# reflect

01/2018

## 08 Esthetic rehabilitation of a complex case

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## Editorial

# Dear Reader

Today, enhancing your efficiency and achieving even more reliable results plays an increasingly important role not only in the dental practice and dental lab, but in all spheres of life. Many companies – e.g. Ivoclar Vivadent – have to take strategical and organizational decisions for the future. Digital processes are playing a major role when striving for more efficiency.

This situation probably isn't any different in your dental practice or laboratory. Tough decisions may be required, and there may be temporary reservations and resistance to change that you will have to cope with. But only by actively taking the future in your hands instead of turning a blind eye to it, will you be successful. As the digital revolution is taking hold of the dental world, dental practices and laboratories must embrace digitalization to thrive. Digital procedures and technologies can be great tools that facilitate your everyday work.

This issue of Reflect will provide you with the latest details about the digital trends that are of particular interest for dental and laboratory professionals and might thus play a significant part in dentistry and dental technology in the future. Gain insight into exciting case reports presented by international experts and their teams. And experience traditional craftsmanship, side by side with digital workflows.

Best wishes

Ken McInnes
Managing Director Ivoclar Vivadent Pacific

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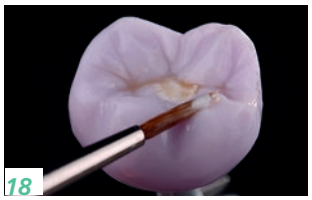

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# 08

## Esthetic rehabilitation of a complex case

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**Publisher:** Ivoclar Vivadent AG, Bendererstr. 2, 9494 Schaan/Liechtenstein, Tel. +423 / 2353535, Fax +423 / 2353360
**Publication:** 2 times a year / **Total circulation:** 43,653 (Languages: German, English, French, Italian, Spanish, Russian, Greek)
**Coordination:** André Büssers, Tel. +423 / 2353698 / **Editorial office:** A. Büssers, Dr M. Dieter, Dr R. May, T. Schaffner / **Cover picture:** Jürgen Seger, Ivoclar Vivadent AG
**Reader service:** info@ivoclarvivadent.com / **Production:** teamwork media GmbH, Fuchstal/Germany

# Sunny prospects: Using power to achieve brightness

The layering concept using IPS e.max Ceram power materials

An article by Bastian Wagner, Munich/Germany

The most important factor when imitating the light-optical properties of natural dentition is brightness. It is important to be able to control this factor selectively during the production of the ceramic restoration. The new power materials in the IPS e.max Ceram range allow the dental technician to be the maestro of brightness.

The work routine in the dental laboratory and dental practice has changed a lot in recent years. Co-operation between dentist and dental technician has become multifaceted and complex. This enables the patient's individual needs to be fulfilled on an even higher level. A prosthetic treatment plan is still an essential and fundamental factor. Contact with the patient is of great importance for the dental technician, in order to ensure a high-quality result. In addition, the dental technician should be a master of his/her craft and understand the anatomical, functional and esthetic factors of natural dentition.

## Working with all-ceramic materials

Another important aspect for successful prosthetic treatment is the use of appropriate materials. In modern dentistry, permanently fixed restorations made entirely from all-ceramic material are highly relevant in the clinical routine. The ceramic layering materials and the multitude of framework materials available on the dental market offer a wide range of choice for a successful treatment concept – according to the different indications and the respective cases. However, due to the wide variety of products it is not always easy to select the best material. The dental technician's job is to produce prosthetic restorations that have a long service life. Functional, biological and esthetic perfection should be adapted to the individual needs and requirements of the patient. For this, it is essential to become familiar with the material properties of the various different materials and know the specific features of the respective ceramic range. For example, it is advisable to make individual shade samples so that the light-optical properties of the ceramic material can be seen. The materials to be used should be ideally coordinated with one another in terms of biocompatibility, stability, esthetics, processing, chroma, brightness value and hue.

This article is an introduction into the new IPS e.max® Ceram power materials. The new ceramic material's indications and advantages will be presented using a patient case as an example.

## The power concept

The well proven IPS e.max Ceram range has been extended with the Power Dentin and Power Incisal materials. The new power ceramic materials have a higher brightness value. The IPS e.max Ceram range now includes three different brightness values and small variations of opacity and chroma.

| Dentin | → | Deep Dentin | → | Power Dentin |
|---|---|---|---|---|
| – | | Value (brightness) | | + |

A comparison shows that the dentin materials have the lowest brightness value and that the new IPS e.max Ceram power materials enable the highest values to be achieved. In particular, a wider spectrum is available for creating a specific esthetical reproduction in a single-tooth restoration.

*01 — Starting situation. The upper right 1 and the upper left 1 are to be restored with veneers*

The power materials are specifically designed for the following situations:

- Reproducible natural brightness on translucent frameworks
- Controllable brightness
- Vibrant alternating layering to imitate natural teeth with a high brightness value
- Stable value in thin layering thicknesses

## Patient case

One of the biggest challenges for the treatment team is the reconstruction of minimally invasively prepared anterior teeth. This situation requires a great amount of attention from the dental technician. There has to be a high level of understanding for the light-optical analysis of natural teeth and the ability to implement this in ceramic in an individual layering concept. In order to achieve an esthetically harmonious restoration, it is imperative to understand the light-dynamic characteristics of the respective ceramic range. The power ceramic materials widen the selection range and with their high brightness value, they represent a clear added value to the IPS e.max Ceram range. The brightness value can be controlled significantly better. The dental technician can adjust the brightness throughout each of the various steps.

The versatility of the enhanced ceramic range is shown through a patient case.

In this case, the patient's two upper anterior teeth were to be restored with ceramic veneers (Fig. 1). The plan was to esthetically improve both the tooth shade and shape. The natural teeth were prepared using a minimally invasive technique. This created space for the ceramic veneers.

02

*02 — Determining the basic tooth shade*

*03 — Determining the light-optical characteristics with a special shade sample (in this case Opal Effect materials)*

*04 — Determining the tooth shade of the prepared teeth*

03


04

## Determining the shade

After a joint analysis of the initial situation and desired target, the tooth shade and the light-optical characteristics were assessed. The shade guide from the respective ceramic range is important for determining the shade (hue), colour saturation (chroma) and colour brightness (value). The preoperative shade analysis showed a high brightness value in the body area of both teeth. The ceramic materials, which were selected through the shade determination, were set in an individual layering concept. Figs 2 to 4 illustrate the importance of targeted shade analysis with photographic documentation.

*05 — Geller model with refractory dies*

*06 — Building the veneers up for the first firing*

The power ceramic materials are especially well suited for tooth shades with a high brightness value. They make the reconstruction of young or bleached teeth easier. The advantages of the power ceramic materials can be seen in this minimally invasive situation.

If the brightness value cannot be helped by the framework material, it is all the more important to use a high value ceramic. A "greyness" within the restoration is therefore prevented. A grey shimmer can occur for example, when a translucent framework material is used or in situations where no framework is required.

## Producing the veneers

In order to esthetically restore the anterior teeth, the veneers were individually built up on refractory dies **(Figs 5 and 6)**. In this case, the prepared teeth have a slight discolouration, which needs to be masked by the ceramic layer. The high degree of reflection (value) made it possible to achieve the required brightness in a minimal layer thickness. Effect materials were used in the build-up to achieve a vibrant appearance. This way, the natural light-optical characteristics were imitated **(Figs 7 to 9)**. An alternating layering concept, using the Power Incisal and the conventional incisal ceramic materials from the IPS e.max Ceram range, gave the ceramic veneer a very high light-dynamic effect with relatively little effort **(Fig. 10)**. The interaction of the different brightness values created a natural in-depth effect within a minimal layering thickness **(Figs 11 to 13)**.

**07**

**08**

***07 and 08 — Alternating the layers with the materials chosen during shade determination***

*09 — Prepared for the second firing*

*10 — The veneers with a high light dynamic on the model*

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*11 and 12 — Veneers on the UR 1 and UL 1: The brightness value of the adjacent teeth has been reproduced exactly. There is a natural in-depth effect within a minimal layering thickness.*

*13 — Harmony in shade and shape: Both upper anteriors appear significantly stronger and have the desired lighter tooth shade.*

## Conclusion

To create a harmonious shade reproduction of natural teeth, it is important to imitate the information obtained during shade analysis using the light-dynamic characteristics in the material. The most important characteristic is the brightness (value). If this is not implemented exactly, even a non-professional will see the ceramic restoration at a short speaking distance. If the value is too high, the restoration will appear to be too white; if the value is too low, the restoration will seem too grey. It is important for the dental technician to be able to influence the brightness value of a veneer. This requires suitable ceramic materials and a patient-oriented working method. The new IPS e.max Ceram power materials are a big plus in everyday laboratory life when translucent framework materials are used and with minimally invasive restorations. The brightness value can even be altered at a later stage with these materials, e.g. if the try-in shows that the brightness has to be increased. This gives the dental technician a high degree of safety, because improvements are easy to achieve. A total remake of the veneer due to correction of the brightness can be avoided in many cases. The power ceramic materials offer more safety in imitating the brightness value of natural dentition.

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Experience this clinical case online

# Esthetic rehabilitation of a complex case

Experience this exciting episode of teamwork online
A clinical case from Israel, presented as a clinical story online

One day at the Bichacho Clinic in Tel Aviv, Israel: A 55-year-old woman introduces herself to the team of experts. She has been unhappy with her smile for a long time and now wants an esthetic smile makeover. Although she has undergone numerous treatments in other practices, she still sees a need for improvement. To make her ordeal worse, one of her treatments had been terminated prematurely to avoid the devitalization of her teeth and the associated need for root canal treatment and even more comprehensive therapies. This situation has caused a considerable level of suffering to the patient.

## Aim: be as minimally invasive as possible

One thing was certain from the outset for the clinical team at the Bichacho Clinic: Only a minimally invasive treatment option was going to be acceptable. The task was to improve the smile of the patient in such a way that she would be a hundred per cent satisfied with the outcome whilst all the functional requirements would also be met.

## An international team of renowned experts

A team of clinicians consisting of Dr Mirela Feraru, Dr Galit Talmor and Prof. Nitzan Bichacho took care of the case. They brought Stefano Inglese from the Oral Design Center in Pescina, Italy, on board to carry out the dental lab work. A new challenge for this internationally renowned team of experts was defined.

"In addition to using a material that meets the esthetic and functional requirements of the case, effective communication between the treatment team and the patient, combined with a sound treatment protocol including photographic documentation, was essential to achieve an optimum final result."

Dr Mirela Feraru

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**01 and 02** — *The patient's smile prior to the minimally invasive treatment*

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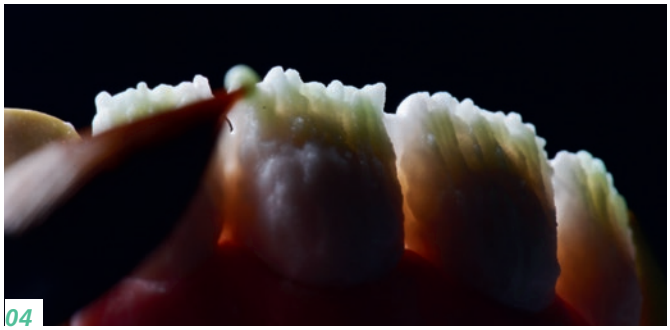

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**03 to 06 —** *Stages on the road to a restoration that provides optimal morphology, function and esthetics*

## Carefully designed treatment plan

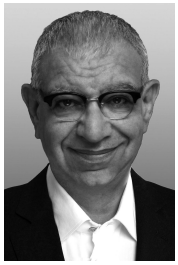
Before the team of experts began with the treatment, they set up a treatment plan including the following phases:

1. Esthetic analysis based on the clinical examination as well as static photographic documentation of the preoperative situation and dynamic documentation using video
2. Replacement of the defective composite fillings in the posterior region
3. Refurbishment of the buccal corridor in the premolar area with glass-ceramic restorations (right and left)
4. Replacement of the defective composite restorations in the anterior region and evaluation of the remaining tooth structure
5. Guided ¾-veneer and crown preparation with the aim of improving the proportions and shapes of the teeth in the esthetic zone
6. Adhesive bonding

## Result: accurate restorations and a harmonious smile

In terms of morphology, function and esthetic appearance, the restorations blend in well with the existing dentition and the face of the patient. The vitality of all the restored teeth has been preserved. The patient is completely satisfied.

*Dr Mirela Feraru*



*Prof. Dr Nitzan Bichacho*

*Dr Galit Talmor*

*Stefano Inglese*

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**Watch now: clinical case packaged into a digital story**

Do you want to find out more about this extraordinary patient case? Then watch it online. We have packaged the case into a digital story for you – with a wealth of information, pictures and videos. Get to know the complete clinical and technical workflow involved in the treatment.


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# Digital and dental: What is possible and what will be possible

The present and future of digitalization in dentistry

An article by Prof. Dr med. dent. Daniel Edelhoff, Munich/Germany

The digitalization of the dental world is advancing inexorably. Digital and dental are becoming more tightly linked. As a result, dentists now have numerous advantages. By cleverly combining digital and conventional working methods, they can work more efficiently and reliably.

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We live in a high-performance culture in which we expect everything to be faster and more efficient. Digitalization is a major contributory factor and has also taken hold of the dental world. Digital working steps are taking over rapidly and digital islands are infiltrating into the analogue world.

Digitalization in the dental sector already offers considerable advantages and this has aroused great interest amongst many dentists and dental technicians. The benefits include the standardization of working steps, an increase in material quality and reproducible restorations. Dental technicians today are able to receive far more information from the patient than ever before, thanks to digital imaging by means of devices such as the digital volume tomograph (DVT) and 3D facial scanners. This increases the predictability of dental work so that the desired end result can be achieved safely and efficiently.

## Treatment plan, test drive and monitoring

For me as a dentist, there are three key factors that determine complex treatments:

1. planning throughout the entire treatment,
2. test driving the restoration and
3. monitoring.

***01 —*** *Prof. Edelhoff in an interview about the digitial future of dental medicine*

Many procedures do not lead to the desired result because there isn't a suitable treatment plan – or in some cases no treatment plan at all. Thanks to the possibilities of CAD/CAM technology there is now great potential in this respect.

"Planning involves collecting the data obtained from different components and deciding on the best way to implement them. We already have much more planning safety than we did ten years ago."

Monitoring gives us confirmation: Specific situations, such as the initial status, are scanned and then, after a certain amount of time, a second scan is taken and superimposed, and this data is then compared. This method makes it possible to recognize and identify changes at an early stage. Based on the collected data, we can then decide whether restorative treatment is advisable or even necessary.

## Retaining as much tooth structure as possible

An important advantage of CAD/CAM is the fact that minimally invasive procedures can be performed.

In the restoration of anterior teeth, for example, around 70 % of the tooth structure has to be sacrificed to produce a classical full crown, whereas 360° veneers only "cost" around 30 % of tooth structure.

In the posterior region, likewise around 70 % of the tooth structure has to be sacrificed to produce a full crown, whereas only approx. 32 % of tooth structure is removed for a partial crown.

The benefits of digital processes for both, dentists and their patients are very clear. Future developments should include even more gentle procedures. I have visions of being able to replace lost enamel using a purely additive technique – this means, without having to remove any of the existing tooth structure in the process.

## CAD/CAM materials are reliable

Thanks to CAD/CAM, we are now able to work with great materials, which were previously not accessible to us. One example is zirconium oxide; another is high-performance polymers. For example, CAD/CAM manufactured, tooth-coloured polycarbonate splints are great for a functional and esthetic "test drive", especially as I can continue to work under the splint. This is only possible due to digitalization. CAD/CAM manufactured materials have a high degree of reliability due to their standardized production.

## In the end everything returns to manual

Every dentist would do well to integrate digital procedures as far as possible into their every day professional life. They would make their own work easier and also that of their dental technician. Through more efficient treatment and high-quality results, the dentist will also have more satisfied patients.

Of course, CAD/CAM cannot do everything. The skilled craftsman - in other words the person - remains indispensable. "Man made" will always be better than "machine made". And only a person can define what looks good. Only a person can provide indispensable qualities such as empathy and trust when communicating with the patient. At the end of a high-tech treatment procedure everything goes back to analogue working methods again, because the treatment ends at the patient and the restoration is inserted into the mouth by hand.

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# Gold standard for chairside restorations

Highly esthetic and high-strength monolithic IPS e.max CAD restorations

A report by Dr Andreas Kurbad, Viersen/Germany

IPS e.max CAD has had a lasting impact on the dental market over the last decade. The clinical reliability of hardly any other dental material has been so well documented. Highly esthetic and high-strength monolithic IPS e.max CAD restorations have become an alternative to metal ceramics and offer a comparable survival rate.

## Introduction

As dental CAD/CAM systems have become established in dentistry, the vision of producing indirect restorations in the dental practice has become reality. An intraoral 3D camera for digital impression-taking, an intuitive design software and a numerically controlled milling machine are the technologies that enable restorations to be created onsite in a short time compared to manufacturing in the dental lab. In addition to the time advantage, the digital method has also the benefit of saving resources, such as impression materials. Furthermore, the need for temporary restorations is eliminated.

Note: Adhesive bonding achieves the best values if it is performed immediately after tooth preparation.

### Requirements placed on materials for chairside manufacturing

The technical prerequisites go hand in glove with materials that are suited for chairside manufacturing. Such materials should be strong enough to withstand a lifetime of use. However, very strong materials are difficult to process in a milling unit, especially since onsite manufacturing processes are expected to take only a short time. Furthermore, the material should also exhibit a tooth-like appearance in accordance with a certain esthetic sensibility. Onsite fabrication methods are not conceived for elaborate enhancements, such as ceramic veneers. The term "monolithic restoration" has become established in this context. This term describes a material that meets the requirement for adequate esthetic integration straight away, without necessitating any reworking. Furthermore, the materials should offer good conditions for adhesive bonding, especially as ever more tooth-preserving preparation techniques are preferred **(Table 1)**.

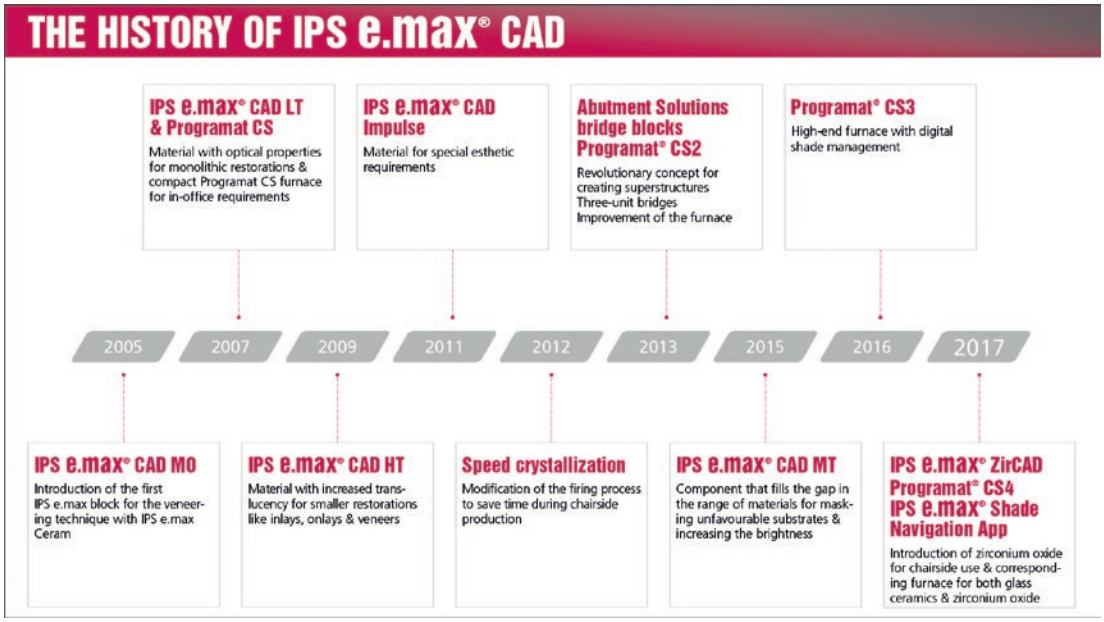
**Basic requirements for chairside materials**

- → Good resistance to oral conditions
- → High strength
- → Easy and fast machining in the milling unit
- → Tooth-like esthetic characteristics

*Table 1*

### Historical review

The beginnings of CAD/CAM fabricated chairside restorations can be traced back to a certain feldspar glass-ceramic. The first attempts of the CEREC era began with the Vita Mark I blocks. The material was further developed and for a long time, Vita Mark II was considered the sole standard for processing restorations onsite. The material was relatively easy to grind and polish and was capable of fulfilling the esthetic requirements well. With a flexural strength of 120 MPa, its field of application was, however, limited. Adhesive cementation was indispensable to ensure a durable stability. By today's standard, relatively high minimum thicknesses were required, resulting in a correspondingly high removal of tooth structure and, at times, unfavourable geometries in the design of the cavities. The introduction of the ProCAD blocks (1998) did not bring the decisive breakthrough either.




*01 — IPS e.max CAD has had a lasting impact on the dental market over the last decade.*

This material was based on leucite-reinforced glass-ceramic and featured a flexural strength of 140 MPa. The blocks are still available in an optimized version as IPS Empress® CAD or as IPS Empress CAD Multi blocks (185 MPa) to this very day. Although these materials produced good to very good long-term clinical results, they always entailed a risk for failure in the form of fractures.

## Introduction of IPS e.max CAD

A new category of glass-ceramic materials brought about the decisive improvement in 2005: lithium disilicate. This material was instrumental in establishing CAD/CAM systems for chairside applications. Ivoclar Vivadent launched the IPS e.max® CAD material on the market. Initially, it was available in MO blocks (Medium Opacity) with a relatively high opacity. These blocks were designed for the veneering technique (Fig. 1). This meant that this material was, in the main, inappropriate for chairside applications. However, this is not where the story ends: Initial experiences showed that the material was dotted with excellent optical properties. In addition, the manufacturing technology made the material attractive for use in the dental practice even if it required a crystallization process of approx. 30 minutes. Above all, it was the flexural strength of 360 MPa, which was clearly superior to all materials used in this segment so far. Soon we began to use the IPS e.max CAD MO blocks for creating monolithic restorations, especially for crowns, even if originally this was not the intended use of the material (Figs 2 to 3).

*02 — Veneered and non-veneered MO restorations were evaluated and compared with each other in this case. Although IPS e.max CAD MO is typically a framework material, the differences between the two restorations are not at all that noticeable.*

*03 — Monolithic MO crown in situ*

## IPS e.max CAD and its levels of translucency

Driven by the excellent optical properties, users urged the manufacturer to increase the translucency of the blocks and to enable the fabrication of monolithic restorations. Ivoclar Vivadent responded by introducing IPS e.max CAD LT in 2007 **(Figs 4 to 11)**. LT stands for Low Translucency. These blocks ensured results that met a high esthetic standard, particularly when used in conjunction with the accompanying IPS e.max CAD Crystall./Shades and Stains characterization materials. With its user-friendly and compact design, the Programat CS (2007) furnace facilitated the applications at chairside. On the one hand, the LT blocks were sufficiently translucent to mimic the characteristics of the natural tooth structure and, on the other, they were sufficiently opaque to mask "problematic" substrate. Even today, this material may still be called a universal ceramic. Nonetheless, it may be regarded as a step forward that another level of translucency was launched in 2009: These were the HT blocks (High Translucency) **(Figs 12 to 15)**. If used in combination with an appropriate luting material, this blocks allowed the shade of the substrate to be integrated into the overall optical effect of the restoration. This meant that partial crowns and veneers could now be created with ease directly onsite in a single visit. The trend towards ever less invasive procedures led to the introduction of still another variant of IPS e.max CAD: the Impulse materials (2011). Impulse Opal O1 and O2 are ideal for fabricating monolithic restorations with the aim to reproduce dental enamel. Outstanding results can be achieved with comparatively minimal effort. As many users had difficulty

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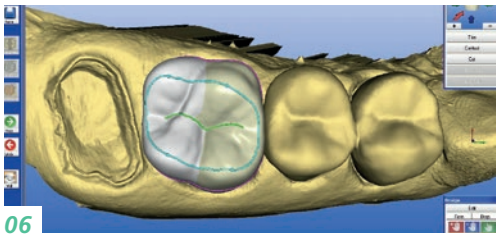

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*04 — Defective restorations in the upper posterior region in urgent need of repair*

*05 — Preparation with the gums in critical conditions*

*06 — The CEREC software V3.8 did not yet allow entire quadrants to be reconstructed in a single step.*

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*07 — Crowns directly after having been ground from IPS e.max CAD LT*

*08 — Monolithic crowns after having been finalized, crystallized and characterized.*

in classifying the Impulse blocks appropriately in the product portfolio, some parts of the assortment were taken over into the recently created category MT (Medium Translucency, 2015). The IPS e.max CAD materials of the medium translucency category are mainly used to improve brightness values. Altogether, five different levels of translucency are available today. With this "toolkit", monolithic restorations offering an utmost level of esthetics can be accomplished in a variety of clinical situations. The Shade Navigation App assists in selecting the correct translucency. In a few easy steps, this app provides useful recommendations on the selection of the correct blocks.

## Range of indications for chairside applications

The range of indications for IPS e.max CAD evolved in tandem with the provision of the blocks. The LT variant is the first choice for crowns and indications that involve "problematic" substrates. Larger blocks enable the onsite fabrication of bridges (up to the second premolar as the terminal abutment). In this case, the processing time is longer than for single-tooth restorations. With the HT variant, inlays, onlays and partial crowns can be manufactured to a high esthetic standard. At IDS 2017, Ivoclar Vivadent launched the IPS e.max CAD 530 MPa initiative. Eleven years of continued quality testing

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*09 — Because of the critical conditions of the gums, the crowns (2007) are seated using a conventional cementation method with glass ionomer cement (Vivaglass CEM).*

*10 — Check-up of the crowns in 2012*

*11 — Situation after ten years (2017): The crowns are intact and do not show any visible signs of damage. Abrasion facets can be observed, e.g. on the bucco-distal cusps of the upper left 6.*

have shown that IPS e.max CAD provides actually a mean biaxial flexural strength of 530 MPa. This is also reflected in the consistently positive results of many scientific studies on the survival rate of IPS e.max CAD restorations (literature). In view of the consistent further development and favourable long-term clinical results, the minimum thicknesses recommended for adhesively cemented IPS e.max CAD crowns have been reduced to thinner dimensions. This means that preparing the teeth is easier and more tooth structure can be preserved. It also allowed the range of indications to be extended to include occlusal veneers, which have come to play a key part in raising the bite in the posterior region. Since the introduction

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*12 — Two insufficient amalgam fillings needing to be replaced*

*13 — The cavities were restored with IPS e.max CAD HT restorations produced at chairside.*

*14 — The final result in 2008: beautiful optical integration*

*15 — Check-up after 5 years (2013): restorations still look beautiful*

of the optically brilliant Impulse blocks (Figs 16 to 21) and the MT materials (Figs 22 to 26), IPS e.max CAD has barely been rivalled for strength and esthetics in the fabrication of veneers and partial anterior crowns.

In 2013, abutment blocks made of IPS e.max CAD were launched. These blocks are cemented to an adhesive base (Ti base) (see Figs 31 and 32). Thus, it has become possible to create single-component monolithic restorations, which are referred to as hybrid abutment crowns. The chairside production of such crowns is realistic and has established itself as a standard among CAD/CAM users for fabricating implant-supported single-tooth restorations in the posterior region.

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**16** — *The UR1 and UL1 of this 23-year-old female were damaged in an accident and restored with composite material.*

**17** — *As the result was esthetically unsatisfactory, the teeth were prepared using a planned, minimally invasive procedure.*

**18** — *The exceptional optical properties of IPS e.max CAD Impulse O1 enable a completely natural appearance …*

**19** — *… and provide a high brightness effect in direct light due to the high level of opalescence and fluorescence.*

**20** — *The teeth were restored to the correct proportions and the smile line was optimized. The patient was satisfied with the result.*

**21** — *The 3-year check-up did not show signs of ageing.*

## Typical workflow

Preparation is mostly minimally invasive due to the high strength of the material. There are no differences with other types of restorations when it comes to optical impression-taking and computer-assisted design. The differences only become noticeable during processing in the milling and grinding machine. Lithium disilicate is a material that cannot withstand unlimited forces. Gentle processing is essential. The grinding process for a typical posterior crown takes on average 15 minutes if an MC XL milling unit is used (Dentsply Sirona). The precision can be increased by using the extra fine processing option. The processing time doubles with this option.

The future lies in the use of new technologies. The PrograMill One milling and grinding machine will deliver significantly better results in less time as it incorporates innovative new technology. For instance, the 5-axis turn-milling technology (5 XT) uses a robotic arm, rather than a milling motor, to move the workpiece. This enables a consistent milling and grinding procedure with many degrees of freedom and increased levels of accuracy. Only a minimal amount of reworking is required after the machining process. As the material is considerably easier to

**22** — *A patient wearing 10-year-old veneered zirconia crowns wants her esthetic appearance to be improved. The crowns appear rather dark and grey. The proportions look unflattering.*

**23** — *The variation in the shade of the preparations made it necessary to use a relatively opaque material that nonetheless provided a certain brightening effect.*

**24** — *The new restorations were ground from IPS e.max CAD MT.*

**25** — *The preparations were effectively concealed under the new crowns (cut-back method) and the brightness of the teeth was considerably increased.*

**26** — *The final result shows a pleasing esthetic appearance.*

process when it is in its pre-crystallized blue state, corrections should be implemented directly at the grinding stage. A try-in can be performed before the crystallization process is carried out if the restoration is machined onsite **(Figs 27 to 29)**.

Crystallization is a mandatory step in the IPS e.max CAD workflow. The restoration is secured on a special firing tray with the help of support pins and firing auxiliary paste (IPS Object Fix). Polishing is basically possible. However, it is also possible to apply a spray glaze or glazing paste. Individualized shade characterizations can be created with IPS e.max CAD Crystall./Shade/Stains materials at the same time as the glaze is applied. The crystallization process takes 15 minutes in the best case when using the spray glaze (speed crystallization), otherwise it takes 25 minutes. Developed specifically for the chairside method, the Programat CS furnaces (e.g. the new Programat CS4 universal furnace) provide optimum results in the shortest possible time and are therefore a sensible recommendation **(Figs 30 to 34)**.

**27** — *Preparation for a three-unit bridge with an ovate pontic design*

**28** — *Try-in of the ground monolithic bridge whilst still in the pre-crystallized state*

**29** — *IPS e.max CAD allows the fabrication of restorations for esthetically sensitive areas without the need for veneering them.*

*30 — The lower right 6 had been endodontically treated but could not be saved because of recurring inflammatory processes.*

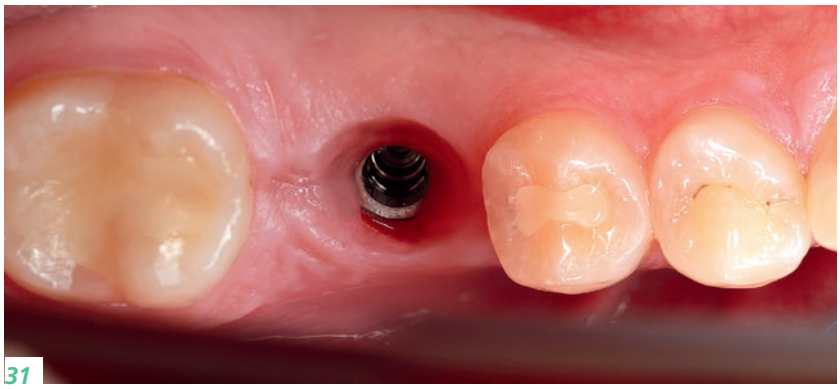
*31 — After the extraction and implantation procedure, the site was ready for the new restoration.*

*32 — A monolithic hybrid abutment crown was created on the basis of a Ti base connector using CEREC software. Crystallization and staining were again carried out in a single step.*

*33 — Beautiful result in 2012*

*34 — Check-up after five years: the result is proof of the success of this therapy concept.*


30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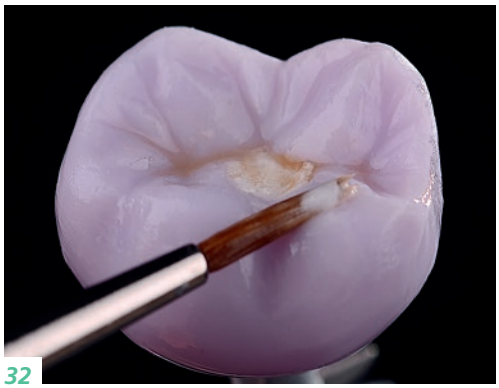
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34

Thanks to the high strength of the material, several options are available for seating the restorations. Adhesive bonding should always be the preferred method. Conventional cementation is also possible but requires a retentive preparation pattern, which is considered outmoded by today's standard. Monobond® Etch&Prime (etching and silanating in a single step) can be used for conditioning the ceramic. Which kind of cementation is used depends on the clinical situation. Posterior crowns can be seated quickly and easily using the self-adhesive SpeedCEM® Plus. For higher esthetic requirements, Variolink Esthetic should be employed. This material is available in a dual-curing and purely light-curing version. More information and guidance is provided by the Cementation Navigation System (CNS).

*35 — The tooth had already been endodontically treated and restored with a PFM crown. After a root fracture, it could no longer be preserved.*

*36 — Extraction and immediate implantation was followed by a temporization phase, at the end of which a pleasing emergence profile had developed.*

*37 — The abutment was ground from an IPS e.max CAD Abutment MO block and the crown from IPS e.max CAD LT.*

*38 — The completed restoration in 2012: a pleasing result.*

*39 — Check-up after 5 years is proof to the long-term stability of this treatment concept.*

## Conclusion

IPS e.max CAD is the gold standard for chairside restorations (Figs 35 to 39). Together with the Programat furnaces designed for IPS e.max CAD and the corresponding cementation materials, a coherent system that ensures the necessary robustness in a wide range of applications has been developed. IPS e.max CAD sets benchmarks for efficient, tooth-preserving all-ceramic restorations that offer a high level of clinical reliability. The new zirconium oxide blocks (IPS e.max ZirCAD LT) complete the overarching IPS e.max system, in line with the motto IPS e.max – all ceramic, all you need.

*Literature is available on request from the editors*

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Cementation Navigation System

# Efficiency and esthetics in the posterior region

Bulk-fill composites: Current trends and future options

An article by Dr Eduardo Mahn, Santiago/Chile

Since bulk-fill composites have been on the market for a number of years, the time has come to take a look back at the introduction, development, current trends and future options of these materials.

When bulk-fill composites first hit the market, they were considered a true innovation. We had been layering posterior composites for more than 40 years, yet many of us were not quite sure for what reasons the layering technique was mandatory. Understanding the reasons why a certain technique is applied is crucial for the correct assessment of the pros and cons of any technique.

## Basically, the reasons were four:

1. Esthetics: It is obvious that a layering technique involving dentin, enamel and effect shades leads to a better final outcome than a technique that uses only a single layer in a standard translucency. As regards the bulk-fill technique, this reason can easily be rejected because, objectively, most posterior restorations are almost always placed using one shade only and most patients are satisfied with the result.

2. Reduction of volumetric shrinkage: The less composite we place, the smaller the volumetric shrinkage.

3. Reduction of shrinkage stress: This reason makes sense and is based on the configuration factor. It is said that the shrinkage stress is reduced if the unbonded surface area of a layer is larger than the bonded surface area. Although there is enough in-vitro evidence on the relevance of the C-factor, a clinical correlation has not yet been shown. This point can be easily illustrated by the fact that Class-I restorations have an unfavourable C-factor but a high survival rate while Class-V restorations have a favourable C-factor but a low survival rate. This example shows that the C-factor is only one of many factors that determine the success of a direct restoration - and frequently not the most important one.

4. Depth of cure: This is probably the most important factor because increments of only 2 mm could be applied before the advent of bulk-fill composites. Some studies suggest that the depth of cure of certain composites is even lower than 2 mm. This was the reason why all layers were restricted to a maximum thickness of 2 mm. If not, the composite material placed in the deeper areas of the cavity would never receive enough light to cure adequately. Having discussed all these factors, we may realize that we are not so far from the bulk-fill technique. If a composite is capable of reducing the stress when applied in thick layers and, at the same time, offers an increased level of translucency and a more effective light-curing process, the bulk-fill technique is feasible. In most cases, shrinkage stress relievers are responsible for the reduction of shrinkage stress. Shrinkage stress relievers are fillers with a lower modulus of elasticity. Their function is to release the stress as the composite polymerizes [4]. The second aspect, i.e. the depth of cure, was achieved by making the composites more translucent with the effect of enhancing the passage of light through the material. As a result, the depth of cure was increased. This point has also been proven to be true. In addition, some companies such as Ivoclar Vivadent improved the polymerization process in deeper areas by adding newly developed initiators (e.g. Ivocerin®) to the formulation.

Nowadays, all major dental manufacturers offer bulk-fill composites. Bulk-fill composites can basically be categorized into two main groups: first, flowable bulk-fill composites requiring a final capping layer and, second, sculptable bulk-fill composites. Generally, these materials increase the efficiency of the restorative workflow as they allow the fillings to be placed with either a single-increment technique (sculptable composite) or a two-increment technique (dentin replacement with flowable composite and capping layer with sculptable composite). These methods are obviously faster and easier to perform than conventional layering procedures. However, this advantage is undermined by the fact that bulk-fill materials are generally too translucent and allow discolourations to shine through the restorations, especially if they are used to replace an amalgam filling. Nevertheless, clinical evidence has shown that the results achieved with the new bulk-fill methods are comparable to the results achieved with conventional multi-layer techniques.

Fortunately, new developments often pave the way for new technologies. By this I mean the Aessencio technology developed by Ivoclar Vivadent. The Aessencio technology allows a composite to be highly translucent prior to being light-cured and causes a drop in translucency as it polymerizes. Once polymerized, the material exhibits a dentin-like translucency and is capable of effectively masking most discolourations. Practitioners can follow a very efficient procedure to accomplish fillings due to the Aessencio technology of Tetric EvoFlow® Bulk Fill and the combination with Tetric EvoCeram® Bulk Fill as the final capping layer. Two steps will be enough in most clinical situations. At the same time, patients will receive a sufficiently esthetic restoration. In addition, the entire adhesive restorative protocol has become more predictable with the recent introduction of universal adhesives, as they have eliminated the need for dentin etching. Dentin etching was one of the reasons for the variability and sensitivity of the adhesive technique in the past years. A recently published meta-analysis showed the importance of predictable clinical protocols as the correlation between in-vitro tests and clinical performance is poor. Furthermore, there is growing evidence in clinical trials and elsewhere that self-etch protocols show a favourable performance.

The clinical case below demonstrates how these materials are used.

## Clinical case

A 33-year-old patient presented with a failing amalgam restoration on the upper right 4 with no interproximal contact (Fig. 1). After the amalgam filling had been removed and a rubber dam placed (OptraDam®), a matrix, wedge and ring were inserted (V4 Triodent). The enamel was etched with phosphoric acid (Total Etch) and then rinsed with water (Fig. 2). Subsequently, the adhesive (Adhese® Universal) was applied with the help of the new VivaPen delivery form and carefully scrubbed into the tooth structure of the entire cavity for 20 s (Fig. 3). Next, the solvent was evaporated until a shiny immobile film resulted. Then, the material was light-cured using a Bluephase® Style third-generation curing light.

**01 —** *Pre-op situation*

**02 —** *Enamel etching with Total Etch*

**03 —** *Application of Adhese Universal with the VivaPen*

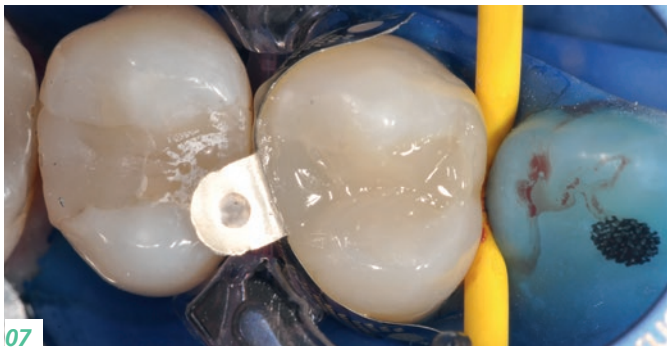
Tetric EvoFlow Bulk Fill was applied to the proximal box and cavity floor (Fig. 4). Initially, the material was as translucent as most other flowable bulk-fill materials. This translucency makes it difficult to mask discolourations (Fig. 5).


**04 —** *Tetric EvoFlow Bulk Fill was applied.*

**05 —** *Tetric EvoFlow Bulk Fill before light-curing. The high translucency facilitates the penetration of light.*

Figure 6 shows how the translucency altered in the course of the curing process and the material started to mask the discolourations underneath it. Then, a final composite layer of Tetric EvoCeram Bulk Fill was applied. Excess composite was carefully removed and the filling contoured to an adequate anatomical shape prior to undergoing final polymerization (Fig. 7). This was all accomplished in a single step, as most of the cavity had already been filled before with Tetric EvoFlow Bulk Fill. After final curing, the restoration was polished with OptraPol. Then, Fluor Protector S was applied. The completed restoration rather closely resembles the natural tooth structure. It is virtually impossible to detect the margins from the occlusal and frontal view (Fig. 8). The X-rays show the excellent radiopaque properties of both materials, i.e. the flowable and sculptable variant (Figs 9a and b).

06



07

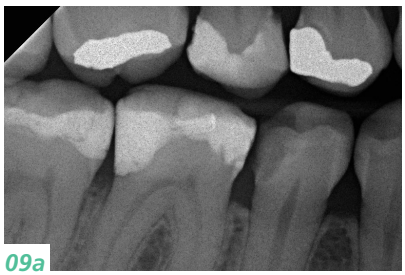
**06** — *Once cured, Tetric EvoFlow Bulk Fill exhibits a dentin-like translucency, masking discolourations.*

**07** — *Tetric EvoCeram Bulk Fill was applied as a final layer. All excess was removed before curing.*

**08** — *Completed restoration after 1 week. Occlusal view*

**09a and b** — *X-ray images before and after the restoration. Both the flowable and sculptable variants offer adequate radiopaque properties.*

08



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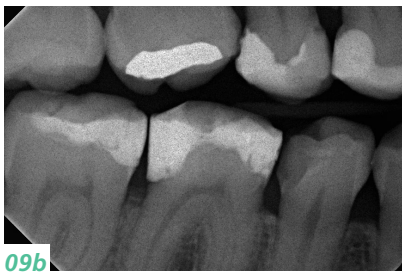

09b

## Conclusion

To sum up, the "bulk-fill technique" using Tetric EvoFlow Bulk Fill and Tetric EvoCeram Bulk Fill allows us to be more efficient with almost no compromises compared to the conventional layering technique. The C-factor is no longer an issue due to the shrinkage stress relievers. As expected, marginal gaps do not occur more frequently and are not larger compared to the conventional layering technique. Application is clearly quicker and the esthetic effect is in most cases similar to that of conventional composites. The differences in the translucency of materials for conventional posterior composite restorations are no longer of relevance due to the Aessencio technology. This sets a new standard in this group of composite.

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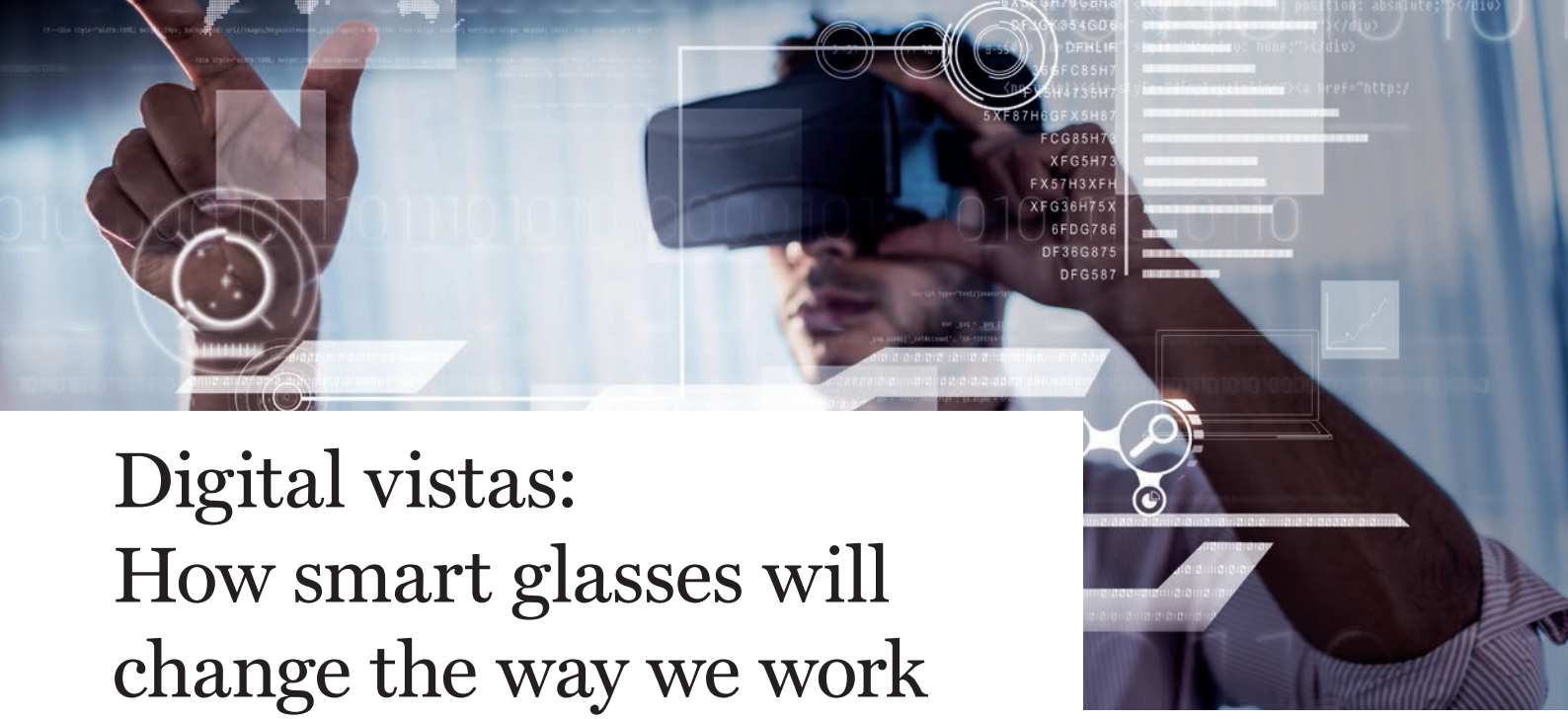

# Digital vistas: How smart glasses will change the way we work

Smart glasses as an auxiliary aid in the digital dental workflow

A background report by André Büssers, Ivoclar Vivadent AG, Schaan/Liechtenstein

View Ivoclar Vivadent blog

As a result of digitalization, the lines between virtual and real are becoming increasingly blurred. Mixed reality is the buzzword. Smart glasses, for example, create a mixed reality environment. Could they also be a useful tool for dental professionals?

## Blending the real and virtual worlds

Smart glasses such as the Microsoft HoloLens mix virtual reality with the real world. A voice guides the person wearing the glasses and tells them what to do. Based on these instructions, the user carries out certain working steps. In contrast to a computer game, the persons and objects the user sees through the glasses are real. The data glasses augment this reality by projecting e.g. arrows or other supportive signs and elements into the wearer's field of vision.

## Substantially more efficient

People who use such data glasses work more quickly and efficiently. That's the rationale behind it. Users no longer need to read lengthy, tedious manuals. All relevant information can be transferred to the screen of the data glasses in real time. Moreover, the risk of error is reduced as every single working step is performed under expert guidance. Many companies believe that this technology will ensure uniform, standardized procedures – and generate added value for them. Another benefit is that the tool allows products and services to be presented to customers in a more illustrative way.

## A small computer on your nose

In a nutshell, data glasses are small, wireless computers that sit on the bridge of your nose. The device connects to the internet via sensors and cameras. Among other things, data glasses can incorporate virtual objects (3D holograms) into the user's field of vision by means of projected light points. The user can even interact with these holograms. Technology companies are currently developing the apps required by these glasses. The launch of the Microsoft HoloLens in 2015 was a world premiere. New developments by other suppliers are expected to enter the market in the near future.

## Data glasses are gaining ground

Mixed reality technology is still in its infancy. This will change, however, because this technology works. It is clear where the journey is headed: Data glasses are becoming more and more popular. This is obvious in various fields of life and work, including the e-learning, industrial and medical sectors. It is certainly more than fantasy to predict that this technology will also find its way into dental practices and dental laboratories. Things definitely remain exciting.

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# Dental photography as marketing tool

*Why is good dental photography important?*

Good dental photos are an important tool to learn about clinical cases, practical procedures and challenges. Dental technicians in particular tell me again and again how important good photographic documentation is for them. They are mostly visual people.

In addition, dental photography is a powerful marketing tool. Those who do good work and document it well will clearly have a competitive edge.

*Can you describe the advantages more specifically?*

Look at it from the point of view of patients. They expect excellent results. Photos enable you to explain the treatment plan to them most clearly. In this way, they can follow the individual treatment steps from the beginning. Close-ups allow patients to see the structure of their mouth - their teeth, lips, cheeks, chin - and they can see how their smile and their facial appearance are affected by their dentition.

In addition, dental photos assist technicians and dentists in their work. The photos enable them to plan the forthcoming project accurately - and visualize the prospective outcome convincingly. This gives you additional assurance that you will complete the case successfully.

*Can you think of any other advantages?*

Dental photography allows you to see the smallest of details, which are often not visible to the naked eye. This also enables you to analyse your own mistakes without much effort. Proficient documentation also helps dental professionals to improve their work and develop.

And – as mentioned at the beginning: Those who know how to document their day-to-day work with convincing pictures will have an excellent marketing tool at their disposal. There is no better proof for the quality of your work. A picture says more than a thousand words.

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## Expert advice: Creating esthetically demanding Class-IV restorations efficiently and effectively

Anterior restorations require a high level of skill and technical knowledge about the material to be used. Reproducing the natural play of light is especially important in Class-IV restorations to prevent the restoration from looking optically "dead".

A new guide by Dr Markus Lenhard (Switzerland) describes step-by-step an esthetic and economically efficient approach to create Class-IV restorations with IPS Empress Direct. The guide introduces techniques that are particularly easy to learn and implement without compromising the esthetic result. Learn some tips and tricks for shade selection, shade analysis, tooth preparation, bonding, layering, finishing and polishing as well as for applying special effects. The guide is available in English and German.