

A teal-colored dental crown and abutment are shown against a light blue background. The crown is positioned on the left, and the abutment is on the right. The word "reflect" is written in white lowercase letters across the center of the image.

# reflect

02 / 2017

## 16

### Augmented Reality

How Augmented Reality facilitates dental treatments

### 04 Digital Dentistry: How virtual jaw measurements make prosthetics more efficient

How to record individual mandibular movements even more effectively for CAD/CAM

### 10 Achieving more with less

Wafer-thin and brilliantly shaded: lab fabricated non-prep veneers for correcting misaligned teeth

The logo for Ivoclar Vivadent, featuring a series of green dots of varying sizes above the text "ivoclar" and "vivadent" in blue, with a registered trademark symbol. Below the text is the tagline "passion vision innovation" in black.

ivoclar  
vivadent®  
passion vision innovation



## Editorial

### Dear Reader

Being digital does not only mean using cutting-edge machines and technologies. It also entails a new lifestyle and mindset. Here are a few examples from my home country: In China, 731 million people have access to the internet every day. Ninety-five per cent of them use mobile phones for that purpose. In 2016, mobile payments in China reached 790 billion USD, which is about 11 times the amount in the US. We are already living in a digital world. This also applies to the dental realm: social media have become the most important marketing tools for Ivoclar Vivadent China. We have also digitalized our daily operating system to manage our sales and marketing teams by means of exclusively mobile-based tools.

The true meaning of digitalization is to improve our efficiency and performance. This will finally make our life and work better than ever before. In this issue, you can read about how augmented reality and the electronic measurement of jaw movements will revolutionize the work of dentists and dental technicians. The take-over of the Swiss start-up company Kapanu AG by Ivoclar Vivadent will ensure that our customers have even more opportunities at their disposal to achieve efficient and reliable results – for the benefit of all stakeholders, users and patients.

As usual, this new issue also includes exciting case reports from all over the world, which we are sure you will find very inspiring. I wish you much reading pleasure!

Sincerely

A handwritten signature in black ink, appearing to read 'Yan ZL' followed by a horizontal line.

Dr Zhouqun Yan  
Managing Director  
Ivoclar Vivadent Greater China





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## Augmented Reality

How Augmented Reality facilitates dental treatments



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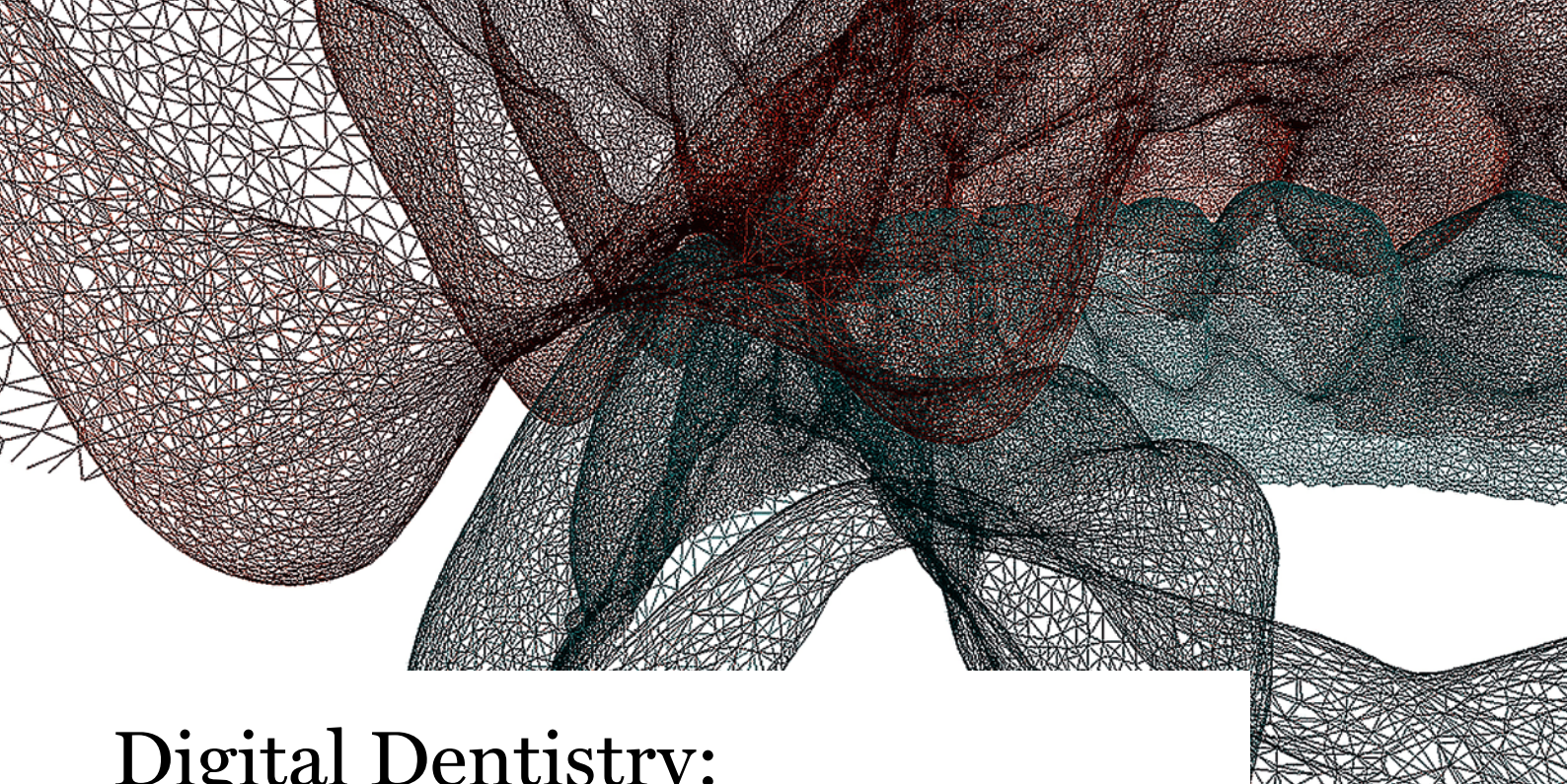
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[Learn more about the exciting topic of "Augmented Reality": reflect-digital.ivoclarvivadent.com/en](https://reflect-digital.ivoclarvivadent.com/en)



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# Digital Dentistry: How virtual jaw measurements make prosthetics more efficient



[How to record individual mandibular movements even more effectively for CAD/CAM](#)

A feature article on the topic of prosthetics

The digital future has not bypassed dentistry. Prosthetics is an interesting example of how CAD/CAM can be utilized to work much more efficiently by using instrumental movement records. Digital models of the jaw can be moved “live” and in real time on the computer screen to imitate the movements of the patient’s jaws. This optimizes the production of dental restorations.

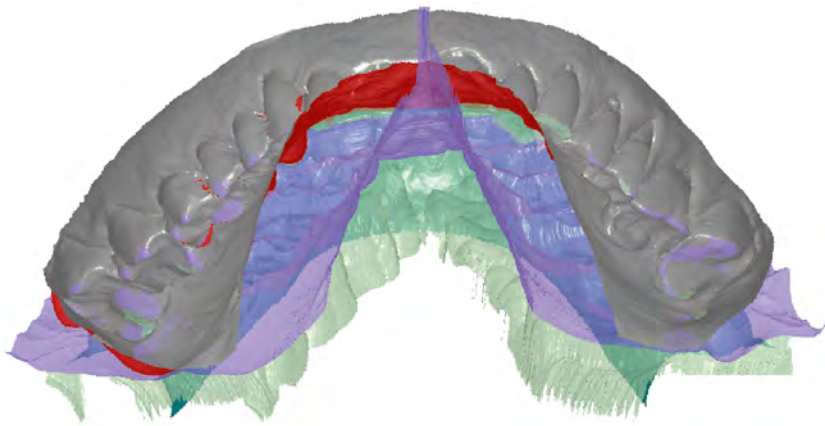
## Recording the patient’s individual mandibular movements

Prof. Dr med. dent. Bernd Kordass, from the Ernst-Moritz-Arndt University in Greifswald/Germany, is one of the leading experts in the field of electronic measurement of the mandibular function. “This refers to the use of a sensor-based system, which records and quantifies the patient’s individual mandibular 3D movements – for example during intercuspitation and during translatory or gliding movements as well as whilst speaking, chewing and grinding”, explains Professor Kordass. The data recorded serves as a basis for the design of the occlusal surfaces of restorations or dentures to be produced. If the dental restoration is produced via digital workflow with CAD/CAM, the system allows the digital models to be

displayed and analyzed in real time on the computer screen. All of this helps in producing custom-made dental restorations with a far more accurate occlusion.

## The occlusal surfaces adapt to their environment almost automatically

This sounds modern and innovative. However, this is not a new approach. Professor Kordass has been involved in this procedure since the 1990’s. “However, the type of digitalization that is now available finally offers the possibilities that we had hoped for in the past”, he says, in light of the ever-advancing development. “In concrete terms, we are now able to functionally optimize the occlusal surfaces automatically according to movement patterns”. Thanks to

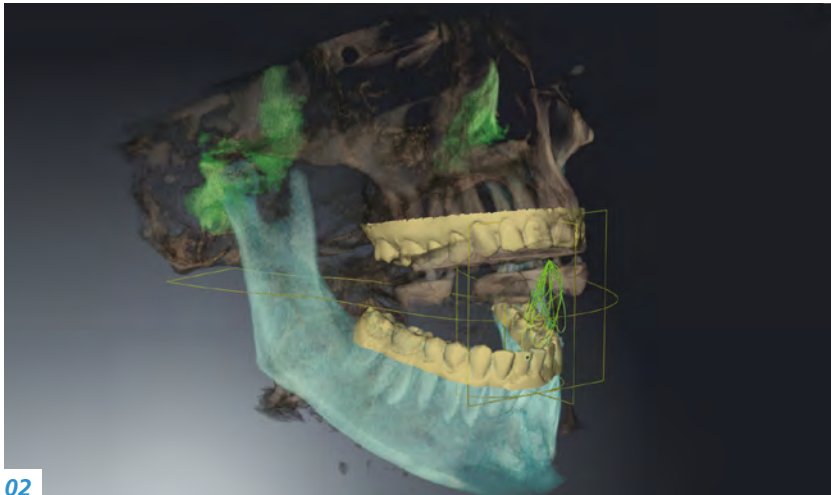


01

**01** — Envelopes as 3D lines of individual movements for analysis of the functional occlusion and optimization of the occlusal surfaces, e.g. for CAD/CAM restorations

**02** — An example for current analysis possibilities with masticatory function records, intraoral scans and digital volume tomography (SICAT Function; SICAT, Germany)

**03** — New visual measuring system (Zebris, Germany) for particularly efficient and practical measurements



02



03

CAD/CAM, the occlusal surfaces adapt almost completely automatically to their environment in terms of function. "This has not been possible until now". The results are even more accurate and better.

## A clear view through the occlusal maze

"Thanks to new systems and increasingly sensitive sensors, we are able to find our way through the maze of occlusal data without limitations", the expert explained. One example is the new visual measuring system "zebris JMT" from Zebris Medical GmbH in Germany. The system was presented for the first time at IDS 2017 and visualizes areas within the occlusion that are otherwise invisible because they are in between the occlusal surfaces. "It is the virtual world which makes certain processes accessible to us. And now we can even check the occlusion in real time and "live" on the patient", Professor Kordass pointed out.

Below is a summary of the most important advantages of the digital occlusion analysis according to Prof. Dr Bernd Kordass:

- More accurate measurements and analysis in real time
- An insight into processes that have been hidden until now
- Better insights lead to more precise results, or better fitting and more accurately functioning dental restorations.
- Users are able to work more efficiently. They are able to acquire the correct data quickly and easily and have them permanently available on-demand.
- Patients benefit from even better functioning dental restorations.



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# An efficient approach to restoring deciduous teeth



The flowable bulk-fill composite Tetric EvoFlow Bulk Fill streamlines the filling of posterior teeth  
An article by Dr Niklas Bartling, Altstätten/Switzerland

Flowable bulk-fill composites are used to replace dentin in Class I and II cavities. In this article, a straightforward treatment approach is presented, which is also ideal for pediatric dentistry. It is easy to implement and highly efficient and it produces excellent esthetic results.

For a long time, the restoration of carious deciduous teeth in the posterior region using composite resin was considered to require a lot more effort compared with other materials. This perception has fundamentally changed with the advent of the bulk-fill technique. In most cases, the time-consuming layering of filling material is reduced to the placement of a single increment. The newly developed Tetric® EvoFlow Bulk Fill is suitable for this type of indication. In combination with other components from Ivoclar Vivadent, it enables dental practitioners to effectively treat young patients.

## Differences in treating deciduous and permanent teeth

The ways and means of treating permanent teeth in adult patients cannot be automatically transferred to the deciduous teeth of children. This also applies to restorative measures. In addition to the psychological requirements of patient management in children, the difference in the micromorphology between the deciduous and the permanent dentition plays an important part. For example, it is important to note that the uppermost enamel layer of primary teeth has an aprismatic structure (30 to 100 µm). As a result, this layer cannot be etched with phosphoric acid. However, if the tooth surfaces are lightly abraded before the etchant is applied, acid-etch conditioning is sufficient to achieve a retentive pattern. Moreover, primary dentition contains larger dentin tubules. The mineral content of the intertubular dentin is lower than that of the permanent dentition. Because of its specific structure, primary dentin should not be etched with phosphoric acid for longer than 10 seconds. If left in contact with the acid for a longer time, demineralization will progress into deeper areas, which the primer will no longer be able to neutralize. Self-conditioning adhesives such as Adhese® Universal meet the requirements

of this situation and have shown to produce favourable bond strength values on primary teeth.

The adhesive plays a decisive role in ensuring the success of the restorative treatment. It should be pointed out here that Adhese Universal provides ideal handling conditions for treating primary teeth, since it is dispensed by means of a pen applicator equipped with a fine metal tip.

## What makes this filling material so special?

As is the case with compomers, composite resins are suitable for use in deciduous teeth. A clinical study conducted on Class II cavities in primary molars in 2006 showed that Tetric Flow produces satisfactory results. Primary teeth are less susceptible to attrition than permanent teeth. Therefore, the low wear resistance of flowable composites plays a subordinate role.

The new Tetric EvoFlow is a flowable composite resin that can be applied in single increments of up to 4 mm. If used in primary teeth, it does not require a capping layer. Consequently, most cavities in primary teeth can be filled in one step. The innovative light initiator called Ivocerin® is responsible for this attribute. Studies have shown that a complete depth of cure can be achieved even under difficult conditions, e.g. if the curing light is held in a tilted position. This built-in safety feature is especially beneficial in pediatric dentistry.

The composite does not cure prematurely under the operatory light of the dental unit, which facilitates handling. A chemical light sensitivity filter allows dental practitioners to take advantage of long working times of more than four minutes without having to dim the light (8000 lux). In contrast to most of the flowable bulk-fill materials on the market, Tetric EvoFlow Bulk Fill exhibits a dentin-like translucency after it has been polymerized and it blends in smoothly with the colour of the surrounding primary teeth. Of the three colours available, shade <sup>1</sup>W is particularly suitable for pediatric dental care.

### How is the material used in routine clinical practice?

Like most adults, many young patients do not share the enthusiasm of dental practitioners for filling dental cavities. As a result, they are not always willing to cooperate. In such circumstances treatment must be swift. The following case

study describes how a primary tooth is efficiently restored using Tetric EvoFlow Bulk Fill (Fig. 1).

A clean and relatively dry working field was established with the OptraGate® lip and cheek retractor. It assists in keeping the mouth of young patients open and retracts the soft tissue from the tooth requiring treatment. In addition, cotton rolls may be used to isolate the working field. After having prepared the tooth and excavated the carious tissue, a matrix was placed (Fig. 2). Then, the Adhese Universal bonding agent was applied. It was subsequently evaporated and light-cured (Fig. 3). Next, the cavity was filled with Tetric EvoFlow Bulk Fill (Fig. 4). For this purpose, the tip of the applicator was placed on the cavity floor and the material was dispensed, while slowly pulling the tip, which remained in the material, to the surface. This application method prevents the formation of voids. Tetric EvoFlow Bulk Fill is characterized by excellent surface affinity.



**01** — Preoperative situation: distal caries in tooth 54



**02** — Prepared cavity and matrix in place



**03** — Adhese Universal was applied with the VivaPen for 20 seconds and then evaporated with air and light cured for 10 seconds.



**04** — The cavity was filled with Tetric EvoFlow Bulk Fill. Excess material was removed with a probe.



**05** — *Light curing with Bluephase Style for 10 seconds*



**06** — *Polymerized restoration after removal of the matrix*



**07** — *The filling was polished with OptraPol.*

The filling was light cured for 10 seconds (Fig. 5). Then, the matrix was taken out (Fig. 6) and excess was removed with rotating instruments (fine-grain diamonds, Arkansas stone). The surface was reduced and the morphology adjusted as necessary. Next, the occlusion was checked and the filling was polished. The proven OptraPol polishing system was used for this purpose

(Fig. 7). The polishers are highly filled with micro-fine diamond particles and quickly produce a smooth and long-lasting, high-gloss finish (Fig. 8)





08 — Completed Tetric EvoFlow Bulk Fill filling after the application of Fluor Protector S to the distal surface of tooth 54

## Conclusion

This treatment approach using the flowable composite Tetric EvoFlow Bulk Fill and the matching components is highly efficient. Fillings can be placed quickly and easily. The critical phase of the treatment is reduced to a minimum due to the short application and curing times. As a result, this material is highly suitable for pediatric dental procedures.



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## Tips from an expert: How Dr Petr Hajný heightened the efficiency of his dental practice

In modern dentistry efficiency is essential. Since the competition continues to grow, the economic aspects of dental work are gaining in importance. Working efficiently benefits not only you: Your patients will be pleased about shorter appointments due to faster and more efficient treatment methods. Read about how Dr Hajný from Prague has learned to treat three patients in the same time that he used to take for two patients due to using efficient restorative materials.

# Achieving more with less



Wafer-thin and brilliantly shaded: lab fabricated non-prep veneers for correcting misaligned teeth

An article by Carola Wohlgenannt, MDT, Dornbirn/Austria

Lab-fabricated non-prep veneers made it possible to sidestep orthodontic treatment in the clinical case presented in this report. Despite the limited space available, brilliant shade dynamics were achieved with the help of specially shaded Enamel and Effect materials (IPS e.max Ceram Selection).

“Less is more”. However, using less is often difficult. In view of the high demand for minimally invasive restorations, dental technicians are presented with new challenges in many cases. The extent of the preparation is often reduced to minimize the invasiveness of the treatment, leaving only limited space for the fabrication of an esthetically pleasing, functional restoration. Such situations necessitate adequate ceramic materials and experience to reproduce the subtle interplay of shades seen in natural teeth. While previously various ceramic powders had to be combined with each other to create the required mixture, this procedure has now been simplified with the introduction of new ceramic materials. IPS e.max® Ceram Selection are specially shaded Enamel and Effect materials with brilliant shades and natural-looking light-optical properties. The range comprises twelve shades that are divided into three groups. The six Special Enamel shades are designed to produce lively translucent effects in the enamel area. The three Light Reflector Effect materials have light-reflecting capabilities and are suitable for areas where a high brightness value is desired.

The three Light Absorber materials with light-absorbing properties are used to increase the in-depth effect. With this variation in materials, imitating natural teeth with individual characteristics is much easier than before. The range of possibilities is particularly convenient in cases where space is limited, such as in very thin restorations (e.g. veneers).

## Clinical case

The approximately 40-year-old patient wanted the position of her teeth corrected (Fig. 1). She consulted her dentist with regard to this problem. She rejected orthodontic treatment because of the expected costs, the long treatment time and the limitations during therapy. An orthodontist had recommended the extraction of a tooth in the lower jaw to compensate for the crowdedness and to provide the basis for orthodontic treatment. All of this was out of question for the patient. She also emphasized that no tooth structure should be removed for the esthetic correction.



01 — Incisal view of the preoperative situation



02

02 — Mock-up in wax placed on the model



03

03 — Selecting the basic tooth shade (Dragon Shade, Drachenberg & Bellmann)

## Treatment plan and mock-up

The possibilities of an esthetic improvement in the upper jaw were discussed together. In particular, teeth 11 and 13 were responsible for the unevenness in the dental arch. The teeth were inclined from the axis towards the palatal. The idea was to use two ceramic non-prep veneers to correct the misalignment and achieve harmony in the dental arch. With the help of a study model, the ideal tooth position was established in wax (Fig. 2) and then converted into “fast and easy” resin veneers (mock-up). The first impression after the placement of the mock-up was positive. There was a strong aha! effect. The patient agreed to the treatment. The existing chalky spot on tooth 21 was masked with composite in the dental practice.

## Challenge: reproducing the shade of the natural tooth

The shape and morphology of the veneers were defined by the mock-up. Now a matching tooth shade for the ceramic materials had to be determined.

The challenges were posed by the dynamic interplay of shades, the “beautiful” translucency of the natural anterior teeth and the limited space available. How can the light-optical properties be reproduced as perfectly as possible in only a wafer-thin layer of ceramic material? The Enamel and Effect material concept of IPS e.max Ceram Selection provided the solution to this conundrum. First, the basic tooth shade was determined, for which shade samples mounted on a gingiva shield (Dragon Shade, Drachenberg & Bellmann, Germany) were used (Fig. 3). Conventional shade tabs - without gingival section - may impair the result.



04



05

**04 and 05** — Selecting the IPS e.max Ceram Selection materials using shade tabs. On the right: shade tab with the intensive enamel shade “quartz”; on the left: shade tab with the light intensive Effect material “cream”

Already during the selection of the basic tooth shade, it became evident that standard dentin materials would not be sufficiently intensive to reproduce the natural tooth shade due to the thin layer thickness with which the veneer had to be created. It was therefore decided to use the Enamel and Effect materials of the IPS e.max Ceram Selection range. Self-made shade samples were used as reference for the targeted selection of the materials. Among others, the Light Reflector Effect material in shade cream should lead to the desired result (Fig. 4). In addition, three enamel shades were chosen. The intensive enamel shade “aqua” was selected to emphasize the bluish translucent areas along the marginal ridges (Fig. 5). The enamel shade “apricot” should lend warmth to the incisal, enhance the translucency and heighten the chroma. In addition, the slightly greyish but still warm enamel shade “quartz” was chosen.

## Creating the veneers

Refractory dies for teeth 13 and 11 were created with the help of the master model (Fig. 6). The dies were then soaked in water to prevent them from drawing moisture from the ceramic materials during the layering procedure (Fig. 7). The veneers were built up in layers in accordance with the shape defined by the mock-up (Fig. 8). No dentin material was used. The colour-intensive Effect shade “cream” was used for the dentin core replacement. The other



06



07

**06** — Master model with dies made of investment material

**07** — Investment material dies are being soaked with water



08

**08** — Building up the veneer for tooth 11 using IPS e.max Ceram Selection materials



09



10a

**09** — Incisal view of the completed veneers on the model

**10a** — Veneer 11 features an insertion handle at the incisal edge to be removed by grinding once the restoration is seated.

**10b** — Despite their thin layer thickness, the veneers exhibit natural light-optical properties.



10b

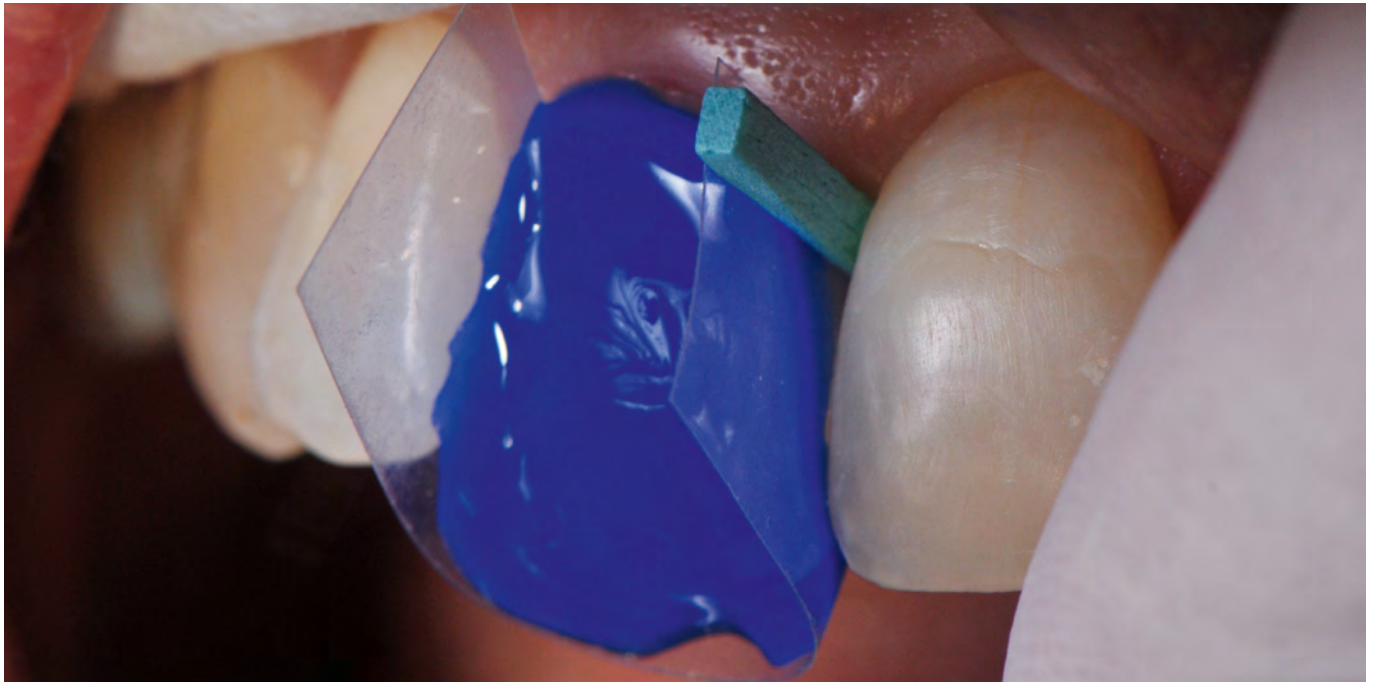
Effect shades selected served to bring out the warm-translucent interplay of shades. It did not take long to build up the veneers in ceramic. However, the esthetic appearance of a restoration is not determined by the shade effect alone. Subtle, barely noticeable surface structures can underline the natural appearance of a restoration. Adequate time and attention was therefore dedicated to designing the surface morphology of the veneers. At the final firing, the ceramic surfaces were slightly smoothed and, once fired, refined by mechanical polishing. Polishing was carried out carefully by hand.

Figure 9 shows that the teeth were successfully brought into alignment with the adjacent teeth to create a harmonious appearance. An initial evaluation in the dental lab showed that the veneers demonstrated a natural interplay of shades in spite of the thin material thickness (Fig. 10). However, the effect in the mouth will ultimately decide the success of the restoration.

## Seating the restoration and final result

An essential aspect for the success of veneers is the cementation procedure. No matter how brilliant the ceramic materials are and how skilful the work of the dental technician is, if the shade of the adhesive cementation material is not chosen correctly, the joy of the “new smile” will be short lived. Variolink® II luting composite in shade neutral was used for incorporating the veneers. Prior to placing the veneers, they were tried in with try-in paste to confirm that the treatment goal had been achieved. Once the ceramic veneers and tooth surfaces were conditioned (Fig. 11), the veneers were bond-

ed to the teeth. The result was impressive. Teeth 13 and 11 now blended in harmoniously with the rest of the dental arch (Fig. 2). The tooth shape was aligned with the shape of the adjacent teeth, while slightly asymmetrical contours supported the natural appearance of the restorations. The light-optical properties of the veneers left nothing to desire. The intrinsic interplay of shades and variations of translucency seen in the adjacent teeth were faithfully reproduced. After the functional criteria had been checked, the patient was discharged from the practice (Figs 13 and 14).



11 — Conditioning of tooth 11 for the adhesive cementation procedure



12 — Situation after seating the veneers on teeth 11 and 13



**13 and 14** — Final check of the functional aspects. The veneers blend in with the dental arch naturally and “invisibly”.

## Conclusion

In principle, such challenges can only be met if the dental technician understands the light-optical properties of natural teeth and is able to use appropriate ceramic materials. The procedure demonstrated in this report eliminated the need for dental technicians to mix the individual materials

themselves. Suitable materials in the ideal shade could be applied “directly from the tub”. In this way, the balancing act between maximum esthetics and minimum invasiveness was successfully and reliably accomplished.



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# Augmented Reality



How Augmented Reality facilitates dental treatments

An interview with Roland Mörzinger, CEO of Kapanu AG, Zurich/Switzerland

Digitization should be included in any dental practice or lab strategy. Augmented Reality is an example of a sensible use of digital processes in dentistry. Read our interview with Roland Mörzinger, CEO and co-founder of Kapanu AG (Zurich/Switzerland).



*Mr Mörzinger, what does Augmented Reality mean?*

Augmented Reality expands the real world with virtual contents. In most cases, this means the superimposition of additional digital information on live images or videos. For instance, if you watch a live football game in Augmented Reality, the distance from the line to the goal is displayed during a free kick by means of a circle or line.

*What has Augmented Reality to do with the dental world?*

Augmented Reality is an exciting topic for the dental world and offers enormous possibilities. In concrete terms, the question is how this technology can facilitate dental treatment procedures - from planning with the patient to the collaboration between the dentist and dental technician.

*Can you explain your technology in more detail in relation to this?*

Our flagship project is called “Kapanu Augmented Reality Engine”. Our software allows users to superimpose their dental designs onto recordings of the patient in natural motion. To do so, they can import 3D models of patient-specific dental restorations as well as teeth from tooth libraries that contain natural-looking beautiful teeth. These digital models can then be viewed in real time. This virtual try-in allows patients to see their new smile before they consent to the treatment. In addition, visualization of the treatment goal facilitates the communication not only with the patient but also between the dental professionals.

*Kapanu was present at Ivoclar Vivadent’s stand at IDS 2017. What did you show there?*

Our “Kapanu Augmented Reality Engine”, as it were, premiered at IDS. Using a light hearted approach, we were able to show visitors what possibilities Augmented Reality holds in store for dentists, dental technicians and patients. The visitors were encouraged to have a go at the new technology with the help of an app and 3D images. They were able to see themselves with new teeth or bleachings in natural motion. Those who wanted could take a selfie and send it to themselves.





01 — The Kapanu team at IDS 2017



02 — Dental treatment procedures are facilitated.

### *What response did you get?*

The response was overwhelming. There was virtually a non-stop flow of visitors coming to our stand. After some time we even realized that we did not have to guide them through the process anymore. They tried the apps out themselves and sent themselves selfies without needing any help from us. We were really pleased to see this because, firstly, it was proof to us that the topic was popular, and, secondly, it impressively showed that this technology is user-friendly and straightforward to use - self-explanatory, so to speak. And that is exactly how it should be: high-tech but easy to use so that no obstacles or reservations stop people from using it.

### *Please briefly summarize the advantages of Augmented Reality for dental professionals in the future.*

I can imagine that this technology will make visible what the treatment results will look like in the future. You can check if everything matches and see if the patient likes the restoration. This will make the treatment more efficient.

### *How important, do you think, is digitization in the dental field?*

In my opinion, there is no way to get past digitization. The feedback at the fair also showed that many dental customers welcome smart digitization and, to some extent, also expect the industry to offer them digital solutions.

### *What or who is actually Kapanu?*

Kapanu AG is a start-up and spin-off company of ETH Zurich. The firm was founded in 2015. It is based on a highly qualified team of scientists and developers specializing in innovative software for the dental industry. In June 2017, Ivoclar Vivadent acquired Kapanu AG. Since then, we have been working together on the development of innovative dental applications that connect real-life processes with the digital world. The outcomes of this cooperation will hold a lot in store for the users.

### *Mr Mörzinger, thank you for the interview!*



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# Guided concept in the esthetic zone



A review of the surgical and prosthetic considerations

An article by Dr Stefen Koubi, Marseille/France and Gérald Ubassy, Rochefort du Gard/France

In case of complex restorations in the anterior region, a precise and targeted therapy represents the preferred treatment option in order to achieve predictable and reproducible results.

## Introduction

The restorative treatment of anterior teeth often presents a considerable challenge to general dentists. The aim is always to obtain the best possible result. A well-guided approach is necessary if the envisaged outcome is to be achieved. Precision planning and a consistent protocol are indispensable. Modern dentistry has simplified the ways and means of attaining esthetic results. Nevertheless, the success of the treatment, in the anterior region in particular, greatly depends on very careful planning, which includes a detailed analysis of the patient's smile as well as the fabrication of a working model. This model is used to plan and reproduce the shapes and contours of the future restoration with utmost precision. The present article describes a comparatively simple treatment technique on the basis of a clinical case. The initial esthetic

treatment plan was jointly developed by the dental technician and the dentist. It served as the guide or "GPS" for all the clinical steps, and it helped the dental team to successfully "navigate" through the treatment.

## Clinical case presentation

A woman in her forties consulted our practice because of extremely mobile front teeth, which had caused esthetic problems (Figs 1 and 2). The teeth had moved forward and the level of the smile line had dropped. Due to severe periodontitis, the upper front teeth showed considerable gingival recession (Fig. 3). A detailed examination revealed that the four upper front teeth could not be saved and had to be extracted. The plan was to insert two implants in the sockets of tooth 12 and 22 after the extraction process. Subsequently,



01

01 — The patient was dissatisfied with her smile.

02 — The anterior teeth were damaged due to periodontitis and had moved forward.



02



**03** — Intraoral view. Severe periodontitis had caused gingival recession on the two central incisors in the upper jaw.

**04** — Situation after tooth extraction

**05** — Placement of the provisionals during the implant insertion appointment

**06** — Situation after six months



**04**



**05**



**06**

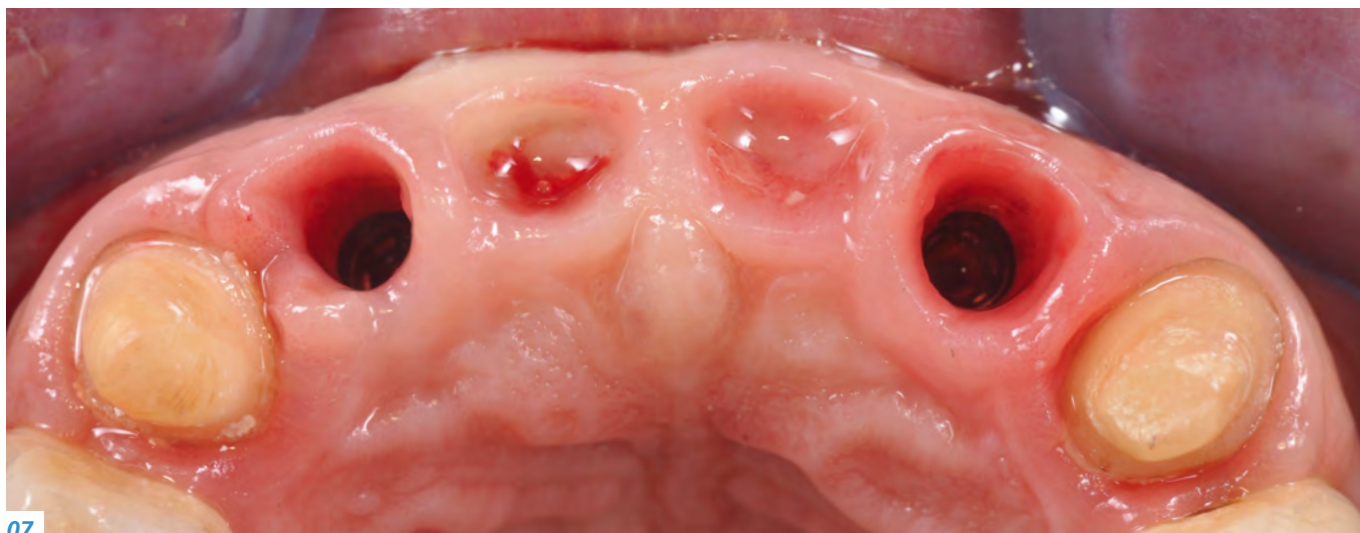
an implant-supported bridge extending from tooth 12 to 22 would be fabricated and tooth 13 and 23 would be restored with single crowns. The main objective was to restore the harmonious appearance of the smile line and the convex shape of the gingiva. The patient's smile was analyzed by means of a photographic record. Furthermore, impressions of the situation were taken. Based on this information, a provisional bridge spanning from tooth 13 to 23 and incorporating the esthetic and functional adjustments would be produced with PMMA material (Telio® CAD).

### Surgical procedure

At the second treatment session, the four upper incisors were extracted. The canines 13 and 23 were prepared to receive the provisional bridge (Fig. 4). During the same ap-

pointment, two implants (V3, MIS Implants Technologies) were inserted in the sockets of tooth 12 and 22. They would serve as the abutments for the implant-supported bridge. The surgical procedure also included two connective tissue grafts in the area of tooth 11 and 21 in order to increase the horizontal volume of the jaw. The augmentation of the ridge tissue helped to restore the convex shape of the dental arch and established a sound basis for the development of a natural-looking emergence profile. Therefore, the alveolar sockets of tooth 11 and 21 were filled with a bone replacement material (xenograft product, Bio Oss) to prevent the gingival tissue from collapsing after the tooth extraction.

After the surgical procedure, the provisional bridge was placed (Fig. 5). The provisional restoration plays a significant part in this type of treatment and considerably influences



**07** — Occlusal view after the removal of the provisional restoration

**08** — Excellent soft tissue conditioning. Due to the well-constructed provisionals, interdental papillae had formed successfully.



**08**

its outcome. A flowable composite material was applied to the base of the provisional bridge to condition the gingival tissue and shape the desired emergence profile. Suitable conditioning of the gums helps to preserve the tissue volume.

**Note:** When the model for the provisional restoration was fabricated in the dental laboratory, the alveolar sockets had to be prepared accordingly. Since this type of minimal surgical intervention prevented the need for flap surgery, the wound healed cleanly and quickly. Hardly any postoperative complaints occurred.

### Six months later

The gingival conditioning measures showed to be successful when the provisional bridge was removed (Figs 6 and 7). Even the papillae between the upper tooth implants were

beautifully formed. This situation established an ideal basis for the smooth and esthetic integration of the permanent all-ceramic restorations (Fig. 8). Since bone resorption had progressed to an advanced stage in the anterior zone due to severe periodontitis, tilted implants had to be used: A screw-retained denture could not have been considered as a viable option in this case.

### Fabrication of the permanent restoration

After the final impression-taking process, a virtual model of the provisional restoration was produced. The frameworks were cut back to create a suitable basis for the ceramic restorations. The abutments were fabricated with IPS e.max® Press using the press technique. They were extraorally bonded to the titanium bonding bases with the reliable Multilink® Hybrid Abutment luting composite (Fig. 9). The zirconium oxide frameworks for the bridge as well as for the crowns on tooth 13 and 23 were produced with IPS e.max ZirCAD MT: a material featuring highly translucent and outstanding esthetic properties (Figs 10 and 11). The frameworks were characterized and individually veneered with the highly esthetic IPS e.max Ceram layering ceramic (Figs 12 and 13).



**09** — Hybrid abutments made with pressed ceramic (IPS e.max Press) on the model



**10** — Crown copings and bridge framework made with IPS e.max ZirCAD MT (translucent zirconium oxide)



**11**

**11** — Translucency of the zirconium oxide



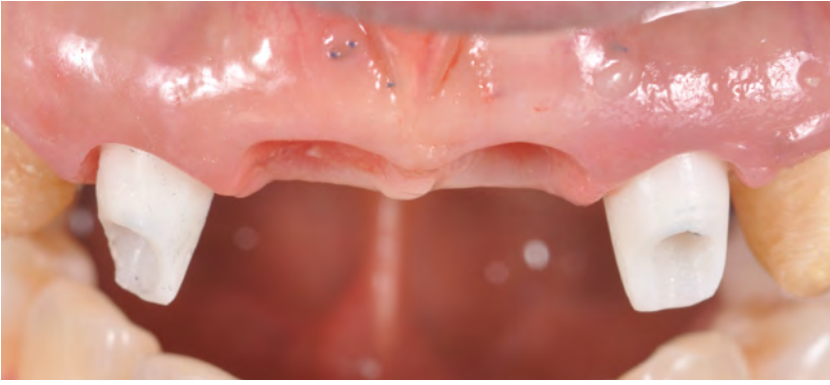
**12**

**12** — Veneering of the framework with the IPSe.max Ceram layering ceramic

**13** — The restorations before placement



**13**



14 — *The all-ceramic abutments in situ*



15 — *Integration of the bridge in the periodontium*

## Seating of the restorations

The try-in session again showed that the soft tissue was well-formed (Figs 14 and 15). The zirconium oxide-supported restorations were placed with the self-adhesive SpeedCEM® Plus luting cement. For this purpose, the IPS e.max

Press lithium disilicate abutments were etched with hydrofluoric acid and then silanized with Monobond Plus in order to condition them for the bonding procedure to the bridge. The permanently seated zirconium oxide-supported crowns and the bridge exhibited a translucency level similar to that of lithium disilicate (Figs 16 to 18). The result in this case was exceptionally esthetic: The relationship between the restorations and the soft tissue looks harmonious and natural (Figs 19 to 21).



16 — *Natural-looking emergence profile*



17 — *Inspection of the functional parameters*



18 — *Occlusal view. The convex shape of the gingiva has been restored.*



19 — Close-up of the smile. Ideal light-optical properties



20 — Front view of the lip line with the patient smiling



21 — A happy patient

## Conclusion

Precise planning and excellent collaboration among the members of the dental team are essential in the treatment of complex cases, since it is important to carry out the surgical interventions carefully and in stages. This immensely contributes to the final esthetic outcome. The ability to use translucent zirconium oxide in the anterior tooth region, due to the highly attractive optical properties of this material, opens up entirely new esthetic possibilities. In complex restorative procedures in the anterior zone, straightforward, well-planned and digitally based treatment protocols are the method of choice for obtaining predictable and reproducible results.



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