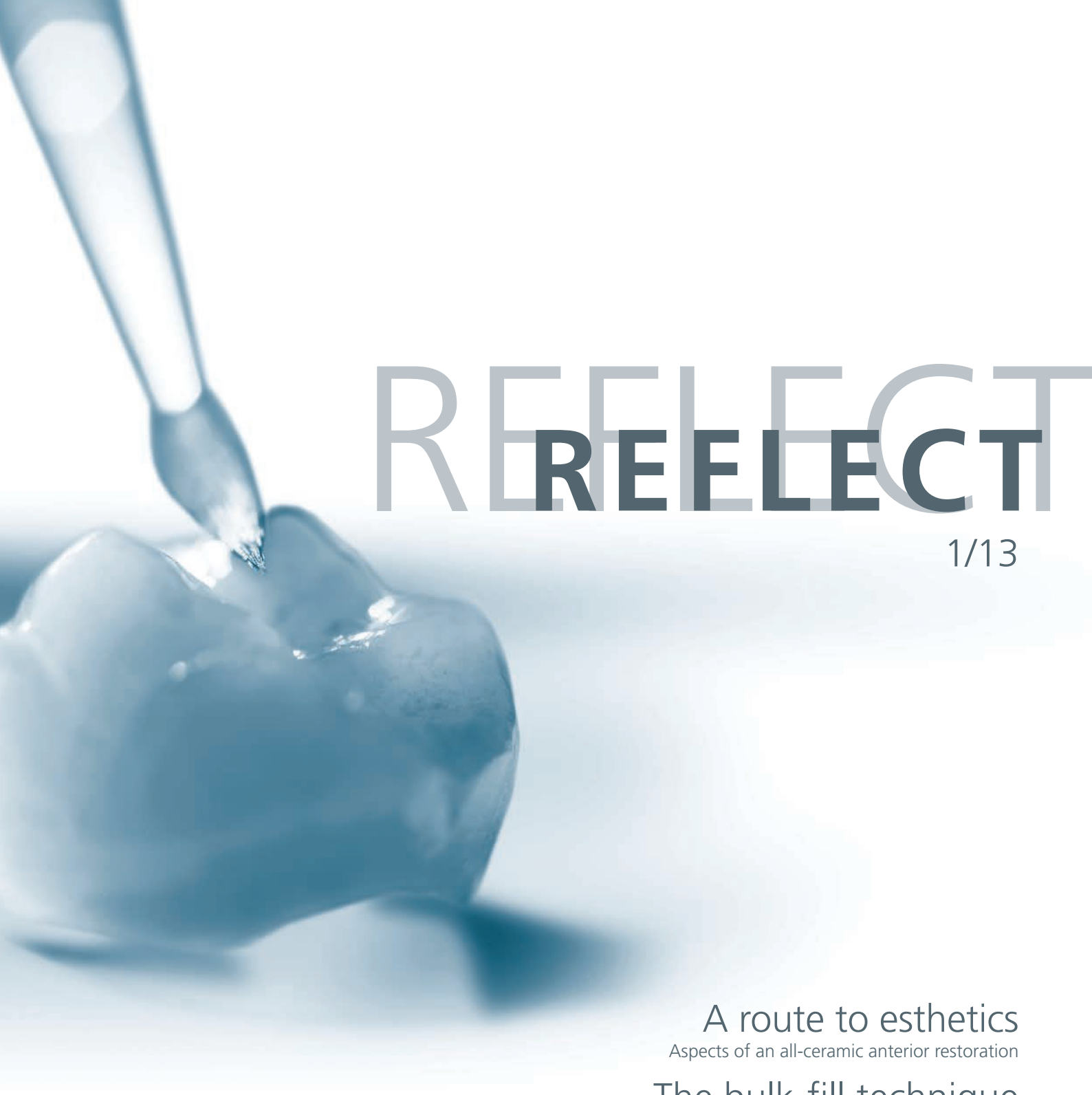

REFLECT

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A route to esthetics

Aspects of an all-ceramic anterior restoration

The bulk-fill technique

Economical composite-based posterior restorations

High tech complete denture prosthetics

Treatment of an edentulous patient with SR Phonares II and IvoBase

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passion vision innovation

Dear Readers

The present issue of Reflect is published simultaneously with the start of the International Dental Show (IDS) 2013 in Cologne, Germany. IDS, held every other year, represents the top event in the global dental market. Innovations from international research departments and laboratories face up to the competition, exhibitors present their new products in modern stalls and make use of the most recent presentation and communication technologies. All of this turns a visit to IDS into a very special and emotional event.

The continuously increasing number of visitors has established IDS as the world's leading trade show and sector meeting place. This emphasizes that even in today's digital era, personal communication plays a very important role. And IDS truly is a place for communication and a market place where visitors receive the latest information about the most recent products and procedures developed for dentists and dental technicians.

Similarly, Ivoclar Vivadent uses IDS as a platform to present innovations from its three product categories "Direct Restoratives", "Fixed Prosthetics" and "Removable Prosthetics". The company especially values the direct exchange with visitors. At IDS, visitors can undoubtedly see that we are developing innovative products offering new and lasting possibilities. Because we believe: Innovation makes the difference and directly leads to a better performance, esthetic appearance and cost effectiveness.

I hope you will enjoy reading the articles in this issue of Reflect. Our authors are internationally renowned dental professionals who have found restorative solutions to their cases with the help of innovations such as Tetric EvoCeram Bulk Fill, IvoBase and SR Phonares II. It goes without saying that our all-ceramic system IPS e.max is also included in this issue. Consequently, the article "A route to esthetics" by Oliver Brix and Dr Sergey Chikunov represents the highlight of this issue. We have also prepared a long version of this article in an iPad edition.

Get inspired by our articles.

Yours sincerely

Norbert Wild
General Manager
Ivoclar Vivadent GmbH, Germany

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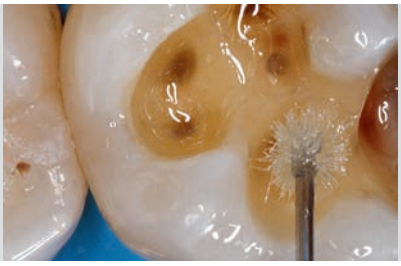

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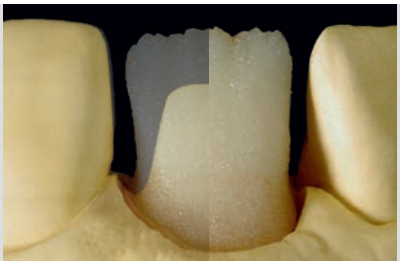

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The availability of certain products can vary from country to country.

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The bulk-fill technique

Economical composite-based posterior restorations
Professor Dr Jürgen Manhart, Munich/Germany

Posterior composites are normally applied in a complex and time-consuming incremental technique. What are known as bulk-fill composites are faster and easier to process and therefore present an inexpensive alternative.

Direct composite restorations have become an indispensable element of modern dentistry. They are used because they offer a wide range of applications, they help preserve and stabilize the tooth structure and, compared with indirect restorative techniques, they enable an economical and time-saving procedure.

Composites are placed with an incremental technique, usually in single increments of a maximum thickness of 2 mm. The individual increments are polymerized separately. This procedure can be very time-consuming if large posterior cavities are restored. Therefore, many operators have been looking for an alternative to the multilayer technique to place composite restorations in a less time-consuming and therefore more economical fashion. A few interesting new product developments have recently been launched. These products are offered in the category of bulk-fill composites [1-3].

Bulk-fill composites

It is the objective of certain composite manufacturers to streamline the posterior composite-based filling technique. This has led to the introduction of "fast-track" filling techniques, which often involve the application of simplified bonding agents in conjunction with direct low-shrinkage composites offering sufficient mechanical strength. Generally, the following factors may, among others, assist in placing light-curing posterior composite restorations in a faster and therefore more cost-effective way:

- Universal shade of filling material ⇒ no need for shade selection, which can be a daunting task
- Highly translucent shade of composite ⇒ increase in the depth of cure of the individual layers, reducing the number of layers required to place the restoration
- Optimization of the initiator system (e.g. with Ivocerin®) used in light-curing composites ⇒ reduced curing times and increased curing depths
- Low-shrinkage composite materials with minimal stress build-up ⇒ application of thicker layers and therefore fewer increments
- High-performance light-curing devices ⇒ short curing times at high light intensity
- Functional yet effective occlusal design ⇒ fast finishing and polishing

Bulk-fill composites have been developed for the "fast track" procedure. These composites can be placed more quickly because they are cured with a shorter curing time at an accordingly higher light intensity, offering an optimized depth of cure (up to a thickness of 4 mm). Dental manufacturers are offering these composites in two subcategories:

1. Low-viscosity flowable composites. These materials require the application of a final layer of conventional posterior hybrid composite to protect the resto-

Fig. 1 Preoperative situation: fractured composite filling on tooth 16

Fig. 2 After removal of the existing filling, caries is detected on the mesial side.

Fig. 3 Situation after removal of carious material: the cavity margins are finished and a rubber dam is applied.

ration surface because they contain comparatively large filler particles and a low filler content and have a reduced wear resistance [3].

2. Regular to high viscosity variants featuring a stable and mouldable consistency. These materials can be used up to the occlusal surface without requiring a covering layer.

For both types of materials, the maximum layer thickness is restricted to 4 mm because of their limited depths of cure. This means that only the high-viscosity representatives applied in cavity depths that do not exceed their maximum depth of cure can be considered bulk-fill materials in the true meaning of the word. If a defect is deeper than the maximum curing depth of 4 mm or if a flowable variant is used, an additional layer of material will be required.

Bulk-fill materials are generally more translucent than other restoratives to ensure that light of sufficient intensity reaches deep composite areas. The degree of translucency may vary considerably between single products. In individual cases, the mesial surfaces of restorations in the upper premolar region may esthetically not completely blend in with the surrounding dentition if a highly translucent material is applied.

These materials have been optimized for economic efficiency and, in terms of materials science, offer properties that are comparable with those of conventional light-curing composites [2,4-6].

If used correctly, bulk-fill composites show a marginal integrity that is comparable with that of restorations fabricated using a conventional layering technique.

Used in combination with an accompanying adhesive system, bulk-fill composites provide a reliable seal of the cavity floor, which is one of the factors contributing to the prevention of postoperative sensitivity in vivo [7,8]. The few data available from clinical studies to date have shown a satisfactory to good intraoral performance [9-11]. These results should be further substantiated by additional examinations involving an extended data base. An analysis of the large body of in vitro data allows us to conclude that the new bulk-fill composites, on the whole, hold their own by comparison with conventional composites and can be successfully used in clinical applications if they are applied correctly in line with the manufacturer's directions and in compliance with the recommended field of applications [3,7,8].

Case presentation

A 45-year-old male patient visited the practice with the desire to replace a defective composite restoration on tooth 16 (Fig. 1). The tooth reacted to cold stimuli. Percussion-tapping did not show any suspicious symptoms. After the patient had been informed about the treatment options and the corresponding costs, he decided in favour of a bulk-filled restoration made of the mouldable composite Tetric EvoCeram® Bulk Fill.

Tetric EvoCeram Bulk Fill is a nano-hybrid composite featuring a typical dimethacrylate monomer matrix and inorganic filler particles (79-81 wt %) with a smooth consistency. The material can be applied in increments of up to 4 mm and each increment can be cured in 10 seconds (intensity of the curing light > 1,000 mW/cm^2). The mouldable consistency and material properties of this material enable the operator to restore a cavity with a single material using the bulk-fill technique. Applying a different material to cover the occlusal surface is unnecessary – a step that is normally needed if a flowable bulk-fill composite is employed.

Since Tetric EvoCeram Bulk Fill is available in three universal shades (IVA, IVB, IVW), the shade selection procedure is very straightforward. After the tooth had been cleansed and a local anaesthetic administered, the exiting composite material was removed. In the process, additional proximal caries extending towards the mesial aspect was detected (Fig. 2). After the carious material had been removed, the cavity was finished with fine diamonds. The restoration on tooth 15 showed overhanging margins and the distal aspects of these margins were re-contoured. The tooth was isolated with a rubber dam (Fig. 3). Next, a segmented metal matrix

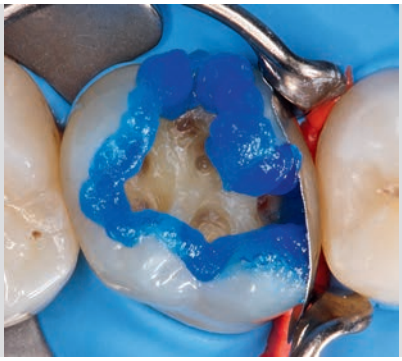

Fig. 4 Phosphoric acid gel is first applied selectively to the enamel margins.

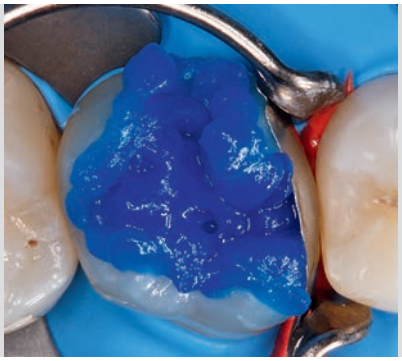

Fig. 5 After 15 seconds, the dentin is also etched. The procedure continues for another 15 seconds.

Fig. 6 An appropriate amount of ExciTE F is applied to the enamel and dentin.

Fig. 7 The solvent is carefully evaporated from the adhesive.

Fig. 8 The adhesive is light-cured for 10 seconds.

Fig. 9 The surface of the cavity is covered in a glossy even coating – the result of correct adhesive conditioning.

band was placed around the cavity and a phosphoric acid etch was performed. The acid was first applied along the enamel margins (Fig. 4) and allowed to react for approx. 15 seconds before the dentin portions of the cavity were also covered with etching gel (Fig. 5). After an additional 15 seconds, the etching gel was thoroughly rinsed off. Excess moisture was carefully removed using compressed air. Attention was paid not to overdry the demineralized dentin

Fig. 10 Tetric EvoCeram Bulk Fill is applied.

Fig. 11 The first increment is applied in a dimension that ensures that the following increment can be placed in a thickness that does not exceed 4 mm.

Fig. 12 The first increment is light-cured for 10 seconds.

Fig. 13 The second Tetric EvoCeram Bulk Fill increment fills the entire remaining volume of the cavity.

Fig. 14 A functional yet effective occlusal anatomy is created.

Fig. 15 The second increment is light-cured for 10 seconds.

Fig. 16 Final result: tooth shape and esthetic appearance have been successfully restored.

structure. As seen in Figure 6, an appropriate amount of ExciTE® F was applied to the enamel and dentin and gently scrubbed into the tooth structure for 10 seconds using a VivaPen® brush. Next, the solvent was carefully dispersed (Fig. 7) and the bonding agent light-cured for 10 seconds using a Bluephase® Style curing light (Fig. 8). A glossy layer evenly covering the entire cavity surface was now visible (Fig. 9).

After the depth of the cavity had been determined using a periodontal probe (6 mm from the floor of the box to the occlusal marginal ridge), Tetric EvoCeram Bulk Fill in shade IVA was applied to the mesial box of the cavity until the remaining depth was no more than 4 mm in the entire cavity (Figs 10 and 11). Next, the composite was light-cured for 10 seconds with a Bluephase Style at an intensity of approx. 1,100 mW/cm^2 (Fig. 12). The remaining volume of the cavity was filled with the second Tetric EvoCeram Bulk Fill increment (Fig. 13). After a functional but effective occlusal anatomy had been established (Fig. 14), the material was again light-cured for 10 seconds (Fig. 15). After removal of the metal matrix band, the restoration was checked for imperfections and additionally light-cured from the buccal and palatal aspect for 10 seconds each time.

Now the rubber dam was removed, the restoration carefully finished and the occlusion adjusted. Subsequently, the restoration was polished to a shiny smooth surface using diamond-impregnated silicone polishers (OptraPol® NG). Figure 16 shows the completed direct composite restoration, restoring the original tooth shape with an anatomical and functional occlusal surface, a physiological proximal contact point and an acceptable esthetic appearance. To complete the treatment, a fluoride varnish was applied to the teeth using foam pellets.

Conclusion

Composite-based direct restorative materials will gain in importance in the years to come. These materials present a scientifically validated high-quality permanent treatment option for the occlusal stress-bearing posterior region and their reliability has been documented in the literature [12]. As the economic pressure on the health system continues to rise, basic treatment options to restore posterior teeth with a straightforward, quick and therefore cost-effective method are required alongside time-consuming high-end restorations. Bulk-fill composites meet this requirement, allowing users to achieve clinically and esthetically satisfying posterior restorations in an economically more efficient procedure than conventional hybrid composites.

A literature list is available from the editors on request.

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Every case is unique

Esthetic restoration featuring a customized abutment made of lithium disilicate glass-ceramic
Dr Marco Bartolini and Gianfranco Bartolini, Riccione/Italy

Biocompatibility significantly contributes to the long-term clinical success of implant restorations and an efficient fabrication procedure enhances the economic success of the treatment team.

Since the introduction of implantology in dental medicine, many changes have taken place in this field. As a result, osseointegration is now considered a matter of course and the restoration of dentitions with implants has become an established procedure throughout the world. Due to ongoing research and development in this field, this treatment modality has become increasingly popular. Furthermore, the number of companies that manufacture dental implants and the corresponding denture components has risen commensurate to the speed at which the developments have been made. However, the large number of commercially available systems has not helped to improve the esthetic and functional results. Many operators are finding themselves overwhelmed by the confusing variety of products and have difficulties choosing the most suitable components.

> The correct selection of the abutment is decisive to the success of implant-supported restorations.

Implant-supported crowns are not all the same – each patient has individual needs that have to be taken into consideration. Today's dental teams have numerous treatment options at their disposal. Generally, abutments are divided into two categories: ready-made or customized (titanium, zirconium oxide, etc.). Ready-made abutments are machined components with standardized shapes and dimensions; custom-made abutments are specially created to fit the individual patient.

Figs 1 and 2 Starting situation: Root fracture in tooth 11 as well as severe discolouration

Fig. 3 Healed tissue after the extraction of tooth 11. The implant can be inserted at this stage.

Fig. 4 The provisional during the healing phase of the implant

Custom abutments

Nowadays, customized abutments are considered to be an efficient solution for placing a restoration on an implant. Moreover, this type of abutment offers more control over the esthetic and functional aspects of the restoration than ready-made abutments.

Benefits of customized abutments:

- Esthetic results: imitation of the natural contour and emergence profile of the tooth
- Excellent control of the fit: positioning of the subgingival margin
- Thorough and precise removal of cement excess in the luting of crowns

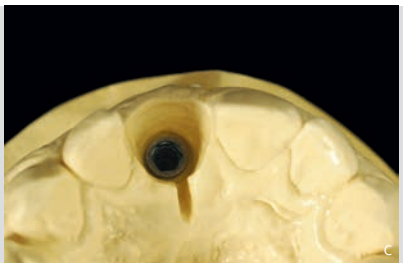
The new IPS e.max® Press Hybrid Abutment made of lithium disilicate (LS_2) together with a titanium base (Ti base) offers an optimum solution for fabricating functional implant-supported restorations (strength of 400 MPa) and satisfying discerning esthetic demands. Due to the combination of the titanium base and the lithium disilicate glass-ceramic, implant-supported restorations can be tailored to the needs of the individual patient. The long-lasting bond between the two components, that is, the Ti base and LS_2, is generated with the self-curing luting composite Multilink® Implant, which can also be light-cured if desired.

The following case study shows how efficiently an anterior dental implant is provided with an individually created abutment (press technique) and an esthetic crown, which was also produced with the press technique.

Case study

A 42-year-old patient consulted the practice because of a root fracture. Tooth 11 had become discoloured due to this injury (Figs 1 and 2). After a thorough diagnosis revealed that the tooth could not be preserved, a new restoration was planned. The tooth was extracted (Fig. 3) and a conical NanoTite™ Certain® implant (diameter 4,1, Biomet 3i) was inserted. During the healing period of about 90 days, the lab-fabricated provisional restoration was placed (Fig. 4). The provisional enabled the soft tissue to be conditioned and optimally prepared for the permanent restoration. After the healing phase, the implant was exposed and the provisional fabricated in the laboratory was placed. The provisional was adjusted to the gingival situation in order to stabilize the peri-implant soft tissue. Next, the precision impressions as well as all the other required information was conveyed to the dental lab technician. The models were fabricated in the customary way in the dental laboratory (Figs 5a to c). Precision is also called for in this process. The models were subsequently placed in the articulator in accordance with the maxillo-mandibular relationship record.

A commercial titanium base, which complies with the IPS e.max Press Abutment Solutions Instructions for Use, was selected for the fabrication of the customized abutment. According to these directions only bases made of Ti or Ti alloys with a shoulder margin width of at least 0.6 mm and a height of at least 4.0 mm should be used. In the case presented, we decided to use a titanium base coated with titanium nitride. This material has a gold-like colour and is very hard.



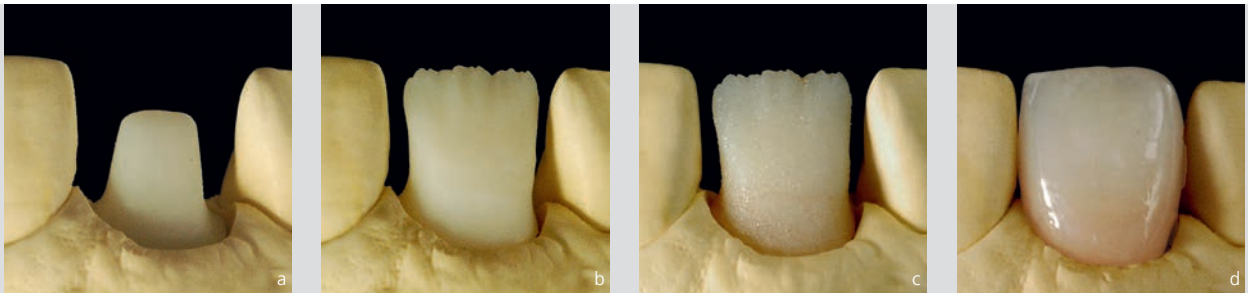
Figs 5a to c Impression-taking of the implant and the lab-fabricated master casts

Fig. 6 The IPS e.max Press abutment on the titanium base (coated with titanium nitride) after divestment

Fig. 7 The two components are prepared for cementation with the self-curing luting composite Multilink Implant.

Fig. 8 The customized abutment after cementation

Fig. 9 The customized abutment is tried in.



Figs 10a to d Fabrication of the crown framework (coping) with lithium disilicate and subsequent layering of the permanent crown with IPS e.max Ceram

Since the ideal crown shape was already determined during the wax-up stage, the subsequent working steps were carried out efficiently with the silicone matrix, which was based on the wax-up. The abutment was built up in wax and its shape and size were checked with the matrix. Then, the built-up abutment was reproduced with IPS e.max Press (lithium disilicate glass-ceramic) in the suitable tooth colour (LT A1). After the restoration had been pressed, it was divested (Fig. 6) and fitted on the titanium base. A spray was used to localize any occlusal interference. After a few adjustments had been made, the abutment fit precisely on the titanium base and was ready for polishing.

Next, both components – the abutment and the Ti base – were prepared for cementation with the self-curing luting composite Multilink Implant (Fig. 7). The instructions of the manufacturer were closely observed in the process. The bonding surfaces were carefully cleaned. The pressed component (lithium disilicate) was etched with five per cent hydrofluoric acid and rinsed with water. Then, the primer (Monobond Plus) was applied to both the dried parts. Subsequently, the restoration was cemented with the luting composite (Fig. 8). After the cement residue had been removed, the fit of the abutment and the gingival emergence profile were checked in the mouth of the

Fig. 11
The customized abutment and the completed ceramic crown are ready for permanent placement ...

Fig. 12
... and are seated without any problem.

Fig. 13
An X-ray is taken to check the final situation.

Figs 14 and 15
The shape and surface structure of the tooth look very natural. As a result, the crown blends in smoothly in the oral cavity.

patient (Fig. 9). Since all the parameters were in order, the work in the laboratory could proceed.

The silicone matrix of the wax-up was also used in the fabrication of the permanent crown. The crown or coping was correspondingly built up and then reproduced with IPS e.max Press lithium disilicate glass-ceramic. After the coping had been divested and its fit checked, the customized ceramic veneer was applied using the IPS e.max Ceram layering ceramic. A sophisticated layering scheme was used to produce the natural-looking result. Special attention was given to finishing the surface structure of the restoration (Figs 10a to d).

The ceramic crown was sent to the dental practice together with the hybrid abutment (Fig. 11). The dentist in charge of the case re-checked the fit of the abutment and cemented it to the crown. For this purpose the self-curing luting composite Multilink Implant was used. Finally, the cement residue was meticulously removed and an X-ray was taken to check the situation (Figs 12 and 13).

Conclusion

The customized hybrid abutment made of IPS e.max Press offers an excellent solution for highly esthetic requirements and ensures outstanding integration, high precision and the possibility of creating a customized emergence profile. Since this procedure is not time-consuming or expensive, we consider it to be our treatment of choice. In the end, the patient "only" sees the crown which looks as if it has emerged like a natural tooth from the gingival tissue. The dental team, however, is fully aware of the importance of the "underlying" components and the responsibility of choosing them properly. This knowledge enables them to achieve natural-looking results (Figs 14 and 15).

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A route to esthetics

Aspects of an all-ceramic anterior restoration

Oliver Brix, Bad Homburg/Germany, and Dr Sergey Chikunov, Moscow/Russia

A detailed analysis of the preoperative situation, a systematic interdisciplinary approach and suitable materials enable us to create restorations in harmony with the surrounding natural dentition.

The custom-tailored fabrication of tooth replacements leads to highly esthetic restorations that blend in harmoniously with the natural surroundings. Machinery and software may assist us in achieving these results. In the final analysis, however, it is the human factor and the notion that every patient case is unique that determine the outcome.

Many aspects must be taken into account to meet the requirements of patients, or to satisfy the expectations created in them. Manufacturing a standard dental replacement or producing a copy of the natural tooth will not be sufficient. The idea of "symmetry" is a fallacy. Instead, we should strive for "harmony". To achieve this goal, a holistic approach and an understanding of the complex stomatognathic system are required.

Thoughts on achieving harmony with "pink" esthetics

The gingival architecture plays a considerable part in an esthetic reconstruction. No matter how beautifully layered, a crown will not meet the criteria of esthetics if the surrounding gingival tissues are inadequate. We can only achieve harmony if the restoration is embedded in a "pink" frame of healthy gingival tissue. For this purpose, it is necessary to cooperate closely and communicate systematically as early as in the pre-prosthetic planning phase.

Thoughts on "white" esthetics

As a matter of fact, we embark on the path towards esthetics at a much earlier stage than we think. The moment we learn about the design and structure of the natural tooth, we have taken a large step forwards. A cross-section of the

Fig. 1 Preoperative situation: The young patient was unhappy about the appearance of her anterior restorations.

Fig. 2 The teeth were noticeably overcontoured. They looked unduly large and bulky. We decided to rebuild them.

Fig. 3 The gingival line had to be optimized. The picture shows the situation a few days after surgical crown lengthening.

tooth helps us to interpret its natural characteristics. By looking at the interior of the tooth, we obtain a great deal of information about its "white" esthetics. Revealing though our findings may appear, we may be frustrated by the realization that we will never be able to copy nature. However, this statement is not intended to be discouraging – to the contrary: Let's be inspired by nature. Advanced, all-ceramic systems enable us to create restorations that resemble the "natural tooth" very faithfully.

Thoughts on the material

In our laboratory, we have been using the IPS e.max® all-ceramic system for many years. This system presents a "whole dental world on its own", offering a comprehensive range of indications ranging from occlusal veneers, inlays and onlays to complex implant-supported reconstructions.

Why use all-ceramics? If we look again at the cross-section of the natural tooth, we will obtain the clues to answer this question. For instance, we can see the interplay between light and dentin. Natural teeth impress with their ability to interact with light. Tooth colour is determined by the light-scattering properties of the dental tissues. The optical properties of the different structures combine in complex processes (reflection, diffusion, fluorescence, opalescence, etc.) to form an overall impression. Our goal is to incorporate this interplay into the reconstruction of the tooth. In our opinion, this is only possible with all-ceramic materials.

The concept

Interpreting the light optical properties is a prerequisite for selecting appropriate materials. The foundation for the result is laid down with the framework, whose shade can be modified according to the initial situation. The accompanying layering ceramics (IPS e.max Ceram) and our skills enable us to achieve true-to-nature imitations of the natural tooth structure. We can create a "tooth" that conveys vitality and promises long lasting esthetics because of its homogeneous surface.

Like for most of our patients, we have employed pressed ceramic restorations (IPS e.max Press) for the case described below. In this respect, it should be noted that the vast range of different ingots is not intended to confuse you. The range of shades is well thought out and reflects the above knowledge about the optical properties of teeth. For instance, translucency and opacity have opposing effects – low-opacity ingots result in a high degree of translucency while high-opacity ingots provide a low degree of translucency. Translucent ingots demonstrate limited masking capabilities – a property that needs to be taken into account in conjunction with discoloured preparations in particular.

> Ingot selection forms the basis for a successful shade adaptation of the crown.

The layering pattern affects the colour and brightness values by approx. 40 per cent only. Analysing the shade of the tooth preparation therefore presents a vital part. Likewise, dental technicians should know "their" ingots and the associated optical properties. A custom-made key ring may be of invaluable assistance in this respect.

Presentation of a typical patient case

The patient case described below presents a "dental fairy tale". It tells the story of a young woman who turned from a "duckling" into a beautiful "swan".

Examination and planning

The patient visited the practice because of esthetic concerns. She was unhappy about the appearance of her upper anterior restorations. An analysis of the preoperative situation provided the foundation for the further treatment in line with our principles. Generally, a portrait picture is ideal to assess the overall impression and detect disharmonies. Assessment is performed using the known reference lines. The shortcomings were easy to spot on the preoperative pictures of the patient (Figs 1 and 2). The crowns were grossly overcontoured and looked bulky.

We prefer a manual approach for treatment planning. Reconstruction of a patient case is impossible without a wax-up. The patient's requests and esthetic improvements were all integrated into the wax-up, which was then submitted to the operator as treatment proposal. We need to be aware of the fact that the vision we have as dental technicians does not always tally with the expectations of the patient, who, first and foremost, does not want to experience too much pain.

Together, the initial situation was discussed and surgical crown lengthening was proposed. The gingival line is essential to achieve a harmonious effect, or an ideal proportion between width and height. Figure 3 shows the situation after soft tissue contouring. The wax-up was duplicated and cast in stone. The stone cast was used to discuss the treatment from a three-dimensional perspective. After all parties involved in the treatment were satisfied, a "template" was created.

Figs 4 and 5 Removal of the existing restorations. The preparation was slightly recontoured according to the indications of the wax-up. The soft tissues offered ideal conditions.

Fig. 6 The tooth shade was communicated with photos. Black and white pictures enable the dental technician to determine the brightness value and dentin shade.

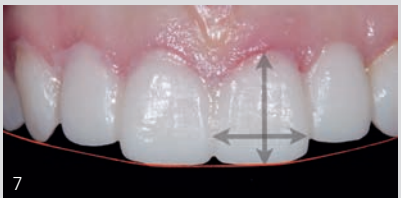

Fig. 7 The temporary was fabricated chairside with a vacuum-formed tray. The esthetic improvements were visible.

Fig. 8 The temporary restoration allows all parameters to be checked and adjusted chairside.

Fig. 9 The effect of the restoration in the facial environment – harmonious relation to the lips and smile line.

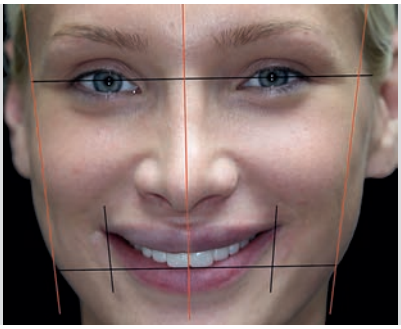

Fig. 10 An additional check using the facial reference lines.

Mock-up

In this case, the template consisted of a vacuum-formed tray made of flexible material (1.5 mm) and this template was used to produce the mock-up. The operator was able to assess the planned treatment in the oral cavity and to adjust the preparation, taking into account the clinical parameters. As a result, the necessary space was created at the "right" place (Figs 4 and 5). At the time of the preparation, the soft tissues were in a healthy condition, providing an ideal frame for the "white" esthetics of the restoration. Pictures were used for shade communication. Black and white images assisted in determining the brightness value and dentin shade (Fig. 6).

The template was also of valuable help in the temporization procedure. The temporary restoration was effectively fabricated and inserted using a composite material (Telio® CS C&B). An immediate improvement was observed to the satisfaction of everybody. Figure 7 shows the amendments in toto and provides a preview of the envisaged result. At this stage, all parameters (shape, function, phonetics, etc.) were checked again (Fig. 8). Intraoral corrections may be easily performed and do not necessarily require the involvement of a dental technician. Again, the most important impression was the facial environment (Fig. 9). A harmonious relation to the lips and smile line was achieved. An additional check was carried out on a new portray picture with reference lines, showing any corrections that may be taken into account in the final restoration (Fig. 10).

Completion

The working model indicates the scope of restoration work required (Fig. 11). A silicone key was used to evaluate the material options (Fig. 12). To make the right choice we need to have a clear idea of the space available for the restoration. The silicone key allows us to establish the exact amount of space and to decide whether we can utilize translucent materials, retain the shade or even use materials with increased opacity. We opted for the IPS e.max Press ingot MO 0 in this case. The copings were subsequently veneered with the respective IPS e.max Ceram layering materials. From this, it was only a small step to fabricate the final restoration. All parameters were established. The result is the logical consequence of the quality of the preliminary work (Fig. 13).

Fig. 11 The scope of the restoration work is visible on the working model.

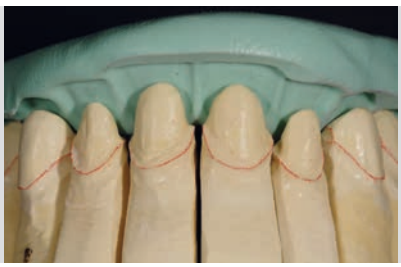

Fig. 12 The silicone key was used to establish which materials may be used for the restoration.

Fig. 13 Completed restoration on the model

Figs 14 to 16 Result of our efforts. The details come together to form a consistent whole and the restoration blends in harmoniously.

To avoid an additional try-in on the patient, the correlation of the wax-up and the temporary was checked by means of the silicone key. In this case, everything went according to plan. We forwarded the all-ceramic single crowns to the practice with a feeling of having done the job well.

The restorations were seated according to the guidelines using a rubber dam. Composite materials are subject to oxygen inhibition, which means that the layer of material which is in contact with air during polymerization does not cure properly. To prevent this effect, all preparation margins were covered with glycerine gel (Liquid Strip). Then, the ceramic restorations were seated in the mouth step by step using Variolink® II.

Figure 14 shows the result. The details come together as a whole to create a harmonious impression and the restoration blends in seamlessly. This is testimony to an all-ceramic restoration that was created with loving attention to detail (Fig. 15). The "miracle" has been accomplished – the patient turned into a "swan" and was elected Miss Russia in 2010 (Fig. 16). Such visible evidence of dental art is part of the most beautiful moments in our professional lives. Sometimes, the miracle continues: in 2011 our patient was crowned Miss Globe. Can you ask for more?

Conclusion

Advanced manufacturing techniques form the basis for all-ceramic restorations. The range of options available allows us to achieve highly esthetic results effectively. The combined skills of the dental technician and dentist enable the creation of tailor-made restorations. The first steps towards an esthetic restoration are taken as early as at the first consultation appointment with the patient and continue with a comprehensive analysis and careful treatment planning. This is a well-established route, which, however, does not mean that there is no room for creativity. Our understanding of the stomatognathic system and our material knowledge complement our creativity and skills.

To go directly to the iPad version:

Scan the QR code with your iPad
or enter the following link:
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This case has also been published in a book titled "Fascination All Ceramics": 250 pages, 1,250 photographs, € 150. Available in German, English, Italian and Spanish. To order a copy, contact: asselmann@teamwork-media.com

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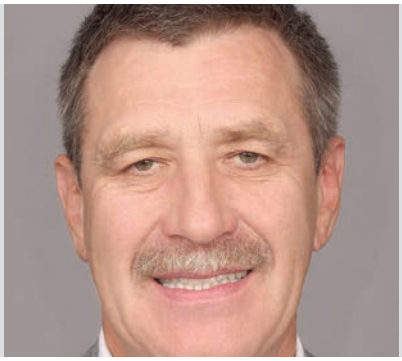
Achieving a synergistic effect

Rehabilitation of an edentulous patient with partially removable, implant-supported zirconium oxide bridges
Sergej Starchiy, Ekaterinburg/Russia

Synergy is a state in which knowledge, technologies and materials work successfully together. Similarly, the skilful combination of different materials and methods may also affect the final result in a particularly fruitful way in dentistry.

The issues involved in the rehabilitation of edentulous patients are usually not limited to the fact that they have no teeth. These patients often face deeper problems, for which there are several reasons. For instance, their articulation may be impaired or they may not be able to chew food properly because they are wearing dentures. Such inconveniences can usually be redressed with the help of implants. The prosthetic reconstruction depends on the location and number of implants. There are as many treatment options as there are limitations: implant-supported bar prostheses, telescopic prostheses, occlusally screw-retrained prostheses – just to mention a few.

The patient's oral care status and age also play an important role in the selection of the treatment option. In this respect, the patient's ability to take appropriate care of the dental prosthesis including the implants and surrounding tissues should be critically assessed. Edentulous patients of a comparatively young age are normally willing to attend regular recalls and take appropriate measures of hygiene to maintain the improvement in oral health gained in the course of the dental treatment. This patient group may be offered advanced esthetic and functional dentures. Improvements in CAD/CAM applications and the resulting extensions of the range of indications have made it possible to offer this type of tooth replacements. Basically, these advances include the possibility of achieving extensive implant-supported superstructures using hypoallergenic zirconium oxide in a high-precision fabrication method. The indications include long-span bridges, which are either cemented to customized abutments and adhesively luted or secured in place with screws. Both options have their advantages and disadvantages.



Figs 1 and 2 Initial situation: 54-year-old patient with gingiva-supported complete dentures

Fig. 3 Diagnostic set-up of implant-supported upper reconstruction

Fig. 4 The upper and lower set-up were duplicated with denture base material and the resulting prototypes were reduced in a targeted fashion.

Fig. 5 The reduced acrylic prototypes were scanned for the CAD/CAM procedure.

Fig. 6 Upper model with zirconium oxide framework. The titanium bases were temporarily placed.

Cemented or adhesively luted dental prostheses are difficult to remove if they need to be adjusted or repaired.

Furthermore, later corrective firings in the ceramic furnace may result in deformations of ceramic-veneered reconstructions. Another issue that needs addressing is the temporary restoration to be provided if repair work is necessary – after all, the entire superstructure has to be removed with only telescopes or bars remaining in the oral cavity. Screw-retained implant superstructures tend to ensure a more accurate and therefore more passive fit to implant platforms. In addition, they can be more easily removed in the case of repairs or adjustments. However, the question as to what remains in the oral cavity and as to how provide a suitable temporary restoration remains.

My own observations and the experiences of my colleagues have shown that the removal and re-insertion of implant-supported dentures have adverse effects on the implants and the mucous membrane. Connective tissue adherent between the implant superstructure and mucous membrane may be damaged or destroyed during removal. For this reason, a sensible approach would be to find a compromise between these two treatment options: dentures that consist of a part that stays in the oral cavity and can be easily provided with a temporary restoration and parts that are subject to wear and can be exchanged.

Patient case

A 54-year-old edentulous male patient presented to our clinic. At the appointment, he was wearing complete resin dentures. However, he did not use his dentures all the time because they were functionally and esthetically inadequate (Figs 1 and 2). As he was the head of a large company and had a great deal of contact with other people, his concern was not to lose his high social status. These considerations were taken into account in the selection of an appropriate treatment.

Twelve NobelReplace implants (Nobel Biocare®), six each in the upper and lower jaw, were inserted to secure the reconstruction. What was special in this case was the fact that we used a partially removable, occlusally screw-retained superstructure with adhesive titanium bases as the mesostructure. The superstructure was to be completed with pink gingival elements and "prepared tooth cores". For this purpose, a diagnostic set-up was fabricated for the upper and lower jaw using the implant models as a basis (Fig. 3). After the set-up had been approved by the practitioner and patient, it was duplicated with denture base material (Fig. 4). Next, the teeth of this acrylic prototype were "prepared" and gingival sections were prepared by reducing the material by a specified amount (Fig. 5). The prototypes were then scanned. The data generated from the scan were used as a basis to produce CAD/CAM zirconium oxide duplicates. Appropriate titanium bases were inserted into these zirconium oxide frameworks (Fig. 6).

Fig. 7 The zirconium oxide frameworks were duplicated on the model to produce a model with detachable segments.

Fig. 8 Single frameworks were waxed up, invested and pressed using IPS e.max Press MO ingots.

Fig. 9 All single-crown frameworks were veneered with IPS e.max Ceram.

Fig. 10 The gingival sections were directly waxed up on the zirconium oxide framework and pressed using pink IPS e.max ZirPress ingots.

Next, the models including the zirconium oxide mesostructures were again duplicated to fabricate models with detachable segments (Fig. 7).

Ceramic-veneered single-crown restorations were planned for the superstructure. Conventional single-tooth frameworks were waxed up (Fig. 8), invested and pressed using IPS e.max® Press MO ingots. Subsequently, the pressed ceramic frameworks were individually veneered using IPS e.max Ceram (Fig. 9). The only exceptions were the single crowns in the region of teeth 13, 35 and 45, as screw access canals were centred at the cores. For this reason, the frameworks for these cores were made of zirconium oxide and veneered with IPS e.max Ceram, which is an inherent material of this system. The decision to use zirconium oxide frameworks was based on the fact that the

Fig. 11 Upper denture and …

Fig. 12 … lower denture with pressed IPS e.max ZirPress gingival sections

Fig. 13 The lithium disilicate crowns were carefully placed.

Figs 14 and 15 The zirconium oxide-based crowns were placed on the mesostructure using holding gel.

Fig. 16 A smiling patient at the end of the treatment

crowns on these frameworks had to be placed with a temporary cement. All the other crowns were bonded to the mesostructure with RelyX U100 (3M Espe). This adhesive resin was the material of choice because these all-ceramic crowns were based on lithium disilicate frameworks. Had they been based on zirconium oxide frameworks, the adhesive effect would have been unpredictable. Before proceeding, the single crowns were placed on the zirconium oxide mesostructure, kept in place with holding gel and then assessed in the articulator for proper functioning. The gingival sections were waxed up directly on the zirconium oxide framework and pressed with pink IPS e.max ZirPress ingots (Figs 10 to 12).

To etch the ceramic-veneered IPS e.max pressed frameworks we used IPS® Ceramic Etching Gel. Next, all those all-ceramic crowns that did not cover a screw access canal were carefully cemented in place in the laboratory (Fig. 13). To take a picture of the final work in the laboratory, the zirconium oxide based crowns were placed on the mesostructure with the help of holding gel (Figs 14 and 15). At the insertion appointment, the practitioner cemented the zirconium oxide crowns in the region of teeth 13, 35 and 45 using a temporary cement.

Conclusion

In my opinion, the reconstruction presented in this report provides a viable treatment method to combine functionality and reparability. If fractures or chippings occur in any of the single crowns, which are the parts of the reconstruction that are subjected to the most stress, they can be easily repaired. The crown can be removed from the mesostructure in the oral cavity and be repaired or replaced in no time at all. If necessary, a temporary restoration can be fabricated chairside, without the need to remove the entire reconstruction, which is no doubt a significant advantage.

The use of an advanced all-ceramic system such as IPS e.max results in a uniform shade effect and outstanding esthetic results. The high fracture strength of the IPS e.max press ceramic in both the coronal and gingival areas ensures the longevity of the restoration. As the individual teeth can be shaped individually, the esthetic and phonetic features can be optimally designed to meet the needs of the individual situation – to the satisfaction of the patient (Fig. 16).

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High tech complete denture prosthetics

Treatment of an edentulous patient with SR Phonares II and IvoBase

Juerg Hengartner, Rueti ZH/Switzerland

The incorporation of complete dentures in the upper and lower jaw is a demanding undertaking for both the patient and the operator.

Even at a ripe old age, patients are becoming very discerning with regard to the esthetics and function of their dentures. The SR Phonares® II teeth and the IvoBase® injection system have opened up new possibilities to meet these demands.

Figs 1 and 2
The starting situation shows the classical features of a denture wearer: short upper lip, teeth that are hardly visible, prognathic position of the lower jaw.

Starting situation

The 71-year-old patient had been wearing a complete denture in the upper jaw for 34 years. This denture was never relined and showed poor fit. Due to overloading of teeth 13 to 23 by the remaining lower front teeth, a flabby ridge had developed. The upper teeth were only visible if the patient smiled very broadly. As the natural front teeth 33 to 43 had been extracted eight months previously, the lower partial denture was provisionally modified into a complete denture.

Since the alveolar process was almost completely resorbed, we began to fabricate the new upper and lower complete denture at the request of the patient (Figs 1 and 2).

If patients are actively involved in all the treatment process and decision-making, they are more likely to accept the completed denture.

Impression-taking

The initial impression was made with alginate. The alginate was mixed to a thicker consistency for the impression in the lower jaw in order to better recreate the floor of the mouth and the mylohyoid line. The patient had to open his mouth wide for a short time, while the impression in the lower jaw was taken. This helped to prevent any overcontouring in the buccal region. In principle, the lower tray may only cover the mylohyoid line by a maximum of 1 to 2 mm. If the muscles on the floor of the mouth raise the tray, the tray should be shortened in the lingual region. In the vestibular region, the tray should rise only slightly when the cheek is pulled.

The second impression was taken with Virtual® Heavy Body and Virtual Light Body. At the time of impression-taking the patient was asked to refrain from making any muscular movements. Proactive movements during impression-taking reduce the expansion of the base. In the upper jaw, the philtrum was pulled downwards with the thumb and index finger in order to reproduce the labial frenulum in silicone. As a result, the cheek fraenum was also placed under moderate tension. For the impression of the lower jaw, the patient was instructed to open his mouth to the fullest extent after the tray had been lightly pressed on. This provided the vestibular margins with a natural delimitation.

Model fabrication

The models were fabricated immediately following impression-taking. Hard stone plaster Type 4 was used to create the models. The plaster was mixed under vacuum. Once the plaster had set, the impression trays were carefully removed. The A line was cut, tapering towards the anterior aspect, with a width of 8 mm on both sides of the median raphe and a depth of up to 0.8 mm on the dorsal side.

Intermaxillary relation

In order to determine the vertical dimension, the old denture was measured. The distance of the incisal papilla to the incisal edge of the central incisors represented a deciding factor in this case. Deviations from the previous dimensions would have disfigured the patient too much and revealed the fact that he is actually wearing dentures. The information gained about the upper anterior teeth was transferred to the new bite pattern and used as a reference.

For bite-taking, the patient was asked to sit in an upright position. The incisal length of the upper wax wall was extended by 2.5 mm. Subsequently, the wax wall was trimmed to the Camper's Plane. In the posterior region, the wax wall was reduced in order to prevent the forward displacement ("proglissement") of the lower denture. For this purpose, the area in which the forward sliding movement could occur was examined with the index finger and the wall was reduced as many times as were necessary until this movement was no longer possible. Then, the lower wax wall end was transferred to the model. When the ridge inclination exceeds 22.5° compared with the Camper's Plane, this type of adjustment is far more accurate than a "stop line". Next, the patient was asked to bite down on the warm soft wax to the vertical markings, without any operator guidance. After the lower pattern had been remodelled (two planes gliding on each other were required),

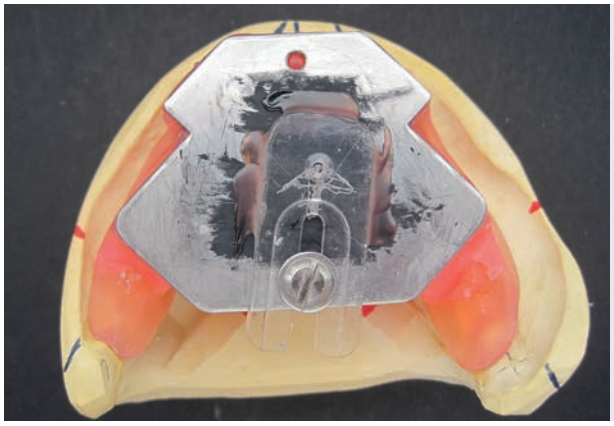

Fig. 3 The centric position is easy to distinguish in the jaw relation record. Apart from the correct occlusal height, this represents the basis for a functional occlusion.

a first speech test was conducted. In this test, an adequately large speaking distance was maintained. Then, the patient was asked to bite down in the centric position. Subsequently, the mid-line of the upper pattern was transferred to the lower pattern. The area of the first premolars was also marked in both patterns. The centric was determined or rather checked and adjusted according to the markings by performing excursions of the lower jaw (repeated movements forwards-and-back, right-and-back, forwards-and-back, left-and-back). In order to ensure the precision of the bite-taking, interocclusal records were produced on the basis of the previously described bite patterns. In a further appointment, the prosthodontist produced a maxillomandibular relationship record (Fig. 3).

Selection of tooth shape and shade

The tooth shade was determined with the help of the SR Phonares II shade guide. The shade range includes 16 A-D shades and four Bleach shades. The shade was selected in daylight with indirect sunlight. In many cases, patients who are fitted with new dentures ask for lighter teeth than in their old dentures. They forget the fact that natural teeth become darker as they grow older. As a result, the old denture should be used as a reference in most cases and the new shade should not deviate too much from that of the previous teeth.

The selection of the tooth mould should also be based on the old denture. Since the SR Phonares II range comprises 18 upper and six lower tooth moulds, it satisfies a wide spectrum of requirements. Furthermore, a broad range of tooth moulds that are adjusted to the different ages of the patients as well as soft and bold versions are available. The posterior teeth for both the upper and lower dentitions come in three different large normal shapes and three large lingualized shapes. In the case described, I chose S72 for the anterior teeth and Typ NU5/NL5 for the posterior teeth.

Dental cast analysis

The alveolar ridge line plays a prominent part in the dental cast analysis. The fossa of the lower posterior teeth and the large palatal cusps of the upper posterior teeth should not exceed this ridge line on the buccal aspect. The number of posterior teeth in the posterior region is restricted in accordance with the findings from the first bite-taking ("proglissement region").

Figs 4 and 5 The results from the dental cast analysis are drawn on the working models. The bite pattern is removed piece by piece and replaced with the functional SR Phonares II teeth.

Fig. 6 Due to the specific interproximal design of the Phonares teeth, a natural-looking esthetic embrasure is easy to achieve.

Fig. 7 The denture was completed in steps. After the upper front teeth, including the first premolars, were set up, the posterior teeth in the lower jaw and in the upper jaw were placed. The lower front teeth were set up last.

Fig. 8 The central fossae of the posterior mandibular teeth were positioned within the ridge line. The red marking ("proglissement") must not be transcended under any circumstances during the set-up.

Set-up in the Stratos 200

The teeth were set up on the basis of the bite patterns. The wax wall was removed piece by piece and the corresponding teeth were placed (Figs 4 to 6). For some of the front teeth, the axis and length of the previous denture were maintained. SR Phonares II and SR Phonares II Typ teeth were used. These denture teeth, which are made of nano-hybrid composite resin (combination of nano-composite surface and PMMA core), are extremely tough and wear resistant. The teeth are highly esthetic due to their unique surface texture and the harmonious blend of translucency, opalescence and fluorescence.

The denture was set up as usual: upper left or right central incisor. For the alignment, the respective lower central incisor was set up and then removed again. Generally, the tooth axis points towards the opposite vestibule. In any case, the teeth should be positioned in the neutral zone between the tongue and the lips. Subsequently, the remaining upper front teeth, including the first premolars, were set up according to esthetic principles. Then, the lower premolars and the molars were positioned with the help of the template. At this stage, it was important to make sure that the central fossa did not run along the buccal side of the ridge line. Furthermore, the mentioned forward displacement line ("proglissement line") should not be transcended under any circumstances. This would inevitably lead to a forward sliding movement of the lower denture and cause the anterior alveolar process to atrophy. Next, the upper premolars and molars were placed. The lower front teeth were set up last (Figs 7 and 8). This approach allows the lower anterior dentition to be completed as needed. Due to space constraints, for example, fewer lower incisors may be necessary in some cases. The area between the upper

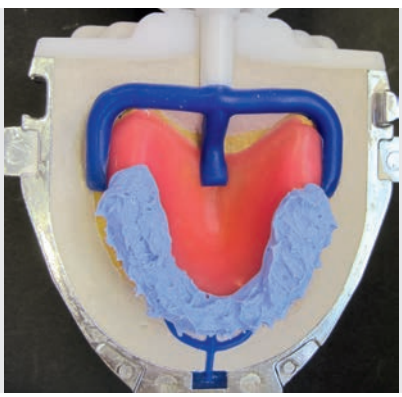

Fig. 9
The wax-up is prepared for further processing in the IvoBase Injector. The blue ready-for-use parts serve as place holders during the injection process.

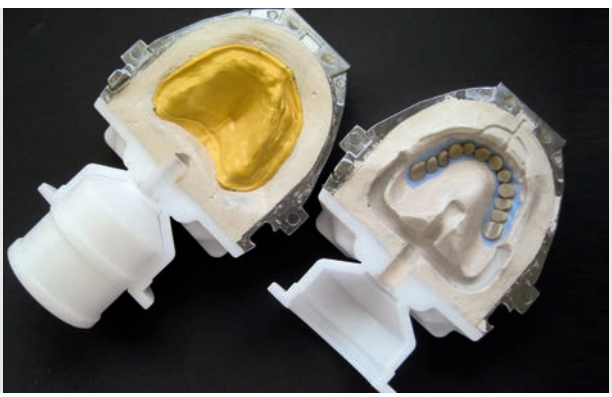

Fig. 10
The prepared flask halves

Figs 11 and 12
The natural-looking restoration blends in smoothly with the overall appearance of the patient. No one would suspect that the teeth are actually dentures.

canines and the premolars is important for making the sibilant sounds. In order to produce these sounds, the tongue has to touch this area to form a "wind tunnel". Until optimal hissing sounds can be produced, the tongue can be supported by adding or removing wax in this area.

Try-in

When the wax-up was tried in, all the important factors were checked: i.e. the smile line, face midline and agreement of the canine positions with the wings of the nose. Furthermore, a speech test was carried out at an adequate articulation distance and naturally the statics of the chewing surfaces and the canines were analyzed. The patient was asked to count backwards from 66. This exercise is more effective than having the patient produce sentences and words. Since counting is an almost unconscious process, patients do not have to concentrate on what they are actually saying. As a result, sibilant sounds and articulation can be more accurately assessed. The midline of the face has to be determined very carefully, since no face is completely symmetrical. In many cases, the nose, philtrum, incisal papilla and the chin centre are far from being aligned. Furthermore, the position of the central incisors in the old denture should be examined very carefully and any shortcomings should be redressed in the new denture during the try-in.

Completion

In the case presented, the adjusted wax-up was then used to create the denture base with the new IvoBase Hybrid material and the advanced software-driven IvoBase Injector. This trend-setting system combines well-known manufacturing know-how with convenient injection technology. The flask with the cartridge containing the denture base material was placed in the injector and the RMR key and the start key were activated. The RMR function reduces the residual monomer to 0.7%. The injection process does not require any further monitoring.

After the program has come to an end, the flask can either be left in the unit over night or immediately removed and cooled in water for at least 15 minutes. Then the denture base is ready for the next working step. As the innovative resin is pressed into the flask at 15 bar, an unrivalled homogeneous surface is produced. The sensor-controlled flask clamps prevent the occurrence of raised bites. Nonetheless, the injection sprues and aeration channels to the filter (Figs 9 and 10) take some familiarization. Moreover, the fact that a new cartridge needs to be used for every press cycle is new. However, after several injection cycles, one becomes accustomed to these changes and one would not want to do without the system.

The IvoBase Hybrid denture base material is easy to process and polish. Nevertheless, sophisticated modelling of the gingiva should be avoided. One should also rely on nature as the model in this area. All margins, rough spots and sharp edges are removed from the denture base. In addition, it is important to ensure that the tongue is kept away from the chewing surfaces of the lower posterior teeth. For this purpose, the transition between the lingual tooth surface and the chewing surface has to be rounded correspondingly.

Insertion and recall

When the dentures were placed, only small adjustments were required. Slight pressure points usually become imperceptible after five minutes. If they are removed immediately, the denture base is usually changed unnecessarily. Adequate space must be provided for the frenulum labii and the cheek fraenum and all the edges should be rounded. Real pressure points usually become noticeable after about one or two days. It is advisable to offer patients a recall appointment during this time.

Conclusion

Outstanding results have been obtained with SR Phonares II and IvoBase and a profound knowledge of complete denture prosthetics (Figs 11 and 12). Implant-supported restorations may be fabricated with IvoBase High Impact. As a result of the various innovations, the IvoBase Injector is now easier to operate, the SR Phonares II teeth are easier to set up and the dentures have become easier to finish.

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