

# CAD/CAM

international magazine of dental laboratories

## opinion

Dental technicians:  
The missing link

## case report

Full-mouth restoration  
with Zolid FX

## feature

The art of ultra-  
aesthetic dentistry



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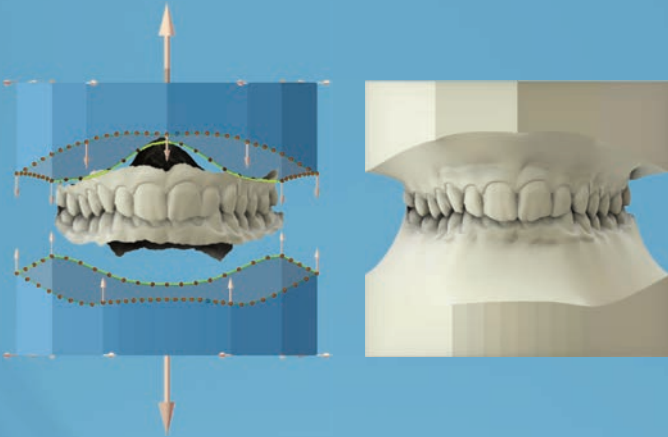
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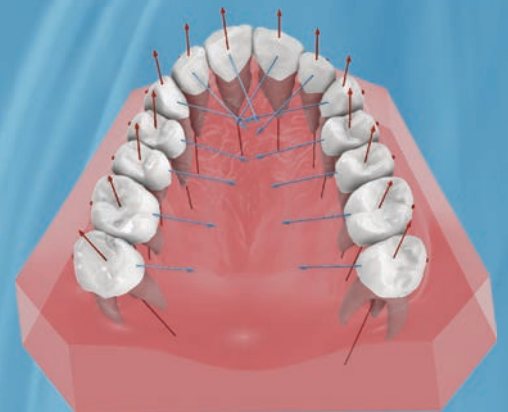
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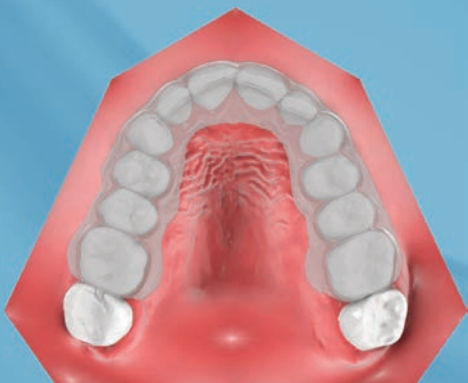
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**Magda Wojtkiewicz**

Managing Editor



## Dear readers,

**It does not take much** to see how new technologies change the dental world. Intra-oral scanners, milling machines, chairside and in-laboratory CAD/CAM systems, 3D printers—all these products have been available on the market for some time. Whereas some innovations are not visible at first sight and are repeatable in nature, like software updates and minor improvements to speed up usability, many new solutions bring almost immediate change to the quality of work.

In an interview in this issue of **CAD/CAM** magazine, Dr Ryan C. Lewis, an experienced prosthodontist from the US, says that “Dental technology advances dentistry by increasing communication, efficiency and accuracy.” He adds that the most important technologies that he currently utilises are CAD/CAM milling, intra-oral scanning, digital implant planning, 3D printing and photography.

In another interview, Dr Alon Mozes, CEO and co-founder of Neocis, the first dental robotics company, states that “the world of dentistry is becoming more and more digitally focused” and that “there are obvious advantages to leveraging the skills of a robotic system”. Solutions that until recently seemed to be technologies of the future are now commonly available.

One of the interesting things about dental technology is how much it draws on other industries: CAD/CAM and 3D printing came from the manufacturing sector, and many regenerative materials used in dentistry were originally developed for use elsewhere in the body. Technologies invented without dental applications in mind have been used in and have changed dentistry and the dental laboratory forever. It is very likely that soon we will observe extended use of mobile phone applications to facilitate communication between dental professionals and patients. Many dental mobile applications are available today—some measure brushing time, and others register progress in orthodontic treatment—but so far they have not gained popularity among either dentists or patients.

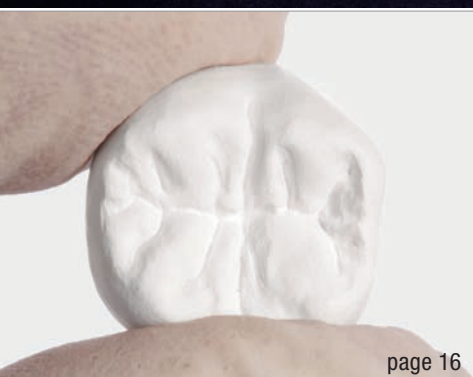
The continued evolution of manufacturing processes, materials and technologies changes interactions between dentists, dental technicians and patients. Human teeth have not changed much in the last 100 years; dentistry, however, as a profession, has moved from basic tools to high-tech solutions and outstanding care.

Sincerely,

Magda Wojtkiewicz  
Managing Editor



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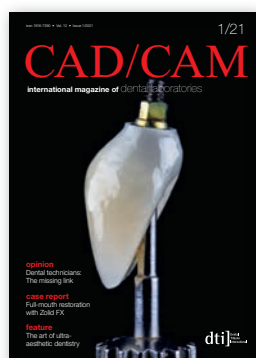


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# Dental technicians: The missing link

Dr Ali Nankali, UK



**Fig. 1:** Dr Ali Nankali believes that dental technicians have received insufficient support during the pandemic, from both the government and the members of the dental team. (Image: © Ali Nankali)

If you ask a dental patient to which member of the dental team we should give our thanks, many of them would say to dentists and dental nurses. What do you think is the correct answer? I assume we all agree that dentists cannot provide an appropriate health care service without their team. Members of the dental team who are registered with the General Dental Council (GDC) are clinical

dental technicians, dental hygienists, dental nurses, dental technicians, dental therapists, dentists and orthodontic therapists. Unfortunately, it seems to me that some members of this team have not been treated equally during the COVID-19 pandemic. In this article, I want to talk about dental technicians as an integral part of the dental team.



**Fig. 2:** Chad Cluff. (Image: © Queen Mary University of London) **Fig. 3:** Adel Houmani. (Image: © Ali Nankali)

I am a prosthodontist, and a large part of the health care services that I provide depend on dental technicians. We are in constant contact, as they help me during patient treatment and sometimes provide training for new learners while observing various issues that need to be addressed, such as delays in receiving work or a slight decrease in the quality of work.

Chad Cluff, tutor dental technologist at Barts and the London School of Medicine and Dentistry at Queen Mary University of London in the UK, told me that many dental laboratory spaces are relatively inadequate for adopting required social distancing measures. Thus, not everyone can be present at work at the same time, and the absence of some employees can cause a delay in the delivery of the service and affect work performance. Cluff noted that the situation is currently beyond remedy.

Adel Houmani, lead technical skills manager at the university, said that the delays in work could have been caused by other reasons. He noted that all dental impressions have to be properly disinfected and that the process requires additional time. He also mentioned that it is unknown whether the virus can survive in dental impressions, and therefore dental technicians should do their best to avoid any contamination.

Houmani also added that some dental laboratories are a great deal quieter than usual. According to him, this quietness could be explained by patients not visiting the dentist regularly since the onset of the pandemic. There has been a decrease in workload, and this is directly affecting dental laboratory finances and thus putting the owners and partners under pressure. So how can we help dental technicians?

According to Houmani, dental laboratory fees are always a topic of discussion. However, since many dentists are looking to save money, increasing the fees would result in losing orders. It seems that this issue is gradually worsening, and a few organisations, such as the Dental Technologists Association in the UK, have warned that patients will soon be experiencing long delays in receiving their custom-made dental appliances.<sup>1</sup>

It has upset me to learn that, whereas dentists are being supported via the National Health Service, the country is likely to lose many qualified dental technicians for the lack of government support.<sup>2</sup> Some sources suggest that over 1,000 dental technicians are currently out of work and that many of them are unable to maintain their registration with the GDC.<sup>3</sup>

According to dental technicians, dental technology has for too long been considered external to the dental team.<sup>4</sup> However, I want to emphasise that we are a team, and we have continued to provide health care services to everyone



**Fig. 4:** Dr Ali Nankali. (Image: © Ali Nankali)

who has needed our help during the pandemic. We need to realise that, during this pandemic, dental technicians have faced great difficulty in accessing any form of support, not just that from the government. Therefore, they do not only need financial help from health authorities; they also need support from the members of the dental team.

We, as members of the dental team, should appreciate what dental technicians are doing for us and our patients, and this appreciation should be passed on to other members of our society. To achieve that, I am starting with myself. As stated recently, dental technicians have to maintain their registration with the GDC and keep their continuing professional development (CPD) up to date to remain employable.<sup>5</sup> As president of UKDentalCourses, an active educational organisation in the UK, I am happy to tailor non-profitable CPD courses to their needs. Therefore, I ask our respected dental technicians to send their requests to [enquiry@ukdentalcourses](mailto:enquiry@ukdentalcourses), and we will do our best to address your needs.

In addition, UKDentalCourses would like to invite every member of the dental team to attend The Restored Link online event. The event is aimed at showing dental technicians our appreciation and respect and listening to their enquiries. Please join us and express your needs and concerns.

*Editorial note: A list of references is available from the author upon request.*

## about



**Dr Ali Nankali** is a clinical senior lecturer at Barts and the London School of Medicine and Dentistry at Queen Mary University of London and the president of UKDentalCourses, an online education platform that offers continuing professional development opportunities to dentists worldwide.



# “Dental technology advances dentistry”

By Iveta Ramonaite, Dental Tribune International



Dr Ryan C. Lewis, a prosthodontist and owner of Longmont Prosthodontics.

**With its transformative power,** digital dentistry is slowly taking over dental practices and laboratories all around the world. In this interview, prosthodontist Dr Ryan C. Lewis talks about how digital dentistry can help improve workflow efficiency and highlights some of the latest advancements in digital dentistry.

**Dr Lewis, digital technologies are being taken up in dental practices worldwide. In your opinion, is it still possible to imagine dentistry without them?**

Dental technology advances dentistry by increasing communication, efficiency and accuracy. The most important technologies that I currently utilise are CAD/CAM milling, intra-oral scanning, digital implant planning, 3D printing and photography.

We initially integrate digital technology with CAD/CAM milling abutments and digitally design restorations. If we compare this to UCLA casting abutments and hand waxing porcelain-fused-to-metal restorations, we do not only

save significantly on our gold costs, but we are also able to increase the efficiency of fabricating the restorations. If we then consider intra-oral scanning and the ability to digitally submit cases to the laboratory, plus the savings in impression material, shipping costs, time to ship, and cases getting lost or delayed in shipping, it is easy to appreciate the benefits that digital dentistry offers.

All of my implant cases are now digitally planned. After using digital planning and fully guided surgery, my surgeon no longer wants to place implants the traditional way. It provides peace of mind knowing that the implant will be positioned ideally, the referring doctor will be happy with the work and the patient will have the desired outcome.

3D printing has changed the way that we produce surgical guides. 3D printers have become so accurate and inexpensive that any dentist can now afford to have them in his or her office and print surgical guides as well as casts for diagnostic purposes or aligners at a relatively low cost.

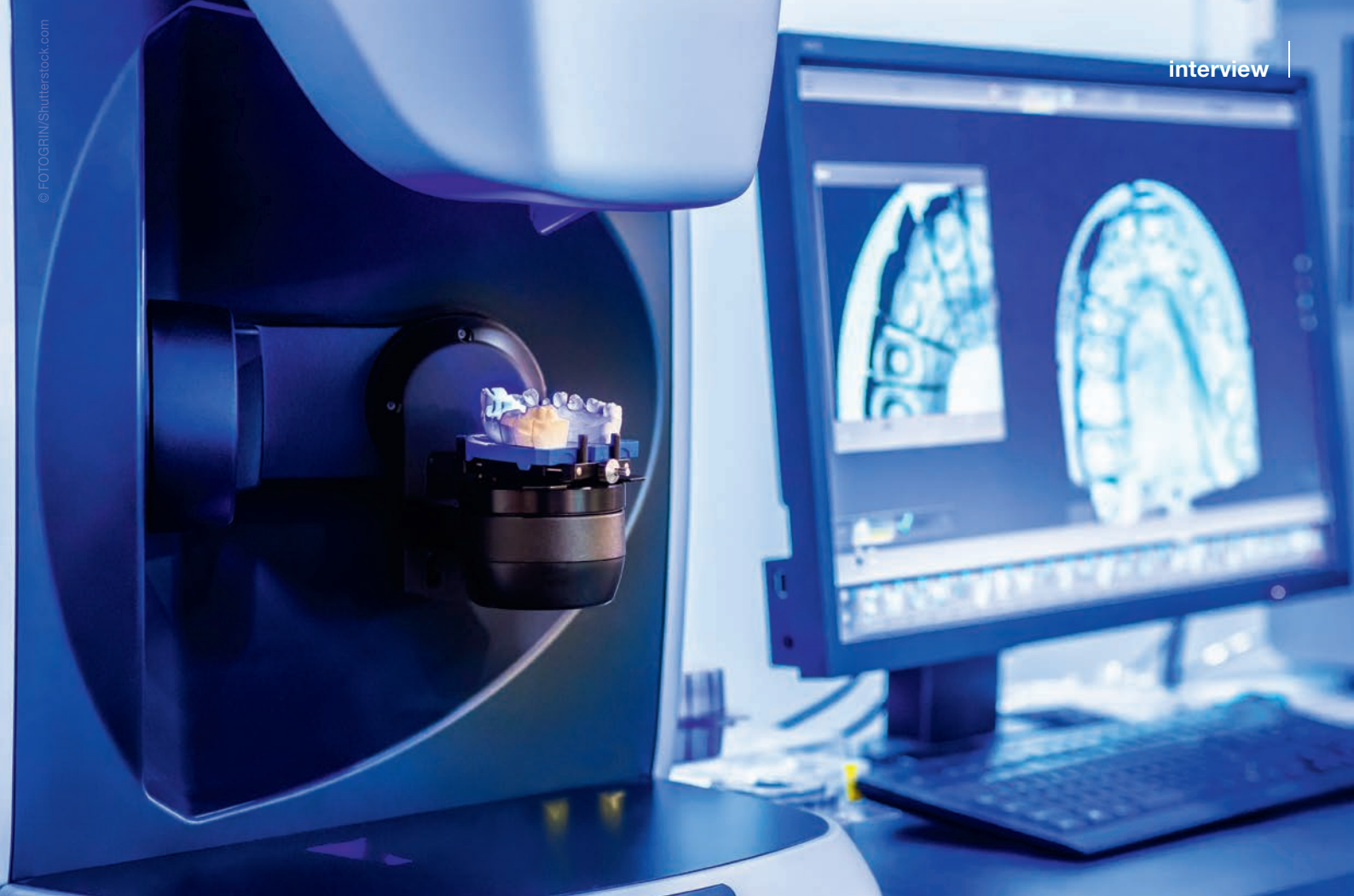
Additionally, photography has become essential when communicating with my dental technicians. The accuracy and quality of my restorations would suffer significantly without it.

“3D printing has changed the way that we produce surgical guides.”

**What are some of the latest, most notable advances in digital dentistry?**

Digital implant treatment planning, intra-oral scanning and 3D printing. With digital implant treatment planning, we can significantly improve the accuracy of our implant position. We now can integrate facial scans and intra-oral scans without full-arch digital wax-ups. This ensures that we are accurately planning our new tooth positions. Because our digital diagnostic wax-ups are so accurate, we can also plan our full-arch implant positions with confidence. This allows us to place implants immediately at the time of extraction in cases where we would have previously recommended extraction of teeth and healing first.





For Dr Ryan C. Lewis, going back to traditional dentistry would significantly impact his costs, efficiency, quality of work, and ability to communicate with surgeons and dental technicians.

3D printing is now very predictable and accurate. It allows us to print the surgical guides in the office without worry or concern about the accuracy of the guide. My full-arch immediate load provisionals are printed on the same printer as my surgical guides.

**Dental laboratories seem more ready and willing to adopt digital solutions compared with dental clinics. How do you think this could be explained?**

Digital technology greatly increases the efficiency of the technician. This decreases overhead expenses and treatment costs. It also increases the accuracy of the restorations. Many laboratories now report that digitally designed and milled crowns provide the lowest number of remakes by percentage out of any product they offer. Typically, these are modelless crowns that are manufactured without a printed or stone cast. From the laboratory perspective, it is a great tool to utilize.

For many dentists, the new technology changes their workflow significantly and takes time to integrate into their traditional workflow. Because of this and the startup costs, it is difficult to switch to digital dentistry when using a traditional pathway has brought success in the past. However, as in my practice, once the digital pathways have been integrated, going back to a traditional one would increase overhead and decrease efficiency significantly.

**How has the SARS-CoV-2 pandemic changed your view, or that of your colleagues, on the relevance of digital dentistry and the importance of adopting digital solutions?**

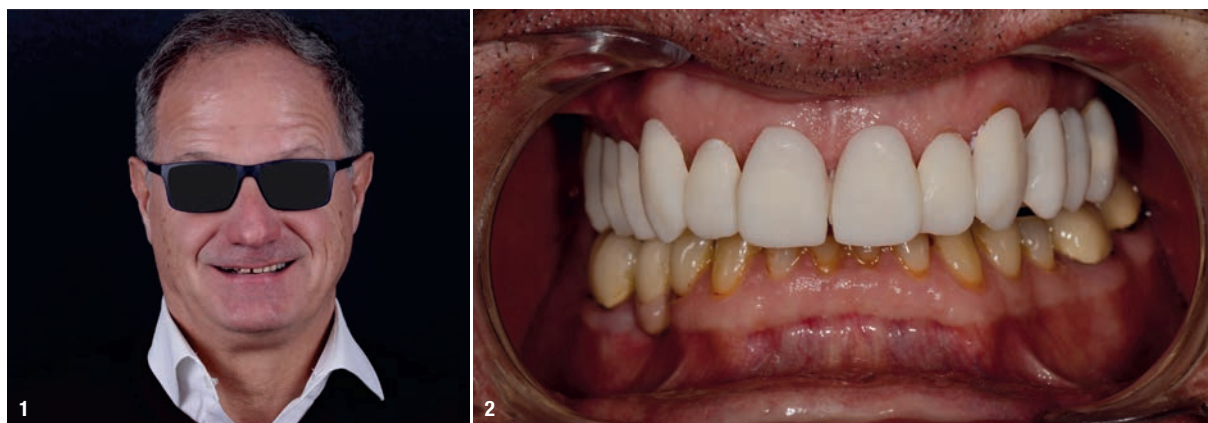
The pandemic has highlighted the potential contamination risks associated with transferring impressions or other components from the patient to the laboratory. Intra-oral scanning offers the safest solution, the one with the least risk of cross-contamination. Unfortunately, this is a problem that is likely not going to go away any time soon, so this is great not only now, but also as we move forward into the future.

**“Intra-oral scanning offers the safest solution, the one with the least risk of cross-contamination.”**

*Editorial note: The webinar, titled “Advancements in contemporary digital dentistry,” is available on demand at Straumann Campus (<https://campuslive.straumann.com>). The registration is free of charge.*

# Fully digital workflow with a twist

Dr Marco Tudts & Bob Bosman Elst, Belgium



**Fig. 1:** Smile before the treatment. **Fig. 2:** Mock-up (GC Temp PRINT, GC) in the mouth.

A 61-year-old male patient presented suffering from severe tooth wear, which can be classified as attrition, abrasion or erosion depending on its cause. The entire smile line had been lost and even became negative (Fig. 1). The patient was an extrovert, and hence a new nice smile would impact his social life positively.

The destructive wear of his teeth had already caused several endodontic treatments and temporomandibular joint dysfunction caused by the loss of the vertical dimension and resulting in tense and tired muscles. Severe tooth wear had caused morphological change of occlusal tooth, decrease of vertical dimension, pulp pathology, occlusal disharmony and changed masticatory function. In this condition, more complex therapies

are needed, such as endodontics, periodontics and full coronal coverage.

A digital impression was taken, and the master model was printed. A digital wax-up/mock-up was made in exocad DentalCAD (exocad) using the Smile Creator module. A standard length of 10.8mm and width of 8.4mm was used, as described by Mauro Fradeani.

This set-up was a really nice starting point for this patient's biotype. The idea was to verify the integration because the vertical dimension had to be increased by several millimetres and the patient wanted to rejuvenate his smile inconspicuously, as naturally as possible, in addition to all the comfort of a balanced occlusion.



**Fig. 3a:** Printed temporary restorations relined with G-ænial Universal Injectable (GC). **Fig. 3b:** Temporary restorations in the mouth after relining with G-ænial Universal Injectable. **Fig. 4:** Smile with the provisional restorations in zirconia, characterised with GC Initial IQ Lustre Pastes NF (GC).





**Fig. 5a:** Putty key on the provisional restorations. **Fig. 5b:** Putty key on the substructure.

This digital wax-up/mock-up was printed in GC Temp PRINT (GC) as veneers so that it could be placed in front of the teeth (Fig. 2); a small support towards the palatal side was present so that it could be placed over the natural dentition in a stable manner. This made it possible to evaluate both the aesthetics and the musculature's response to the new occlusal height. The patient could also take this printed wax-up home, giving him the opportunity to show it to his partner, but also to check it for himself in his own private space and without any time pressure or pressure from strangers. Having his or her smile remodelled is something really drastic, so the patient should be given as much time as he or she needs with all the possible tools.

After the patient's consent had been obtained, it was possible to proceed with the treatment plan: the veneers were adapted in DentalCAD and printed again as temporary crowns (GC Temp PRINT, light shade).

These crowns were relined with G-ænial Universal Injectable composite (Shade A2, GC; Fig. 3a) and manually polished. Optionally, they could have been glazed with OPTIGLAZE color (GC). The cervical border was

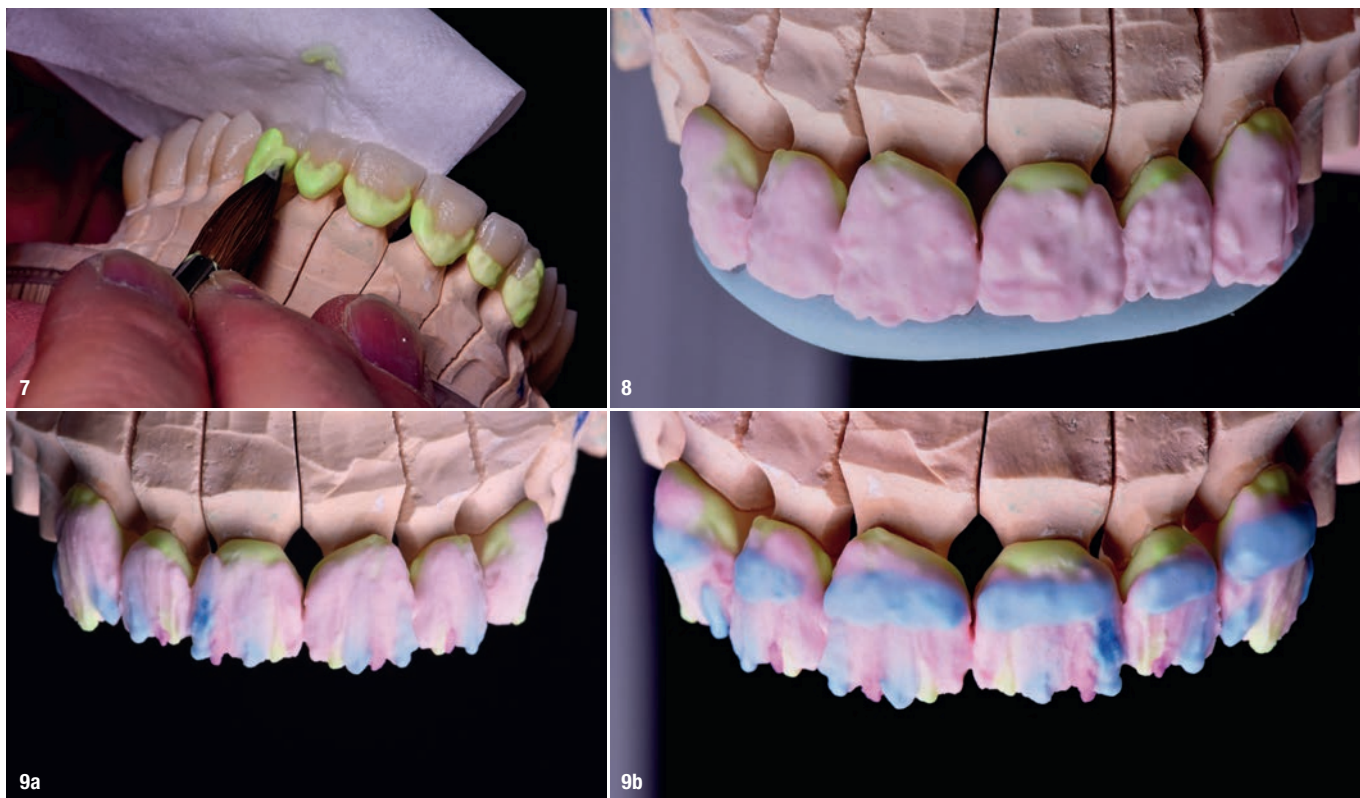
sandblasted (50 µm is sufficient) so that it could be easily connected to the composite and then only the relined part had to be polished again (Fig. 3b).



**Fig. 6a:** Wash firing: GC Initial IQ Lustre Pastes NF.



**Fig. 6b:** Wash firing: GC Initial IQ Lustre Pastes NF, sprinkled with GC Initial IQ Lustre Pastes NF CL-F (anterior). **Fig. 6c:** Wash firing: GC Initial IQ Lustre Pastes NF (posterior).



**Fig. 7:** Creation of the neck. **Fig. 8:** After application of the dentine material, the horizontal line was checked with the putty key. **Fig. 9a:** Mamelons and cervical surfaces: 50% FD-91 + 50% DA2 (green), A1 (dark pink), 50% A1 + 50% E58 (blue). **Fig. 9b:** The enamel blocker (50% A1 + 50% E58; blue) was also used on the cervical part.

The vertical dimension was increased by 8 mm. To ensure that this would be comfortable for the patient, three months were taken to revise the situation. The patient suffered no headaches, muscle stress or any other problems. Hence, the first phase of the aesthetic adaptation was begun. Minor gingivectomy with bone correction was carried out first. An impression was taken, and long-term provisional restorations were

manufactured in full zirconia. Those were characterised with GC Initial IQ Lustre Pastes NF (GC) and cemented temporarily (Fig. 4). A recall was planned for three months later. This period also allowed the soft and hard tissue to heal properly after the periodontal surgery.

At that point, definitive work could begin; however, owing to a skiing accident, the definitive impression



**Fig. 10:** Central incisor with GC Initial IQ Lustre Pastes NF CL-F. **Fig. 11:** Colour firing with GC Initial IQ Lustre Pastes NF CL-F.





**Fig. 12:** Enamel firing.

needed to be postponed for another three months. This did not pose a problem because of the highly durable provisional restorations.

For cases like this, the comfort of the patient is always the priority. Hence, after six months, the definitive impressions were taken, both digitally and conventionally. The conventional impression was used to create the master working model. This was mostly due to famil-

ilarity with the procedure. We feel that what we are mentally comfortable with will also yield the best possible end result. However, a digital impression could have been used as well.

For the substructure, multilayered zirconia (Shade A2) was used. The design was a small, adapted copy of the provisional restorations. A 0.4mm buccal cut-back was done for the posterior teeth and the canines.



**13a**



**13b**



**14a**



**14b**

**Figs. 13a & b:** Correction firing. **Fig. 14a:** Restorations before polishing. **Fig. 14b:** Restorations after polishing.



**Fig. 15:** Prepared teeth before luting. **Fig. 16:** Final result in intercuspal position.

For the four anterior teeth, a 0.6 mm cut-back was done and the incisal height was decreased by 0.4 mm. To maintain control of the horizontal line, a palatal putty index of the provisional restorations was made for use as a key during the ceramic build-up (Figs. 5a & b).

The zirconia substructure was slightly adapted and went into the furnace for a regeneration firing. Thereafter, the workflow continued with the wash firing. After application of the GC Initial IQ Lustre Pastes NF (Fig. 6a), the Initial CL-F (Clear Fluorescence) powder was sprinkled on top of the wet paste (Figs. 6b & c). This gave the opportunity to sandblast after the wash firing without damaging the colour. Moreover, it ensured that the colours would not slip down.

Zirconia does not absorb heat well, and the heat must be carefully adjusted to avoid chipping. The problem of chipping is also a consequence of poor adjustment of the heating program. The larger the volume of zirconia, the slower the heating up and cooling down should take place. In this case, the heating temperature was dropped by 30 °C per minute, and the cooling down should have a similar rate. To keep it simple: the time to heat up should be more or less the same as the cooling down.

The part until the CL-F was the first layer. For the neck, IN-42 (Terracotta; 40%) was used with A2 (60%), and then the main colour was A2 (Fig. 7). After applying DA2 to the full contour (Dentin A2), the horizontal



**Fig. 17:** Night guard to protect the restorations and periodontal tissue. **Fig. 18:** Final result, portrait. The patient was satisfied with the aesthetics and function of his new smile.

line was checked with the putty key (Fig. 8). After the cut-back, the mamelons were shaped. FD-91 (Fluo Dentin Light; 50%) with DA2 (50%), A1, and A1 (50%) with E58 (Enamel; 50%) were alternated, as shown in Figures 9a & b.

In the cervical part, this mixture was also used. This mixture could be called an enamel blocker; it works as a softer transmitter of the colour. This mixture can also be used as a transition towards the enamel in the incisal third; however, in this case, it was used as a softer, lighter cervical part. It is all about breaking the light with a chameleon effect inside the material.

If the mamelons are to be clearly distinguished from the dentine material, CL-F should be applied on top of the mamelons (Fig. 10). For floating mamelons, a wall of CL-F is applied to the cut-back, then the mamelons are created and then again a layer of CL-F is applied. In this case, it was chosen to have the mamelons differentiated from the dentine material.

This first bake is the colour firing (Fig. 11); if the colour is not chromatic enough or already too chromatic, it is easier to adapt in this phase. After application of the enamel material, colours should no longer be adapted because this will destroy the appearance, which could become very greyish.

The enamel firing could be considered the morphological firing. For the enamel, a mixture of E58, EI-14 (Enamel Intensive Yellow) and EOP Booster in three equal parts was used (Fig. 12). The program was exactly the same as for the colour firing.

The correction firing was done with the same mixture, but diluted with a fourth part of CL-F (Fig. 13). The temperature was dropped by 5°C. In case another firing is necessary, the temperature can be dropped by an extra 2°C.

After finishing of the structure, the crown was glazed with just some liquid, at 50°C lower than normal. The intention was to seal the surface. After this firing, the crowns were hand polished with a mixture of pumice and 50µm aluminium oxide (Fig. 14).

The preparations were cleaned and isolated with retraction cords (Fig. 15). The crowns were cemented with a resin-modified glass ionomer (GC Fuji PLUS CAPSULE, GC). The cement excess was easily removed when the rubbery state was reached, and margins were polished.

Increasing the vertical dimension is often a challenging task. The temporisation phase was used to evaluate

the influence of the increase on the temporomandibular function. Aside from the function, restoring the vertical dimension had a positive influence on the aesthetic appearance. After treatment, a better balance in the facial dimensions as well as a fuller, more youthful smile could be seen (Figs. 16–18).

## about



**Bob Bosman Elst** graduated in 1991 as a dental technician. While working at his own independent dental laboratory in Belgium, he has continuously been working on expansion and developing innovative techniques for the dental industry. Over the years, he has participated in more than 40 master courses,

including those by Brusch, Tysko, Calgaro, Adolphi, Galle, Hegenbarth, Sieber and Polansky, either as a lecturer or as an active participant. His work has been recognised by many in the field. In 2007, Elst won the third prize (in the Young Ceramics category) during the world tour of Nobel Biocare in Las Vegas in the US. He came in as the first European of all the participants in this highly reputable event. He set up a help desk for dentists, covering all aspects of implant-supported restorations and porcelain. In 2017, he became a trainer of the GC Europe Campus, where he found the perfect forum for sharing his passion and experience.



**Dr Marco Tudts** graduated as a dentist from KU Leuven in Belgium in 1991 and completed his postgraduate qualification in aesthetic and prosthetic dentistry in 1994. For 12 years, he was a part-time associate at KU Leuven, complex rehabilitation being his major research topic, and participated in various multicentre studies.

In 1996, he started a multidisciplinary private practice, specialised in complex rehabilitation, which he is still running. In 2004, he obtained an MSc in dental implantology from Montefiore Medical Center in New York in the US. In 2008, he opened a look-over-shoulder training facility for dentists focusing on implantology, 3D technology, CAD/CAM and 3D guided surgery. He is the developer of the Navigator System for guided surgery (Zimmer Biomet Dental). Since 2015, he has been a staff member in the Department of Oral Health Sciences at Ghent University in Belgium. Here, he is currently preparing his PhD dissertation on 3D-guided surgery under Prof. H. De Bruyn.



# Full-mouth restoration with Zolid FX— a successful concept for sophisticated prostheses

Joachim Maier, Germany



**Figs. 1 & 2:** Pronounced abrasion due to bruxism, resulting in significant loss of the vertical dimension.

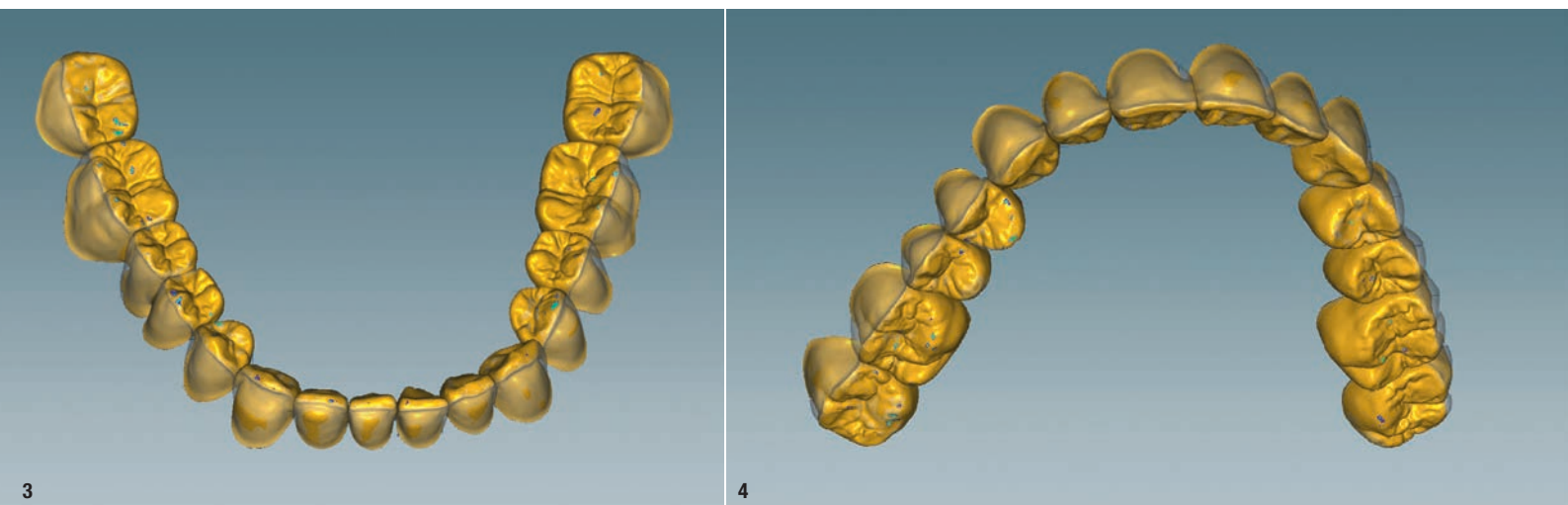
## Case description

The patient case outlined here describes the challenges that prostheses have to meet under high stress. The patient presented to the practice with pronounced abrasion and asked to have his natural dental appearance restored. Full-mouth restorations have their own challenges, and this was particularly so for this patient, who tended to re-

lieve his daytime stress by grinding his teeth at night. After completion of pretreatment and splint therapy, the patient presented to us with the status shown in Figures 1 and 2.

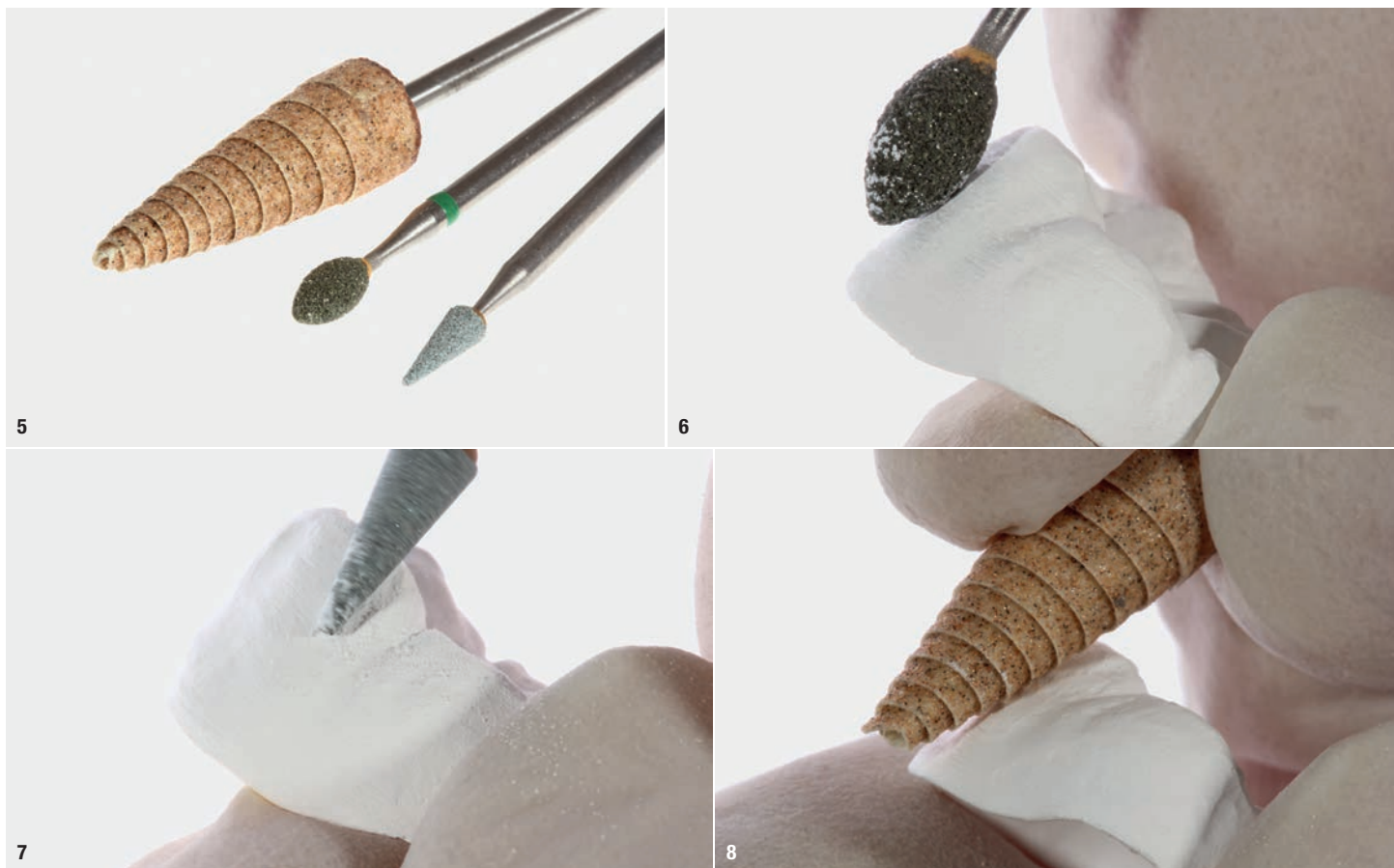
## Goal definition

Our task was to fabricate prostheses which, in addition to their natural aesthetics, could withstand high mechani-



**Figs. 3 & 4:** The occlusal design was created, and the contacts placed on unveneered zirconia. These should not be positioned directly on the veneer interface.





**Fig. 5:** Tools for surface characterisation before sintering. **Figs. 6–8:** Stones and sandpaper cones were drawn over the surface by hand without rotation.

cal stress and offer corresponding durability. The patient and clinician wanted all-ceramic restorations consisting of single crowns in the maxillary and mandibular regions, except for a three-unit bridge in the fourth quadrant. The restorations were to be fabricated at the occlusal height specified during splint therapy. This was specified to us via a corresponding occlusion registration record.

### Choice of materials and design

We always attempt to use only a single material for each case or restoration. Different ceramics have different light properties, which can be an optical disadvantage. For restorations consisting exclusively of single crowns, we usually choose veneered zirconia and in exceptional cases also lithium disilicate. The bond between lithium disilicate and veneering ceramics demonstrates higher strength than between zirconia and corresponding veneering ceramic. However, we appreciate the concentration of zirconia as a universally applicable material for frames. With a limited choice of materials, we can gain maximum experience and thus achieve a very high level of production reliability and predictability of the results.

Depending on the mechanical stress, we select a different thickness for the veneering ceramic on zirconia.

In the case of extreme stress, we also dispense with a glaze in the functional area of the contact points.<sup>1</sup> For bruxism patients, however, we choose unveneered lithium disilicate for individual crowns in the posterior region, as the natural abrasion and associated loss of height observed for this material are similar to that



**Fig. 9:** Interim status of the surface treatment before partial smoothing.



**Figs. 10 & 11:** If required, the fissures can be recontoured with a pointed carbide cutter. **Fig. 12:** After sintering, diamond silicone polishers are recommended for refining the zirconia surface. For example, the Zolid Sinter-State Polishing Kit (Amann Girrbach) is well suited here. **Fig. 13:** Stone and diamond polishers from EVE-Diacera HP Set for zirconia.

of natural teeth. Unveneered, smooth-polished zirconia would exhibit less loss of height over the years and would result in uneven abrasion of the teeth, having

unforeseeable consequences. Our standard solution is thinly veneered zirconia if only a few teeth are to be restored, for example in the case of isolated gaps.



**Figs. 14 & 15:** Silicone brushes with diamond grains do not change the shape of the surface, but smooth it. Contact with the workpiece should be made at a slight angle so that the bristles can deflect better and do not kink.

In this case, we decided to partially veneer the crowns and the bridge owing to the exceptional mechanical stress on the prostheses.

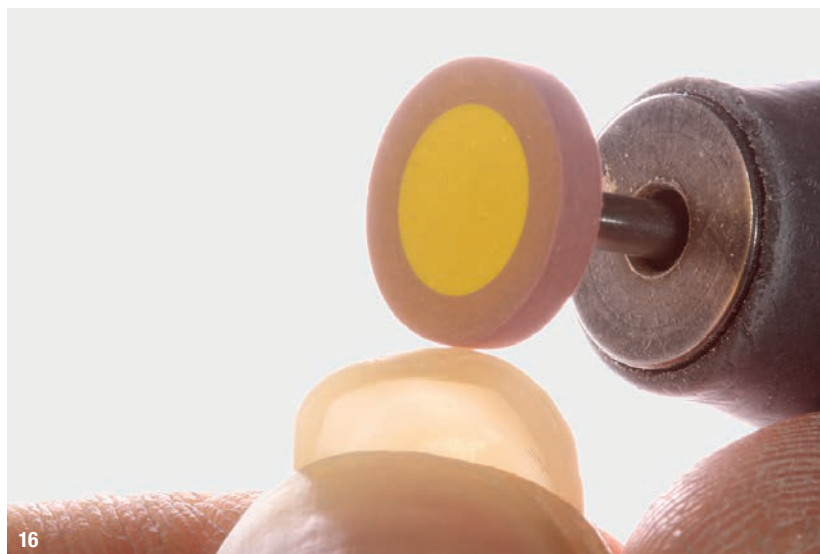
The visible vestibular parts were to be veneered with the Creation CT veneering ceramics. We wished to place the transition to the unveneered area outside the heavily stressed functional paths and static contact zones. At the time of fabrication, we had ZI, Zolid and Zolid FX (Amann Girrbach) at our disposal. Owing to the small bridge span, we selected the super-high-translucency material Zolid FX Multilayer (Amann Girrbach) for the full-mouth restorations, including the bridge from tooth #45 to tooth #47. The tooth stumps were not significantly discoloured. This allowed us to make full use of the optical advantages of the translucent material. To achieve maximum individuality, the Zolid FX multilayer crowns were partially stained with liquids before sintering. It is recommended to use a pre-stained blank that is slightly lighter than the tooth shade to be achieved in order to avoid a restoration that is too dark.

### Design of the functional areas

In virtual design, we try to create as few occlusal contact points as possible. We consider this to be sufficient if the tooth can be loaded axially. A reduced number of occlusal contacts helps us to keep the dynamic function under control. This is absolutely necessary in the case of extremely hard zirconia, as defects in this area can lead to unforeseeable consequences for the softer components of the masticatory organ. Our occlusal design can be viewed as an example in Figures 3 and 4. The areas to be veneered are defined with some distance to the contact paths and surfaces. Normally, we extend the cut-back to such an extent that small optical optimisations of the incisal cutting edge are possible through the individual layering technique of the veneer, particularly in the anterior region. The anterior teeth are therefore often given a cut-back that runs approximately in the middle of the incisal edge in a mesiodistal direction. However, in patients where extreme functional loading can be expected, this boundary line runs all the way along the outer buccal edge of the abrasive surface to prevent chipping under these particular conditions.

### The surface quality of zirconia

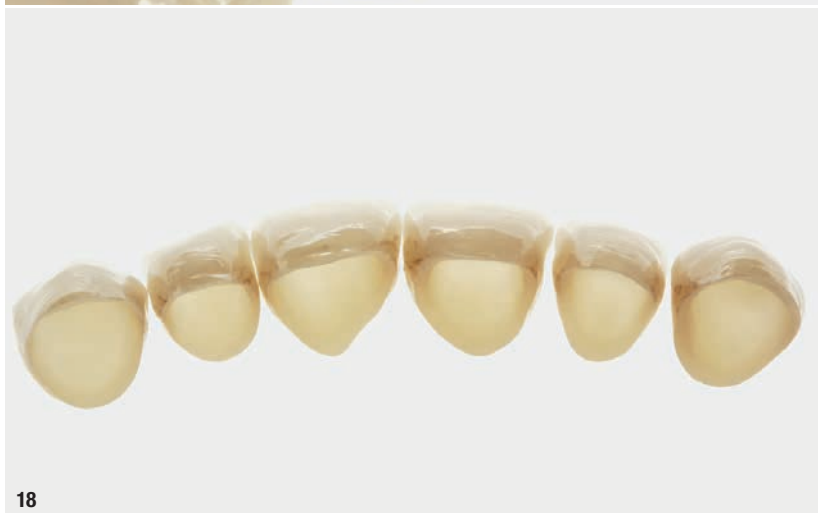
In this case, the unveneered areas of zirconia were provided with a surface structure prior to sintering. Figures 5 to 9 show the tools, work steps and results of surface characterisation prior to sintering. The powerful characterisations can only be performed by hand with a coarse stone, for example, without the use of a motor. These structures are subsequently smoothed



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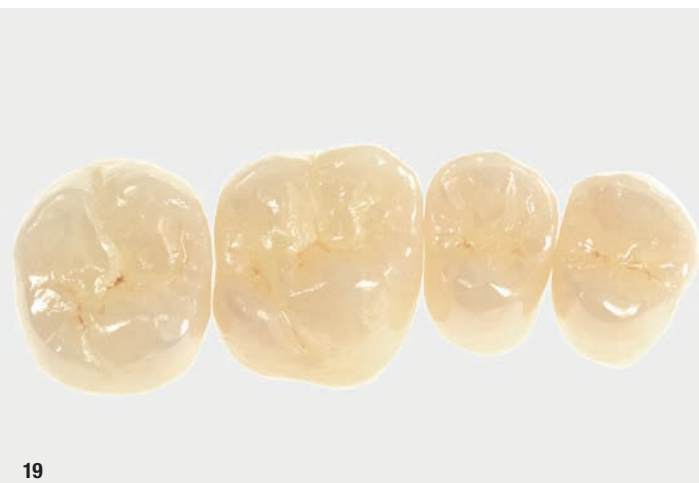
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**Fig. 16:** Low-structure, smoother areas, such as those found at the exposed tooth equator, are partially polished with silicone wheels. **Fig. 17:** The objective is a high-quality surface with a matt finish. Only the small occlusal contact or functional surfaces are polished to a high gloss. **Fig. 18:** The nature-like translucency of Zolid FX makes it possible to dispense with part of the dentine layering with veneering ceramics.





19



20

**Figs. 19 & 20:** The combination of areas with monolithic zirconia and areas with buccal veneering combines the entirely different advantages of two ceramics.

again slightly at the raised areas with mostly smoother surfaces. It is important that these structures are not applied to bridges in tensile stress areas, to prevent any possible initial formation of cracks. Finally, the fissures are reworked if necessary. Figures 10 and 11 demonstrate this final processing step before cleaning, infiltration and sintering. The small contact and guide surfaces on zirconia must be polished to a high gloss after sintering and grinding to prevent mutual abrasion and early failure of the restoration. The analysis of an internal study by our laboratory showed that polishing with a diamond polisher or the finest diamond grinder largely removes the deep surface damage caused by a Rotring diamond bur. The success of this approach has been confirmed by Coldea et al.<sup>2</sup>: if final sintered Y-TZP is processed with coarse abrasives, subsequent polishing is absolutely necessary. It is recommended to grind or polish gradually with increasingly finer grinders or polishers. The surfaces are smoothed with suitable diamond silicone polishers, that is, the spikes are removed without causing any further surface damage. This can

be facilitated quite easily, for example, with the polishing sets in Figures 12 and 13.

In contrast to veneering ceramics or lithium disilicate, our polished zirconia samples have very low roughness depths. The smooth surface of final sintered zirconia that can be achieved by polishing also has advantages in abrasion behaviour compared with veneering ceramics. Preis et al. came to this conclusion in a comparison of the abrasion behaviour of zirconia and veneering ceramics on natural enamel.<sup>3</sup> Abrasion caused by zirconia was considerably less than that of veneering ceramics. Owing to the veneering ceramics, the antagonist exhibited a roughened surface and partially also cracks and fractures in the enamel. The contact surfaces with zirconia were polished.<sup>3</sup> In an *in vitro* study, Sripetchdanond and Leevailoj showed that monolithic zirconia had a lower wear depth on human enamel than glass-ceramic and human enamel did.<sup>4</sup> The best result of our laboratory test regarding the lowest roughness depth was obtained with an epoxy resin-bonded, diamond-



21



22

**Figs. 21 & 22:** New teeth with abrasion facets and cracks that suit bruxism patients. Stability, function and inconspicuous integration of the restorations were the objectives of our work.



containing stone. The remaining surface structures were efficiently polished with two-stage diamond polishers as shown in Figure 13. The surface quality can be further increased with a subsequent glaze layer. However, one must allow for abrasion of the glazing material in the functional area. A meticulously smoothed surface is therefore a prerequisite for long-term success. Nevertheless, we now avoid the use of glazing material as far as possible, as solubility and a surface that tends to roughness in an acidic environment in the long term have been observed and discussed critically in the literature.

After sintering, the surface was again smoothed with diamond silicone polishers in wheel and brush form (Figs. 14–16). High-gloss polished zirconia tends to have a mother-of-pearl-like shine, which does not really resemble a natural tooth. We therefore try to polish only those parts which are in direct contact to a high gloss. All other areas receive a rather matt finish, easily visible at the crowns of this patient case as shown in Figure 17. The nature-like translucency of Zolid FX (Fig. 18) makes it possible to manage it with a reduced veneer thickness. The Zolid FX frame material with its dentine-coloured shade assumes parts of the optical dentine core. The fluorescence is applied with a fluorescent liner before veneering.

### Goal achieved?

The work was tried in as an intermediate step in the mouth. The shade and natural appearance with incisal facets and enamel cracks both suited and pleased the patient. The occlusal contacts were checked by the dentist with shimstock and, where necessary, discreetly optimised with a Rotring diamond burr and subsequent polishing in analogy to the laboratory procedure. Back in the laboratory, we finished the work with glaze firing without glazing material (Fig. 19). The cemented restorations looked authentic and inconspicuous in the mouth (Figs. 20–23). The patient and our dental partner were both very satisfied with the restorations. The near-natural appearance exceeded the expectations of the patient. He considered the reconstructed occlusal height and function to be very comfortable.

*Acknowledgement: Our thanks go to Dr Cornell Lischka for the excellent cooperation.*

*Editorial note: This article first appeared in BYT—Another Dental Magazine in March, 2019, and an edited version is provided here with permission from Amann Girrbach. A list of references is available from the publisher.*



**Fig. 23:** The patient was very satisfied with the restorations.

“The near-natural appearance exceeded the expectations of the patient.”

### about



After completing an apprenticeship in dental technology in the 1990s, master dental technician **Joachim Maier** worked as a dental technician at the school for dental medicine in Tübingen in Germany. This was followed by five years at a renowned laboratory in Stuttgart in Germany and then by a collaboration with

Dr Kenneth A. Malament in Boston in the US and support as a visiting lecturer of the postgraduate programme in prosthodontics at Tufts University School of Dental Medicine and Harvard School of Dental Medicine in Boston.

In 1999, he achieved his master's degree and was co-founder and part owner of Bodensee Dentaltechnik in Meersburg in Germany. Today, he runs the Bodensee Oral Design Center in Überlingen in Germany. The laboratory specialises in fixed prostheses with all-ceramic systems. He gives presentations and courses in Europe, the US and Asia on all-ceramic, minimally invasive restorations, implant-borne prostheses and CAD/CAM technology and reports on his 15 years' experience with veneering zirconia and more than 10,000 workpieces.

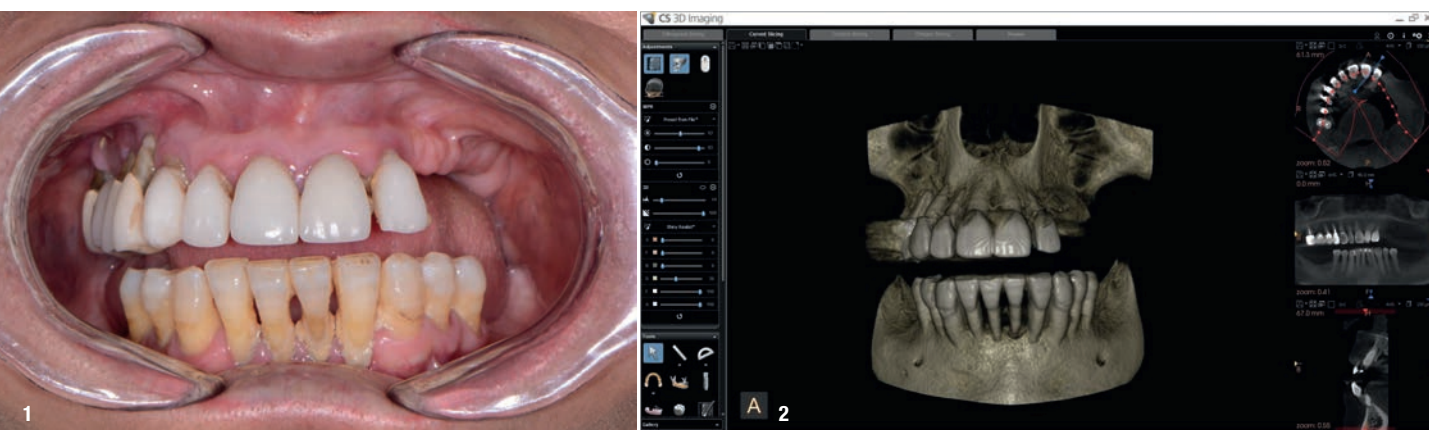
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# Incorporating an inclusive approach to oral rehabilitation

Dr Ara Nazarian, USA



**Fig. 1:** Pre-op retracted frontal view. **Fig. 2:** CBCT scan using the CS 8100 3D (Carestream Dental).

## Introduction

Today, we are starting to see a large increase in patients needing full-mouth extractions, whether it is due to decay, periodontal disease or infection. Also, as people mature and age, their periodontium is exposed to many more variables that may contribute to the loss of their teeth. For these patients, the greatest concerns are the availability of various treatment options within their budgets, the duration of the surgical and prosthetic process, and whether they will be able to function as they did when they had healthy teeth. For dental providers, the most common

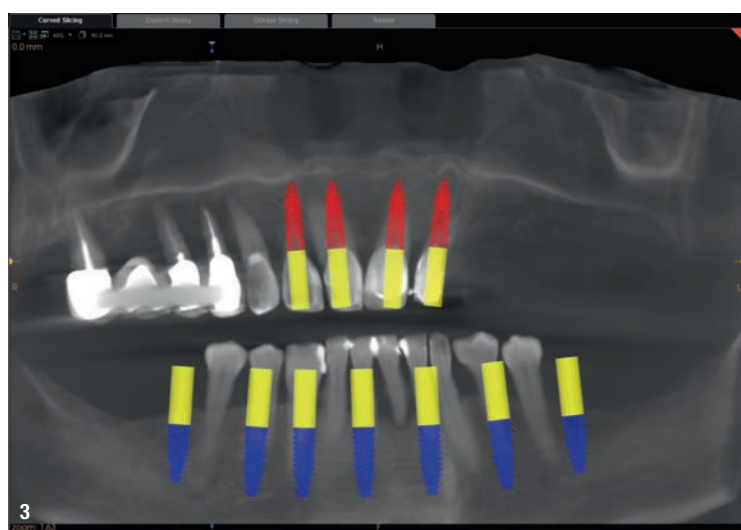
goals are to perform the necessary treatment efficiently, effectively and predictably within their comfort zone.

## Clinical case

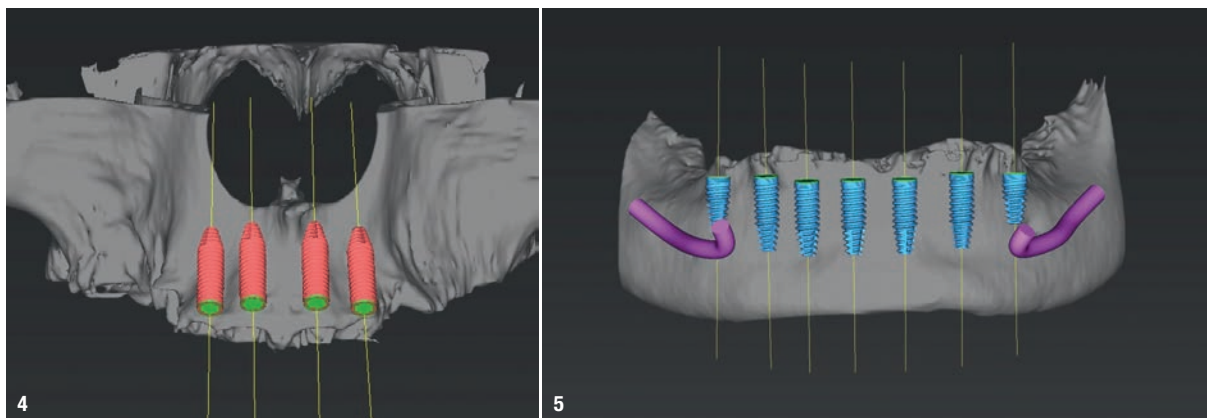
In this particular case example, the patient was referred to me by her dentist. According to her previous dental provider, she had undergone quite a bit of dental work in the maxillary arch with a combination of porcelain veneers and bridgework several years prior, but had neglected to maintain regular hygiene appointments and oral home care. When she did finally return to her dentist with a concern about the spacing and mobility of her maxillary and mandibular teeth, he referred her to me for comprehensive treatment with an all-inclusive approach under intravenous sedation.

When the patient presented to my practice for an initial evaluation, all the necessary diagnostic information was obtained, including a medical history, a smile questionnaire, digital photographs and all the necessary radiographs. Upon clinical examination, it was very apparent that this patient had generalised advanced periodontal disease (Fig. 1). In fact, most of her teeth had Class II–III mobility with accompanying extensive cervical decay.

Upon reviewing the diagnostic information, it was understood that all the teeth in both the maxillary and mandibular arches needed to be removed. Because of this, the patient was very interested in dental implants. In order to determine whether this patient was a good candidate,



**Fig. 3:** CS 3D imaging of the proposed treatment.



**Fig. 4:** 3DDX plan (3D Diagnostix) of the maxillary implants. **Fig. 5:** 3DDX plan of the mandibular implants.

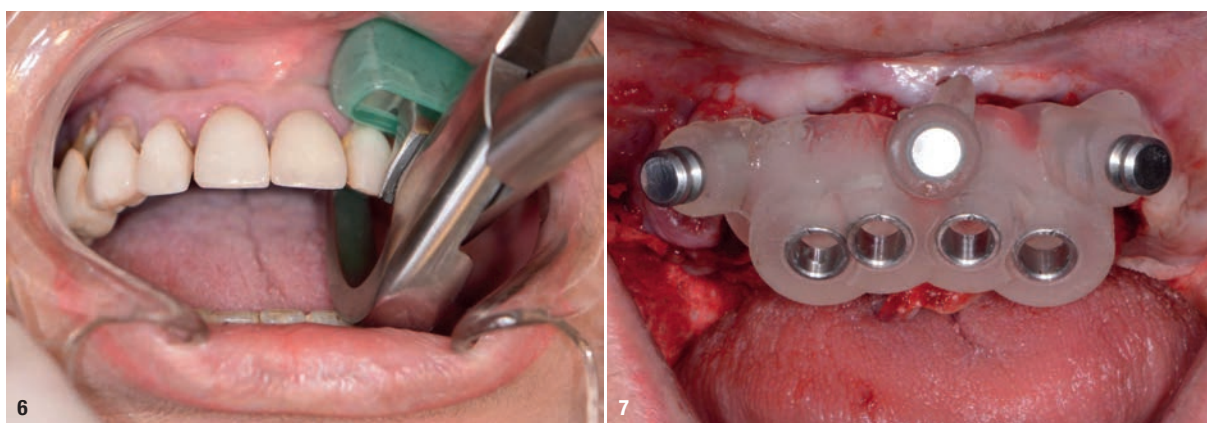
a CBCT scan was taken using the CS 8100 3D (Carestream Dental) to accurately capture the volume of bone required for optimal dental implant placement (Fig. 2). This would allow us to assess the bone height and width, as well as the ridge orientation and relationship to anatomical landmarks. Interpreting the CBCT information, it was very clear that there was insufficient bone on either side in the posterior maxilla for dental implant placement. If the most distal implants in the premaxillary region were placed at an angle according to all-on-four protocols, the anterior–posterior spread would still not be sufficient for a fixed restoration. The patient did not want to undergo any type of sinus augmentation or zygomatic implants owing to the extent and additional recovery time of such treatments. Using CS 3D Imaging Software (Carestream Dental; Fig. 3), four dental implants were virtually planned in the premaxillary region to support a palate-free metal-reinforced overdenture. In the mandibular arch, there was sufficient bone to plan the placement of seven dental implants without compromise.

Discussion with the patient included the desired treatment plan both surgically and prosthetically, the pros and cons, and information about the consequences of a surgical failure in terms of risks, time and cost. Once the patient confirmed this treatment plan, diagnostic impressions were

acquired using Silginat (Kettenbach) as well as jaw relations using Futar (Kettenbach). Silginat may be poured up and deferred multiple times without concern of distortion. Digital photographs were also forwarded to the dental laboratory regarding the positioning of the maxillary and mandibular incisal edges, midline, occlusion, restorative space and lip support. This way, the dental laboratory had clear instructions for the proposed positions of the teeth for the immediate dentures.

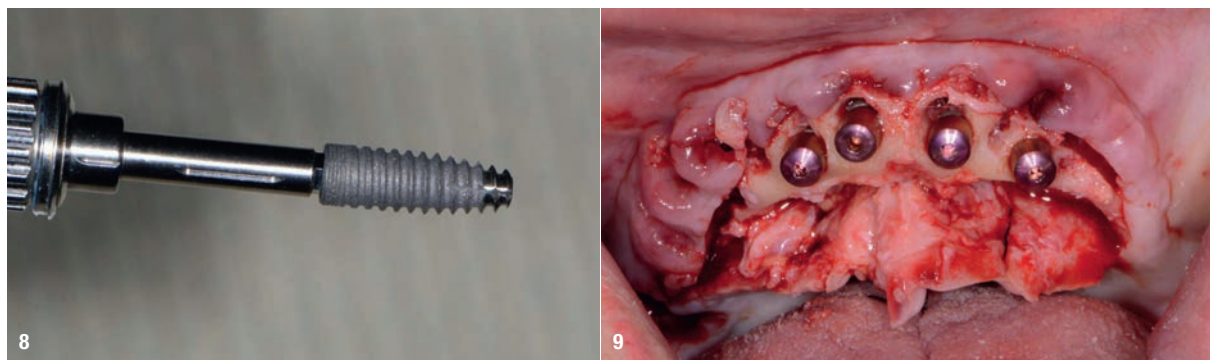
Since the dental implant placement would be implemented using surgical guides, the information on the CS 3D software was transferred to 3DDX (3D Diagnostix) for surgical guide fabrication. Once the position of the implants, number of retention pins and design of the guides were confirmed from both parties (dentist and 3DDX) through a secure video conferencing meeting, fabrication was initiated by 3DDX (Figs. 4 & 5).

The next appointment would be for the planned surgery once the patient had obtained medical clearance from her assessing physician. Our goal was to extract all of her teeth, level the bone where needed, place the dental implants with adjunct grafting and provide provisional restorations to the patient in one appointment.



**Fig. 6:** Extraction using the Physics Forceps (GoldenDent). **Fig. 7:** Maxillary surgical guide.





**Fig. 8:** Engage dental implant. **Fig. 9:** Implants placed for the maxillary overdenture.

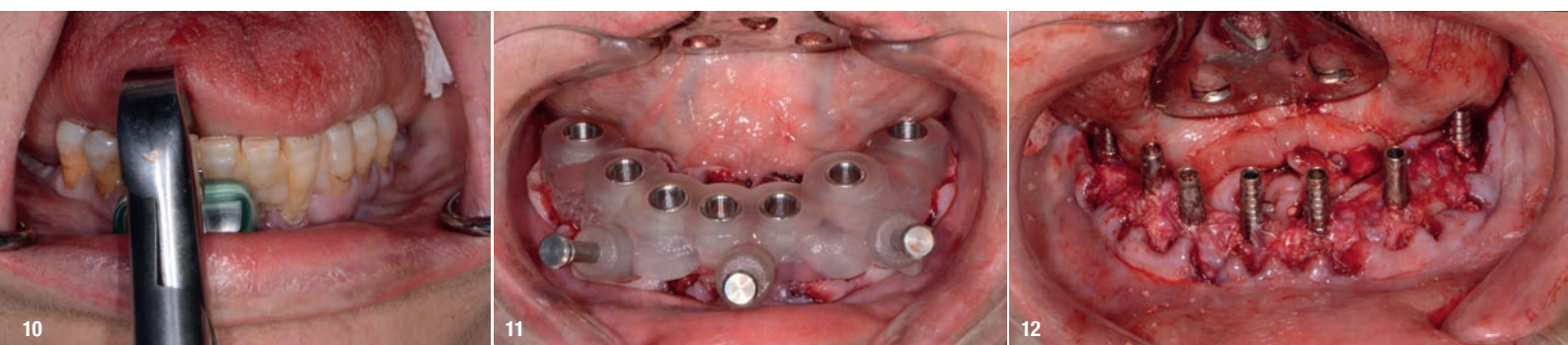
The patient was appropriately sedated using intravenous medications, and local anaesthetic was administered to both arches. Starting with the maxillary teeth, atraumatic extractions were accomplished using the Physics Forceps (GoldenDent), which implements a modified Class I lever movement (Fig. 6). Once the teeth had been extracted, a full-thickness flap was reflected on both the facial and palatal aspects of the ridge using the Reflector (GoldenDent) so that the surgical guide would fully seat without any interference from underlying tissue. Once positioned, sites for the three retention pins were prepared on the facial portion of the guide with the AEU-7000 surgical motor (Aseptico) and corresponding handpiece. Once the surgical guide had been fully secured (Fig. 7), initiation of the drilling sequence using the Guided Surgical System Instrumentation Kit (OCO Biomedical) at a speed of 800–1,200rpm with copious amounts of sterile saline was begun, followed by the insertion of four 3.25 × 12.00mm Engage dental implants (OCO Biomedical) at a speed of 20rpm until increased torque was necessary (Fig. 8). At that point, the ratchet wrench was connected and the implants torqued to final depths, reaching a torque level of about 40–50Ncm.

Using the Degranulation and Shaping Bur Kit (GoldenDent), any irregular areas of the ridge as well as unwanted remnant tissue was removed. Extended healing caps were placed into the dental implants (Fig. 9), followed by a cortical mineralised/demineralised bone grafting material (OCO Biomedical) in areas around the implants

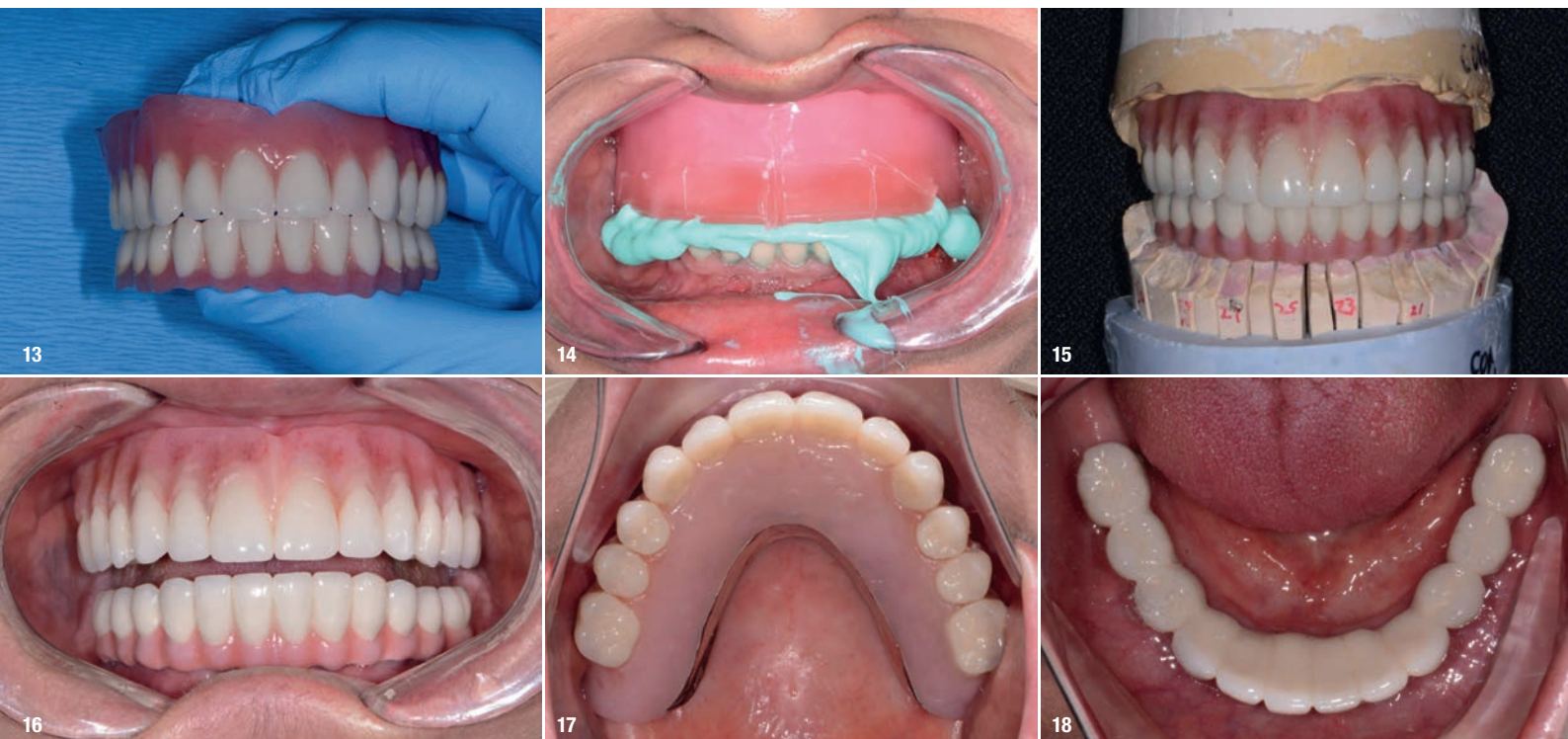
and within the sockets. Primary closure was achieved with 4/0 chromic gut sutures (Salvin Dental Specialties).

In the mandibular arch, any remaining teeth were extracted using the Physics Forceps (Fig. 10) followed by full-thickness flap retraction using the Reflector. The CBCT-based surgical guide was positioned and secured in the same fashion as the maxillary guide (Fig. 11). Using the OCO Biomedical guided kit, the osteotomies were performed, followed by the placement of seven Engage dental implants.

Since a fixed provisional restoration was planned, an objective reading, in addition to a high insertion torque, was preferred. Using the Penguin RFA (Aseptico), a baseline implant stability quotient (ISQ) reading was taken, and all values averaged over 70Ncm, an indication for adequate immediate loading. Since the ISQ values were favourable, slim stock abutments were tightened to 25Ncm into the Engage dental implants (Fig. 12). The access openings were filled with Teflon tape, followed by TempoSIL (COLTENE). The mandibular immediate denture, which had already been relieved in the areas of the dental implants, was tried in to verify a passive fit. Once confirmed, a plastic cap spacer was placed on each abutment to avoid the restoration locking on during the relining procedure with REBASE II FAST hard reline material (Tokuyama Dental). Within 2–3 minutes, the material polymerised, so the immediate denture was removed and shaped like a fixed bridge (Fig. 13) using the Torque Plus laboratory handpiece (Aseptico) and an acrylic bur (Komet).



**Fig. 10:** Extraction using the Physics Forceps. **Fig. 11:** Mandibular surgical guide. **Fig. 12:** Implants, abutments and grafting material placed.



**Fig. 13:** Maxillary and mandibular provisional restorations. **Fig. 14:** Establishing jaw relations using Futar Fast (Kettenbach). **Fig. 15:** Dental laboratory work. **Fig. 16:** Delivery of definitive restorations. **Fig. 17:** Maxillary overdenture. **Fig. 18:** Mandibular fixed bridge.

Four months later, the patient presented for impressions for the definitive restorations. The maxillary restoration would be a palate-free metal-reinforced overdenture, whereas the mandibular restoration would be a sectioned bridge. The healing caps in the maxillary arch were removed and LOCATOR abutments (Zest Dental Solutions) placed and tightened to 25Ncm. Impression posts were then snapped into the overdenture attachments. Using a heavy and light polyvinylsiloxane material (Panasil, Kettenbach) in custom trays, an impression was taken of each arch. From these impressions, the dental laboratory fabricated a wax rim on an overdenture framework for the maxillary arch and a wax-up of teeth on a porcelain-fused-to-metal bridge framework for the mandibular arch (Fig. 14).

Once tried in, marks were made on the maxillary wax rim for the midline, incisal edge and smile line. Jaw relations were established using Futar Fast bite registration material (Kettenbach). The dental laboratory was instructed to place denture teeth in the following wax-up so that the patient could view and approve everything for final fabrication.

Within several weeks, the definitive restorations were completed and delivered to the dental practice (Fig. 15). The mandibular porcelain-fused-to-metal bridge was cemented with Premier Implant Cement (Premier Dental), taking care not to overfill the recesses. The processing inserts in the LOCATOR attachments of the overdenture was changed to the blue attachments, which exert about 680g of retention per cap.

The patient was instructed on cleaning and maintaining her dental restorations (Figs. 16–18). In addition, we reviewed the importance of scheduled professional cleaning, the effects of continued tobacco use and overall oral health habits. With this new enhanced look, the patient was motivated to care for her investment.

## Conclusion

Providing an all-inclusive approach to oral rehabilitation means that the patient may benefit from the convenience and savings of treatment by one provider from start to finish. With proper training and education, those who seek to deliver this type of treatment may assist more patients in gaining more aesthetic and functional smiles.

## about



**Dr Ara Nazarian** maintains a private practice in Troy in Michigan in the US with an emphasis on comprehensive and restorative care. He is a diplomate of the International Congress of Oral Implantologists. He has conducted lectures and hands-on workshops on aesthetic materials, grafting and dental implants throughout the US, Europe, New Zealand and Australia.



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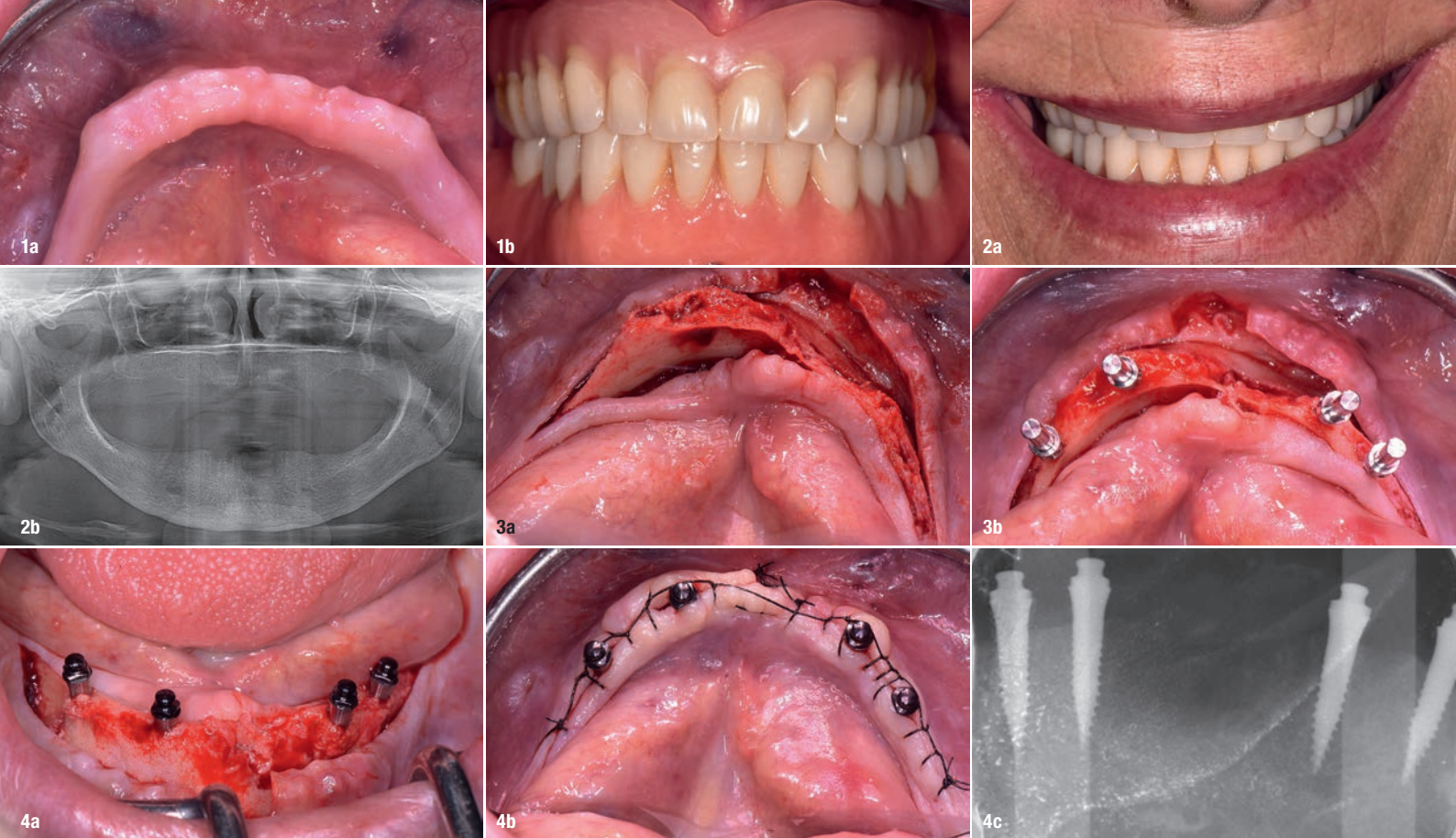
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**Fig. 1a:** Occlusal view before the treatment showing a very thin ridge. **Fig. 1b:** Frontal view of the ill-fitting mandibular denture. **Fig. 2a:** Frontal view of the initial clinical situation. **Fig. 2b:** Preoperative radiograph. **Fig. 3a:** A flap was raised to obtain a clear view of the underlying bone. **Fig. 3b:** Preparation of the four implant sites. **Fig. 4a:** Placement of the four implants. **Fig. 4b:** The flap was closed with a 4/0 polyamide continuous suture. **Fig. 4c:** Radiograph taken immediately after surgery.

# Implant-retained overdenture on a very thin bone ridge

Drs Nicola Alberto Valente, Murali Srinivasan & Nicole Kalberer, Switzerland

## Initial situation

A healthy 60-year-old female patient with no medical history presented at our clinic with a non-fitting full mandibular denture. Her chief complaints at this point included the lack of retention of her mandibular denture and poor aesthetics, coupled with difficulty in chewing and embarrassment at social events. The treatment plan comprised the rehabilitation of jaw function and aesthetics with a new set of dentures, including a conventional maxillary complete denture (CD) and a mandibular implant-supported overdenture (IOD) retained by four implants. For standard implants, the ridge would have had to be reduced by a vertical osteotomy in order to gain thickness and to reach the wider portion of basal bone. However, this would cause both a loss of height and a reduction

in vestibule depth, which would be unfavourable for the rendition of the prosthesis (Figs. 1 & 2). After evaluating the patient's motivation, the decision was made to use the new Straumann® Mini Implants (2.4mm diameter) with the integrated Optiloc® retention system for a new denture supported by four implants. The implants were planned for placement in the regions 34, 32, 42 and 44. Due to the very limited width of the ridge, open flap surgery was planned in order to place the implants safely under direct vision.

## Surgical procedure

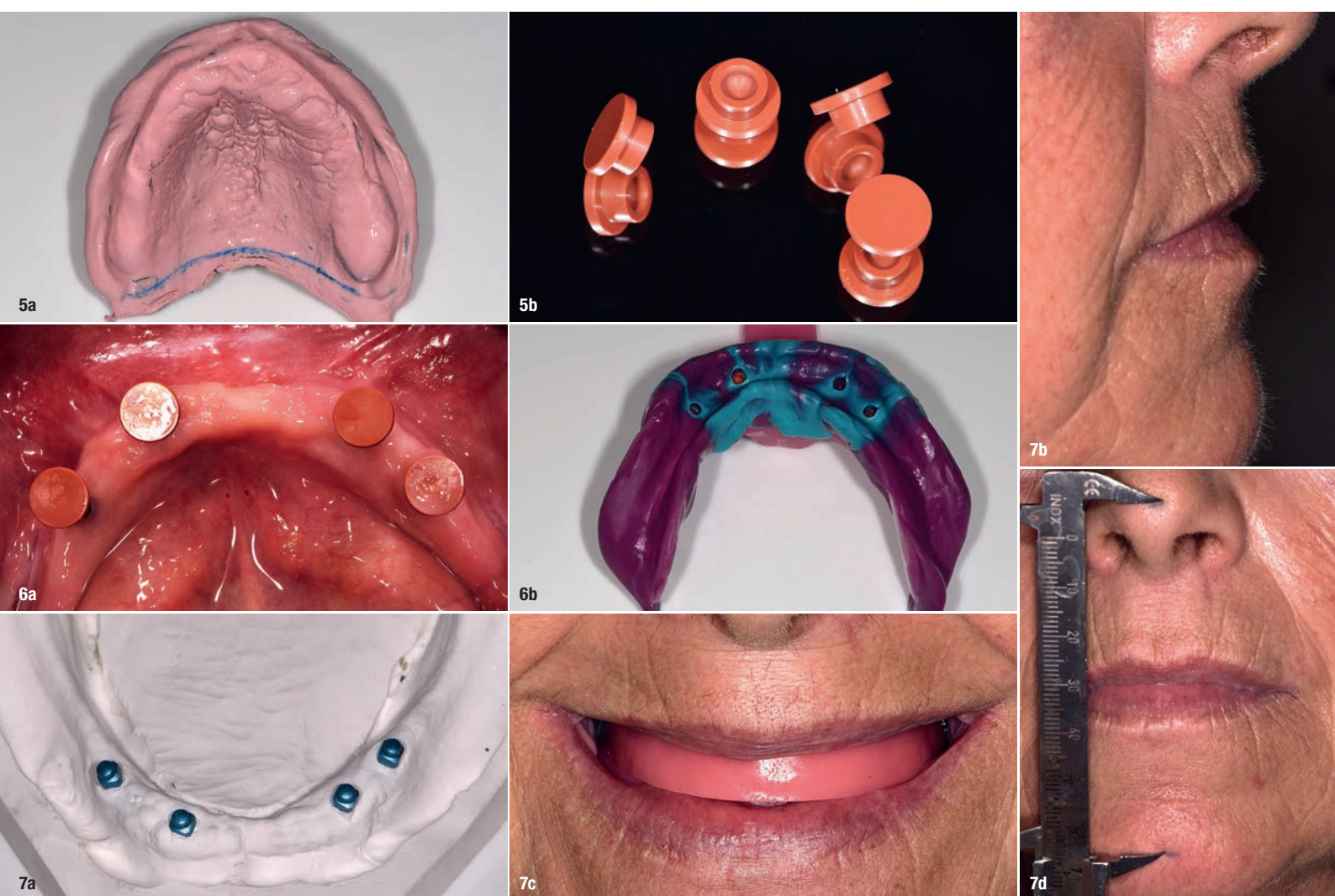
After a careful crestal incision, keeping the edge of the blade always in contact with the thin bone ridge, a central release incision was performed. The flap was raised



to obtain a clear view of the underlying bone (Fig. 3a). In the area of the left incisor, the ridge appeared to be too thin for implant placement, probably owing to a previous cystic lesion. The implant that had initially been planned in region 32 was therefore moved to region 33. For the implants in regions 42 and 34, the site was prepared sequentially with the needle drill (1.6mm diameter) and the pilot drill (2.2mm diameter), while only the same needle drill was used for the implants in regions 44 and 33. During the preparation of the implant sites, parallelism was verified at all times through the parallel posts (Fig. 3b). Finally, the four implants were placed in the respective sites, initially using the vial caps and then inserted and stabilised with the Optiloc® ratchet adapter and the ratchet itself (Fig. 4a). The flap was closed with a 4/0 polyamide continuous suture (Figs. 4b & c). Owing to the thin bone crest, immediate loading was avoided by grinding resin from the existing prosthesis in order to prevent contact with the transgingival part of the implants during the healing phase.

## Prosthetic procedure

After a healing period of six weeks, the patient was referred to the Division of Gerodontology and Removable Prosthodontics at the University Clinic of Dental Medicine in Geneva in Switzerland for the final rehabilitation of her completely edentulous maxilla and mandible, with the Straumann® Mini Implants placed in the latter. During the first consultation, preliminary impressions were taken using an irreversible hydrocolloid impression material. Simultaneously, the patient's conventional mandibular CD was relined using a functional impression tissue conditioning material for better interim retention. In the maxilla, a conventional impression was taken using a customised impression tray, enabling a mucodynamic border moulding followed by a mucostatic final impression using zinc oxide eugenol impression material. In the mandible, the Optiloc® impression/fixation matrices were placed on the Optiloc® before a mucodynamic impression was taken with an elastomeric polyvinyl siloxane



**Figs. 5 & 6:** A mucodynamic impression was taken. **Fig. 7a:** The master models were prepared using the Optiloc® analogues and standard techniques. **Figs. 7b–d:** Aesthetic teeth exposure was ensured (**b**), the occlusal planes were checked (**c**), and the vertical dimension of occlusion was defined (**d**).





**Fig. 8a:** Final bite registration was performed. **Fig. 8b:** Photographs of the patient's natural dentition helped in preparing the final teeth set-up. **Figs. 9a & b:** The final set-up was checked during try-in.

(PVS) impression material (Figs. 5 & 6). The preparation of the master models and corresponding wax rims and all subsequent laboratory works were carried out in the Swiss-based dental laboratory Zahnmanufaktur Zimmermann und Mäder in Bern using the Optiloc® analogues and standard techniques (Fig. 7a). The next clinical steps included verification of the upper and lower lip support (ensuring aesthetic teeth exposure), checking the occlusal planes, defining the vertical dimension of occlusion, and final bite registration (Figs. 7b–d).

Communication with the dental laboratory using photographs of the patient's natural dentition was a key factor for successfully preparing the final teeth set-up (Figs. 8a & b). During try-in, the final set-up was checked for lip support, occlusal planes, teeth exposure and occlusal contacts (Figs. 9a & b). Moreover, the patient

was able to suggest modifications and give her consent before the final prostheses were prepared. To prevent fractures and ensure the longevity of the mandibular IOD, a polyether ether ketone (PEEK) reinforcement was incorporated in the final prosthesis (Fig. 10). The new conventional maxillary CD and mandibular IOD on the Optiloc® retention system was then finalised in the dental laboratory, placing the Optiloc® housings and processing inserts on all Optiloc® model analogues and following the usual manufacturing procedures. The dental laboratory delivered the completed maxillary CD and mandibular IOD (Figs. 11a & b). During the final consultation, the appropriate retention inserts (low force) Optiloc® were selected and inserted into the housings using the Optiloc® retention insert placement tool (Figs. 12 & 13). The completed conventional maxillary CD and mandibular IOD were then inserted into the patient's mouth, and



**Fig. 10:** A PEEK reinforcement was incorporated in the final prosthesis. **Figs. 11a & b:** The dental laboratory delivered the completed maxillary CD and mandibular IOD.

**Figs. 12a & b:** Retention inserts (low force) Optiloc® were selected and inserted into the housings using the Optiloc® retention insert positioning tool. **Figs. 13a & b:** Occlusal and frontal view at the final consultation. **Figs. 14a & b:** Frontal view of the inserted completed conventional maxillary CD and mandibular IOD.

final post-insertion and denture hygiene instructions were given to the patient (Figs. 14a & b).

## Conclusion

The case was successfully handled. The patient was highly satisfied and reported increased functional comfort and social confidence. The use of four 2.4 mm diameter Straumann® Mini Implants to support a mandibular overdenture has proved to be a reliable technique, which guaranteed satisfactory results both for the operator and the patient in a case where traditional techniques with larger diameter implants were not possible.

*Editorial note: The surgical procedures were performed by Dr Nicola Alberto Valente and prosthetic procedures by Dr Nicole Kalberer supervised by Dr Murali Srinivasan. This article originally appeared in implants—international magazine of oral implantology, Vol. 21, Issue 1/2020.*

## about



### Dr Nicola Alberto Valente

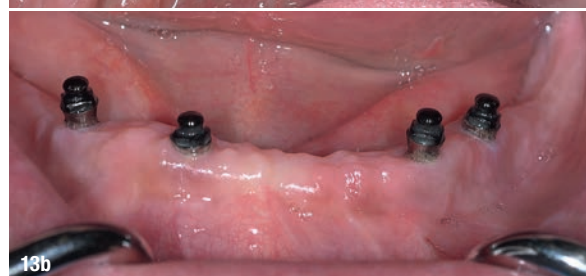
graduated in dentistry from the University Cattolica del Sacro Cuore of Rome, Italy. He completed his Master of Science in Oral Sciences and his specialty programme in periodontics at the State University of New York at Buffalo, NY, USA. He is a Diplomate of the American Board of Periodontology

and has had an ITI Scholarship from the University of Geneva, Switzerland. He has worked as Chef de Clinique in the Unit of Oral Surgery, Service of Maxillofacial Surgery of the University Hospitals of Geneva, University of Geneva until 2019. He will start his new duties as Clinical Assistant Professor at the State University of New York at Buffalo in 2020.

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A close-up photograph of two ultra-aesthetic dental crowns. The crowns are a light, natural-looking color with a glossy finish, showing some texture and shading. They are set against a vibrant red background that resembles gum tissue. The crown on the right is slightly more prominent and shows a small, dark, fibrous detail at its base.

# The art of ultra-aesthetic dentistry

Nasser Shademan, Malaysia





## about

**Nasser Shademan** is a certified dental technologist and an internationally renowned smile designer, professional dental artist and ceramist with extensive knowledge and technical skill in the fields of aesthetic dentistry and micro-dental technology. He is the founder of micro-aesthetic dentistry and the developer of the "20-minute smile design" concept. He is currently a visiting professor at Goethe University in Frankfurt am Main in Germany. Shademan is an international speaker and conducts hands-on courses on different aspects of natural aesthetics and micro-dental artistry. He frequently publishes articles in dental journals throughout Asia, Australia, Europe and the US.

**There are times** when we copy the natural teeth of patients and fabricate an identical yet improved version of them. This means that we apply improvements on many different levels, including colour or smile arrangements, in order to turn the old, misaligned and broken natural smile into an almost identical but beautified version. Natural smiles are not always aesthetically suited to the individual face of a person, and if a patient agrees to undergo aesthetic treatment, then we have a good opportunity to turn something good into something even better. There are sometimes instances when a patient has anterior teeth that are relatively large in size and their anatomy, arrangement and texture do not particularly support the patient's facial make-up, sex or age. In addition, there are situations where the patient has lateral incisors which are somewhat large in size or are deformed, or has poorly shaped canines.

In many cases, we are able to improve the colour arrangements of teeth. Naturally, we do not follow the previous colour map of the patient's natural teeth, but we recast it into a new, more aesthetic tooth colour map. You might come across a patient who is very slim and small in size and has a tiny feminine face, but who has a surprisingly masculine smile owing to a relatively large set of anterior teeth. This is, of course, natural, but it might create an unpleasant impression regardless. Once aesthetically enhanced, the smile will actually appear more harmonious and therefore even more natural-looking.

Reproducing natural aesthetics is an unpromising journey, which is best completed

when we pay close attention to detail in every step. I always produce the highest aesthetic provisional restorations and test these closely for ultimate colour, form, texture and tooth arrangement with my type of most superior aesthetic provisional restorations, which I call "ultra-aesthetic provisional restorations". This is very helpful in guiding me and the entire aesthetics team towards understanding all possible aesthetic challenges that may lie ahead, so we can plan the most natural and best-fitting solutions accordingly. Achieving highly aesthetic outcomes is only possible when dentists, ceramists and patients team up in a sincere way in order to achieve individualised ideal outcomes.

## Techniques and materials

This case shown in the image presented a number of aesthetic challenges, including discoloured natural abutments. Hence, a medium-transparency zirconia core was used with a multilayer ceramic build-up (according to the technique used to create ultra-aesthetic provisional restorations). The finest details were produced under 6–8× magnification.

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## contact

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# “There are obvious advantages to leveraging the skills of a robotic system”

By Brendan Day, Dental Tribune International



Dr Alon Mozes, co-founder and CEO of Neocis. (Image: © Neocis)

**As digital technologies** become increasingly enmeshed in the everyday workflow of dental practices, dental education is changing to reflect their growing influence. One example of this is the recent announcement by the New York University College of Dentistry (NYU Dentistry) that it would be implementing Yomi, a robot-assisted surgical device developed by the health care startup Neocis, into its dental implant procedures. Dental Tribune International recently spoke with Dr Alon Mozes, CEO and co-founder of Neocis, about the path toward Yomi's creation and the benefits this system offers both dental students and practicing clinicians.

**Dr Mozes, thank you for taking the time to chat. How did the idea for Yomi initially come about? Your father is an experienced endodontist. Did this instill a desire in you to work in a dentistry-related capacity?**

Funnily enough, I actually spent one afternoon when I was in high school at my father's private practice while he was performing a procedure and drilling into a patient's mouth. It wasn't a great experience, and I decided then and there that I didn't ever want my occupation to involve being stuck inside a dental office. So, my career

path tended more toward engineering and computer science, and I quickly became really interested in computer graphics and special effects.

I began my career at Sportvision, the company that developed the yellow line you see during American football games on TV, and while there, I developed a baseball pitch tracker. It was great fun at Sportvision, but I wanted to make my way back to Miami and work on the medical side of things. I went back to the University of Miami for my PhD, which is where I connected with Mako Surgical, a very successful startup that was doing robotic surgery in the orthopedic area.

**You worked at Mako Surgical as a software engineer, correct?**

Yes, along with Juan Salcedo, the co-founder of Neocis, who was a design engineer at Mako. Working there gave us an in-depth understanding of robotic surgery, and we were looking to break into an interesting market. That was when I turned my attention back to dentistry. I started to investigate opportunities in the dental world and found that dental implants really stood out not only as a prime market opportunity but also, more importantly, as an excellent clinical match for the style of robotic surgery we wanted to develop at Neocis.

**It's just been announced that NYU Dentistry will be the third American dental school to integrate Yomi into its curriculum. What kind of benefits does Yomi specifically offer dental students?**

The world of dentistry is becoming more and more digitally focused. You have preoperative digital technologies like CBCT scanners and intra-oral scanners, whereas in a post-operative sense, there are devices like CAD/CAM milling machines that take the digital files and create prostheses from them. But there's still a large gap when it comes to the surgical portion of dental procedures, a gap that needs to be addressed in order to fully digitise dental workflows.

This is where the Yomi platform comes in—it gives students an opportunity to conduct implant surgery in a digital way. And if students are able to access that kind of technology, it is going to give them a huge leg up, given that it's the direction in which the industry is headed.

Yomi can also act as a kind of democratising technology where, if you plan the case ahead of time, the system is going to make sure the procedure goes exactly according to this plan. So, it really can provide dental students with tools to advance their skills.

**Turning toward clinical practice—what sort of issues does Yomi help to solve? Do practitioners need prior experience with implant navigation systems in order to use it successfully?**

For novice implant surgeons or general dentists who don't do that many implant cases, there are obvious advantages to leveraging the skills of a robotic system. But for even the most experienced dentists and oral surgeons, there's an opportunity with Yomi to do cases that would otherwise be very challenging.

There may be cases where the practitioner wants to drill very close to the sinus without perforating it or drill close to a nerve. If he or she does this with a freehand technique, it often means making a large incision in the gingiva and opening the flap up to expose the bone. With Yomi, there's the potential to conduct more flapless procedures, which are well documented as being less painful and even offering faster healing times for the patient.

We also recently received clearance from the U.S. Food and Drug Administration (FDA) for Yomi to be used in full-arch surgery. These are often very challenging cases, but they can potentially be sped up and made more efficient with the integration of Yomi.

**Yomi remains the first and only robot-assisted surgical device to receive clearance from the FDA to be used for dental implant surgery. Have you seen attitudes change in the American dental community toward such innovative systems since you first released Yomi?**

There's definitely been a good amount of growth so far, but we still feel that we're just starting to scratch the surface in terms of Yomi's potential. The typical questions that we've been asked since day one have concerned the role of the dentist in the procedure and whether or not Yomi will just do everything. Of course, that's not the case. With a robot-assisted surgery system, our goal is to make sure that the dentist is not only involved in the surgical planning and is using the software, but is also hands on when the time comes for the procedure itself.

This approach provides comfort not only for the dentist but also for the patients, and it's helped us make sure that skeptics out there really understand our approach, how safe it is, and just how many advantages Yomi can bring to clinical procedures.

**Do you have any plans at Neocis to expand Yomi's capabilities, either in a dental capacity or for other areas of health care?**



NYU Dentistry's Dr Huzefa Talib (left) and Prof. Robert Glickman using Yomi. (Image: © NYU Dentistry)

There's definitely a great deal of scope for expansion. We've developed the Yomi platform and fine-tuned it for dental implant surgery initially, and as I mentioned, we've now received clearance for it to be used in a range of cases from single implant cases in the aesthetic zone through to complex full-arch cases.

We see this as a great start. Once Yomi is installed in dental practices, there are really many opportunities for it to be used in areas adjacent to the actual implant procedure. We're helping dentists plan their cases, and we can add artificial intelligence and machine learning to help this preoperative stage go better and faster. We're also continuing to address more complex surgeries such as orthognathic surgery, whereas tooth preparation for a crown, for example, is also something that can leverage this kind of technology. There's a real opportunity for robotic assistance and automation in these areas, and we believe that Yomi's usefulness can continue to be expanded far beyond dental implants.



According to Mozes, Yomi is a "democratising technology" that "can provide dental students with tools to advance their skills." (Image: © Neocis)





A recent study found that ultra-Orthodox Jews who use kosher phones that do not have internet access showed less anxiety, had a better night's sleep and experienced less bruxism and facial muscle pain compared with secular people who are often dependant on their mobile phones.

## Living in digital age: Can smartphones be detrimental to oral health?

By Iveta Ramonaite, Dental Tribune International

Since digital technology is so deeply rooted in our society, it would be hard to imagine a world without the internet. Whereas smartphones used to be a commodity, they have now become a necessity for most people, offering limitless opportunities and opening the door to the rest of the world. Ironically, when overused, smartphones can also socially isolate people. A new study has also found that excessive use of smartphones and social media may cause certain health problems, including bruxism and facial muscle pain.

The internet allows us to access the most hidden corners of the world, experience new cultures and stay con-

nected with family and friends. During the pandemic, the internet was also instrumental in helping us maintain our oral health, as many dental practices offered teledentistry to patients who needed urgent care. It also helped dental professionals stay up-to-date with the latest technology and advancements by offering online education opportunities.

But what if not everyone is in favour of internet freedom and the dangers that come with it? Some religious groups, for example Haredi Jews, shun the use of the internet. In this, Haredi Jews are following the advice of





“This creates a cycle of growing dependency on cell phones, which leads to feelings of stress and anxiety, and the feeling that someone might write something on social media and I’ll miss it and not be in the loop. In short, phones are actually causing many people stress, and we’re seeing physical manifestations of this.”

According to the findings, the researchers established a clear link between mobile phone dependency and bruxism and jaw pain, which are markers typically associated with stress and anxiety. The participants who use their phones to a lesser degree were found to have a better and less interrupted night’s sleep. Among those who tend to use their phones regularly, 45% were found to have a moderate-to-high need to constantly have their phones available, and some 50% felt that their phone causes them a moderate-to-high level of stress. Among kosher phone users, only 22% felt the need to be available and only 20% thought that their device causes feelings of stress.

Excessive phone usage was also found to pose oral health problems. Some 24% of regular smartphone users reported that they were grinding their teeth during the day, and 21% experienced bruxism at night. In comparison, only 6% of the participants who used a kosher phone reported grinding their teeth during the day and 7.5% at night. Some 29% of people who have regular devices reported pain in their jaw muscles compared with 14% of the kosher phone users.

Finally, excessive mobile phone use was found to disturb sleep. More than half of regular smartphone users reported waking up at night, in comparison with only one-fifth of kosher phone users.

In light of the findings, the study authors suggested limiting phone usage to avoid adverse health effects. Friedman-Rubin was quoted as saying: “We are of course in favour of technological progress, but as with everything in life, the excessive use of smartphones can lead to negative symptoms.” She concluded by saying that the public ought to be aware of the adverse effects of excessive phone use both on the body and mind.

*Editorial note: The study will be published in Quintessence International in 2021.*

their rabbis. For that reason, most members of the group, also often referred to as ultra-Orthodox Jews, use “kosher” smartphones, which offer only a limited selection of applications and do not include a browser so as not to expose the population to secularism or inappropriate content such as pornography, which is regarded as especially harmful to the younger generation.


### The negative aspects of excessive smartphone usage

In a recent study, researchers from Tel Aviv University’s Maurice and Gabriela Goldschleger School of Dental Medicine examined smartphone use by a group of secular people, who tend to use their smartphones heavily in their daily lives, and smartphone use by ultra-Orthodox people, the majority of whom use kosher phones that do not include internet access. In total, the study involved 600 people aged 18 to 35. The researchers inquired into certain negative aspects that are associated with excessive use of a mobile phone, including anxiety, a tendency to wake up at night, the need to be available to the mobile phone, bruxism and jaw pain.

“We believe these symptoms are related to FOMO, fear of missing out,” said co-author Dr Pessia Friedman-Rubin, of Tel Aviv University’s dental school, in a press release. “People are constantly using their phones because they are worried they will miss something, and check WhatsApp, Facebook and other apps.”

“Phones are actually causing many people stress, and we’re seeing physical manifestations of this.”

—Dr Pessia Friedman-Rubin,  
Tel Aviv University



Since dental students had to suspend their clinical training during the pandemic, some dental schools around the world have announced that they will not be taking in new students in 2021.

# COVID-19 and dental education: Will dental schools admit new students in 2021?

By Iveta Ramonaite, Dental Tribune International

Since the COVID-19 pandemic has severely restricted access to clinical practice, students around the world have been adversely affected by the far-reaching consequences the pandemic has had on dental education. To make the most of the current situation, numerous schools have instituted video and virtual platforms in order to familiarise students with standard clinical procedures. However, the knowledge gained through online learning is limited, and some students are now being asked to repeat the 2020–2021 academic year in order to complete the necessary clinical training. To this end, some dental schools have announced that they will not be admitting new students in 2021.

Owing to the high risk of the virus spreading through aerosol transmission in clinical practice, dentistry has been severely affected by the pandemic. This has manifested itself in a lack of the in-person training for dental students

which is crucial for the successful completion of their education. Students have also been burdened by various fears and worries caused by factors such as the necessity to adapt to the updated infection control protocols and the need to rise to academic challenges.

The gravity of this situation is clearly evident in Scotland. Since final year dental students have been unable to graduate owing to a lack of practical clinical experience, Universities Scotland, the representative body of Scotland's 19 higher education institutions, has announced that dental schools will not be accepting new students in September 2021. Mairi Gougeon, Scotland's public health minister, was quoted as saying that the decision was difficult but necessary.

"The quality and calibre of dental treatment in Scotland is outstanding and it needs to be protected by taking the



dents should be proportional to the amount of clinical time missed. However, EDSA noted that dental schools should consider carefully all the options available to safely increase the provision of clinical teaching and to avoid extensions where possible, since these may lead to financial burden. The spokesperson added: "Students must be protected from the financial impact of extending their studies. They should not pay additional fees, and schools and governments should seek to provide financial support for living costs, especially for those who may struggle in the case of an extension."

### Dental schools in the US still accepting students

Although the COVID-19 pandemic has severely disrupted dental education in Scotland, the situation is not the same in some other parts of the world. For example, for dental schools in the US, it is business as usual. Dr Karen P. West, president and CEO of the American Dental Education Association, told DTI: "Dental education continues to move forward in the US, and all existing dental schools in the country are continuing to accept new students this year. In fact, applications to schools are thriving."

Students in the country have been quick to adapt to the changes in teaching and learning and have embraced the shift to virtual classrooms, with all its possibilities. "Although the COVID-19 pandemic disrupted learning last year, schools adapted and developed innovative educational environments in which to teach and learn. In accordance with the Centers for Disease Control and Prevention guidelines for patient care in the COVID-19 environment, students are providing clinical care, and competency assessments are continuing," she noted.

appropriate measures in education to ensure future dental professionals have reached the General Dental Council's standard of clinical competence and can enter the workforce with confidence," she noted.

To help avoid crippling debt for students, the Scottish government will be offering financial support to those who have been asked to repeat their final year. According to Gougeon, affected students will be eligible for a bursary equal to the amount of their student loan.

### Dental schools in Europe are yet to make the decision

Discussing the situation in Europe, a spokesperson at the European Dental Students' Association (EDSA) told DTI: "We know that a lot of students are particularly worried about their lack of experience and the impact it will have on their future education and job prospects. Every student has the right to build a successful career and to receive dental training that prepares him or her to deliver safe and effective oral health care to the population he or she serves. If a student has received insufficient clinical experience to provide this, then a limited extension to the length of his or her course may be appropriate, depending on the local context."

According to some sources, several universities in Malta and Greece have already chosen to extend their terms. Other countries are considering taking the same action but have not yet made the final decision.

Talking about possible extensions to the length of courses, the association noted that any extensions granted to stu-

**"Although the COVID-19 pandemic disrupted learning last year, schools adapted and developed innovative educational environments in which to teach and learn."**

"Students are not being asked to repeat the 2020–2021 academic year based on COVID-19 alone. To their credit, faculty and students quickly adjusted to the changed environment, embracing virtual learning options that have allowed dental education to grow and flourish in new and ground-breaking ways," West concluded.

# Full-mouth rehabilitation with three different types of KATANA Zirconia

By Kuraray Noritake Dental



Fig. 1: Three different KATANA Zirconia varieties.

A female patient came to Studio Cortellini in Riccione in Italy in order to improve not just her ability to chew but also the overall aesthetic appearance of her teeth. A clinical examination revealed the presence of several erosive lesions that contributed to her chewing problems and had caused a decrease in enamel thickness. This reduction in enamel, combined with a number of discoloured composite restorations, negatively affected the aesthetics of her smile.

New types of cubic and tetragonal multilayered zirconia, available in Kuraray Noritake Dental's KATANA Zirconia range, made it possible to plan a number of extremely conservative crowns for all different areas of the patient's mouth.

Dr Davide Cortellini, owner of Studio Cortellini, carried out conservative preparations without the need for anaesthesia. In the maxillary arch, the aesthetic zone was prepared for full veneers, while the mandibular anterior teeth were treated for conventional lithium disilicate veneers without any interproximal separation.

Digital impressions were taken using an intra-oral scanner; Angelo Canale, owner of Canale dental laboratory in Rimini in Italy, designed the zirconia restorations using CAD software. The restorations were then milled and aesthetically characterised by the dental ceramist Angela Giordano of the Canale dental laboratory.



**Fig.2:** Dr Davide Cortellini. **Fig.3:** Angelo Canale, MDT. (All images: © Kuraray Noritake Dental)

Three different types of KATANA Zirconia were selected for the restorations: KATANA Zirconia ML for the molars, STML for the premolars and UTML for the anterior teeth. According to Dr Cortellini and Canale, this specific configuration represents the optimal balance between strength and aesthetics. The new types of multilayered and cubic zirconia allow for a natural aesthetic outcome thanks to the gradual colouring and the tooth-like translucencies of the KATANA Zirconia range.

Dr Cortellini cemented the crowns with Kuraray Noritake Dental's PANAVIA V5 cement and bonded the mandibular veneers with the company's CLEARFIL SE BOND adhesive solution.

"The KATANA Zirconia material was a good solution for the patient because it made it possible to obtain an optimal combination of aesthetics and strength while using different types of KATANA with different levels of translucency," Canale said.

Having first become familiar with Noritake's products in 1993, when he undertook a dental ceramics class conducted by the legendary Hitoshi Aoshima in Italy, Canale has been using KATANA Zirconia at his dental laboratory since 2013, when the ML line was launched.

Canale introduced Dr Cortellini to Kuraray Noritake Dental's zirconia in 2013, while the dentist was already using the company's range of PANAVIA cements and CLEARFIL composites and adhesives in his everyday workflow. The frequent collaborators have been

"Three different types of KATANA Zirconia were selected for the restorations (...)"

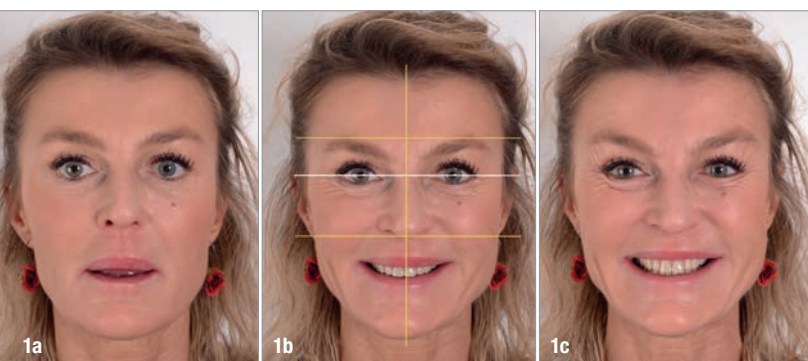
working with different KATANA Zirconia varieties for more complex cases for about three years now, according to Dr Cortellini, and the results have been much appreciated.

In this case, "the patient was very satisfied with the final outcome of this restoration," he declared.



# Full-mouth rehabilitation with three different types of KATANA Zirconia: A case report

Dr Davide Cortellini & Angelo Canale, Italy



**Figs. 1a–c:** Initial situation, extra-oral view.

**Dental zirconia** is no longer just the opaque framework material introduced two decades ago. Nowadays, it offers the high strength needed for long-span bridges, dentine-like translucency and the strength perfect for thin-walled posterior crowns, and enamel-like optical properties for beautiful anterior restorations—depending on its composition and structure. Kuraray Noritake Dental offers three types of dental zirconia with a multilayered structure created using patented powder colouring tech-

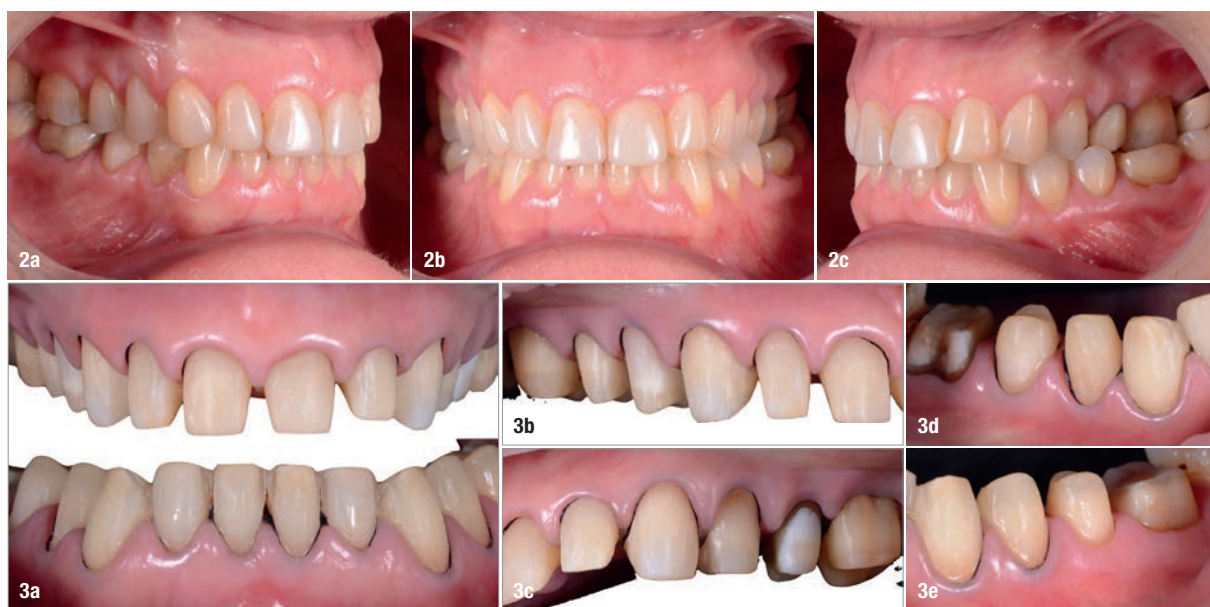
nology. They differ with regard to their optical and mechanical properties, which makes it possible to choose an ideal material for every clinical situation.

## Case presentation

The patient came to the clinic to improve her masticatory ability and aesthetics. The physical examination revealed the presence of several endogenous erosive lesions that made mastication difficult, in addition to partly affecting the aesthetics owing to a decrease in enamel thickness and the presence of dyschromic composite restorations (Figs. 1a & 2c).

The possibility of using the new types of both tetragonal and cubic multilayer zirconia made it possible for us to plan the complete covering of all the teeth with extremely conservative crowns with thicknesses of between 0.5mm and 1.0mm in the axial and occlusal areas and up to 0.2mm at the margin.

Very conservative vertical preparation of the enamel was carried out without anaesthesia. In the maxillary arch, the anterior teeth were prepared for full-veneer crowns, while



**Figs. 2a–c:** Initial situation, intra-oral view. **Figs. 3a–e:** Vertical preparations. Knife edge (a). No finishing line (b–e).



**Figs. 4a–e:** Scanning sequence. Provisional restoration (a). Mandibular arch (b). Maxillary arch (c). Bite (d). Digital vertical dimension of the temporaries. (e). **Fig. 5:** The final result showed excellent integration between the three different types of zirconia and a natural appearance. **Figs. 6a & b:** Final restoration thickness. Buccolingual thickness: 0.6 mm (a). Interproximal thickness: 0.5 mm (b). **Fig. 7:** Minimal preparation for and micro-layering of KATANA Zirconia. **Figs. 8a & b:** Final result, intra-oral view. **Fig. 9:** Final result.

the mandibular anterior teeth were treated with conventional lithium disilicate veneers without interproximal separation (Figs. 3a–e). In this case too, vertical preparation was carried out without a finishing line.

The impression was taken using a TRIOS intra-oral scanner (3Shape; Figs. 4a–e). The technician modelled the zirconia restorations, and these were then completed by the ceramist.

The three different materials were selected on the basis of the specific positions inside the mouth:

- KATANA Zirconia UTML for the anterior teeth;
- KATANA Zirconia STML for the premolars; and
- KATANA Zirconia HTML for the molars (Fig. 5).

The full-mouth rehabilitation procedure using the three different types of zirconia led to a functional and beautiful treatment outcome (Figs. 6a–7). The optical integration between the materials was excellent, and the high translucency, especially in the anterior region, created a true-to-life appearance (Figs. 8a–9).

## contact



**Dr Davide Cortellini** graduated with honours in dentistry and dental prosthetics from the University of Siena in Italy in 1992. He gives lectures in Italy and abroad and is dedicated to clinical activity in his own practice in Riccione in Italy, where he primarily focuses on aesthetic and digital prosthodontics and complex prosthetic rehabilitation.



**Angelo Canale** is a dental technician and has owned a dental laboratory in Rimini in Italy since 1986. He is specialised in fixed prosthodontics for natural teeth and implants with a metal-free approach using different kinds of materials. He is interested in digital techniques using CAD/CAM systems. He has co-authored many articles and has spoken at national and international congresses.





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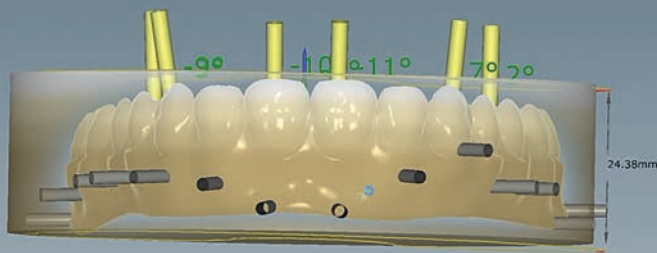
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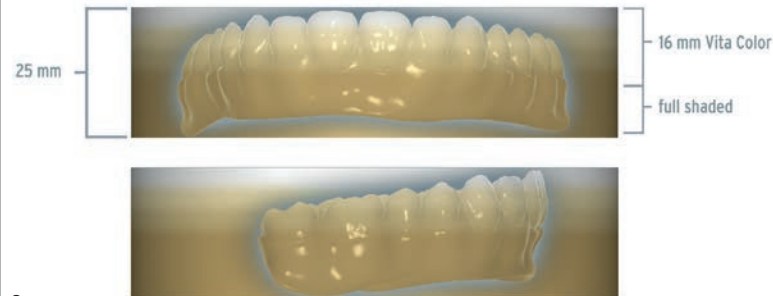
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**Fig. 1:** Zolid Gen-X is available in all common heights on the market (12, 14, 16, 18, 20, 22, 25 mm). **Fig. 2:** Zolid Gen-X 16 mm. **Fig. 3:** Zolid Gen-X 22 mm with proportionally increased polychromatic shade content. **Fig. 4:** Zolid Gen-X 25 mm with extended monochromatic gingival component. **Fig. 5:** Visualisation of the shade distribution of a nested restoration made of Zolid Gen-X with the Ceramill Match 2 CAM software. **Fig. 6:** Optimally aligned restorations with a high gingival component ("REAX" bridge) to achieve the correct VITA shade while observing the asymmetrical shade distribution.

# Aesthetics for all intends and purposes

## Optimising outcomes in implant restorations

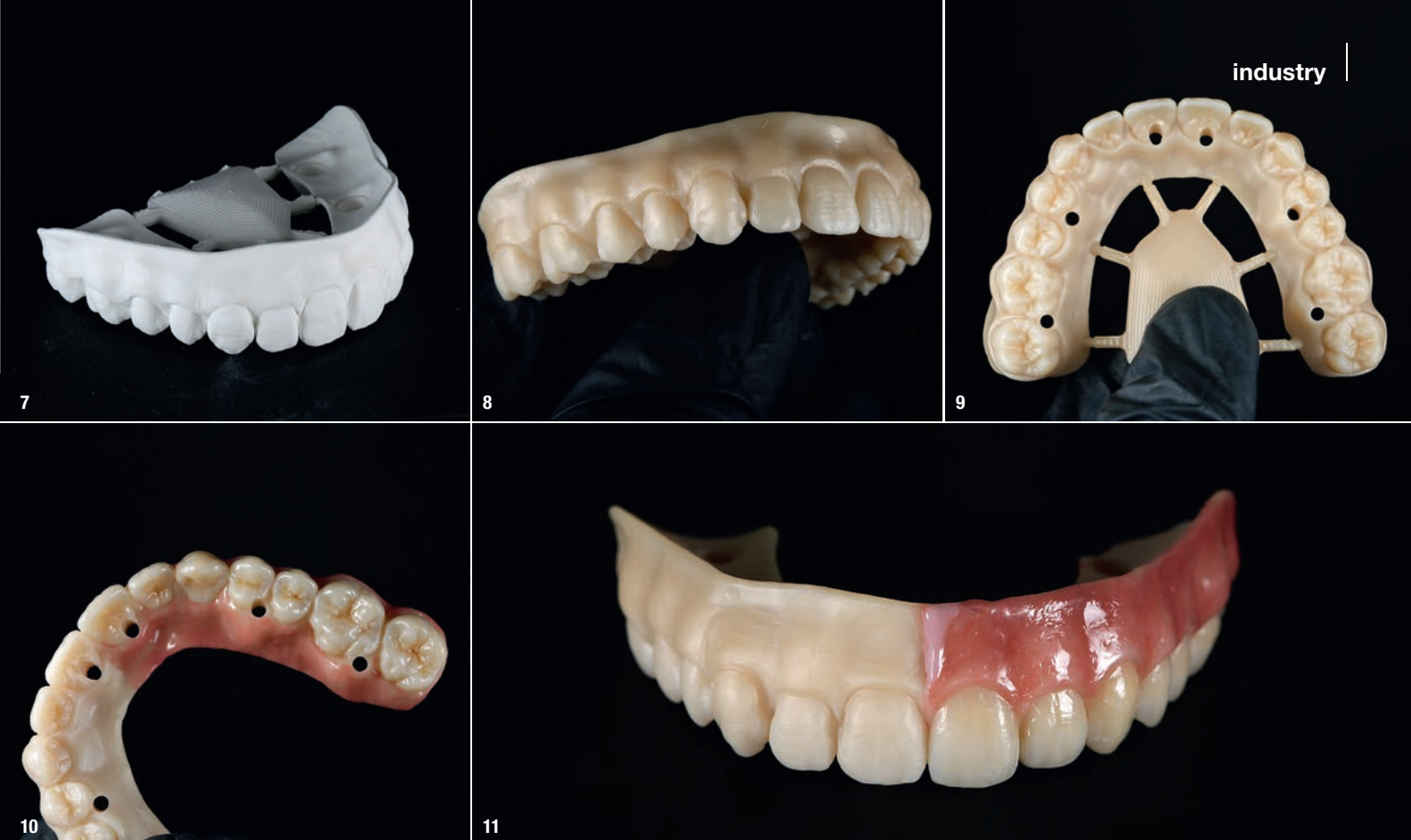
Axel Reichert, Austria

**Industrial multilayer** pre-shaded zirconium-oxide blanks have established a strong positive trend in the dental market for quite some time now and form part of the established state-of-the-art across a wide variety of facets in terms of integrated colour design. They ensure simple, fast and highly accurate reproducibility of colour and translucency in everyday laboratory work. For the user to be able to assess which underlying "optics" are hidden in the blank, nesting concepts are often necessary. However, these must first be imparted to the user so that the desired tooth shade prevails after sintering. If additional pronounced gingival sections are to

be added, which of course cannot meaningfully be accounted for in terms of shade in a tooth-coloured blank, then a simple "symmetrical" or evenly distributed shade gradient is often no longer sufficient for this purpose. In these cases, users can choose the aesthetic and high-strength Zolid Gen-X zirconia with integrated shade gradient from Amann Girrbach (Fig. 1). Zolid Gen-X is available in 16 VITA shades, two Bleach shades and all common heights on the market.

To ensure that the shade gradient of the tooth section is optimally matched with regard to the height of the res-





**Fig. 7:** Zolid Gen-X 25 mm REAX restoration prior to sintering. **Figs. 8–11:** Zolid Gen-X 25 mm REAX restoration customised with MiYO Liquid Ceramic, Benjamin Votteler (Votteler Dentaltechnik).

toration, the relationships between restoration height, tooth sections and colour distribution of the blanks to each other needs to be observed. For this reason, the incisal proportion of all Zolid Gen-X blanks was designed proportional to the blank height: the higher the blank, the greater the incisal proportion. The correct selection of the blank height is therefore decisive for an optimal shade gradient over the entire restoration. However, for a 25 mm high blank, this “symmetrical” polychromatic distribution makes little sense, as tooth or tooth crown proportions of this height do not exist in reality. For this reason, the Zolid Gen-X 25 mm blank is a special variant—preferably for implant-supported restorations with an additional high gingival component (Figs. 2–4).

If the Zolid Gen-X 25 mm blank is divided virtually into four horizontal layer sections, it appears as a 16 mm blank in terms of shade—with polychromatic and monochromatic colour components. Using the Ceramill Match 2 nesting module from Amann Girrbach, the underlying colour distribution of the blank can be visualised (Fig. 5). For 14-unit full restorations, the contours of the Spee and Wilson curves make it difficult to place all teeth optimally and evenly in the shade scheme of the blank. Alignment is therefore often selected to achieve the best possible shade distribution for the aesthetically important anterior tooth region. By using 5-axis milling machines, the fabrication of a full restoration strongly inclined or turned in the blank no longer poses a technical problem. However, if a gingival component is added, this often either no longer

fits into the blank used so far and/or one has to accept deficits in the desired aesthetics due to the only suitable alignment option.

The “asymmetrical” layer distribution of the Zolid Gen-X 25 mm blank allows making ideal use of the most common average height (16 mm) for good and direct shading by providing more “ground clearance”. This ensures a good basis for the anterior tooth aesthetics. The extended monochromatic colour portion below the 16 mm shade gradient in the blank thus enables a good compromise between aesthetics and unlimited use for ideal implementation (Fig. 6).

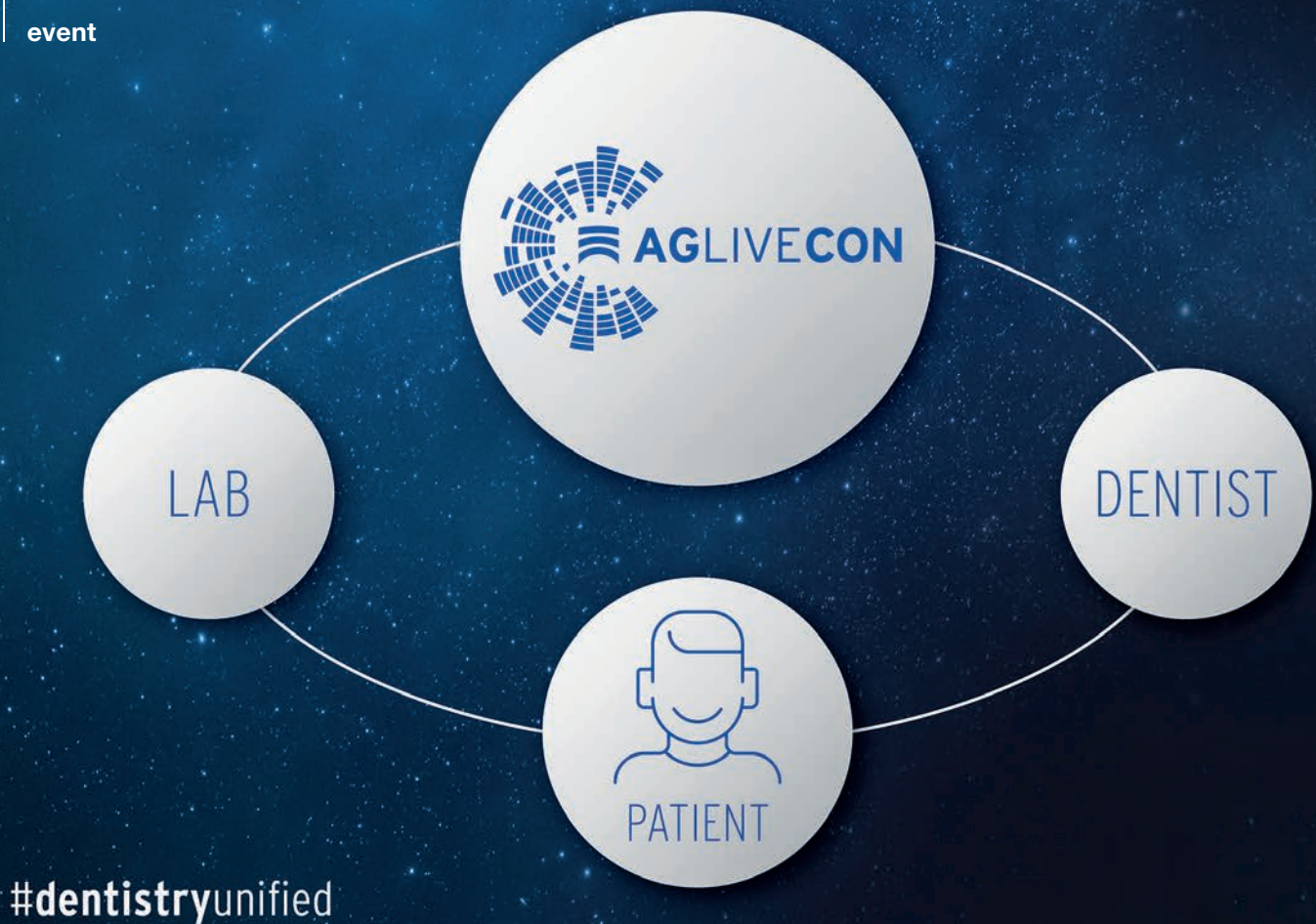
*This article originally appeared in implants—international magazine of oral implantology, Vol. 22, Issue 1/2021.*

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#dentistryunified

# Capitalising on digitisation with the right strategy

By Amann Girrbach

**Digitisation can bring** dental technicians and dentists closer together. How new opportunities arising from this interdisciplinary approach can be used best is the topic of Amann Girrbach's AG.Live CON virtual congress, which will be held from 20 to 24 April.

The event will kick off with a top-class panel discussion in which independent experts such as Profs. Daniel Edelhoff, Florian Beuer and Andreas Moritz will discuss the issues governing current patient care: What is the significance of digitisation for dentistry? Is it possible to sustainably narrow the communication gap between dentists and dental technicians and unite both parties in a common, efficient treatment approach? Will all dentists in future be required to offer direct restorations?

The individual problems and approaches to solutions will be dealt with in greater depth in a wide-ranging programme of specialist presentations.

However, theory is only one part of the equation. During the event, Amann Girrbach will present numerous new product developments at a virtual exhibition, including the AG.Live platform, which offers networking opportunities for dentists and dental laboratories and thus facilitates effortless interdisciplinary teamwork. These networking opportunities also support collaboration in direct restorations, which are increasingly being requested by patients. Using AG.Live, the dentist can always consult a dental technician, whose expertise remains indispensable for high-quality restorations. With its new intra-oral scanner and its AG.Live platform, Amann Girrbach offers dentists an easy introduction to direct restorations and allows them to provide patients with same-day dentistry of laboratory quality.

Dental technicians and dentists can register free of charge for the digital congress at [show.aglivecon.digital](http://show.aglivecon.digital). The website provides information on the congress programme. At the virtual exhibition, participants can contact Amann Girrbach's specialists directly.

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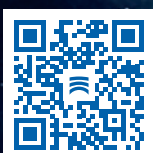
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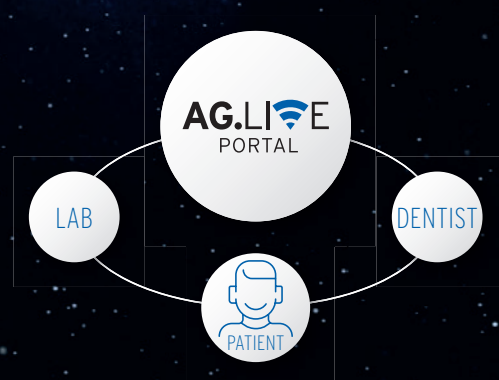


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