REFLECT

3/13

Straightforward and reliable

Posterior composite restorations with Tetric EvoCeram Bulk Fill

Planned, pressed, layered

The complex restoration of eroded dentition using IPS e.max Press

For the benefit of the edentulous patient

The ideal quartet for complete denture fabrication: Methodology according to BPS, SR Phonares II, IvoBase and SR Nexco

ivoclar vivadent®
passion vision innovation

Dear Readers

I recently had the privilege of attending a lecture about "disruptive innovation" held by Dr Hal Gregerson. A disruptive innovation describes the introduction of new technologies, products or services in an effort to promote change and gain advantage over the competition. Two events which shocked the world of photography were given as examples. In 1900, the first Brownie camera revolutionised photography and made Kodak the industry leader. Then, in 1988, digital photography became the second innovation to change the world of picture taking. And although Kodak had invented digital photography in 1975, it did not grasp the opportunity to shake up the market with its very own innovation and subsequently lost its position as market leader.

These examples show how important it is for a company to move with the times and to keep pace with technological advancements. Ivoclar Vivadent is aware of these challenges. As a result, we have established one of the most prestigious research and development centres in the dental industry. Our researchers and developers are dedicated not only to further improving our IPS e.max all-ceramic system but also to developing new, revolutionary innovations which will change dental materials and processes as well as help our patients to carry an even more beautiful smile.

A beautiful smile is also the subject of the following articles, covering a broad range of topics. Read about how anterior and posterior composite restorations are efficiently placed with IPS Empress Direct and Tetric EvoCeram Bulk Fill and be impressed by the final esthetic result. Additional articles describe, for example, the complex restoration of a dentition and the fabrication of a veneer restoration – all cases which were solved with IPS e.max Press. Finally, you can read about the practical application of our quartet for complete dentures: BPS, SR Phonares II, IvoBase and SR Nexco.

I hope that these articles will inspire you and make you smile.

Best regards

Phil Jolly
Managing Director
Ivoclar Vivadent Pty Ltd, Australia

CONTENTS

Page 9

Page 15

Page 22

Take advantage of the versatile options offered by digital magazines for tablets and experience the iPad edition of the article: "Planned, pressed, layered" by Dr Andrea Klink and Benjamin Votteler, MDT (pp. 12-15). Benefit from the interactive photo sequences with additional pictures, and learn more about the products used and the authors.

The availability of certain products can vary from country to country.

PUBLISHER'S CORNER

Publisher Ivoclar Vivadent AG
Bendererstr. 2
9494 Schaan/Liechtenstein
Tel. +423 / 2353535
Fax +423 / 2353360

Publication 3 times a year

Total circulation 58,100
(Languages: German, English, French, Italian, Spanish, Russian, Greek)

Coordination Lorenzo Rigliaco
Tel. +423 / 2353698

Editorial office Dr R. May, N. van Oers, L. Rigliaco, T. Schaffner

Reader service info@ivoclarvivadent.com

Production teamwork media GmbH, Fuchstal/Germany

Straightforward and reliable

Posterior composite restorations with Tetric EvoCeram Bulk Fill
Dr Nicolas Lehmann, Andrézieux-Bouthéon/France

A successful restoration requires not only a conservative approach to preparation but also a well-designed and sustainable filling technique. Bulk fill composites have been a talking point for some time now. Where is the real potential to the user?

In spite of the advances in esthetic dentistry, composite shrinkage remains problematic and may be a possible reason for the failure of a restoration. Composites shrink between 1.5 and 5 per cent by volume when they polymerize. Sophisticated and at times complex filling techniques based on the C-factor (configuration factor) are deployed to offset the effects of polymerization shrinkage: These techniques require the composite to be placed in small individual increments (less than two millimetres) and each increment to be polymerized separately. With the introduction of the bulk fill technique (Tetric EvoCeram® Bulk Fill), this procedure has now been made considerably easier. Tetric EvoCeram Bulk Fill can be placed in single increments of up to four millimetres, allowing a "single-layer technique". The light-curing, radiopaque nano-hybrid composite combines all the beneficial properties of Tetric EvoCeram in one product. Two different indications and the route to treat them are shown on the basis of the two patient cases described below.

First patient case

Caries lesions were detected in teeth 46 and 47 of a 25-year-old female patient (Fig. 1). She had a good general health status. After an analgesic had been administered, the carious lesions were removed (Fig. 2) and the cavities were rinsed with 2% chlorhexidine digluconate solution. Etching gel (Total Etch) was first applied to the enamel margins and, following a waiting time of 15 seconds, to the dentin (Fig. 3). The overall etch time was 30 seconds. Subsequently, the etchant was rinsed off with water and the cavity was dried to medium dryness (Fig. 4). Application of ExciTE® F single-component adhesive is recommended to condition the cavity for the adhesive restoration technique. This material contains primer, adhesive and several solvents all in one. For the adhesive to unfold its full effect, it should be applied on the dentin while it is "slightly" moist. The difficult part for the dentist is to determine the dentin moisture level that favours the optimum penetration of the adhesive. In effect, this is a balancing act: if the dentin is too moist, the formation of a homogeneous adhesive bond is impeded, resulting in what is known as the overwet phenomenon (enclosure of water bubbles at the interface). If, on the other side, the dentin moisture level is too low, the collagen matrix may collapse.

Incorrect application of the adhesive may result in the incomplete infiltration of adhesive resin into the demineralized dentin (leakage).

Fig. 1 Initial situation: Carious lesions on the occlusal surfaces of teeth 46 and 47

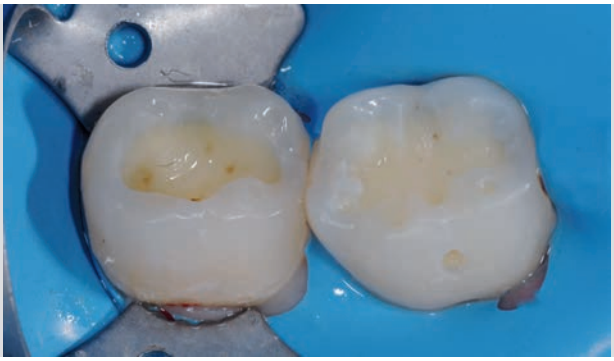


Fig. 2 With a rubber dam in place, the tooth decay was completely excavated.

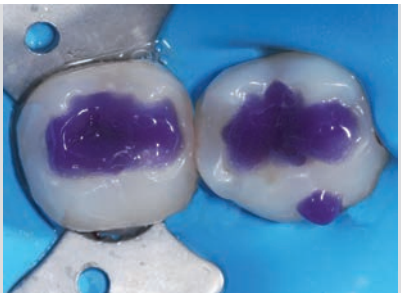


Fig. 3 The enamel and dentin were etched for 30 and 15 seconds respectively.

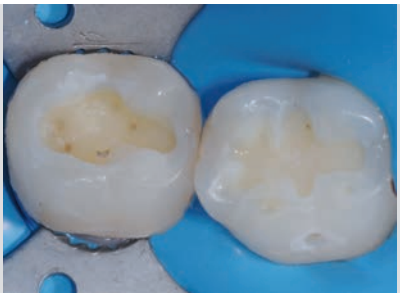


Fig. 4 After the etching gel had been rinsed off, the enamel had a chalky-white appearance, as desired.

Fig. 5 Each cavity was filled with a single increment (Tetric EvoCeram Bulk Fill).

This may lead to postoperative sensitivity, marginal discoloration and, sooner or later, to secondary caries. It is therefore important to follow the manufacturer's instructions for use.

The adhesive (ExciTE F) was applied to the etched tooth structure and the solvent contained in the adhesive was dispersed to a thin layer with a weak stream of air. Next, the adhesive was light-cured for about ten seconds using the Low Power mode of the Bluephase® G2 curing light. The cavity of tooth 47 was four millimetres deep and the cavity of tooth 46 was three millimetres deep. Using the bulk fill technique, I was able to fill both cavities with a single increment each (Fig. 5). I chose this procedure deliberately. Why? The patient's right temporomandibular joint was dislocated due to an accident and she could open her mouth only to a limited extent. If she had been required to keep her mouth open for too long, she would have incurred considerable pain in the mandibular joint. The option to use a fast and yet reliable filling technique (bulk fill) proved to be the ideal route.

For sculpting the composite (shade IVA), I used an Optra-Sculpt® instrument. The composite was polymerized at a low intensity to achieve an optimum marginal seal between the natural tooth structure and restorative. This assisted in mitigating the effects of composite shrinkage. Each restoration was cured for 20 seconds using the Low Power mode (Bluephase G2) and then any excess composite material was removed with fine-grit diamond burs. After removal of the rubber dam, the occlusal characteristics were adjusted and the restoration was polished with Astropol® discs, Astropol® silicone tips and Astrobrush® brushes (Figs 6 and 7).

Fig. 6 Clinical situation after removal of the rubber dam

Fig. 7 Clinical situation six months after the treatment

Figs 8 to 10 Initial situation: Carious lesions

Second patient case

This 17-year-old male patient showed extensive cervical caries in the posterior region. The buccal surfaces of all teeth were affected by tooth decay. Additionally, caries was detected on the lingual surfaces of teeth 37, 36, 35, 34 and 33 (Figs 8 to 10). The patient was generally in good health and he practiced appropriate oral hygiene at home. In an extensive consultation with the youngster we learned that he consumed large quantities of soda drinks every day. It was his high-acid diet that caused the caries and demineralization of his teeth. Following a motivational and therapeutic phase including the use of mouth rinses and fluoridated toothpaste, the patient gradually changed his dietary habits.

The carious lesions were to be restored with composite. For this purpose, the decayed tooth structure was removed and the cavities were rinsed with 2% chlorhexidine digluconate solution (Fig. 11). Similar to the first case, Total Etch gel was applied first, followed by ExciTE F adhesive. In this case too, the aim was to fill each cavity with a single increment. In order to achieve this, I selected again the bulk fill composite Tetric EvoCeram Bulk Fill (shade IVA), which affords a reliable but fast filling technique that is comfortable for the patient. I contoured the composite with OptraSculpt instruments and light-cured each restoration for 20 seconds in the Low Power mode (Bluephase G2). After removal of excess material, high-gloss polishing with Astropol discs, Astropol silicone tips and Astrobrush brushes was performed (Figs 12 and 13). At the recall visit six months later, the patient's oral situation was healthy and stable (Figs 14 and 15).

Fig. 11
After rubber dam placement, the decayed tooth structure was removed.

Figs 12 and 13 The cavities were filled with a single increment each (Tetric EvoCeram Bulk Fill). Clinical situation after removal of the rubber dam.

Figs 14 and 15 Clinical situation six months after the treatment

Conclusion

A "single-increment filling" technique with this "new" generation of composite materials (Tetric EvoCeram Bulk Fill) provides a fast route to restorations with mechanical and esthetic properties similar to those of conventional composites. The simplified procedure increases the treatment comfort for the patient and clinician.

Contact details:

Dr Nicolas Lehmann
17 Rue Joseph le Brix
42160 Andrézieux-Bouthéon
France
nico.lehmann@wanadoo.fr

An esthetic alternative

Direct anterior composite restorations with IPS Empress Direct
Prof. Dr Daniel Edelhoff, Munich/Germany

Modern composite systems offer a versatile range of individualisation options that are comparable with the fabrication of indirect restorations in the dental laboratory and can be easily combined with each other.

Direct composite restorations offer a multitude of advantages: minimally invasiveness, instant esthetic and functional improvement of the clinical situation, direct clinical control over shade effects, possibility of applying modifications to suit the individual requirements of the patient and the avoidability of temporary restorations. Below are described a few clinical cases to illustrate the application possibilities of IPS Empress® Direct in the esthetic anterior region.

First patient case

A 44-year-old female patient presented with the wish to have the extensive tooth structure defects in the upper anterior dentition remedied (Fig. 1). In a previous treatment by Innsbruck-based Prof. DDr Siegfried Kulmer and dental technician Christoph Zobler, the occlusal conditions had been reconstructed with pressed ceramic restorations and in the process the vertical dimension had already been raised.

In addition to the static and dynamic occlusion, the length-to-width ratio of the teeth, the bipupillary line and the lower lip line during smiling present key parameters to be taken into account in the esthetic-functional reconstruction of anterior teeth (Fig. 2). As the patient was seeking a somewhat brighter tooth shade, a few select dentin shades of the IPS Empress Direct range were applied and polymerized on the damaged tooth structure, which had been isolated with

Fig. 1 Initial situation: General defects of the tooth structure led to a considerable esthetic and functional impairment of the anterior region, including the loss of anterior canine guidance.

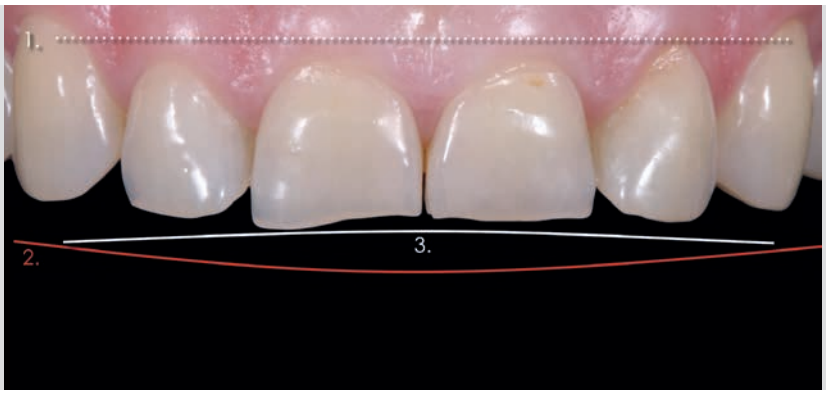


Fig. 2 Initial situation: The anterior teeth show mainly abrasive defects with slight erosion. Two important reference lines should be considered in the restoration: the bipupillary line (1) and the lower lip line during smiling (2). In this case, the existing tooth length considerably deviated from the lower lip line, causing a negative smile line (3).

Figs 3 and 4
Mamelon-like structures were cut into the tooth structure using a flame-shaped finishing diamond.

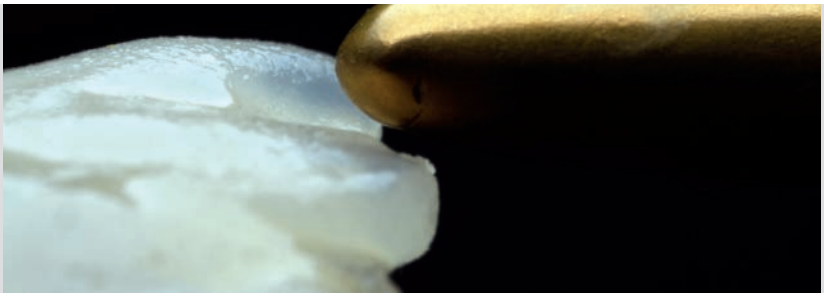


Fig. 5
Select IPS Empress Direct dentin and effect materials, such as Trans or Opal, were applied to the miniscule recesses (in minimal quantities).

liquid Vaseline to make this process reversible. Together with the patient, A2 was selected as the preferred shade. Subsequently, the corresponding dentin and enamel materials were applied. To achieve a harmonious transition between the restoration and existing tooth structure, a more "invasive" composite layering technique was employed. Using flame-shaped diamond finishers (60-micron-coated, red-coded), a mamelon-like morphology was prepared on the tooth structure (Figs 3 and 4). In addition to dentin material, very finely dosed quantities of Effect materials such as "Trans" and/or "Opal" were applied into the resultant recesses (Fig. 5).

The further layering with the corresponding dentin and enamel materials can be performed using a silicone key or a transparent foil.

In the case described here, the restorations were shaped using a "free hand" technique while taking the bipupillary line and the lower lip line into account (Fig. 6). The outcome of the treatment satisfied all parties involved (Fig. 7).

Fig. 6 Picture of implemented modifications. The tooth shapes were rebuilt with dentin and enamel materials using a "free hand" technique and taking the reference lines into account. The concave curvature of the smile line has been transformed into a convex curvature (positive smile line).

Fig. 7 The final picture shows the considerable esthetic and functional improvement achieved with the restoration. The tooth proportions appear appropriate and the tooth lengths (smile line) harmonise with the lower lip line during smiling.

Fig. 8
Initial situation (lip appearance in dynamic occlusion): The upper central incisors had decreased in length due to traumatic abrasive effects.

Fig. 9 Modified tooth proportions. The length-to-width ratio was calculated to be 89.9 per cent; the tooth width was 8.9 mm. To reconstruct the generally recommended length-to-width ratio of approx. 80 per cent, the teeth needed building up by 2.2 mm.

Fig. 10 Situation after application of composite material. The same procedure as in the first patient case was used (A2 tooth shade, IPS Empress Direct). Only "Trans" material was used from the range of Effect materials (see incisal edge layering).

Second patient case

A 39-year-old female patient presented with severely altered proportions of the upper central incisors due to extensive defects in the tooth structure. This situation had a considerable adverse effect on her esthetic appearance (Fig. 8). An analytical evaluation of the tooth proportions was carried out by measuring and determining the length-to-width ratio and the result was a ratio of 89.9 per cent. The existing tooth width was 8.9 mm. To achieve the recommended "ideal proportion" of 80 per cent, the incisal edge had to be increased in length by 2.2 mm (Fig. 9). Shade A2 was selected as the tooth shade. Without local anaesthetic, a mamelon-like structure was cut into the abraded incisal edge area. Dentin material was applied in layers into the resulting recesses and in the process mamelon-like structures were created. Minute amounts of "Trans" Effect material were applied between the "dentin fingers". The layering procedure was then continued with the corresponding enamel materials (Fig. 10).

Individual "free hand" layering assisted in achieving a restoration that integrates impeccably into the existing tooth structure. The anatomical shape of the anterior teeth harmonizes outstandingly well with the patient's dynamic occlusion (Fig. 11).

Fig. 11
Final picture of the anterior region including the mandibular teeth: The restoration demonstrates ideal esthetic and functional integration in dynamic occlusion.

Fig. 12
Initial situation: Young male patient with inadequate composite restorations on teeth 11 and 21. Marked white deposits are visible in the enamel.

Fig. 13
Final picture: After the tooth shape had been reconstructed using dentin and enamel materials, indentations were applied to the surface of the composite and filled with "honey"-coloured material from the IPS Empress Direct Color range. Finally, the characterizations were covered with enamel material and the restoration was finished and polished.

Third patient case

A 17-year-old male presented at the practice, accompanied by his mother, with inadequate composite restorations on teeth 11 and 21 (Fig. 12). He wished these restorations to be replaced. Once an appropriate tooth shade had been selected, the challenge consisted in imitating the whitish deposits visible in the tooth structure. First, the tooth shape was rebuilt using dentin and enamel materials in shade A3. Next, light indentations were applied to the composite surface by means of a fine-grit diamond. With the help of a dental probe, a very thin layer of "honey"-coloured material of the IPS Empress Direct Color range was applied.

After polymerization, the restoration was covered with enamel material and then finished with aluminium oxide stones and finishing and polishing discs coated on one side. Final polishing was performed with a cotton buff and polishing paste (Fig. 13). Achieving a customized coloured structure like in this case is only possible due to the staining and masking options of the IPS Empress Direct Color range.

Discussion and conclusion

Modern composite systems such as IPS Empress Direct offer dental clinicians the possibility of fabricating highly esthetic direct restorations. For certain indications, these restorations are comparable with indirect restorations designed in the dental laboratory. A clinical study evaluated anterior composite restorations, which had been placed to correct the contour of teeth or to close diastemata and resulted in a survival rate of almost 80 per cent after five years. The most frequently reported complications were small chippings. Given their advantages, direct anterior composite restorations present a real alternative to the mostly more invasive indirect restorations.

A literature list may be obtained on request from the editors.

Contact details:

Prof. Dr Daniel Edelhoff
Chief Senior Surgeon, Deputy Chair
Policlinic for Dental Prosthetics
Ludwig Maximilian University
Goethestrasse 70
80336 Munich
Germany
daniel.edelhoff@med.uni-muenchen.de

Planned, pressed, layered

The complex restoration of eroded dentition using IPS e.max Press

Dr Andrea Klink, Tübingen, and Benjamin Votteler, MDT, Pfullingen/Germany

Severely eroded dentition often requires very complex restoration measures. These include a very systematic prosthodontic treatment plan and clinically proven materials.

A growing number of people are consulting dental practices about problems that do not involve tooth damage resulting from carious processes. Their complaints are the result of erosion, abrasion and attrition. Erosion is often caused by chemical processes. The increase in the consumption of low-pH foods has a negative influence on the overall health of teeth. In many cases, adolescents are affected. The young age of these patients presents an additional challenge to the therapeutic measures. Treatments are aimed at achieving a stable long-term result, which corresponds to the expectations of the patients. Modern all-ceramic materials produce esthetic, functional and "stable" results, which restore the oral environment and in many cases the psychological well-being of the patient. Together with clinically proven adhesive bonding systems (e.g. the all-ceramic system IPS e.max®), these materials open up new possibilities for patient-oriented dentistry. The following case study describes a very complex treatment plan, involving the restoration of the complete dentition, and it illustrates the successful outcome. Furthermore, the restorative possibilities offered by digital technology in combination with traditional dental lab techniques (individualized ceramic layering) are shown.

Case study

The patient consulted the dental team because she wished to improve the appearance and function of her teeth (Fig. 1). The young woman complained that she could no longer bite or chew properly. She felt that the front teeth were too short and discoloured: The teeth were dark and yellowish as a result of enamel loss. In addition, she reported that her teeth had become "flatter" and that eating caused her pain. Her wish was to have "even" and natural-

Fig. 1 Portrait picture before the treatment

Fig. 2 Pre-operative situation: Caries-free dentition with secondary loss of vertical dimension of two to three millimetres due to erosion

Fig. 3 Sequential procedure during preparation of all the anterior and posterior teeth

looking front teeth and to be able to chew without feeling pain. Her dentist had recommended that all her teeth be treated with ceramic-veneered base metal crowns. The teeth had been built up with composite on numerous occasions. However, these restorative measures only lasted a short time.

Dental history

During the first consultation it was established that the patient had consumed cola beverages for many years. According to the young woman, she suffered from neither bulimia nor reflux. The patient had a good diet and was in good health. The clinical and radiological examinations showed caries-free dentition with composite build-ups on the labial surfaces of the upper anterior teeth as well as in many occlusal areas of the posterior teeth. The diagnosis was made on the basis of photographic records, the evaluation of the anatomic casts and a functional analysis. The examination showed Class 1 occlusion with static contacts on all the teeth. The bite test according to Krogh-Poulsen did not reveal any abnormal results. The chewing, neck and shoulder muscles showed only moderate tenderness on palpation, while the temperomandibular joint did not show any tenderness on palpation. Neither joint noises nor limited mouth-opening were established. An interocclusal space of five to six millimetres existed in the rest position. The speaking distance was four to five millimetres.

The diagnosis revealed a caries-free adult dentition with lowered bite resulting from two to three millimetres of erosion (Fig. 2). In order to restore the physiological vertical dimension, we suggested that all the teeth be restored with non-invasive, adhesive-bonded all-ceramic restorations.

Pretreatment

The primary treatment step involved an occlusal appliance.

An occlusal appliance is indispensable in the restoration of lost vertical dimension.

Only once the target situation has been successfully stabilized can the final reconstruction of the occlusal vertical dimension take place. In this case, an occlusal appliance with equilibrated occlusion was fabricated on the basis of a bite record of the new vertical dimension and the skull-oriented models in the articulator (Rotofix, Amman Girrbach). The patient was instructed to wear the appliance daily for 24 hours for the next six months and to attend regular recalls. In the next six months, the appliance was adjusted several times, with regard to the dynamic occlusion in particular. After this period, an impression was taken with the appliance in place. The corresponding model was placed in the articulator together with the skull-oriented upper jaw model. An incisal guide plate was produced, which would serve as a measure for the subsequent fabrication of the wax-up and of the permanent restorations. In accordance with the functional and esthetic parameters, wax-ups were modelled on all 28 teeth. In the process, the existing tooth structure was augmented and the space and preparation requirements were documented in order to obtain a physiologically ideal situation.

Preparation of the permanent restorations

Moulds of the duplicated waxed up models were used to produce a mock-up (Telio® CS) in the mouth of the patient. This mock-up was used to evaluate the esthetic and phonetic parameters. The preparation measures had to ensure the exact preservation of the vertical dimension defined by the appliance. As a result a very systematic procedure was required in the preparation of the supporting area. For this purpose, a sequential approach was taken. The upper teeth were prepared and bite records were made. The lower jaw was prepared in a second appointment. Impressions were taken and acrylic resin provisional restorations (Telio CS) were fabricated with the help of the moulds. The provisionals were placed with a temporary eugenol-free cement, which would not impair the adhesive cementation of the permanent restorations at a later stage. Furthermore, the crowns of tooth 31 and 42 were lengthened in order to harmonize the scalloped appearance of the gingiva. Then, the lower teeth were prepared for the permanent restorations. Again, a sequential approach was taken using the upper jaw bite records (Fig. 3). The information gathered in this way during this appointment was used to transfer the models into the articulator. A facebow record was also produced. The lower teeth were temporarily restored according to the procedure described for the upper jaw.

First laboratory phase

The master casts (Giroform, Amann Girrbach) were fabricated as usual. They were transferred to the articulator on

Fig. 4
The master casts for the fabrication of the all-ceramic single crowns

Fig. 5
The maxillary model was placed in the articulator in accordance with the horizontal reference plane (Head-Line). The physiological bite situation was exactly transferred.

Fig. 6
The posterior crowns were fabricated with pressed ceramic.

the basis of the horizontal reference plane and the bite records and with the help of the anterior guidance plate (Figs 4 and 5). The posterior restorations (IPS e.max Press) were fabricated first, followed by the temporary anterior restorations (Telio CAD). The models were scanned and the STL data was uploaded to the design software. The tooth shapes selected from the tooth library were adjusted to the wax-up and the wax was milled accordingly. The CAD/CAM-milled wax crowns were adapted to the model situation. Then they were invested (IPS® PressVest Speed) and fired out. Subsequently the restorations were pressed using lithium disilicate (IPS e.max Press Impulse, Value 1). Next, the full-contour crowns were efficiently divested, separated and tried in. For the try-in, one quadrant each in the upper and in the lower jaw (1st and 3rd quadrant) was characterized, but not yet glazed. As a result, the patient was given the opportunity to request certain shade adjustments. Long-term temporaries were fabricated for the anterior teeth. These restorations were also produced using a combination of digital technology and manual skill. The dentin core (Telio CAD, shade LT B1) was fabricated in a milling machine. Subsequently, the incisal area was individually built up with a laboratory composite (SR Nexco®).

The posterior crowns (Fig. 6) together with the long-term temporaries for the anterior teeth were successfully tried in and then placed (posterior restorations with Multilink® transparent; long-term temporaries with Telio CS Link). During the following few months, the patient was able to test the anterior crowns and present her new appearance to her family, friends and colleagues.

Second laboratory phase

Three months later, the satisfied patient requested that her front teeth be permanently restored. In order to adhere to the principle of tooth preservation, repreparation for the anterior crowns took place through the long-term temporary. As a result, the minimal thickness in the labial area in particular was generated. A red-ringed fine grit diamond bur (diameter of 1.2 mm) was used for this purpose. After the impressions had been taken, the patient was released from the practice with chairside provisionals. Subsequently, the restoration was fabricated in the dental laboratory. The framework material lithium disilicate (IPS e.max Press, shade LT A1) was also chosen in this case (Fig. 7). Natural-looking crowns were fabricated with the carefully selected press ingot in combination with individual build-up materials (IPS e.max Ceram). Due to the fine interplay of colours and a lifelike glow from within the teeth, a true-to-nature result was achieved (Fig. 8). The surface structures were faithfully recreated and manually polished before the esthetic crowns were shown to the patient (Fig. 9). The restorations were placed according to the instructions of the adhesive cement manufacturer. A rubber dam was placed and the acid etch technique was used (Total Etch, Syntac®, Variolink® II transparent) (Figs 10 and 11).

Fig. 7 In order to imitate the vital tooth colour the anterior crowns were layered. The pressed ceramic crown frameworks are shown on the model.

Fig. 8 Individualized layering of the anterior teeth

Fig. 9 Shape, shade, surface morphology and level of gloss: Many fine details have to be observed in the fabrication of an esthetic anterior restoration.

Figs 10 and 11 The restorations look lifelike and natural and harmonize with each other.

Figs 12 and 13 They look good not only in their immediate oral environment, but also in their overall environment.

Fig. 14 The soft tissue has optimally adapted to the restoration.

Conclusion

The restorations blended in smoothly with the facial characteristics of the patient. Despite the fact that the posterior crowns had been fabricated with the staining technique, the results were considered to be highly esthetic. Nevertheless, the appearance of a restoration is not the only criterion for success; the functional aspects must also be taken into account. At the two-month recall, the situation was deemed to be absolutely stable. The soft tissue had adapted to the restorations. The young woman did not have any functional complaints. She was able to chew without any problems and she was highly satisfied with the result (Figs 12 to 14). A well-structured treatment procedure formed the basis for this successful outcome. Our main objective of satisfying the patient and restoring a major aspect of her quality of life was fulfilled.

Direct to the iPad version:

Scan the QR code with your iPad
or enter the following link:
http://www.ivoclarvivadent.com/reflect

Contact details:

Dr Andrea Klink
Poliklinik für Zahnärtzliche Prothetik
Osianderstrasse 2-8
72076 Tübingen
Germany
andrea.klink@med.uni-tuebingen.de

Benjamin Votteler, MDT
Dentaltechnik Votteler GmbH & Co. KG
Arbach ob der Strasse 10
72793 Pfullingen
Germany
dentaltechnik@votteler.eu

For the benefit of the edentulous patient

The ideal quartet for complete denture fabrication: Methodology according to BPS, SR Phonares II, IvoBase and SR Nexco

Dr Jiro Abe, Ph.D., and RDT Kyoko Kokubo, Tokyo/Japan

The rehabilitation of the edentulous patient ranks among the most demanding challenges in prosthetic dentistry. In this article, the authors describe the treatment of an edentulous patient using the Biofunctional Prosthetic System (BPS).

Speech, function, stability, esthetics, comfort – in order to meet the biomechanical, physiological and geriatric requirements of the edentulous patient, the clinical treatment procedure and the processing steps performed in the laboratory need to be precisely coordinated. The objective is to give patients some of their personality back by providing them with natural-looking dentures.

As a result of extensive research in the field of complete denture prosthetics, in-depth experience and state-of-the-art materials (e.g. SR Phonares®, IvoBase®, SR Nexco®), dental professionals can create dentures that have a completely natural appearance. We have been working with the Biofunctional Prosthetic System (BPS®) for many years and have consistently achieved esthetic outcomes based on this efficient and sophisticated methodology. Moreover, optimal synergies can be derived from the combined use of BPS with the IvoBase injection system and SR Nexco lab composite.

Case presentation and history

The edentulous, 68-year-old male patient reported to our dental practice because he was unhappy with his existing complete dentures and wanted to have them replaced. Apart from esthetic defects, the tissue-supported upper and lower dentures of the patient showed considerable mobility. Their poor fit had a far-reaching impact on the quality of the elderly man's life: it caused severe problems in chewing and speaking. During the initial examination, the needs and wishes of the patient were assessed and ways of implementing them were discussed. The patient desired a functional and esthetic prosthetic restoration that could be realized by means of an uncomplicated process. Therefore, the decision was taken to restore the patient's upper and lower jaw with removable dentures.

Initial findings

The examination of the oral cavity revealed severely resorbed alveolar ridges. The posterior area of the lower jaw in particular was affected by bone resorption (Fig. 1). Factors such as the resilience of the mucous membrane, the position of the lip and cheek frenula and the characteristics of the hard palate were also assessed as they influence the quality of the denture bearing area. The extraoral inspection of the patient's face with the mouth closed revealed a very low vertical dimension of occlusion.

In addition, a slightly displaced facial midline as well as a non-parallel bipupillary line was recorded (Fig. 2). The patient did not have any functional problems, and he neither complained about temporomandibular joint problems nor masticatory muscle pain.

Fig. 1 Starting situation: edentulous jaw. The posterior area of the lower jaw in particular showed advanced alveolar bone resorption.

Fig. 2 The extraoral assessment of the starting situation revealed a too low vertical dimension of occlusion.

Fig. 3 Provisional recording of the jaw-to-jaw relation by means of the closed-mouth impression (Centric Tray)

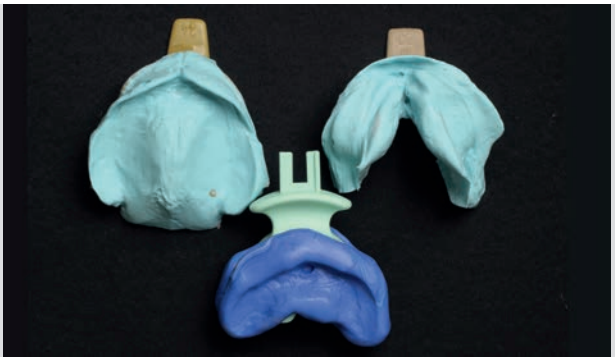


Fig. 4 Anatomical impression of the upper and lower jaw as well as provisional bite registration

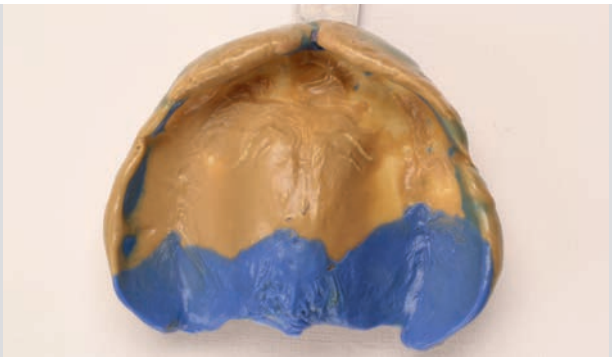


Fig. 5 Functional impression of the upper jaw

Fig. 6 Functional impression of the lower jaw

Anatomic impression and provisional recording of the jaw relation

Following the evaluation of phonetics and function, the maxillomandibular relationship was provisionally recorded. Both the chin and nose were marked with a dot; then the distance between the dots was measured and the vertical dimension was established provisonally. In a next step, a double-arch impression was taken using Centric Tray (closed-mouth impression). For this purpose, Centric Tray was loaded with silicone impression material that was given a slightly convex shape. After the tray had been seated in the mouth of the patient, we asked him to close the jaws at the "preliminary" vertical height and, after having performed the act of swallowing, to stay in this position until the impression material had set completely (Fig. 3).

Apart from providing information on the jaw-to-jaw relationship, an impression of the preoperative situation plays a pivotal role in achieving precisely fitting dentures.

As usual, the anatomical impression served as the basis for the fabrication of custom trays. In many cases, the preoperative situation is not sufficiently taken into account, as it is generally assumed that any deviations may be adjusted based on the functional impression later on. This can indeed be a misconception. If important areas are not covered by the functional tray, they are not captured in the impression. In order to select a suitable prefabricated impression tray, the jaw width is measured with a measuring loop. In the present case, the distance between the exterior of the maxillary tuberosities was measured in the upper jaw, and the distance between the mandibular tubercles in the lower jaw. A slightly overextended anatomical impression was made using a non-slumping impression material (Fig. 4).

Functional impression, final bite registration and determination of the centric position

Based on the existing information, custom trays were fabricated and handed over to the dentist. For the functional impression, a high-viscosity silicone material (Virtual® Heavy Body) was used as the tray material, while a low-viscosity material (Virtual Light Body) was applied along the functional rim. The objective of the functional impression is to record the movements of the chewing muscles and facial muscles. This ensures that the denture borders precisely follow the contours of the oral mucosa. It should be kept in mind that denture "suction" is only achieved, if the borders of the denture adapt snugly to the mucous membrane (valve rim). In the present case, the suction effect was already noticeable when the impression was removed from the mouth after the impression material had set (Figs 5 and 6).

Determination of the maxillomandibular relationship

When the BPS method is used, the joint related centric position of the mandible is determined by means of a horizontal maxillomandibular relationship record. However, a problem arises when the well-proven method of needle point tracing

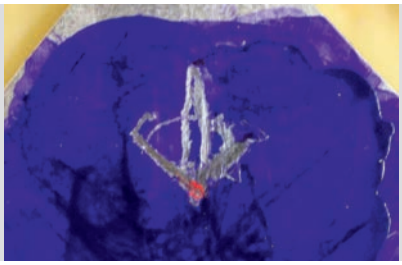


Fig. 7 Needle point tracing using Gnathometer M to determine the centric relation as well as maximum jaw movement

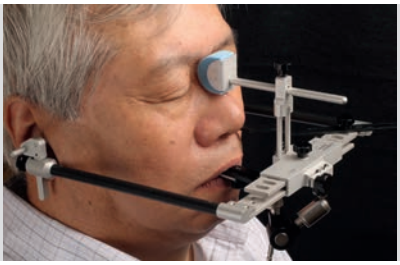


Fig. 8 For the arbitrary skull-joint related orientation of the models in the articulator, a facebow was used (UTS 3D Universal Transferbow).

Fig. 9 Selection of the tooth shade using the SR Phonares II shade guide

Fig. 10 The natural oral soft tissues were mimicked by waxing delicate yet effective vestibular gingival portions.

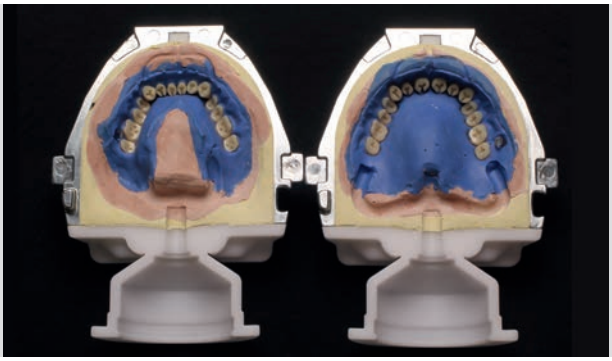


Fig. 11 The dentures were processed with the IvoBase denture base system, a highly volume-stable injection system.

according to Gerber is applied in edentulous patients: How can the templates for the record be fixed in the mouth in a stable position? The Biofunctional Prosthetic System provides a solution to this problem: it comprises the intraoral registration device Gnathometer M. Gnathometer M is prepared for needle point tracing based on a closed-mouth impression. This was also done in the present case. First, the device was correctly positioned in the mouth by means of a mounting jig. Then the needle point tracing record was made (Figs 7 and 8).

Suitable denture teeth were selected during the same appointment. We generally believe that it is very important to involve the patient in the selection process. Information about the patient's satisfaction with previous tooth moulds, shades and tooth positions is also very helpful. In addition, a form selector was used (Phonares II FormSelector), which assisted in determining the suitable tooth moulds based on the patient's interalar width. The Phonares denture tooth line allows teeth to be selected that are matched to the individual characteristics of the patient. Even though these teeth are "prefabricated", they do not look like they are ready-made. Thus dentures result that look customized and are far from having an off-the-shelf appearance. We left it entirely to the patient to select the tooth shade and only offered advice (Fig. 9).

Set-up and completion of the dentures

In the set-up of the teeth, static and functional requirements as well as the patient's wishes were taken into account. The elderly man asked for an even front tooth row without any forced crowding. Due to tooth moulds matched to the age of the patient we were able to fulfil this request whilst avoiding an "unnatural" look. However, not only the alignment of the teeth significantly influences the esthetic appearance. By creating a vestibular gingival portion that has a delicate yet effective appearance, the customized look can be accentuated with little extra effort. In the present case, we used five different shades of wax to faithfully mimic the natural oral soft tissues (Fig. 10).

The wax-up was then tried in the mouth and evaluated on the basis of the following criteria: esthetics, phonetics, occlusal vertical dimension and centric relation. The patient was completely satisfied with the result and no modifications were required.

Following completion of the wax-up, we proceeded to process the denture base. The IvoBase denture base system allows wax dentures to be converted to resin in an easy and straightforward manner. The injection-based system ensures precise and reliable results which do not exhibit any inaccuracies. The models with the waxed denture bases were immersed in water, isolated and then flasked. One of the major advantages of the IvoBase system is that both the monomer and polymer are supplied in predosed capsules. Consequently, an accurate mixing ratio is ensured. Moreover, there is no risk of skin contact during mixing or danger of inhaling monomer vapours. For the case at hand, we chose the High Impact version (IvoBase, basic shade 34-V) which demonstrates high fracture toughness and is thus ideally suitable for removable dentures. After the flasks had been prepared (Fig. 11), they were placed in the injector and the program was started. The fully automatic injection and polymerization process is optimally adjusted to the properties of the IvoBase material; a continuous supply of material ensures that polymerization shrinkage is fully compensated.

Fig. 12
Reduction of the vestibular resin portions in order to achieve a customized rendering of the "pink esthetics" using the light-curing laboratory composite SR Nexco

Fig. 13
Application of different shades of composite (SR Nexco). Layering scheme: BG 34, Dentin A2, Intensive Gingiva 2, Intensive Gingiva 5 and 4, Stains maroon and red, Intensive Gingiva 3, Incisal 20S.

Fig. 14
The dentures showed a lifelike interplay of colours. The shade variations and the surface texture, among other factors, were responsible for the light reflections.

Fig. 15
The patient with the dentures in place

Subsequently, we devoted our attention to reconstructing the soft tissues. With the appropriate materials, the "pink esthetics" modelled in wax can be reliably converted to resin. The light-curing laboratory composite SR Nexco is perfectly suitable for this purpose. It ideally complements the IvoBase denture base material (shade 34-V) and offers dental lab technicians a wide array of design possibilities. After reducing the vestibular areas (Fig. 12), we applied different shades of SR Nexco. What is so remarkable about this composite is that it is available in a wide range of shades and offers outstanding sculptability (Fig. 13). We succeeded in mimicking the typical surface details of natural gingiva such as delicate stipplings, gentle alveolar bulges and slight recessions. After proper finishing and smoothing of the sharp edges as well as polishing, natural-looking dentures were achieved that demonstrated a lifelike interplay of colours. The different gingiva shades (SR Nexco) that had been used and the textured surface with its alternating convexities and flat areas were responsible for the light reflections along the denture base (Fig. 14). The teeth looked like they had actually "erupted" from the gingiva, just as in the natural, dentate jaw.

Final seating of the dentures

The fact that the patient showed a relaxed and satisfied smile when the dentures were seated for the first time was the first sign of success for the dental team (Fig. 15). After all the functional, esthetic and static criteria had been checked, we all agreed that the result was very appealing and would fulfil the patient's needs for a long time. The dentures showed a stable intraoral fit. The patient was able to speak properly. Moreover, the assessment of the static and dynamic occlusion did not reveal any interferences, so that no adjustments had to be made. With much attention to detail, state-of-the-art materials and a proven set-up protocol we were able to create dentures that matched the personality of the patient.

Conclusion

Despite increased efforts to preserve natural teeth, the number of denture wearers throughout the world has remained constant. Due to the possibilities opened up by implant dentistry it is frequently assumed that the classical removable denture has lost significance. However, several objective factors contradict this assumption. Across the globe, the majority of edentulous patients are treated according to conventional methods. The BPS protocol, in combination with SR Phonares denture teeth, IvoBase denture base material and SR Nexco lab composite, is a reliable option that leads to predictable outcomes. The systematic, economical and stress-free procedure results in dentures that leave patients satisfied and help them regain their self-esteem and resume their social activities.

Contact details:

Dr Jiro Abe, Ph.D.
Clinical Professor of the Department of Advanced Prosthetic Dentistry of Tohoku University Graduate School
ABE Dental Office
1-10-1-511 Minami Karasuyama
Setagaya-ku, Tokyo 157-0062, Japan
jiroabe@ra2.so-net.ne.jp

RDT Kyoko Kokubo
Ace dental laboratory
3-32-11 Kyuden
Setagaya-ku
Tokyo 157-0064
Japan
ace-kokubo@m7.dion.ne.jp

Challenge: value

Pressed ceramic veneer restoration with IPS e.max Press Impulse
Michael Beerli, Chesapeake, Virginia/USA

Value is key in imitating the natural tooth to achieve a lifelike result.

In esthetic anterior restorations, the dental technician is ideally involved right from the beginning – even more so, if a diagnostic wax-up, or mock-up, is required to visualize the treatment outcome. However, some situations in everyday practice may make it impossible for the dental technician to be part of the treatment at an early stage and such a case is described in the report below.

Preoperative situation

The female patient visited the practice for emergency treatment. In an accident, the incisal edges of the central incisors had broken off. Primary treatment consisted in covering the fractured teeth with a temporary. The esthetic appearance of the temporary restoration was of secondary importance at this stage (Fig. 1). After initial treatment, it was time to initiate the next stage: final treatment planning. A decision was taken to use two pressed ceramic veneers for the permanent restoration.

In the lab

Being able to talk directly to the patient is an advantage to the dental technician when designing an esthetic restoration. This enables the technician to respond individually to the patient and to gain a better understanding of the patient's desires and expectations. In this case, the patient told us that she had quite prominent incisors and the temporaries were not reflecting her natural smile. Unfortunately, pictures or models of her original oral situation were not available. She also informed us that the two anterior teeth slightly overlapped each other, possibly due to crowding in the upper anterior region and the difference in width of the incisors.

Fig. 1 The patient received two temporaries on her upper anterior incisors as an emergency measure. Esthetic concerns were of secondary importance at this point.

The initial situation on the model resembled the case of a minimally invasive veneer restoration; only the enamel surfaces were in need of replacement. In this case, adapting the shape and structure of the anterior teeth was not as much a challenge as recreating their shade and value. The patient presented very bright teeth with a great deal of depth. The teeth seemed to be shining from the inside because of their high opalescence.

Figure 2 shows that the patient's tooth shade could not be determined with standard shade tabs such as the Chromascop or A-D shade guides; the natural teeth seemed to absorb the light, without appearing grey or dark in shade.

The Ultimate shade guide

With this situation in mind, I remembered a shade guide that we usually have lying way back in the "shade tab" drawer: the Ultimate shade guide.

Fig. 2 Two veneers were planned for the final treatment. The patient exhibited a very bright tooth shade. A standard shade guide did not allow the tooth shade, or value, to be determined accurately.

Fig. 3 We normally use the Ultimate shade guide for shade selection in bleached teeth. In this case, tab no. 4 matched the value of the natural teeth perfectly.

Fig. 4 Photo editing: Playing with the brightness values provides valuable information about the "inner life" of a tooth.

As the name suggests, the Ultimate shade guide is a "drastic option" for determining an exceptional tooth shade.

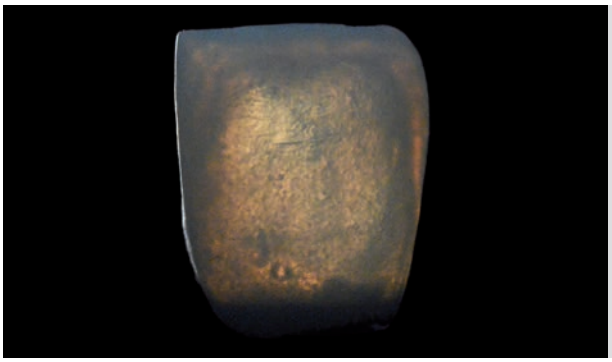


Fig. 5 If a pressed veneer is held against a light source, its opalescent effects are clearly visible.

Originally meant to reflect bleached teeth, the Ultimate shade guide consists of nine shade tabs. Although our patient never had her teeth bleached, tab no. 4 exactly showed the brightness and depth that matched her teeth (Fig. 3).

Shade selection with dental photography

Digital photography and image editing has changed shade selection in recent years. Today I cannot imagine doing without these helpful tools. Adobe Photoshop and Google's Picasa have become the standard software programs for image editing in our day-to-day work. While the pictures are taken with a fixed set of parameters, they are routinely processed, including white balance, exposure and more. By "playing" with the images, or with the value of the tooth, I can visualize various value zones and obtain an impression of the inside of the tooth, almost like "looking" into it. Picasa is a fast and easy to use image editing software. Inside the menu, it contains a "shadow" slider, which increases contrast and lowers brightness. Figure 4 shows the image after editing. Compared to Figure 3, the effects, details, translucence as well as the light absorbing and reflecting zones are clearly visible.

Tips for dental photography

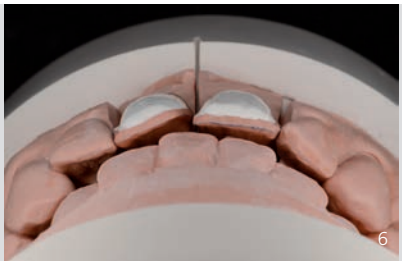
- Always determine the shade before preparing the teeth or set an appointment afterwards (to allow the teeth to rehydrate before shade taking).
- The shade tab (shade guide) has to be on the same facial plane with the tooth under inspection.
- Take the picture with a slight "nose tipped down" angle to obtain a clear picture of the tooth's details.
- Take pictures from various angles.
- Avoid reflections.
- Always use more than just one shade tab.
- Make sure the shade information showing on the shade tab is included in the picture.

Ingot selection

Selecting an appropriate ingot is essential for a successful outcome when working with pressed ceramics. The new IPS e.max® Press Impulse range enables users to realize lifelike results in a rational manner. These ingots are value based rather than shade based like conventional ingots. The Impulse range includes Opal ingots, which enable users to replace enamel without individual layering. This is particularly convenient in very thin veneers or in "extremely" white teeth, as in the case described here.

How can we imitate these white teeth with their expressive inherent shade characteristics? The Opal ingots were the answer to this question. Although these ingots are originally intended only for the replacement of enamel, they are ideally suited for situations like ours. The Opal 1 and Opal 2 ingot shades (IPS e.max Press Impulse) allow the press ceramic technique to be used even with a difficult initial situation (Fig. 5).

After we selected a matching shade tab, we encountered another issue: The shade tab consists of 3 mm of incisal material over a layer of bright dentin. By contrast, the space available in the present situation would only allow for a veneer with a maximum thickness of 0.8 mm. In view of the bright shade and limited space, reproducing the apparent effect of depth presented an additional challenge. We selected an Opal 2 ingot. As we had to extend the incisal edge a little bit and make sure that the incisal preparation line did not show through, we felt that this was a safe choice.



Figs 6 to 8 Models for creating the wax patterns for the two veneers

Fig. 9 Pressed veneers. The translucent restorations were finished on model dies made of light-curing tooth-coloured die material.

Fig. 10 Veneers with IPS e.max Ceram Essence materials applied onto them. The value was close to the desired final outcome.

Fig. 11 Completed restorations. The surfaces of the adjacent teeth were very smooth and the veneers were finished accordingly.

Fig. 12 To check the value, Figure 11 was processed with the software program and then compared with the reference shade tab.

Fabricating the veneers

The veneers were to be pressed in their full anatomical contour and then customized with the staining technique. The wax pattern was created in line with the envisaged restoration; some areas were slightly overcontoured (Figs 6 to 8). Sprueing, investing and pressing were performed according to the manufacturer's directions.

Contouring, shading and glazing

Since the ingot selected (IPS e.max Impulse Opal 2) is very translucent, the shade of the natural tooth abutment (die) was mimicked to achieve the desired shade in the final restorations (Fig. 9). Light-curing IPS Natural Die material is ideally suited for this purpose. This tooth-coloured composite is utilized to prepare a die, facilitating the work with HT or Value and Opal ingots. As the die mimics the shade of the natural abutment, it creates an ideal basis for reproducing the natural shade of the given oral situation. If I use LT or MO ingots (IPS e.max Press), I only use the Natural Die material if the shade of the preparation is either very light or very dark in relation to the desired tooth shade. Rubber wheels as well as green and diamond impregnated stones were employed for finishing the restorations (shape, morphology) and for creating the surface texture. Figure 10 shows the veneers with the Essence material (IPS e.max Ceram) applied onto them. The added shade tab indicates that we are very close to the desired final shade and we are also right on target to meet the most formidable challenge of this case: the value.

Figs 13 to 15
Once incorporated, the restorations met the expectations of the patient. The natural teeth had been successfully mimicked – the balancing act between value and depth proved to be successful.

Before the veneers were tried in on the patient, her natural teeth (abutments) were wetted with fluid (Vaseline or try-in paste) – without fluid, the air between the restoration and the natural tooth structure would block the light and adversely affect the evaluation of the shade.

Usually, I finalize the surface structure at the finishing stage, paying attention to matching the smoothness levels to the natural teeth. The glaze was applied in a thin layer and slightly "underfired". Generally, I prefer a manual final polishing (Fig. 11). Once polished, the veneers were checked for their accuracy of fit, shape and function on the model. When we assessed the shade – or value – of the veneers, we were left with a positive feeling (Fig. 12). We then sent the restorations to the dental practice.

Conclusion

This case was challenging. The value in particular required a special approach. We had to recreate the apparent depth, or inherent interplay of shades, without dropping the value (Figs 13 to 15). I was looking forward to hearing back from the dental practice and was pleasantly surprised to learn that the veneers had been successfully incorporated. The IPS e.max Press Impulse Value ingots facilitated the esthetic design of the restorations due to their inherent fluorescence and opalescence. In sum, we now can use the press ceramic technique to achieve a successful outcome even in a challenging situation like this.

Acknowledgement

I would like to thank David K. Foster, DDS, MAGD, Virginia Beach, USA, as well as Buddy Shafer and Rick Shafer, Bay View Dental Laboratory, Chesapeake, USA, for their assistance.

Contact details:

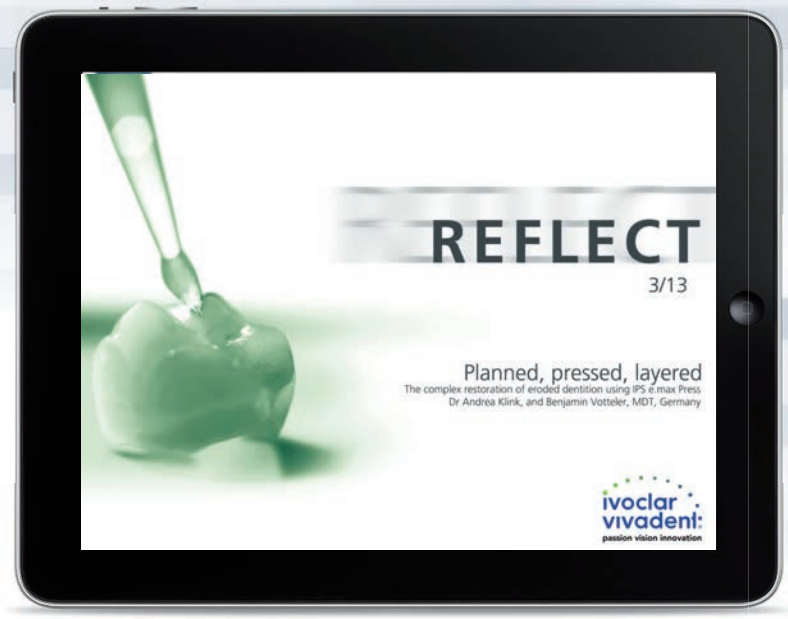
Michael Beerli
Bay View Dental Laboratory
1207 Volvo Parkway
23320-7654 Chesapeake, VA
USA
mbeerli@gmail.com

For forward-thinking minds.

Reflect. The digital magazine by Ivoclar Vivadent.

The highlight article from the new Reflect issue is now available for iPad.

Download it from the Apple App Store free of charge.



Read the digital version of the Reflect magazine by Ivoclar Vivadent in your dental practice, in the lab, at home, on the road or wherever you like. The digital edition includes a long version of the printed highlight article. Enjoy our brilliant photo gallery and update yourself about the products presented in the articles.

The new Reflect is now available for you on the Apple App Store free of charge. Simply search for Ivoclar Vivadent Reflect and download the recent issue to your iPad.

Available on the App Store

665537

www.ivoclarvivadent.com

ivoclar vivadent®
passion vision innovation