount of experience and training, for example, required in order to perform certain procedures. Basically, it is just what common sense calls for and everybody will agree with if

“I am confronted with many instances of damaged nerves caused while placing an implant, during tooth extractions or through an injection.”

they think about it: should one be allowed to place an implant after attending a speakers' corner talk or looking over a colleague's shoulder? No, yet this is often what happens.

A second measure could focus on undergraduate education. Dental schools should devote more time to prevention of lawsuits. This aspect is neglected in the curriculum, although it is an essential part of dentistry. General awareness of the subject needs to be raised and this alone would help prevent mistakes. As I said earlier, mistakes are not always avoidable, but they should at least not arise out of negligence, hubris or greed. Apart from that, there will always be cases of medical malpractice. Dentists are humans too; only he who does nothing makes no mistakes at all.

Thank you very much for the interview.

Data security: How **not to become** the next **Ashley Madison**

Author_Naz Haque, UK

At the heart of the relationship between a dentist and a patient lies trust and respect. Recent events, such as the Sony or, more currently, the Ashley Madison breach, have brought to public awareness the importance of securing one's data. Data security and governance is a very tricky area. I must make it clear I am not a lawyer, but I am a highly experienced information technology professional with a good understanding of data protection and other relevant legislation. All interpretations provided here are my own.

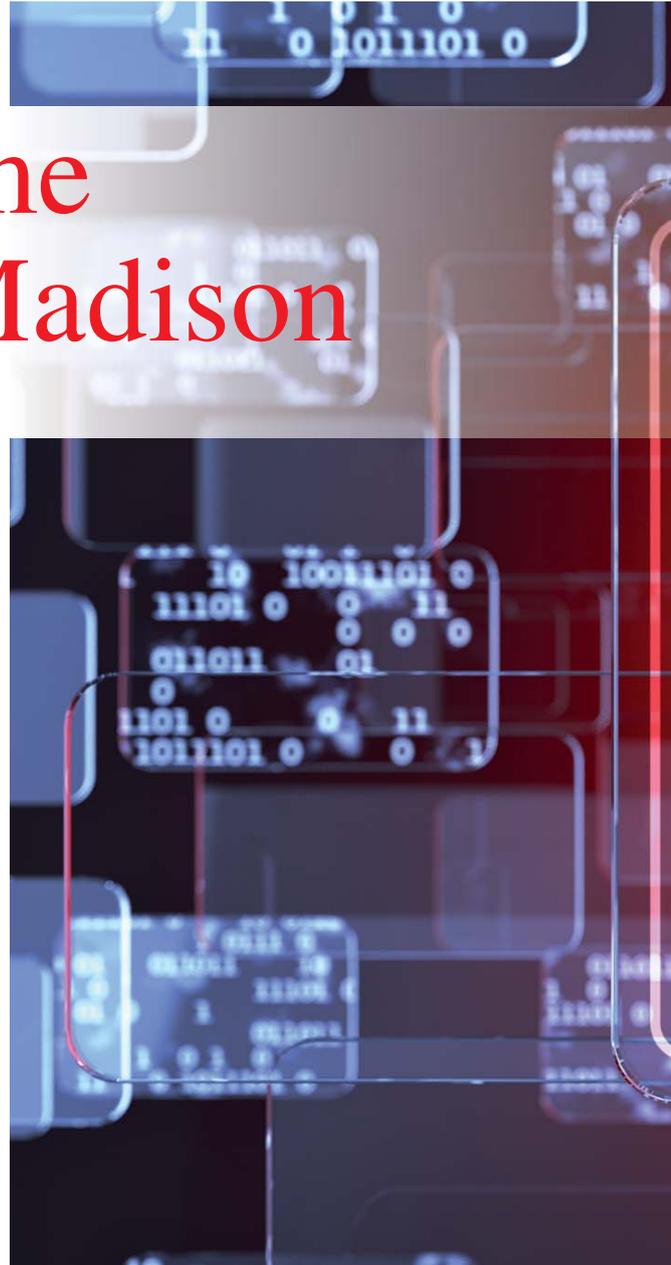
Even if a dental practice has not embraced the digital age and all records and correspondence are ink and paper based, the practice still has a number of responsibilities regarding data security. As dental practices collect patient details, they must register with the Information Commissioner's Office (ICO) here in the UK. Dental records must be stored safely and securely for a number of years (up to six years for the National Health Service; NHS) and kept for a maximum of 30 years (Department of Health). Records must also be disposed of in a policed manner to avoid fines.

What about dental practices who have embraced digital? Data is accessed in two situations, storage and movement, the same as physical records are. This also means that there are the two situations in which data can be compromised in the digital world. Dental practices have an obligation to ensure patient data is backed up, recoverable (in case of disasters), secure and protected. This applies during both storage and movement. If you are using one of the popular industry patient management systems, such as EXACT (Software of Excellence), it should have features to support this in place; liaise with your account manager to verify this.

The next area of concern then is movement of data. This can be via e-mail, online referral tools or portals, feedback platforms or devices, and your

website. E-mail is not a secure medium, and communication with patients about their medical history or medical circumstances using this platform raises potential issues. The service provider you use for your e-mail could also be inadvertently making you breach data security rules. For example, if you are using one of the popular US-based organisations for e-mail, such as AOL, Hotmail and Gmail, and liaise with your patients via this e-mail platform, you have to consider where the e-mails are being stored; most likely on servers outside your own country.

The UK's Data Protection Act states that "personal data shall not be transferred to a country or territory outside the EEA (European Economic Area) unless that country or territory ensures an





adequate level of protection for the rights and freedoms of data subjects in relation to the processing of personal data.” As a dental practice, you should reconsider if you are using a commercial e-mail provider to liaise with your patients, and determine whether your website communication tools and feedback portals are compliant and if not ensure your designated data policy controller addresses this as a priority. Here in the UK, the ICO can issue monetary penalty notices, requiring organisations to pay up to £500,000 for serious breaches of the DPA occurring on or after 6 April 2010. Clients at *Dental Focus* expect us to take care of online compliance and provide guidance on keeping up to date and resolving these issues. Make sure your data is secured and protected before it is too late.

_about the author

CAD/CAM



Naz Haque, aka „The Scientist“, is Operations Manager at *Dental Focus*. He has a background in mobile and network computing, and has experience supporting a wide range of blue-chip brands, from Apple to Xerox. As an

expert in search engine optimisation, Naz is passionate about helping clients develop strategies to enhance their brand and increase the return on investment from their dental practice websites. He can be contacted at naz@dentalfocus.com.

Immediate loading with dynamic navigation implant surgery

Authors _Dr Jan D'haese, Dr Johan Ackhurst & Prof. Hugo De Bruyn, Belgium



Figs. 1a & b _The NaviStent surgical stent.
Fig. 2 _Pre-op panoramic image.

Although osseointegration of dental implants is predictable, thorough preoperative planning is a prerequisite for a successful treatment outcome.^{1,2} Anatomic limitations and prosthetic considerations encourage the surgeon to obtain a very precise positioning of the implants. Historically, standard radiographic imaging techniques (intra-oral and panoramic) were available for investigation of potential implant sites.

Nowadays, it is well known that 3-D CT scans allow for more reliable treatment planning than when only 2-D data is available.³ Transforming the CT scan images into a 3-D virtual image can be achieved using computer software packages, allowing for a 3-D view using CAD technology.³ For years, stereolithographic guided surgery appeared to be the gold standard in computer-guided implant surgery. This technique has been well developed in recent years and several scientific reports have been published regarding accuracy, complications, survival and success.⁴ However, stereolithographic guided surgery has some major disadvantages compared with conventional implant surgery. The surgeon has to rely on a pre-designed trajectory planned in the software, with-

out being able to make intra-operative adjustments. In addition, the loss of tactile feeling during preparation and implant placement is a major drawback.

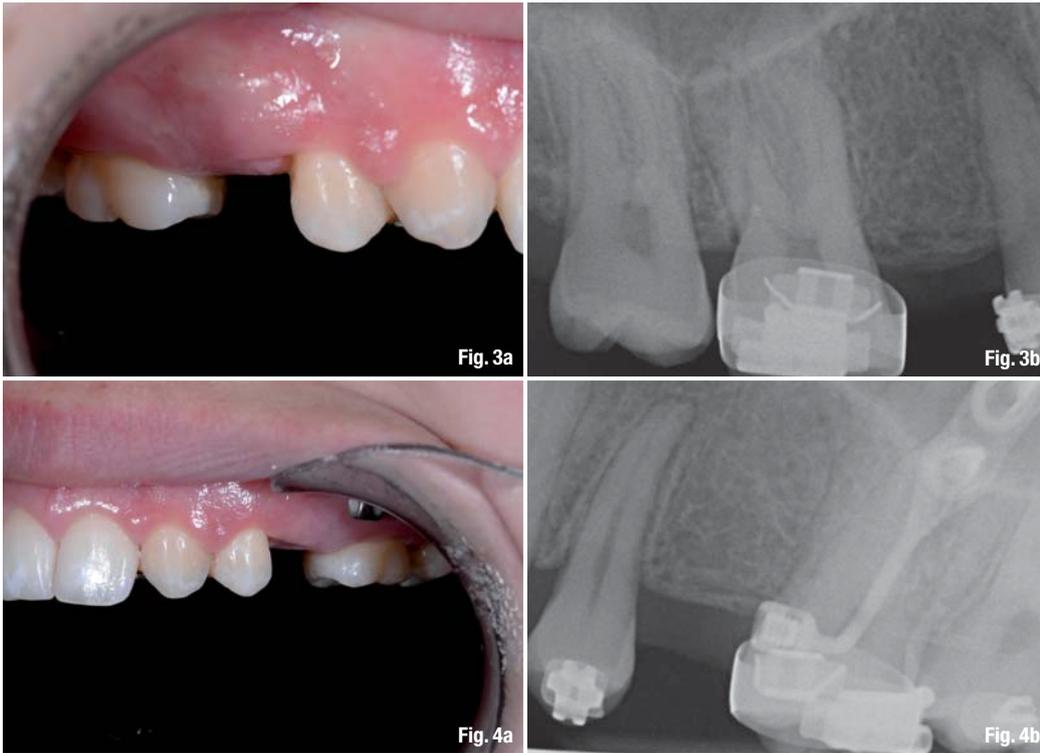
Real-time navigation appears to be a valuable alternative to stereolithographic (static) guided surgery, as it offers the clinician some advantages over the former technique. Using real-time (dynamic) navigation, one can avoid the fabrication of a stereolithographic template, resulting in a less expensive treatment. As navigation is considered a dynamic guided surgery system, changes to the treatment planning (location and size of implants, number of implants, flap or flapless, etc.) can easily be made intra-operatively. Also, the tactile feeling during the drilling procedure, as well as manual control over the implant stability, is still present when using navigation surgery.

Over the last decade, there has been a shift in surgical and prosthetic protocols, resulting in significant reduction in the integration time of a dental implant. This is a logical consequence of the constant improvement of implant characteristics and components simplifying dental implant treatment. Guided surgery using implant simulation software can contribute to better treatment planning, as it provides a preoperative view of the anatomical structures related to the future prosthodontics.⁵ This fact could make immediate loading procedures easier, and allows the clinician to know in advance the potential location and dimension of the future restoration(s). Many guided surgery procedures result in the absence of a flap design. Minimising the surgical flap can have advantages for soft-tissue healing and patient comfort.⁶ However, it

has been shown that flapless free-hand surgery, regardless of surgical experience, leads to mal-positioning of implants and consequently to bone perforations and dehiscences.⁷ This finding suggests that when using free-hand flapless surgery additional guidance during preparation of the implant bed and during implant placement is required. For this reason, navigation surgery can become an important tool in dental implantology, as it benefits from the advantages of using stereolithographic

two provisional crowns within 12 hours of implant placement (immediate loading).

Preoperatively, an impression of the dental arch was taken using an irreversible hydrocolloid (Cavex CA37, fast set, Cavex Holland) to fabricate a diagnostic cast. This cast was used as a model for the moulding of the surgical stent; hereafter called NaviStent (Figs. 1a & b). The NaviStent served as a scanning template and was also worn by the pa-



Figs. 3a & b_Pre-op image of region #15 and a lateral photograph.

Figs. 4a & b_Pre-op image of region #25 and a lateral photograph.

guided surgery and overcomes some important drawbacks of stereolithographic-involved procedures.

Case presentation

The patient treated was a 21-year-old female consulting the dental office for replacement of both second premolars in the maxilla, at regions #15 and 25. The patient was in good general condition and a non-smoker. She had been treated before at the orthodontic department at Ghent University Hospital because of multiple dental agenesis. Intra-oral examination revealed the absence of both lateral incisors and second premolars in the maxilla and both second premolars in the mandible. Periodontal screening showed no signs of pathology. The bone anchors used during the orthodontic treatment were still present in the second and fourth quadrants. Treatment involved placement of two dental implants in the edentulous regions of the maxilla. Both implants were to be restored with

tient during the surgery. Afterwards, the patient was sent for a CBCT scan with the NaviStent in place (Figs. 2, 3a & b, 4a & b).

Planning procedure

A standard CBCT scan was performed according to the procedure outlined in the Navident scanning protocol from ClaroNav. Cone beam images were taken with a Planmeca ProMax 3D Max (Planmeca) with a flat-panel detector and isotropic voxels. The field of view used for this case was 50 mm × 100 mm and a voxel size of 200 µm. The exposition parameters were 96 kV and 10 mA. Care was taken to align the field of view with the jaw and the radiographic tracker, which was situated anterior of the jaw.

All images were carefully reviewed and subsequently the CBCT images were converted into DICOM files and transformed into a 3-D virtual model using the Navident software system. The clinician who placed the virtual implants in the virtual

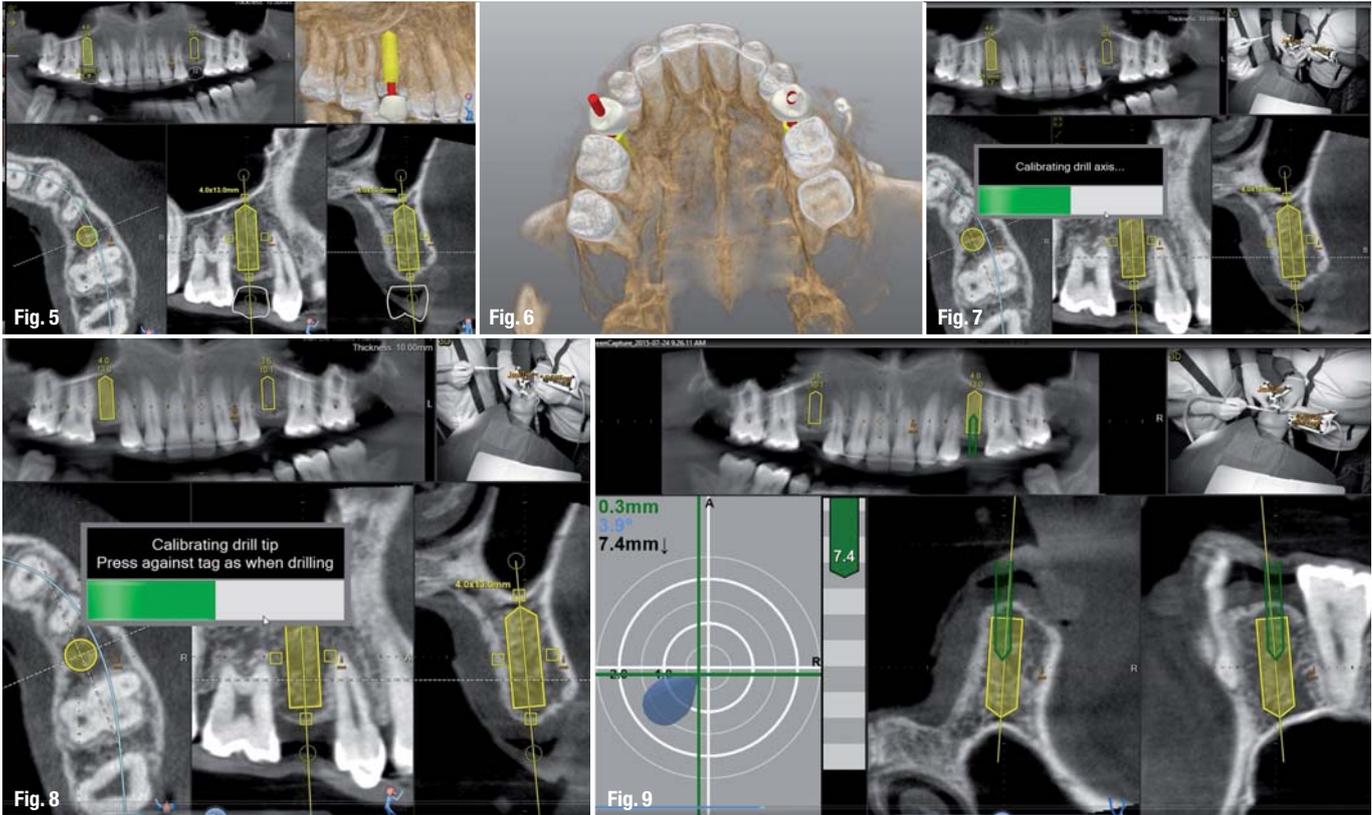


Fig. 5_ Planning in Navident.
Fig. 6_ Planning in Navident.
Fig. 7_ Calibration of the drill axis.
Fig. 8_ Calibration of the drill tip.
Fig. 9_ Surgical guidance using Navident.

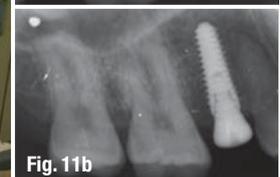
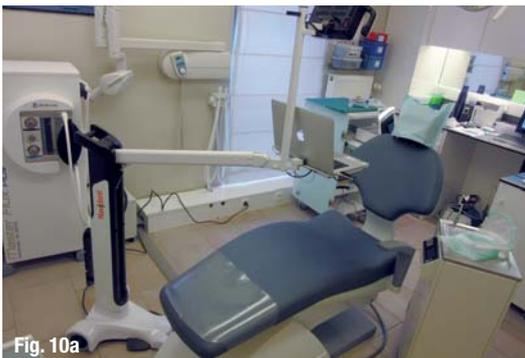
3-D model also performed the actual surgeries. The potential locations for implant placement and corresponding implant lengths and widths were planned in a prosthetically driven manner. A distance of at least 3 mm from the neck of the implant to the gingival zenith was applied, allowing the biological width to create a connective tissue contour around the abutments (Figs. 5 & 6).

_Surgical procedure

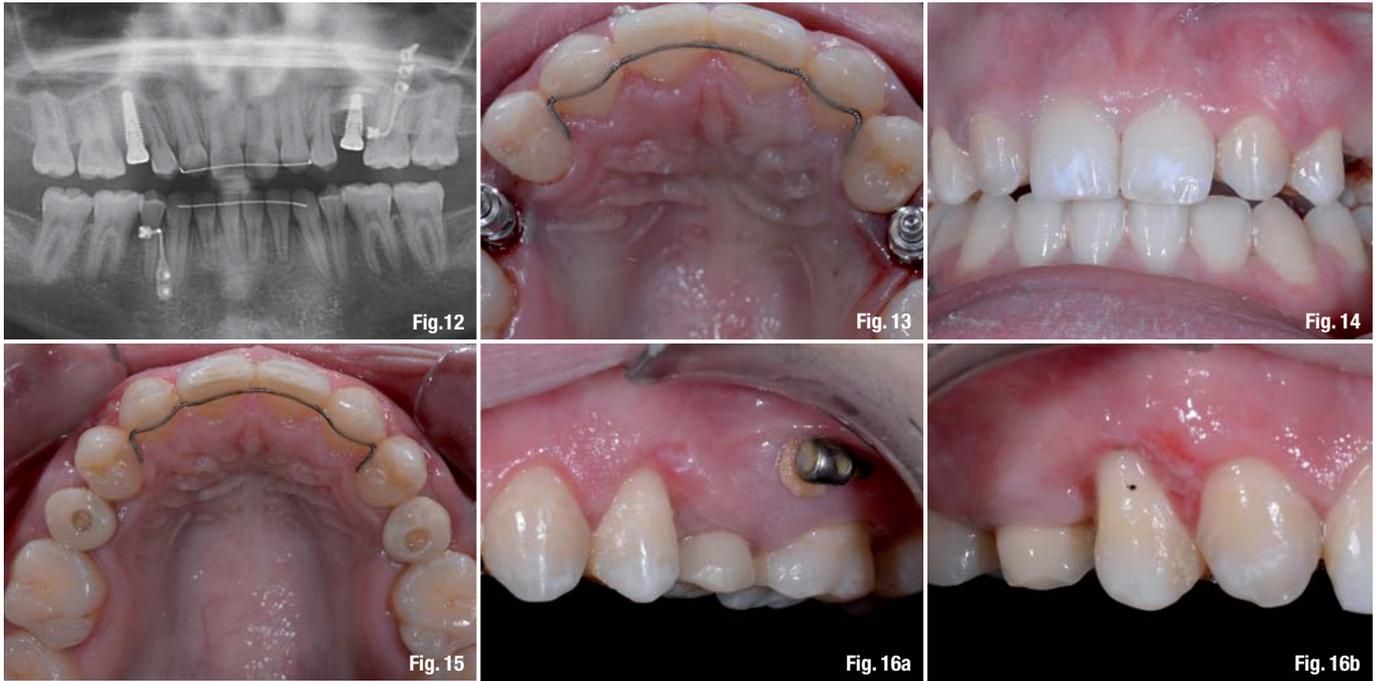
The surgery was performed under local and regional anaesthesia. Appropriate aseptic and sterile conditions were established to prevent postoperative infections. Before the start of the intervention, the NaviStent was placed over the remaining teeth. It was primarily fixated using the undercuts of the remaining teeth and additionally by application

of a denture adhesive (Corega, GlaxoSmithKline Consumer Healthcare).

Before starting the osteotomies, the drilling axis of the handpiece used during the surgical procedure was calibrated. The osteotomies were prepared at a maximum of 500 rpm using the Navident navigation system to guide the drilling procedure in real time by indicating the desired drilling pathway on the computer screen. Prior to the use of each new drill, a calibration process was performed (Figs. 7-9) in order to determine the exact location of the drilling tip. No punching of the gingival tissue was performed prior to the preparation of the implant sites. Before placement of each implant, an extra calibration procedure was performed in order to be able to track the implant itself also in real time during insertion. This means that both the



Figs. 10a & b_ Surgical guidance using Navident.
Figs. 11a & b_ Post-op image of regions #15 and 25.



osteotomy preparation and the implant placement process are tracked in real time. The Navident tracking system uses an on-screen visual representation of the surgical area and auditory cues to aid the clinician (Figs. 10a & b).

Two XPEED AnyRidge implants (Megagen) were installed. At region #15, an implant of 4 mm in length and 13 mm in diameter was placed, whereas at region #25 an implant of 10 mm in length and 3.5 mm in diameter was placed (Figs. 11a & b & 12).

After completion of the dental implant placement, a crown-lengthening procedure was performed in the anterior maxillary region in order to ameliorate the aesthetic outcome. It is beyond the purpose of this report to provide any detail regarding this procedure.

Prosthetic procedure

Immediately after implant placement, impression copings (Megagen) for an open-tray impression were screwed on to the implants and hand torqued (Fig. 13). An impression was taken at implant level using a silicone material (Permadyne Penta H, 3M ESPE Dental) in a plastic Position Tray (3M ESPE Dental). Within 8 hours, two temporary screw-retained acrylic teeth were delivered to the patient and connected to each of the implants. The acrylic teeth were designed based on temporary titanium abutments. Occlusion and articulation were checked and corrected wherever necessary. All superstructures were hand torqued to a maximum of 15 Ncm. No cantilevers were allowed on

the provisional structures in order to avoid extensive non-axial forces. Postoperatively, the patient received a prescription for antibiotics (amoxicillin 1,000 mg, b.i.d., four days), non-steroidal anti-inflammatory drugs (ibuprofen 600 mg, t.i.d.) and a mouthwash (chlorhexidine 0.12%, b.i.d.). After one week, a postoperative visit was scheduled. No signs of infection or inflammation were present and healing was uneventful (Figs. 14 & 15).

Conclusion

With a two-week postoperative follow-up, this was the first immediate loading procedure based on the Navident navigation surgery system. The patient reported no pain or swelling associated with the dental implant procedure. Further postoperative results are being tracked and reported as part of a pilot study being conducted at Ghent University (Figs. 16a & b).

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

Fig. 12 Post-op panoramic image.
Fig. 13 Post-op photograph of the maxillary occlusal surfaces.
Fig. 14 Post-op frontal photograph.
Fig. 15 Post-op photograph of the maxillary occlusal surfaces (post-loading).
Figs. 16a & b Post-op lateral photographs of the restorations in regions #15 and 25.

contact

CAD/CAM

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Restoring chewing function, comfort and self-confidence

Authors_ Dr Fidel Ruggia & René Wöhrle, Switzerland



Fig. 1

Initial situation

Our patient was a 55-year-old female who wanted her impaired chewing function to be restored. Four years before she came to my clinic, the teeth in her mandible were extracted and replaced with a full prosthesis due to advancing periodontitis

(Fig. 1). The teeth in the maxilla also fell victim to periodontitis (Fig. 2) and had to be removed. The patient was otherwise in good health.

In addition to restoring chewing function, she wanted in particular to overcome the social handicap associated with the removable prosthesis.

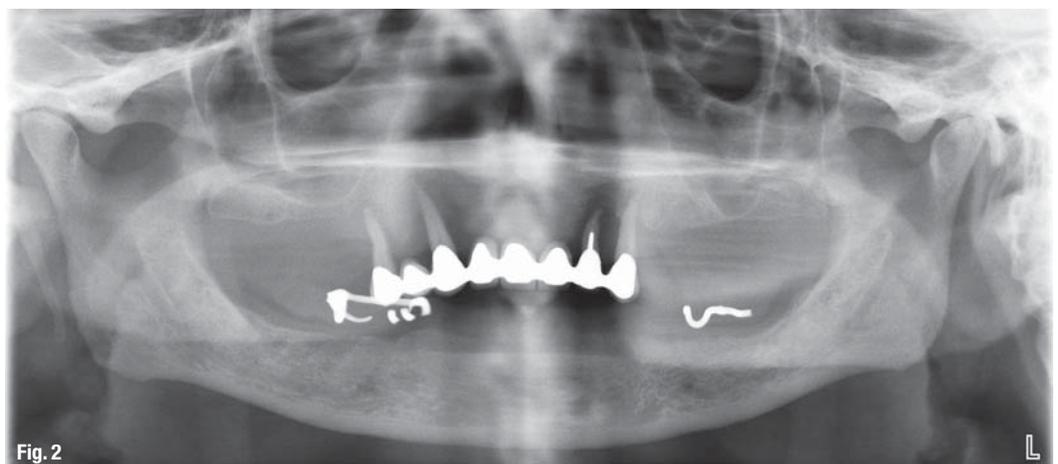


Fig. 2

■ CC DISK NF CoCr

Disc for CAD/CAM based on CoCr.
CTE 13,9-14,0 x 10⁻⁶K⁻¹



■ CC DISK Zr Smile

Disc for CAD/CAM made of pre-sintered ZrO₂.
With exceptional light transmission and translucency.



■ CC DISK Zr Multicolour

Disc for CAD/CAM made of pre-sintered ZrO₂.
For natural restorations with no colouring liquids needed.



■ CC DISK Ti2

■ CC DISK Ti5

■ CC DISK Zr/HT

■ CC DISK PMMA

■ CC DISK WAX



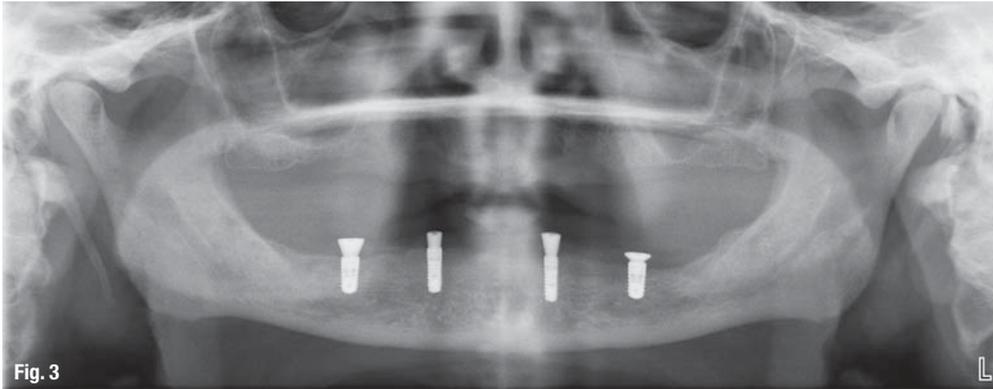


Fig. 3



Fig. 4



Fig. 5



Fig. 6

_Approach

Treatment planning and surgical procedure

The patient's desire to replace the teeth with permanent reconstructions was to be met by implants in the maxilla and mandible as well as fixed restorations. The bone volume and quality in the mandible were sufficient for successful implant therapy (Fig. 3). Four implants (Straumann Bone Level Ø 4.1 mm, length 8 mm, position 36 and 46; Straumann Bone Level Ø 3.3 mm, length 12 mm, position 33 and 43) (Figs. 4 & 5) were placed.

Prosthetic approach

The dental impression (Fig. 6) was mounted with implant analogues and prepared with a gingival mask

made of scannable material (Fig. 7). The master cast was then made from class IV plaster (Fig. 8). For the purpose of bite registration and verification of the implant position, temporary abutments were blocked with composite on the cast (Fig. 9). This ensured that the position of the implants and the jaw-to-jaw relation could be checked in one work step. Care was taken to ensure that the composite did not hamper checking of the position—particularly for the emergence profile. After mounting the cast, the initial tooth set-up was carried out, using the composite bar as a framework. An artificial gingiva was not used in the mandible in favour of better oral hygiene.

The initial esthetic intraoral try-on was performed. Tooth position, emergence profile, relation of tooth length and occlusal plane, color, and of course the esthetics were checked. After checking all of these factors and the patient's feedback, the process moved to CAD software for planning of the bar.

The work was digitised using the Straumann CS2 scanner (Figs. 10–12). The restoration was then designed in the Straumann CARES 9.0 software. We opted for the Straumann CARES Advanced Fixed Bar with basal polished metal surface. This has lower plaque accumulation compared with acrylic veneering.

It was possible to edit the bar (Fig. 13), individual segments, and bar copings directly in edit mode. The different tools were very easy and intuitive to use, e.g. an eye was kept on the necessary cross-section thickness using the 2-D cross-section window (Fig. 14). Using the mock-up scan (Fig. 14), the full shape of the bar was adapted to the set-up. The bar geometry was simple to edit in the segment editing and the interdental spaces were adjusted to



Fig. 7



Fig. 8

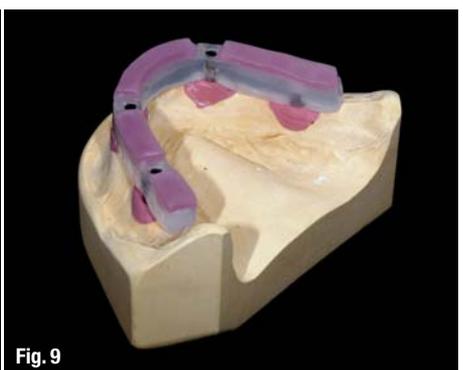
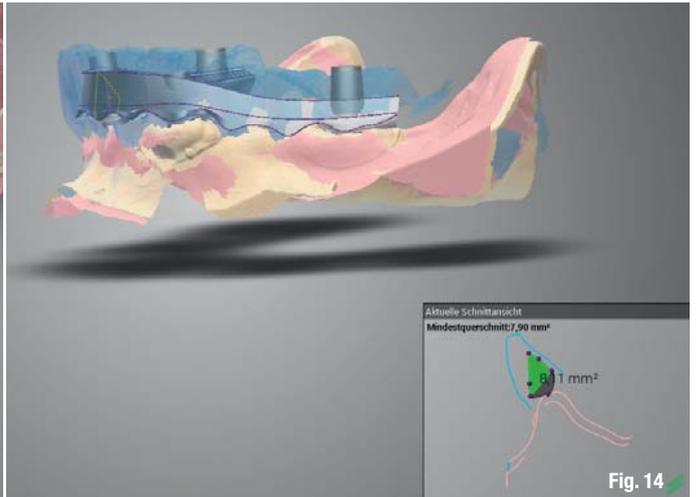
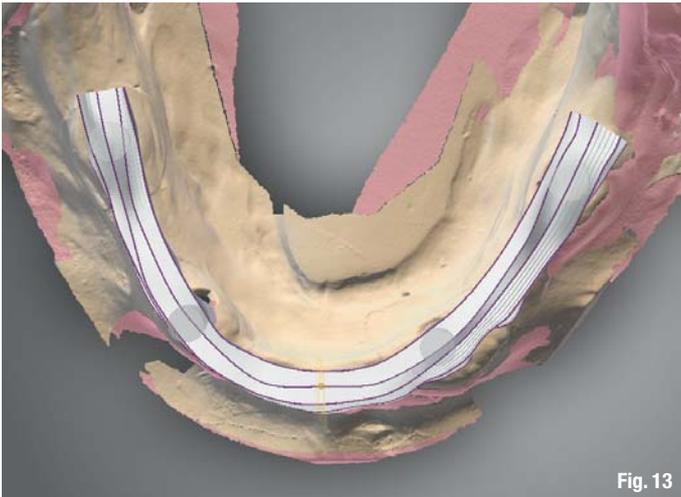
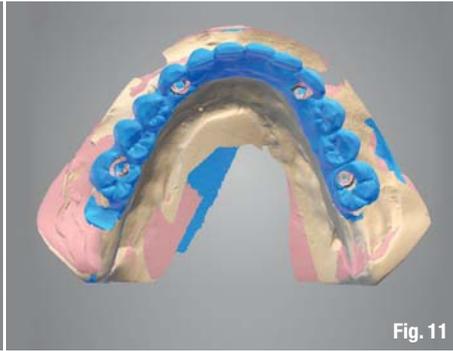
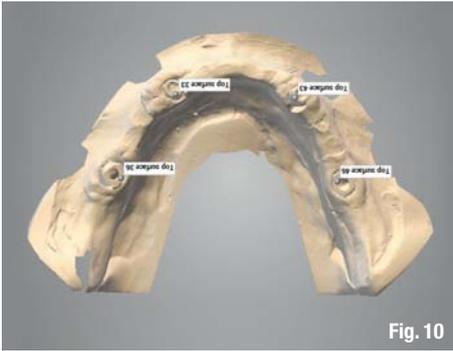


Fig. 9



the mock-up. The shape and height of the individual bar copings were defined to avoid space problems.

After designing, the bar data were sent directly to the Straumann milling center in Leipzig, Germany.

The cast was forwarded by courier to ensure a perfect fit. The sandblasted bar was returned after three to five days, ready for further processing (Figs. 15–17). The bar was then treated with silane (for adhesion). The opaque coating was then ap-





Fig. 19



Fig. 20

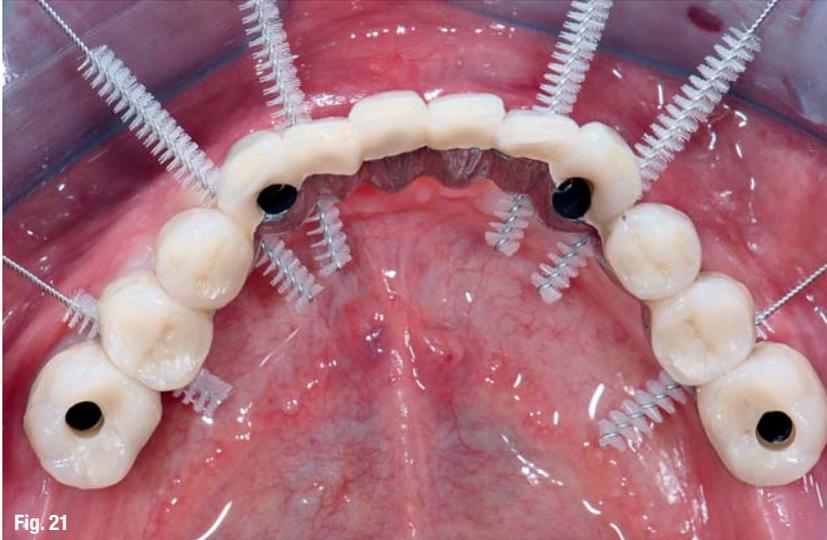


Fig. 21

adays, patients want solutions for an unrestricted quality of life, combining lasting functionality with attractive smiles. Implant-borne restorations (Figs. 19–21) can offer patients precisely this, as this case demonstrates.

The authors would like to thank the ESTETIKER laboratory in Lugano, Switzerland, for its collaboration.

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crea.lign is a trademark of Bredent GmbH & Co. KG, Senden, Germany.

plied and set. The veneers were degreased, sandblasted, and repositioned in the previously made transparent index. The index was secured to the cast over the bar; the luting composite was injected and cured with light. crea.lign, a light-curing composite that achieves a homogeneous, dense surface and thus inhibits plaque formation, was used to finish the CARES Advanced Fixed Bar (Fig. 18). From experience, use of this material reduces the risk of the veneers flaking in the long term. After curing, the occlusion was ground and the bridge was finished and highly polished as usual.

Conclusion

After completion of treatment, the patient confirmed that her wishes had been met in full. Chewing function, comfort, and self-confidence had been fully restored. From a financial point of view, this reconstruction did not cost more than manufacturing a conventional removable prosthesis with bar construction. By contrast, the follow-up costs were reduced to a minimum. A fixed reconstruction has had a psychological benefit for this patient, which would not be possible with a removable solution. We therefore firmly believe that this solution is a valid therapeutic option for the treatment of edentulous jaws. Now-

about the authors

CAD/CAM



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Founder and owner of the Dentalclinic Lugano in Lugano, Switzerland. Teaching position at the University of Zurich, Switzerland. Secretary of the Dentists' Association of the Canton of Ticino. Director of the ITI Study Club Ticino.

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René Wöhrle

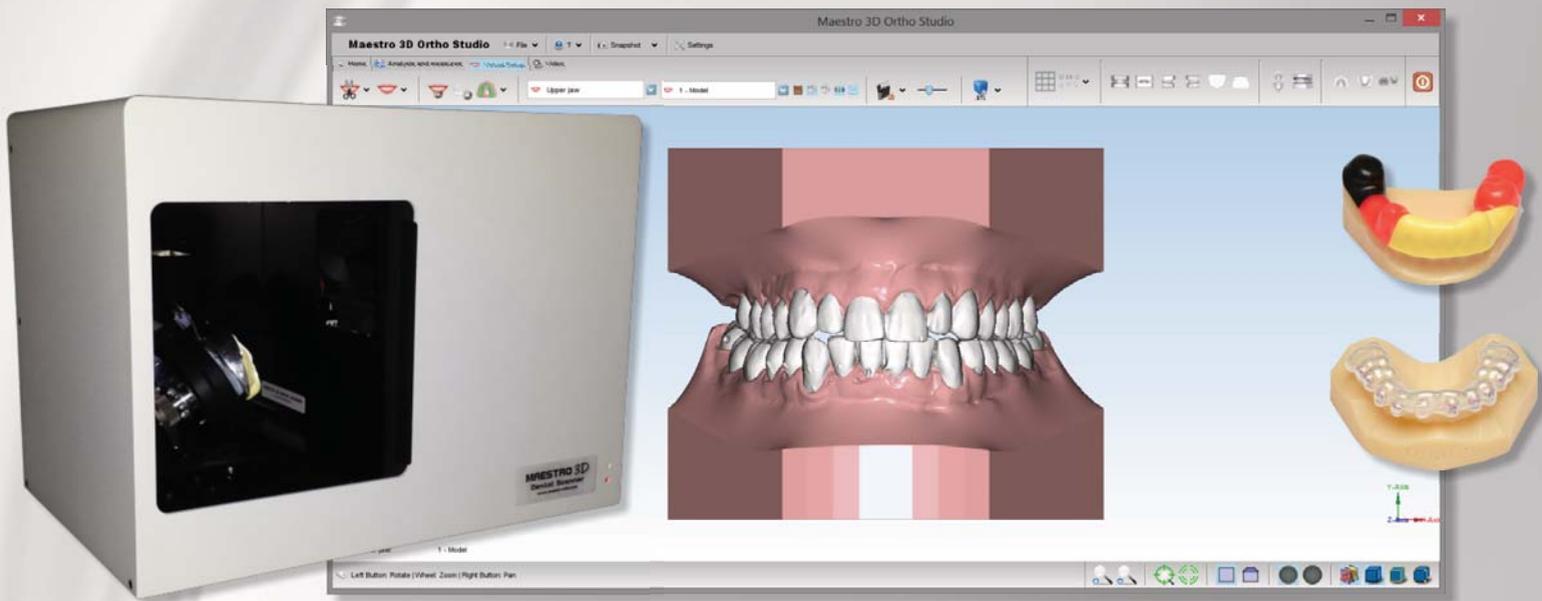
Swiss Certified Dental Technician. Owner of the 3Digital Vision SA dental laboratory in Lugano, Switzerland. Advisor and Project Manager for Digital Solutions. Specialties: CAD/CAM, 3-D printing, laser melting.

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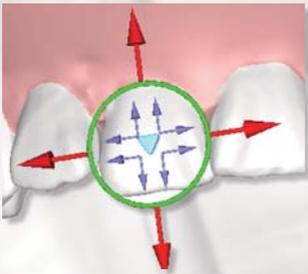
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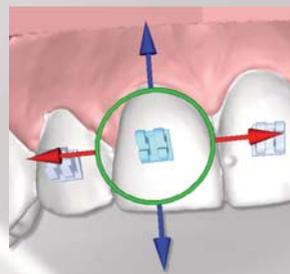
Attachment designer



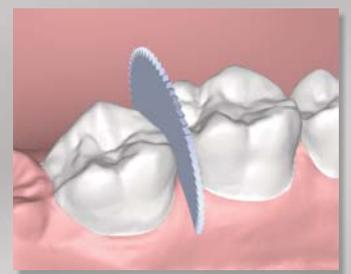
Label designer



Brackets module



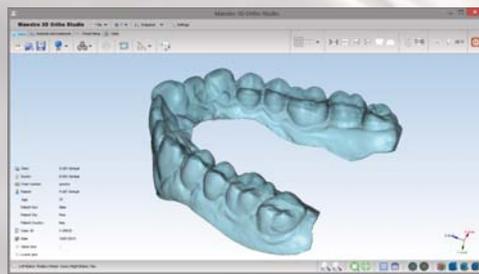
IPR
Interproximal reduction



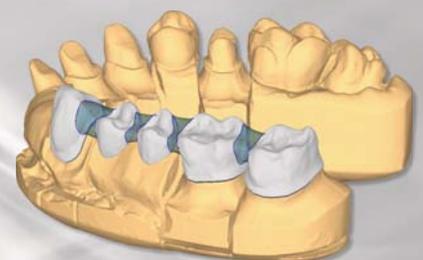
Models Builder module



Clear aligner module



Crown & Bridge



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Clinical case study: Aesthetic anterior restoration with **VITA SUPRINITY**

Author_ Daniel Carmona Cando, Spain

_Initial situation

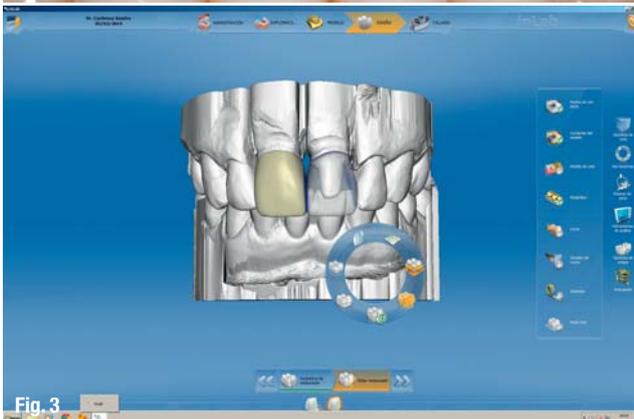
The case documentation shows a 39-year-old patient who presented at Dr Diego Alexander Cardenas' practice in Barcelona, Spain, with two ageing metal-ceramic crowns and loss of soft tissue in regions 11 and 21 (Fig. 1). Following comprehensive consultation, she opted for a new crown restoration fabricated using VITA SUPRINITY. Crucial in this respect was the unique characteristic of this new material that combines the aesthetic potential of a glass

ceramic with the improved strength provided by reinforcement with zirconia.

_Complexity and material selection

Just how complex this case actually was only became apparent following removal of the inadequate restorations for preparation: the tooth stumps were strongly discoloured and fitted with gold metal abutments. The question needed to be addressed as to whether the planned restoration could mask this sufficiently in order to

- Fig. 1** _Initial situation.
- Fig. 2** _Preparation for the post abutment fabricated using VITA ENAMIC.
- Fig. 3** _Virtual design of the anterior crowns.
- Fig. 4** _Try-in of the milled VITASUPRINITY.





achieve a satisfactory result from a visual perspective. In the LABORATORIO DENTAL FONTCAR laboratory, we met this challenge by combining the aesthetic possibilities afforded by VITA SUPRINITY using the cutback technique with the low-melting fine-structure feldspar ceramic VITA VM 11.

_Milling and reworking

The inLab MC XL system (Sirona Dental) was used for virtual design and milling of the crowns. Following the CAM process, reworking of the new high-performance glass ceramic should only be carried out at low pressure using fine-grained diamond-tipped milling tools as well as special polishing instruments. For cost-effective surface processing that is gentle on the material, the technical and clinical versions of the VITA SUPRINITY Polishing Set are recommended. For crystallisation firing, any vacuum furnace that supports slow cooling can be used. The crowns can be placed directly on to honeycomb firing trays with platinum pins, without using firing paste.

_Final result

Despite the unfavourable initial situation, VITA SUPRINITY enabled a comparatively good

final aesthetic result to be achieved in highly efficient fashion, restoring the patient's natural smile. The expectations and hopes of the patient and the entire treatment team were met in full. We would like to thank master dental technician Thomas Gausmann for his enormous local support.

Editorial note: This article is a reprint from DENTAL-ZEITUNG, No. 1/2015, OEMUS MEDIA AG, Germany.

Fig. 5 Following reduction using cut-back technique PRINITY crowns prior to crystallisation.
Fig. 6 Try-in of the crystallised, and as yet unveneered VITA SUPRINITY crowns.
Fig. 7 Crowns veneered using VITA VM 11 successfully cover the dark stumps.
Fig. 8 Final result.

_about the author

CAD/CAM



Daniel Garmona Cando, a master dental technician from Barcelona, Spain, uses the following complex patient case to report on how laboratory users can achieve excellent results with VITA SUPRINITY restorations.

This article provides a step-by-step explanation of how VITA SUPRINITY and the VITA VM 11 veneering ceramic can be used to achieve aesthetic results in a challenging clinical scenario.

A perfect synergy of technologies

CAD/CAM materials in combination with a new luting composite

Authors _ Dr Carlo Monaco, Prof. Dr Giovanni Zucchelli & Luigi De Stefano, Italy

_A platform that allows aesthetic results to be achieved with astonishing ease can be created by combining CAD/CAM technology with a high-strength ceramic and a modern luting material.

State-of-the-art technologies and materials provide a fast route to achieving excellent results.

_Preoperative assessment

A female patient presented with anterior metal-ceramic restorations, wishing for an improvement of her aesthetic appearance (Fig. 1). A radiographic examination was carried out followed by an intra-oral photographic series. Then, the aesthetic param-



Fig. 1 _ Female patient with metal-ceramic restorations, wishing for an improvement of her aesthetic appearance.

Fig. 2 _ Mock-up fabricated on the basis of the wax-up and fitted to the patient's teeth.

With careful clinical planning, the chairside part of the treatment can often be completed in a single appointment. Intraoral digital impressing circumnavigates the risk of deformed impression materials and allows preparations to be visualised in a 3-D format. Three-dimensional visualisation helps patients form a clear idea of what their treatment can achieve and increases the likelihood for obtaining their approval. These advantages are augmented by the favourable mechanical properties of modern ceramic materials such as lithium disilicate glass-ceramics (LS₂). In a nutshell, the benefits of CAD/CAM-based manufacturing include reduced treatment times, enhanced accuracy of impressions and precise visualisation of the treatment outcome. The following case report describes the clinical steps required in the fabrication of anterior single-tooth crowns to achieve functionally and aesthetically first-class results.

eters were evaluated. Using the conceptual treatment planning tool Digital Smile Design (DSD, Dr C. Coachman), the desired changes were visualised on the computer and discussed with the patient. Visualisation is essential an aesthetically motivated treatment that requires preparation of the tooth structure because it affords the opportunity to familiarise the patient with the most salient changes in a straightforward fashion.

After the patient had approved of the treatment, a conventional intraoral impression (polyvinylsiloxane) was taken and a diagnostic wax-up fabricated. The gum line was not altered at this stage. The diagnostic wax-up was key in helping the patient fathom the prospective three-dimensional volumetric change in her anterior dentition and fabricating the temporary restoration. Among other things, the patient's main concerns were to

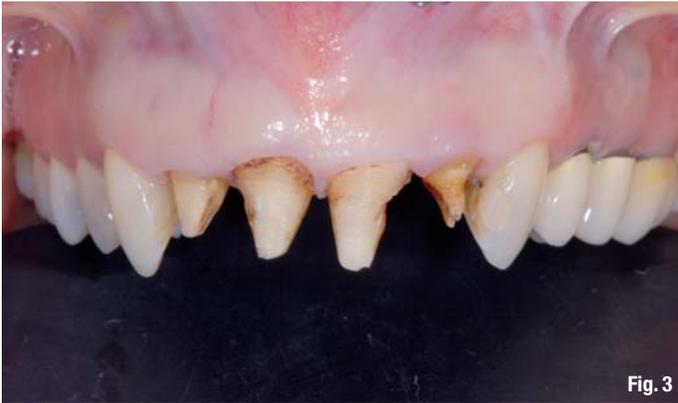


Fig. 3



Fig. 4

have the excessive length of her anterior teeth ameliorated to harmonise with the surrounding dentition and to have the severe palatal curvature mitigated.

Planning and temporisation

The information gained from the DSD procedure and the try-in of the mock-up formed the basis for the final treatment planning. The mock-up model conveyed a precise impression of the morphological changes to be applied to the teeth. At the try-in, the canines were found to be too long in relation to the new appearance of the central and lateral incisors (Fig. 2). To redress this situation, the patient was given the option to have her canines reduced by approx. 1 mm following the insertion of the temporary restoration. Furthermore, the patient was informed of the need for surgical intervention to adapt the course of her gum line. Treatments necessitating a reduction of healthy tooth structure and/or a change of the gingival profile require the use of visualisation software, such as the Digital Smile Design programme, because such changes cannot be made visible with models or mock-ups.

After the existing restorations were removed with a tungsten carbide bur (Fig. 3), the resulting abutments were in a suboptimal condition and

tooth 22 was damaged by a carious lesion. It was therefore necessary to build up the abutments using composite material and an adhesive before the temporary polymethyl methacrylate (PMMA) restorations could be placed. The primary objective was to avoid a further reduction of tooth structure. After completion of the conservative treatment, the built-up teeth were again slightly reduced to create space in the interproximal area with the aim to encourage the papillae to grow into the interdental spaces between the temporary restorations (Fig. 4).

Surgical intervention

Surgical crown lengthening was performed to attain a harmonious gum line. After the periodontal surgical soft tissue procedure, the bucco-lingual bone was reduced using a diamond-coated drill and hand chisel with the aim to expose 5 mm of tooth structure above the alveolar bone crest. After the surgical intervention, the exposed root surfaces were smoothed up to the bone crest with the help of curettes, followed by the preparation of the abutment teeth. Here, the aim was to modify the natural emergence profile of the teeth as they emerge from the alveolar ridge and, as a result, to limit the coronal growth of the soft tissue portions in the buccal and palatal areas. Finally, the soft tissue flaps were secured over the buccal and palatal sides of the al-

Fig. 3 Suboptimal abutments after removal of the existing restorations.

Fig. 4 Abutments after having been built up with composite. Situation at the end of the first temporisation step.

Fig. 5 Second temporary stage after surgical crown lengthening.

Fig. 6 Intraoral digital registration of the temporary restorations.



Fig. 5



Fig. 6

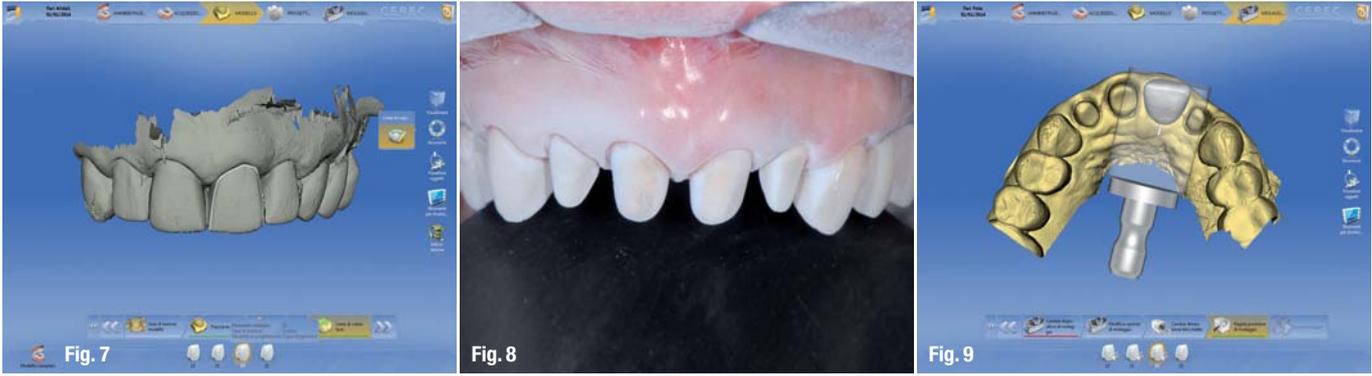


Fig. 7 The temporary restoration was used as a 'biogeneric' model.

Fig. 8 Preparing the digital scan of the abutment teeth.

Fig. 9 Crowns were designed and then milled from lithium disilicate blocks (IPS e.max CAD HT C14/A2).

veolar bone using simple vertical mattress sutures (PGA 6/0) and anchored to the periosteum on the buccal side. After the surgery, the temporary restorations were inserted using calcium hydroxide cement. This intervention meant that the patient was not able to clean her teeth in the areas affected. Instead, she was instructed to rinse with 0.12% chlorhexidine solution for one minute, three times a day.

Temporisation

At the following appointment, the sutures were removed and a precision impression—without placing a retraction cord—was taken. This impression was used to create a second 'series' of temporary restorations amenable to relining. Three weeks after the surgery, the final preparation of the abutments was performed. The gum line was used as a reference to provide orientation in the cervical region. Early temporisation was advantageous to soft-tissue conditioning. With this measure, a potential soft-tissue rebound was easier to monitor and the desired aesthetic outcome could be achieved in a targeted fashion. Over the following five to six months, the temporaries were additionally modified to allow the interdental papillae to grow into an appropriate shape.

Intraoral data capturing

Six months after the surgery, the soft tissue had developed into an ideal shape (Fig. 5). It was

now time to begin with the final prosthetic stage. Only one appointment was planned for this stage. As the patient was satisfied with the morphological shape and function of the temporary restorations, the PMMA restorations were utilised as prototypes for the final crowns. Two digital impressions were required. At the first step, a digital record of the temporary restoration was created and subsequently used as a 'biogeneric' model. At the second step, the abutment teeth were digitally recorded after a retraction cord had been placed. Both the temporary restorations and abutment teeth were coated with a dusting of scanning powder to facilitate optical data capturing (Figs. 6–8). After intraoral scanning (CEREC Bluecam, Sirona Dental Systems), the data were imported into the CAD software (CEREC Software V. 4.2) and integrated into the design of the restorations. The parameters concerning the space for the luting composite and adhesive were set to 30 and 20 µm respectively and the minimum incisal ceramic was set to 1.5 mm. Additionally, digital records of the opposing jaw and bite registration were also taken.

Material

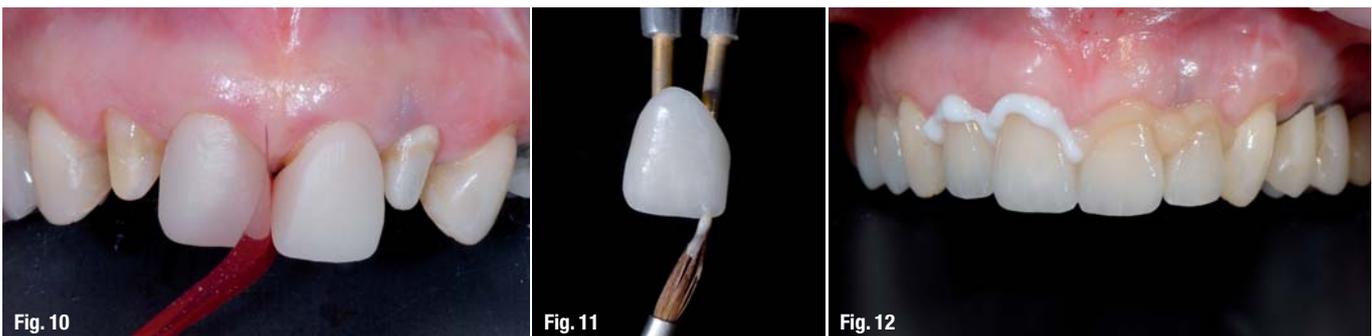
All-ceramic restorations should demonstrate natural optical properties and offer a lifelike surface texture.

Simultaneously with the advancement of CAD/CAM technology, the manufacture of CAD/CAM blanks has been consistently improved. Aesthetic

Fig. 10 Try-in of the milled crowns and adjustment of proximal contacts.

Fig. 11 Customisation using the staining technique.

Fig. 12 Selecting a suitable shade of the luting composite (Variolink Esthetic DC) using glycerine-based water-soluble try-in pastes.





results that look intriguingly similar to the natural dentition can now be easily achieved due to the combination of the 'enamel-like' optical properties of the IPS e.max® CAD HT blocks (high translucency) and the staining technique—no individual layering is required. Lithium disilicate glass-ceramic blocks (IPS e.max CAD HT C14/A2) were the chosen material for the case described here. The blanks were processed in the CEREC milling unit (Sirona) using a Step Bur 12 and a Cylinder Pointed Bur 12S (Fig. 9).

Crown seating

After crystallisation firing, the restorations were fitted on the abutment teeth and their accuracy of fit was evaluated. Minor shape adjustments were performed and the occlusal and proximal contacts adjusted (Fig. 10). Finally, customised effects were applied to the crowns using the staining technique (IPS e.max Ceram Shades) (Fig. 11). The dual-curing luting composite VariolinkR Esthetic DC was selected for placing the crowns. This material is available in several shades to allow an ideal esthetic integration. Water-soluble, glycerine-based try-in pastes provide valuable assistance in selecting the correct colour composite (Fig. 12). With these pastes, the shade effect of the all-ceramic restoration can be simulated before it is permanently cemented. The try-in pastes feature the same shade and translucency as the luting composite after it has been cured. The consistency of the try-in paste is similar to that of the luting composite. In the present case, each time the restoration was tried in with one of the coloured try-in pastes, the shade effect was measured using a colour measurement device (SpectroShade, MHT). With the five different shades Light+, Light, Neutral, Warm and Warm+, the translucency can be modified in varying degrees of percentage, ranging from brighter/whiter to darker/yellower and the darker shades can be used to change between the levels of opacity and translucency. With a translucency of approx. 10 per cent and a relatively bright shade effect,

the 'Light' version was selected for the final cementation. The crowns were seated on the same day (Figs. 13 & 14).

Conclusion

In the case presented here, the combination of CAD/CAM technology, a lithium disilicate glass-ceramic and a colour-balanced luting composite enabled us to use a straightforward and efficient method to restore our patient's smile to its full attractiveness.

Fig. 13_Final seating of the individual crowns. Air blocker (Liquid Strip) was applied to prevent the formation of an inhibition layer during light curing.

Fig. 14_Permanently seated restoration. In only one treatment session, the final prosthetic restoration was completed and seated.

contact

CAD/CAM



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Digital Denture: Complete denture prosthetics for the 21st century

A new CAD/CAM-based procedure has the potential to revolutionise the way complete dentures are manufactured

Author _ Ivoclar Vivadent

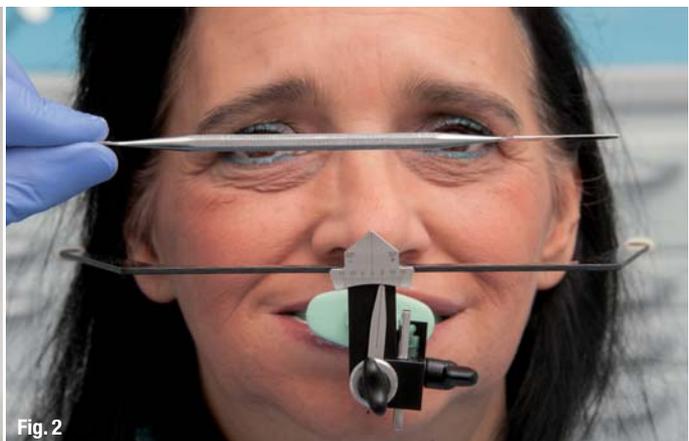
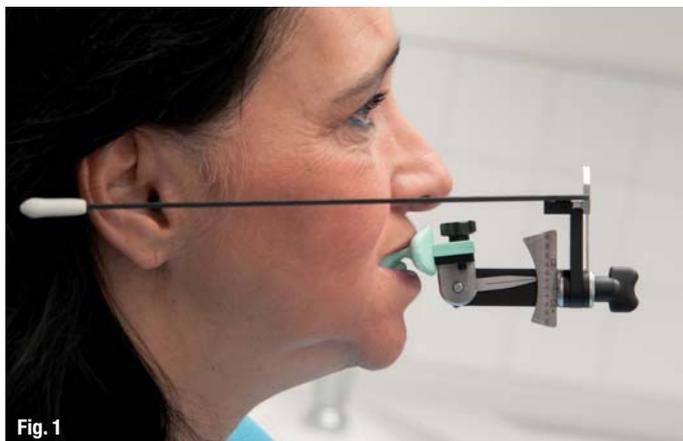


Fig. 1

Fig. 2

Fig. 1 Establishing the patient-specific relation of the temporary bite record to Camper's plane (CP) using a UTS CAD.

Fig. 2 Establishing the patient-specific relation of the temporary bite record to the bipupillary line (BP) using a UTS CAD.

The term 'Digital Denture' describes an integrated manufacturing process for CAD/CAM-based complete denture prosthetics. The Digital Denture process was presented to the public for the first time at IDS 2015. Key elements of this process include innovative devices, software programmes and coordinated materials geared towards the needs of dental technicians and clinicians. Especially designed software programmes streamline complex working steps, i.e. the setup of denture teeth. Digital Denture results in accurately fitting CAD/CAM denture bases and reduces the active working time required for accomplishing complete dentures.

Digital Denture is a clearly structured process consisting of a well-defined number of working steps. The distinctive feature of this process is that users themselves can decide which parts of the process they want to accomplish digitally and which parts they want to perform conventionally. Below follows an illustrative description of the individual steps.

_First step—Clinical

The process begins in the dental practice with an initial impression of the oral cavity. At the same appointment, a preliminary record of the patient's centric and vertical relationship is taken using a Centric Tray. This information forms the basis for the fabrication of customised impression trays with integrated bite plates.

With the help of the preliminary bite registration, the patient-specific occlusal plane can be determined at the first patient visit. For this purpose, a UTS CAD device is attached to the handle of the Centric Tray. Once placed in the oral cavity, the basic bow is aligned to the Camper's plane (CP) and the bipupillary line (BP) (Figs. 1 & 2).

The position of the occlusal plane can be read from the BP and CP scales respectively. The clinician forwards these data, together with the initial impression and preliminary bite registration, to the dental technician.



Fig. 3 WIELAND

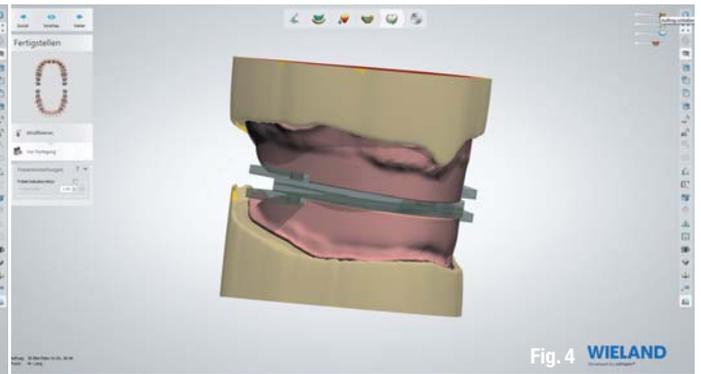


Fig. 4 WIELAND

First step—Technical

The digital workflow can be entered as early as with the fabrication of the customised bite plates—no need for models or a physical articulator. The impressions and bite registrations are digitised one after the other using a scanning device. The two virtual models are set into relation with the data of the preliminary bite registration. For this purpose, the exclusive 'Digital Denture Professional' design software guides the user through the menu step by step. First, the position of the occlusal plane is defined. The CP and BP values defined by the clinician are entered into the virtual UTS CAD (Fig. 3). The patient-specific occlusal plane is determined. During the design process, a uniform offset space to allow for the later application of impression material can be defined for the entire basal surface of the bite plate. In addition, the design software includes the newly designed Gnathometer CAD needle-point tracing appliance utilised for the design of the bite rim (Fig. 4).

Milling is carried out using a Zenotec select ion milling unit—the latest member of the Zenotec select family. The acrylic particles produced during dry milling have a static charge and, as a result, they stick to the surfaces of the milling chamber. Zenotec select ion is equipped with nozzles directed towards the milling tools and acrylic blanks. These nozzles supply ionised compressed air during the milling procedure. The compressed

air neutralises the static charge and the acrylic particles can be easily evacuated. As a result, clean uncontaminated milling chamber surfaces and milling materials are ensured at all times.

Upon completion of the milling procedure, the bite plates are conveniently removed from the disc and any sharp edges smoothed out. The connection to the Gnathometer CAD has been accurately transferred from the design to the bite plate so that the needle-point tracing appliance can be directly attached (Fig. 5).

Second step—Clinical

The dentist now creates the functional impressions. The basal surface of the bite plate is wetted with a commercially available tray adhesive. Subsequently, a closed-tray impression is taken while the patient is performing functional movements. The position of the occlusal plane may be checked another time using the UTS CAD and corrected as necessary.

The maxillomandibular relation is determined using the Gnathometer CAD needle point tracing device, which simply clicks into the milled biting plate. The vertical height of both jaws is set by adjusting the thread of the tracing stylus. Figure 6 shows a typical needle point tracing record.

After the centric relation between the upper and lower jaw has been determined, the bite

Fig. 3 The provisional occlusal plane for the bite record is established using the patient-specific BP and CP values and included in the design.

Fig. 4 Individual tray and Gnathometer CAD aligned to the provisional occlusal plane.

Fig. 5 CAM-based custom tray for needle point registration.

Fig. 6 Patient-generated gothic arch to determine the centric relation.

Fig. 7 Patient-specific aesthetic landmarks: anatomical midline, smile line, lip closure line and canine position.



Fig. 5

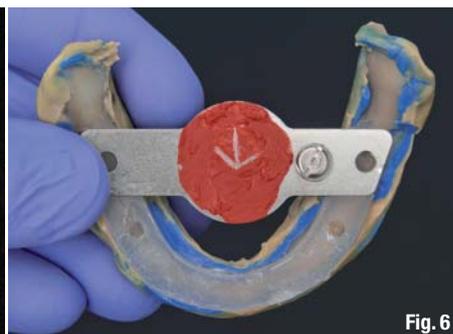


Fig. 6

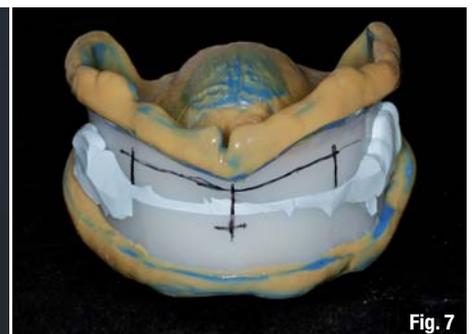


Fig. 7

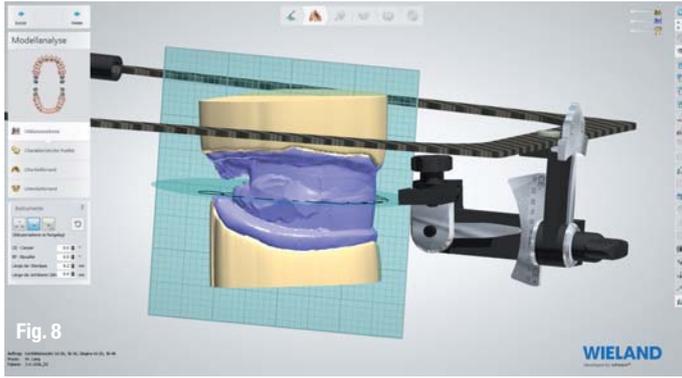


Fig. 8

Fig. 8_The final occlusal plane for the denture design is defined on the specified BP and CP values and included in the denture design.

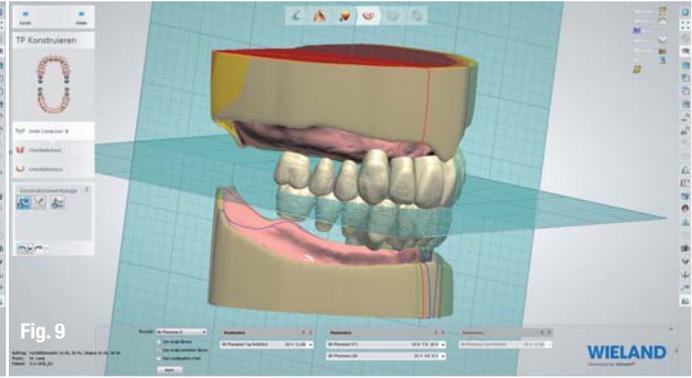


Fig. 9

Fig. 9_The 28-tooth sample setup, arranged in function, is already aligned with the occlusal plane.

plates are immobilised using a registration silicone. Lastly, the patient's aesthetic lines—e.g. midline, canine-to-canine line, lip closure line and smile line—are marked on the record (Fig. 7). This information assists the dental technician in setting up the anterior teeth in line with the patient's specific aesthetic characteristics.

Second step—Technical

The immobilised record and the functional impressions are scanned to generate the functional models for the final dentures.

Using the digital UTS CAD function, the definite final position of the occlusal plane is determined, or corrected (Fig. 8). Following model analysis, the teeth are chosen from a software library of select denture teeth. The programme suggests a setup that is already arranged in occlusion and takes account of the Spree and Wilson curve. The proposed setup is based on the occlusal plane as defined by the technician and can be fully individualised to suit any individual requirements (Fig. 9). This step allows the most significant time savings compared with conventional setup methods. An additional advantage can be achieved by overlaying the bite plates to verify the position of the anterior teeth using the aesthetic lines marked on the bite plates as guidance. The result is one hundred per cent reproducible.

Fig. 10_The monoblock for the esthetic try-in can be easily modified using pink setup wax.

Fig. 11_A transfer template for the insertion of the physical denture teeth is automatically computed at the same time as the output file for the CAM procedure is created.

At the next step, the software computes the gingival portions. The technician is again given every freedom to implement any desired changes by adding or removing additional material with the help of a 'digital' wax knife.

Upon completion of the denture design, the technician is granted the option to mill a monolithic PMMA try-in in the CAM unit. The shape of the denture base corresponds 1:1 to the final denture. If required, the gingival parts can be mimicked with pink setup wax to achieve an aesthetic contrast.

Third step—Clinical

Occlusion, phonetics, aesthetics and suction effect are checked at the try-in, similar to conventional wax try-ins (Fig. 10). If necessary, desired corrections to the position of the teeth can be marked on the try-in denture or on a digital photograph, or, alternatively, directly communicated to the technician. The technician uses this information to modify the design accordingly.

Third step—Laboratory

The technician calls up the saved denture design and implements any modifications as required. Before the output files of the final



Fig. 10

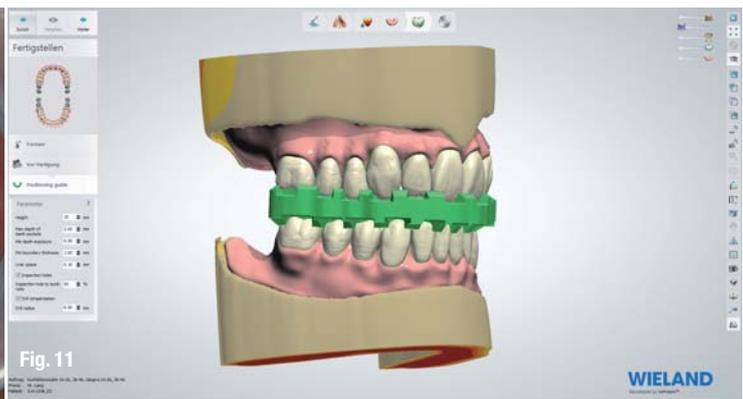


Fig. 11



Fig. 12



Fig. 13

denture base are created for manufacturing in the CAM unit, the CAD software automatically computes an additional transfer template that depicts the occlusal surfaces and incisal edges of the maxillary and mandibular teeth (Fig. 11). This information is then fed into the CAM software to mill the dentures in the Zenotec select ion milling unit.

If conventional methods are used, the denture teeth often have to be manually reduced at the basal surface using a handheld grinder, because the vertical dimension between the maxillary and mandibular teeth is in many cases too short.

The CAD/CAM manufacturing process addresses this situation by cutting two repositioning grooves into the IvoBase CAD for Zenotec disc. As a result, the disc can be secured only in one position using an especially designed disc holder. Then, in the first milling run, the denture base is milled from the top surface to its final shape including the holes for the placement of the physical teeth. After that, the disc is removed. The pre-fabricated denture teeth are polymerised to the denture base using IvoBase CAD Bond and the transfer template computed and prepared beforehand (Fig. 12). The transfer template is used to verify the correct placement of the teeth. To conduct the second milling run, this time on the basal surface, the disc is again secured to the disc holder in exactly the same position as before (Fig. 13). Now, if individual teeth turn out to be too long, the excess will be ground away during the second milling run. The result of the milling process is a CAD/CAM denture that can be polished to a high gloss using familiar methods.

Fourth step—Clinical

Incorporating the final dentures is carried out in the same way as the incorporation of conven-

tional dentures (Fig. 14). Particularly noteworthy is the excellent basal fit of the dentures. As the manufacturing process is not affected by polymerisation shrinkage or any other thermal influences and results in the precision typical of CAD/CAM methods, the dentures exhibit an exceptional accuracy of fit and provide an outstanding suction effect.

Outlook

The trend towards digitisation is not a new or unknown phenomenon in dentistry. Digital technology has started to make inroads into fixed dental prosthetics several years ago and has advanced successfully. It was therefore only a question of time until it would also start to gain a foothold in removable prosthetics. The Digital Denture process may represent an essential milestone in the advance of dental technology in fixed prosthetics. And this trend is said to continue: additional indications will advance the modernisation of removable prosthetics and the efficiency of the manufacturing processes will be consistently optimised.

Fig. 12 The positioning jig allows the denture teeth to be easily placed in the holes milled for the physical teeth. An inspection window allows the user to check if the teeth are placed firmly in their position.
Fig. 13 The disc holder is especially designed to ensure precise repositioning of the disc for the final milling process.



Fig. 14

Fig. 14 CAD/CAM-fabricated custom-made dentures: harmonious integration into the patient's overall aesthetic appearance.

contact

CAD/CAM

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Treatment coordinator: The bridge to case acceptance

Author | Lina Craven, UK



_You might think that in financially challenging times the last thing you need is a new member of staff. For a practice to thrive and prosper in a difficult financial climate, however, it has to become more efficient, more competitive and more profitable. One way to do that is to introduce a treatment coordinator (TC) into the team or if you already have one then to offer appropriate training. This is a relatively new role to the European market, but in the US, where the role is a central part of any practice, it has proven to dramatically add value to the patient experience, reduce in chair time and increase case acceptance.

The introduction of a well-trained TC will change your entire approach to new patient care, as well as increase profitability. While many practices know how to attract patients, their case acceptance ratio is low. The first contact, first visit and follow-up are the most important elements of the new patient process, yet they frequently represent a wasted

opportunity because of a lack of skill, focus, time or all three.

In my experience, a major downfall of practices is the unwillingness of practitioners to delegate the new patient process to staff, or what we call the TC role. This is often due to a wide range of factors, including the practitioner's perception that the patient wants communication on his or her treatment to come from the practitioner, the perception that patients pay to see the practitioner, a lack of trust to empower staff or time to train staff, and the financial implications of introducing the new role.

Relinquishing new patient management to well-trained staff is not a new trend, although its application has been limited in Europe. However, patients' expectations, competition for private work and the team's demand for career progression and job satisfaction are key drivers for introducing the TC role.

The TC concept

A TC is someone in your practice who, with the right skills and training, will facilitate the new patient process. He or she bridges the gap between the new patient, the practice and the staff. The TC promotes and sells the practice and its services by demonstrating their true value to prospective patients, frees up the practitioner's time, increases case acceptance ratios and, resultantly, increases practice profits.

Consider the time spent by the practitioner with the new patient and calculate how much of that time is non-diagnostic. A TC can often reduce up to 60 per cent of practitioner-patient time. Rather than this being a barrier to patients—which is indeed what many practitioners perceive to be the case—in my experience, patients actually feel much more at ease with the TC and therefore better informed. Doctor time is not always doctor time. As a typical example: if an new patient appointment is 30 minutes, but the clinical part is actually only 15 minutes, there is potentially 15 minutes still available. Think about the impact an additional 15 minutes for every new patient in the appointment diary could have.

A good TC will manage all aspects of the patient journey, from referral to case start, and potentially increase your case starts. He or she is the first point of contact. People buy from people, so the development of a relationship and establishing of rapport between the TC and the new patient are crucial to the success of your conversion from referral to start of treatment. The TC informally chats to the new patient prior to consultation. This helps not only to foster rapport but also to gain a better idea of the patient's needs and wants.

I recommend to all my TCs to be present at the consultation to listen and understand clinically what is and is not possible in order to allow the TC to determine how he or she will conduct a top-notch case presentation. The TC carries out the case presentation, reiterates the treatment options available to the patient, discusses these, answers any questions the patient may have, and clarifies proposed treatment. He or she also discusses the informed consent, shows before and after photographs of similar cases, and addresses any barriers or concerns the patient may have. The TC also explains the financial options and determines the most suitable payment method for the patient's needs, as well as prepares the walk-out pack. The value of a walk-out pack should not be underestimated and should reflect the values of the practice, including all information the patient needs, the finance agreement

or contract, diagnostic report, photographs of the patient (an excellent marketing tool), informed consent and anything else the practitioner feels adds value to the consultation.

Too many new patients are lost due to lack of follow-up. A good TC follows up and provides monthly information on patient conversions to assist with strategic planning. All practices should have a patient journey tracker.

Filling the role: An internal solution?

There are no hard and fast rules. It depends upon the size and aspirations of your practice and the qualities of existing members of your team. If you have a team member who fulfils the characteristics of a TC and he or she wants the challenge, then the answer is yes. Keep in mind that you may well need to fill that person's current position.

Some practices streamline job descriptions allowing them to create the new role without having to hire another staff member. Whether it is a full-time role or not depends upon various factors, including the size of the practice; the number of practitioners, chairs and patients; and the profit aspirations. Many practices implement the role and monitor its progress and impact. This often helps the team to accept the change and gives the practitioner the opportunity to assess any training needs of the TC and to access how remuneration will be affected.

The role of your TC should fit in with your practice's culture and aspirations for patient care. However you choose to implement the role, the only guarantee is that you will benefit enormously. Augmenting your team with a well-trained TC can reap tremendous rewards for you, the team and your patients. A TC's tailored and personal approach to care, follow-up and communication with patients fosters trust and increases patient satisfaction and retention.

about the author

CAD/CAM



Lina Craven is founder and Director of Dynamic Perceptions, an orthodontic management consultancy and training firm in Stone in the UK, and has many years of practice-based experience. She can be contacted

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Teamwork— For predictable outcomes

“Working as a team allows us to make the most of our individual strengths and knowledge”

Two doctors in the United States—one a general dentist, the other an oral surgeon—advocate a team approach to implant dentistry that creates a virtual clinic, consisting of a surgical specialist, an anesthesiologist, a restorative dentist and a dental technician or laboratory.

The Nobel Biocare team asked Drs Tarun Agarwal and Uday Reebye for some insights about teamwork in general and the All-on-4 treatment concept in particular.

Drs Uday Reebye and Tarun Agarwal agree that well-organised teamwork is beneficial for the patient and clinician alike.

How did you begin working together?

Dr Tarun Agarwal: I first met Uday while he was a medical student at the University of North Carolina. Later, after he completed his oral surgery residency and opened his practice here in North Carolina, I began sending him the surgical cases that I wasn't comfortable tackling. Our professional relationship flourished when Uday encouraged me to participate and collaborate on our surgical cases. He was very open to sharing tips and tricks and even allowing me to participate in the surgery.

Dr Uday Reebye: At the same time, Tarun taught me about prosthetic and implant advancements that had a great impact on my work.

Dr Tarun Agarwal: It became pretty clear that the cases we did together were the cases that turned out best and went the smoothest. I think it was the strategic collaboration and taking the 'holistic' (surgical and restorative) approach to the case that made the difference.

For you, your dental practices and the patient: What are the main benefits of the team approach?

Dr Uday Reebye: Implant dentistry is rapidly evolving and its complexities require solid prosthetic and surgical knowledge. Working as a team allows us to make the most of our individual strengths and expertise.

Sharing knowledge is essential for making advances in our field. Many times the biggest



changes I make on my surgeries are due to what Tarun has taught me on the restorative side; and conversely, Tarun has changed his treatment planning and prosthetic planning since he began getting involved in surgeries.

Dr Tarun Agarwal: What's more, I now have the confidence to tackle complex cases that I would never have even started in the past.

The patient is the real winner in our teamwork approach. They are provided with a seamless treatment experience. Each member of the team is focused on his or her core competency, which leads to better results.

I should also mention that practice productivity has steadily increased. As our mutual caseload has grown, so have referrals and our reputation within the community. It's like a snowball gaining size and momentum going downhill.

Would you say that you each bring different qualities to the partnership?

Dr Tarun Agarwal: Without question. Dr Reebye is a dual degree (MD and DMD) board certified Oral Maxillofacial Surgeon. His expertise and knowledge of surgery is light years ahead of mine. I am an esthetically-focused general dentist that has tremendous experience with digital dentistry.

By each having an open mind we are able to blend the digital technologies of restorative dentistry into the surgical world of complex implant dentistry. Over time, we have learned a great deal from each other, and now have a greater appreciation for the complexities and issues that each other deal with in the treatment process.

Do you ever have a difference of opinion when it comes to planning the treatment?

Dr Tarun Agarwal: Of course we do! Sometimes we have to bend on the surgical side and sometimes we have to bend on the restorative side...

Dr Uday Reebye: ...and it usually works out that whoever wins the argument has thought through the issue at hand a little longer and harder.

Dr Tarun Agarwal: I can give you an example. Uday was hesitant to begin using computer guided implant surgery. Initially, it was slower than the traditional technique he was used to, but for me, it made the restorative component absolutely more predictable and quicker. After our first case, he became aware that the extra 20 to 30 minutes of his time saved the patient multiple visits on the restorative side.



Dr Uday Reebye: It was an easy trade-off to make. At the end of the day, we resolve any differences of opinion guided by a single principle—to do what's in the best interest of the patient.

Is the All-on-4 treatment concept especially appropriate for your team approach?

Dr Uday Reebye: Yes, in my eyes, the All-on-4 treatment concept can only be successful as a team effort. It is a beautiful treatment concept that marries surgical and prosthetic philosophies.

I have to tell you that teamwork brings a great deal of enjoyment to the clinic. If you are happy when working, patients are happier, assistants are happier, and somehow that brew results in great outcomes.

Dr Tarun Agarwal: It really does! In our team approach, the restorative dentist creates the case blueprint, the surgical specialist serves as an engineer—by verifying the blueprint is surgically

Dr Uday Reebye (left): 'As similar as we are, I think we have a completely different approach to problems. The dichotomy in the way we think, I believe, is what provides strength and success. Many times, at the end of arguing about the correct treatment plan, we end up with a beautiful 'hybrid' that otherwise would never have been realised.'



Dr Tarun Agarwal (left): 'Over time we have pushed each other to take a closer look at each other's perspective.'

feasible—and the anesthesiologist is totally focused on patient comfort.

Starting with the endpoint in mind and collaborating to make it possible has routinely led to great outcomes.

What do you see as the main benefits of the All-on-4 treatment concept, both for clinicians and patients?

Dr Uday Reebye: We see so many edentulous or about-to-be edentulous patients who need new teeth. Previous treatment modalities were so expensive and difficult that these patients left our clinics depressed, with no hope in sight. The All-on-4 treatment concept allows us as clinicians to give hope to many patients who once had few or no encouraging options. Now we can dramatically change the lives of these patients for the better.

Dr Tarun Agarwal: And because this treatment concept is more affordable for patients, a greater number of patients become implant candidates. For us, the All-on-4 treatment concept has virtually created a new market.

What would you say to clinicians thinking about starting with the All-on-4 treatment concept?

Dr Tarun Agarwal: Go learn about it with an open mind! There are literally millions of patients who can benefit from this treatment. Nobel Biocare has a predictable workflow with a tremendous support system to make you successful.

Dr Uday Reebye: Before I took my first All-on-4 class, all I heard from many clinicians (none of which had taken a class or done All-on-4 surgery), that the concept was flawed and a recipe for disaster. Seven years later, all I can say is that I am so happy we did not listen to them. My advice? 'Keep an open mind, take a course, and see for yourselves what a great service you can provide for your patients!'

For any clinicians out there looking to adopt a team approach like yours, is there a secret to successful partnership?

Dr Tarun Agarwal: You have got to let go of your ego. We are all equals to the patient, after all, each bringing a different area of expertise to the team...

Dr Uday Reebye: ...and let me add this: Listen to your patients. Be willing to talk to other clinicians to share ideas, and never be afraid to reach out when you need help. Most of us love to share what we know with each other—to be of help and to learn more at the same time.

And finally—enjoy! It is a wonderful journey...

Note: The All-on-4 is a registered trademark of Nobel Biocare.

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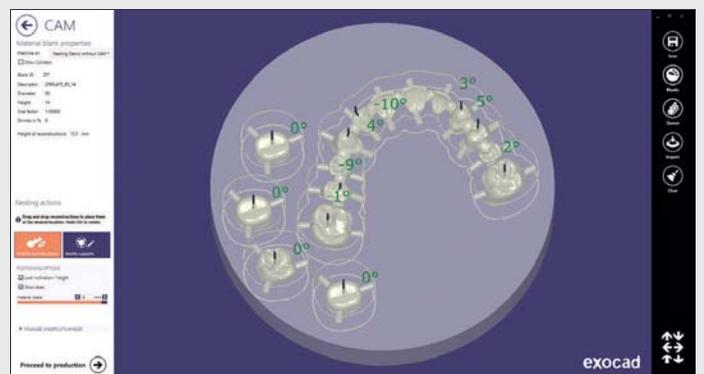
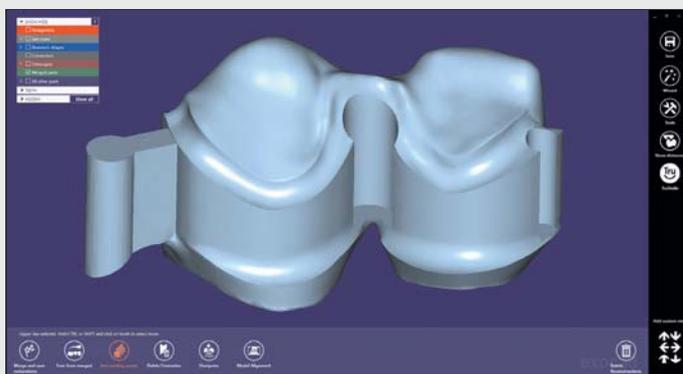
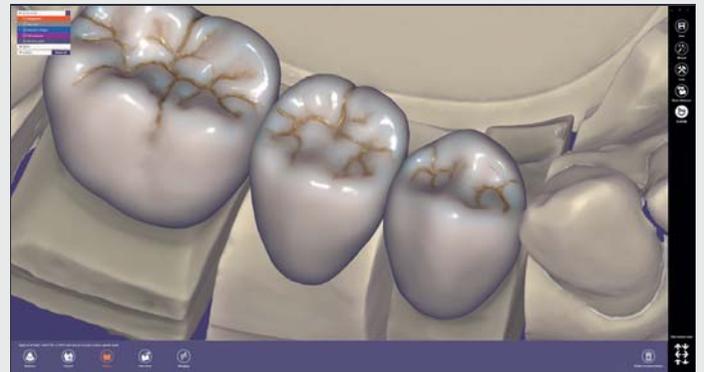
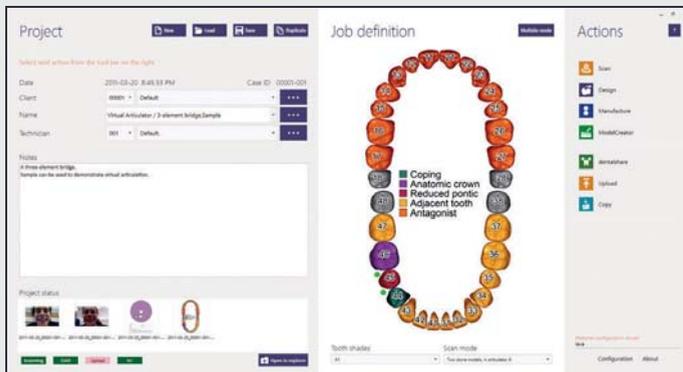
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Interdent: CAD/CAM comprehensive solution for amazing results

Author_ Urša Zagožen, Slovenia



Fig. 1

Fig. 1_ Satisfied Interdent customers.

_Interdent is a European manufacturer of materials for dental laboratories and one of just six manufacturers of dental alloys, from melting

to final product. The company offers a complete solution with its CAD/CAM System, which includes milling units and various kinds of discs. In order to achieve that, the company responds to new trends and offers its customers a wide range of discs, which are produced in accordance with European legislation and provide customers with high-quality and dependable results.

to final product. The company offers a complete solution with its CAD/CAM System, which includes milling units and various kinds of discs.

With more than 37 years of experience in dentistry and exportation to more than 50 countries around the world, the company's mission is to produce quality products at a reasonable price in order to achieve mutual collaboration with its customers and their complete satisfaction (Fig. 1).

In order to achieve that, the company responds to new trends and offers its customers a wide range of discs, which are produced



Fig. 2

Fig. 2_ Vanik Kaufmann-Jinoian, a satisfied user of CC DISK NF CoCr.



Fig. 3

Fig. 3_ A construction milled from CC DISK NF CoCr.



Fig. 4a



Fig. 4b

Become king with Interdent's cobalt–chromium discs

CC DISK NF CoCr is the successor to the classic I-Bond NF dental alloy, also known as "the king among alloys", which has been on the market for many years and has numerous satisfied users. For the last two years, it has continued its reputation in the form of a disc intended for porcelain-fused-to-metal restorations. Its greatest advantage is an ideal coefficient of thermal expansion (13.9 to $14.0 \times 10^{-6} K^{-1}$) and, for this reason, is the first disc on the recommended list of alloys for VITA Zahnfabrik metal–ceramics.

The disc guarantees customers safety and consistent quality. Distinguished dental technician Vanik Kaufmann-Jinoian from Switzerland attests to this: "CC DISK NF CoCr is one of the best discs made of non-precious alloys that I have used so far for milling structures such as bridges and copings. This alloy gives me safety, quality and profitability in performing dental restorations of high quality." CC DISK NF CoCr is available in thicknesses of 8, 10, 12, 13.5, 15 and 18 mm (Figs. 2 & 3).

You use zirconia discs at work, but do you desire aesthetics comparable to that of lithium disilicate?

Then CC DISK Zr Smile will fulfil your wishes: owing to its 49 % light transmission at 1 mm and translucency, which is close to that of lithium disilicate, it produces top-notch results. It is specifically designed for aesthetic solutions in the anterior region. CC DISK Zr Smile is available in thicknesses of 12, 14, 16, 18, 20 and 25 mm (Figs. 4a & b).

One of a kind

CC DISK Zr Multicolour is another highly aesthetic zirconia disc. Produced with a colour gradient,

it offers aesthetic solutions in designing anatomic crowns and frames for ceramic firing.

Forget about staining and firing—you are only one step away from the perfect aesthetic solution with this zirconia disc. It is available in thicknesses of 14, 18 and 22 mm and in the following translucent versions: A2 with colour gradient A1–A2.5 and A3 with colour gradient A2–A3.5 (Fig. 5).

Figs. 4a & b CC DISK Zr Smile (a), and a demonstration of its high translucency (b).

Fig. 5 An aesthetic construction milled from CC DISK Zr Multicolour.

Fig. 6 Interdent discs made of various materials (CoCr, Ti, Zr, PMMA).

Fig. 7 CAD/CAM mills of different shapes for different materials.



Fig. 5



Fig. 6



Fig. 7



Fig. 8a



Fig. 8b



Fig. 8c

Figs. 8a–c _ Milling units
CC POWER (a), CC COSMO (b)
and CC TRENDY (c).

_ We have even more to offer

Besides the discs already mentioned, Interdent has several other high-quality and well-priced discs in its range. They are available in various thicknesses and (some of them) even in different colours. The disc size, with a diameter of 98 mm, is suitable for the widest CAD/CAM milling units.

The offering of Interdent discs made of various materials includes the following (Fig. 6):

_ CC DISK Zr is made of biocompatible pre-sintered zirconia. It is available in two different translucencies (ordinary and high translucency) and in different colours.

_ CC DISK Ti2 is used for the production of crowns and shorter range bridges and single superstructures over implants.

_ CC DISK Ti5 boasts particular hardness (Vickers hardness of 353) and it is thus used to produce appliances that need to be rigid and tough, such as single crowns, larger bridges, and especially superstructures over implants.

_ CC DISK PMMA is used for fabricating temporary restorations, for gingival formation after placing implants, and for accurate determination of the occlusal contacts before seating zirconia prosthetic structures.

_ CC DISK PMMA Transparent is used for manufacturing cast and anatomical constructions, for press ceramic and for verifying larger constructions thereafter made from zirconia.

_ CC DISK PMMA Pink is used for fabricating the base for complete prostheses, partial prostheses,

and immediately loaded dentures on implants as a long-term provisional solution.

_ CC DISK PMMAX-Ray Opaque is used in CAD/CAM milling machines for making X-ray visible teeth on an implant diagnostic template to view the placement of the teeth while planning the position of the implant.

_ CC DISK WAX is used for making crowns, bridges, and cast bases.

In order to achieve the best results, it is important to use a specifically designed rotating instrument for each material. Interdent offers these rotating instruments in its CAD/CAM System besides the three milling units, CC POWER, CC COSMO and CC TRENDY (Figs. 7 & 8).

_ about the author CAD/CAM



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Fig. 1

Fig. 1 _ATLANTIS ISUS Bridge produced using additive manufacturing technique. The framework is designed with an optimised surface for ceramic or composite layering technique. (Courtesy of Nexus Dental Laboratory, Harrogate, UK)



Fig. 2

_The new production technology, called additive manufacturing, is a metal 3-D printing technique that provides new possibilities for advanced geometries. ATLANTIS ISUS additive manufacturing of implant suprastructures takes another step beyond CAD/CAM. The result is an ultimate design for the ATLANTIS ISUS bridges and hybrids in cobalt-chrome for all major implant systems.

face. The surface is sandblasted and ready for veneering with ceramic or composite materials, which eliminates the dental laboratory time needed before veneering of the suprastructure.

'Our laboratory efficiency is improved. Since suprastructures are delivered sandblasted and ready for veneering, there is no need for final adjustments'—Proteket, a dental laboratory from Oslo, Norway.

_Factory of the Future award to DENTSPLY Implants

DENTSPLY Implants in Hasselt, Belgium, where SIMPLANT guides and ATLANTIS ISUS implant suprastructures are produced, won the Factory of the Future Award 2015.

Under Horizon 2020, the European Framework Program for Research and Innovation for 2014–2020, continues to work with the concept of Factories of the Future. The Factory of the Future multi-annual roadmap for the years 2014–2020 sets a vision and outlines routes towards high added value manufacturing technologies for the factories of the future, which will be clean, high performing, environmentally friendly and socially sustainable. The priorities have been agreed upon within the wider community of stakeholders across Europe after extensive public consultation.

The award shows that DENTSPLY Implants are in line with the European Framework Program for Research and Innovation when it comes to the future of manufacturing and development.

_State-of-the-art production

After design approval of the ATLANTIS ISUS bridge or hybrid, the suprastructure will be sliced into a multitude of layers. Each layer will be traced by a laser beam in a bed of powder. Before each passing of the laser, the machine adds a new layer of powder. This fusing process creates a highly detailed and solid suprastructure.

The suprastructure is heat treated, removing internal stresses in the material. In addition, all screw seating and implant/abutment connections are milled after the heat treatment to ensure high precision. The milling strategy for ATLANTIS ISUS implant suprastructures is optimised to produce a precise and passive fit.

_Laboratory efficiency

When ordering a suprastructure produced with additive manufacturing, customers benefit from the same order entry, design approval, delivery performance and accuracy as they are used to.

In addition, suprastructures will be delivered with more advanced geometries and an optimised sur-



Note: Not available for the North American market.

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Institute of Dental Education together with the University of Turku. NIDE has started off strong by already organising five courses in 2015—with several more lined up for 2016.

NIDE's courses are an intriguing blend of theoretical and practical perspectives, complemented by fun activities outside the classroom. Most of the courses are held in Finland's beautiful capital, Helsinki, with some of them also taking place in the coastal city of Turku. All courses are taught in English by leading experts in their fields.

_Ensuring an optimal balance

The Nordic Institute of Dental Education offers a wide range of academically accredited courses. In particular, NIDE specialises in 3-D and CAD/CAM education, but its courses also cover several other essential topics, such as aesthetic, restorative and adhesive dentistry.

As dental professionals are becoming increasingly aware of the benefits of CAD/CAM, there is more demand than ever for high-quality continuing education surrounding the technology. What differentiates the Nordic Institute of Dental Education from traditional training providers is the balance of academic, clinical and practical

_The Nordic Institute of Dental Education (NIDE) is a joint venture founded by Planmeca and the University of Turku. It has been a logical next step in Planmeca's close and decades-long collaboration with the university world. Utilising the dental company's technological innovations, as well as the University of Turku's strong academic pedigree, NIDE offers continued education courses to international dental professionals looking to strengthen their expertise.

The Nordic Institute of Dental Education's upcoming courses.

Planmeca expanded its operations in the field of dental education last year by founding the Nordic

NIDE CAD/CAM courses		Dates
Fundamentals of CAD/CAM	An accessible entry point into the world of CAD/CAM, the course invites participants to learn the basic principles of the treatment method of the future.	17–19 February 2016
		6–8 June 2016
		5–7 October 2016
Beyond the basics of CAD/CAM	Recommended for users with previous CAD/CAM experience, this intermediate course covers CAD/CAM techniques for creating multiple restorations—further increasing clinical proficiency.	10–11 March 2016 9–10 June 2016
CAD/CAM summer school	An intensive package combining NIDE's basic and intermediate CAD/CAM courses ('Fundamentals of CAD/CAM' and 'Beyond the basics of CAD/CAM'). In addition to learning, participants will also get a chance to experience Finland's long summer days.	6–10 June 2016
Advanced CAD/CAM	Designed for more experienced users aiming to hone their craft, this advanced course will help develop a deeper understanding of CAD/CAM.	To be announced soon



content in its courses. NIDE's curriculum is built on a theoretical foundation, but also incorporates a strong hands-on approach to learning—featuring example cases that have been handpicked by lecturers.

Additionally, specialists from Planmeca are readily available during courses to teach correct techniques and answer questions on the equipment used. This helps participants gain practical insights on digital technology, which support the academic aspects of the courses.

The Nordic Institute of Dental Education currently offers two CAD/CAM courses—one for participants wishing to enter the world of computer-aided design and manufacturing, and one for intermediate users looking to deepen their understanding. Both courses are held in Helsinki. The 'Fundamentals of CAD/CAM' course teaches the basic principles needed to successfully utilise the technology, while the course: 'Beyond the basics of CAD/CAM' helps to achieve a higher level of proficiency.

NIDE will add a third CAD/CAM course to its program in 2016—an advanced course for more seasoned users who want to expand their expertise.

In addition to its standard CAD/CAM courses, NIDE also offers tailor-made study tours for groups from clinics, distributors, or dental associations.

Fun in and out of the classroom

The Nordic Institute of Dental Education's courses bring together participants from diverse clinical and cultural backgrounds. In 2015, NIDE has hosted dental professionals from countries as varied as Belgium, Bulgaria, Croatia, Finland, Egypt, Lithuania, Norway, Portugal, Sweden, and Zimbabwe. This broad range of nationalities creates a truly international atmosphere for participants to exchange experiences and ideas in.

In addition to the cutting-edge academic and clinical contents featured in its courses, NIDE also wants visiting dental professionals to experience Finland in more leisurely ways. This is achieved through offering an interesting side programme as part of the courses, highlighting the beauty of Helsinki and its surrounding archipelago. A complimentary Nordic dinner is also included, as well as the possibility to try a traditional Finnish sauna. The side programme has received a great deal of positive feedback from participants, who have valued the authentic Nordic experience alongside the course's high-quality content.



With a rare blend of scientifically proven concepts, academic backgrounds, technological expertise, and beautiful Nordic surroundings, NIDE's continued education courses are truly one of a kind.

about NIDE

CAD/CAM

The **Nordic Institute of Dental Education** is a Finnish joint venture company founded by Planmeca Oy and the University of Turku. NIDE offers high-quality continuing education courses to international dental professionals, who wish to strengthen their expertise in the latest topics in the field of dentistry. NIDE's courses utilise the strong academic pedigree of the University of Turku, the best lecturers in the field, as well as Planmeca's world-leading technology.

All NIDE courses are taught in English at the University of Turku or at Planmeca's headquarters in Helsinki. The University of Turku provides ECTS credits and course certificates to students.

NIDE's expertise covers a wide range of topics, such as 3-D imaging, CAD/CAM technologies, aesthetic dentistry, biomaterial sciences, prosthodontics, endodontics, and orthodontics.

contact

CAD/CAM

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www.nordicdented.com

International Events

2015

12th International CAD/CAM Expo & Symposium
20–22 November 2015
Los Angeles, USA
www.dloac.org/symposium

ADF

24–28 November 2015
Paris, France
www.adf.asso.fr

Greater New York Dental Meeting

27 November – 2 December 2015
New York, USA
www.gnydm.com

CAD/CAM International Conference 2015

4–5 December 2015
Suntec, Singapore
www.capp-asia.com

2016

**20th UAE International Dental Conference
& Arab Dental Exhibition—AEEDC**
2–4 February 2016
Dubai, UAE
www.aeedc.com

ICOI Winter Symposia

12–14 February 2016
Miami, Florida
www.icoi.org

Academy of Osseointegration Annual Meeting

17–20 February 2016
San Diego, USA
www.meetings.osseo.org

151st MIDWINTER MEETING

25–27 February 2016
Chicago, USA
www.cds.org

ECR—European Congress of Radiology

2–6 March 2016
Vienna, Austria
www.myesr.org

AADR/CADR Annual Meeting & Exhibition

16–19 March 2016
Los Angeles, USA
www.iadr.org

IMAGINA Dental

5th Digital Technologies
& Aesthetic Dentistry Congress
7–9 April 2016
Monaco
www.imaginadental.org

International Osteology Symposium

21–23 April 2016
Monaco
www.osteology.org

Dental Digital Marketing Conference

29–30 April 2016
Dallas, USA
www.dentalmarketingconference.com



submission guidelines:

Please note that all the textual components of your submission must be combined into one MS Word document. Please do not submit multiple files for each of these items:

- _ the complete article;
- _ all the image (tables, charts, photographs, etc.) captions;
- _ the complete list of sources consulted; and
- _ the author or contact information (biographical sketch, mailing address, e-mail address, etc.).

In addition, images must not be embedded into the MS Word document. All images must be submitted separately, and details about such submission follow below under image requirements.

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Article lengths can vary greatly—from 1,500 to 5,500 words—depending on the subject matter. Our approach is that if you need more or less words to do the topic justice, then please make the article as long or as short as necessary.

We can run an unusually long article in multiple parts, but this usually entails a topic for which each part can stand alone because it contains so much information.

In short, we do not want to limit you in terms of article length, so please use the word count above as a general guideline and if you have specific questions, please do not hesitate to contact us.

Text formatting

We also ask that you forego any special formatting beyond the use of italics and boldface. If you would like to emphasise certain words within the text, please only use italics (do not use underlining or a larger font size). Boldface is reserved for article headers. Please do not use underlining.

Please use single spacing and make sure that the text is left justified. Please do not centre text on the page. Do not indent paragraphs, rather place a blank line between paragraphs. Please do not add tab stops.

Should you require a special layout, please let the word processing programme you are using help you do this formatting automatically. Similarly, should you need to make a list, or add footnotes or endnotes, please let the word processing programme do it for you automatically. There are menus in every programme that will enable you to do so. The fact is that no matter how carefully done, errors can creep in when you try to number footnotes yourself.

Any formatting contrary to stated above will require us to remove such formatting before layout, which is very time-consuming. Please consider this when formatting your document.

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Please number images consecutively throughout the article by using a new number for each image. If it is imperative that certain images are grouped together, then use lowercase letters to designate these in a group (for example, 2a, 2b, 2c).

Please place image references in your article wherever they are appropriate, whether in the middle or at the end of a sentence. If you do not directly refer to the image, place the reference at the end of the sentence to which it relates enclosed within brackets and before the period.

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Questions?

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