

DENTAL VISIONIST



Successful implementation of restoration concepts!

Treatment protocol, dental technology and new materials harmonize together!



The prosthetic implant restoration concept

Dr. Andreas Kurbad explains the protocol for the best red-white esthetic.

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Achieve the best results with veneering composite

Master Dental Technician Urszula Mlynarska demonstrates the most important steps for natural results.

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Perfection at the highest level!

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SIMULTANEOUS
DENTAL MILLING
CHAMPION



**Zfx milled
VITA ENAMIC
crown**



**Individual
Zfx Abutment**



**ZimmerBiomet
Implant**

**An overall system consisting of implants (Zimmer Biomet),
Zfx abutments and VITA ENAMIC hybrid ceramics**

Thanks to the cooperation between Zimmer Biomet, Zfx Dental and VITA Zahnfabrik, dental technicians are able to produce abutment crowns that fulfill the latest requirements of modern implant prosthetics. Full anatomic abutments for single tooth implants that are customized on the individual patient can thus be produced. This procedure enables a comfortable and cost-efficient process that is highly interesting for the daily workflow.

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Editorial

Successfully implement sustainable restoration concepts!



Whether it is shade communication between the practice and the laboratory, using new materials for complex cases or modern technologies, it is important to keep the entire supply concept in mind and to ideally coordinate all sub-steps in a situation-specific and indication-related manner.

In which cases can the strengths of hybrid ceramics be used in a particularly profitable manner? How does the restoration have to be conditioned for a reliable bond between the luting composite and hybrid ceramic? How can I optimally shape the gingiva with an implant restoration? How can different materials be combined with each other in digital fabrication processes?

In this edition of DENTAL VISIONIST, we share the latest insights and everyday practical tips that will help you to successfully implement restoration concepts.

Stay curious!
Have fun reading.

Angeley Eckardt
Managing Editor



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PUBLICATION DETAILS

Publisher

VITA Zahnfabrik H. Rauter GmbH & Co. KG
Spitalgasse 3 | 79713 Bad Säckingen

Editorial Production/Design/Layout

qu-int. marken | medien | kommunikation
Waldkircher Straße 12 | 79106 Freiburg

Managing Editor

Angeley Eckardt
qu-int. brands | media | communication
Waldkircher Straße 12 | 79106 Freiburg

Publication: three issues per year

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INFORMATION

The testimonials by dentists and dental technicians published in this magazine are based on practical experience with the specified VITA materials gained during the course of processing, and/or on manufacturer information based on the data provided in the technical and scientific documentation (VITA Zahnfabrik, Bad Säckingen, Germany; download from www.vita-zahnfabrik.com). The testimonies from the dentists and dental technicians named reflect the status of the report authorization of 08/2016. The testimonials by developers or technical marketing published in this magazine are based on individual and/or internal studies conducted by VITA R&D (VITA Zahnfabrik, Bad Säckingen, Germany) and/or on the results of pilot testing.

For best results: Digital shade communication between practice and laboratory



A prerequisite for accurate shade reproduction is the precise and efficient transfer of relevant tooth shade information from the dentist to the dental technician. Digital communication with software and app solutions such as VITA ShadeAssist and VITA mobileAssist (VITA Zahnfabrik, Bad Säckingen, Germany) enables the transmission of acquired measurement data and patient photos in seconds. For example, the practice can send information via Bluetooth from a tablet, directly from the treatment unit to the technical workplace. Dr. Philipp Grohmann (Berikon, Switzerland) reports in an interview how he successfully implements this technology in routine clinical practice.



*Dr. Philipp Grohmann, Dentist
Berikon, Switzerland*

DV: What devices and systems do you use to efficiently exchange tooth shade information between yourself and the laboratory?

Dr. Philipp Grohmann: In addition to the VITA shade scales, I use the VITA Easyshade V digital shade measuring device and the associated VITA mobileAssist app.

DV: In your opinion, what measurement results and additional information are important for a technician to reproduce the tooth shade precisely?

Dr. Philipp Grohmann: Instead of a mere number like A3, the practice would ideally provide the associated Delta E value, the specific LCH (Lightness Chroma Hue) values, and intraoral photos.

2M3



4,1



Fig. 1 After an accident, the teeth in region 11 through 13 were devitalized and were scheduled to be restored with veneers. Since tooth stumps 11 and 12 were too gray, they were first pretreated with internal bleaching.



Fig. 2 Bleaching produced an adjusted stump shade. This is just as important for the dental technician as the shade of the neighboring tooth and can also be transmitted with the app or by email.



Fig. 3 The end result after fixation. The veneers were manufactured by Dental Technician Alex Keller (Schönenberger Dentaltechnik, Glattbrugg, Switzerland). The shade measuring device and the communication app were a valuable aid in this case.

"Achieving predictable results with digital shade communication."

DV: What process do you use to transmit digital tooth shade information from the practice to the laboratory?

Dr. Philipp Grohmann: In most cases, the laboratory receives intraoral photos and the tooth shade information determined with VITA Easyshade V via app by email. This provides the dental technician with a very good working foundation.

DV: What prior knowledge is required to successfully use the VITA software and app solutions in daily clinical and laboratory practice?

Dr. Philipp Grohmann: Naturally, it is helpful if you already know how to use certain programs on a tablet or similar device. But no special computer knowledge is required. The software is self-explanatory.

DV: How do you and your team benefit from using the new technologies for digital shade determination and communication?

Dr. Philipp Grohmann: The entire practice team was trained in a standardized workflow with the shade measuring device and app so that shade determination and communication take place very efficiently, objectively, and clearly. The unambiguous transmission of all information to the laboratory ensures predictable results in shade reproduction. The digital data can also be used for patient discussions, and it can be easily archived. This makes it simple to follow up on particular work steps. The use of the new technology is beneficial, particularly when the dental technician cannot be personally present for the shade selection.



Composite or ceramic?

A systematic classification of indirect tooth shade materials



*Dr. Sebastian Horvath, Dentist,
Jestetten, Germany*

Indirect, tooth-colored ceramic materials such as feldspar and glass ceramics have now become established as standard for CAD/CAM-fabricated restorations. The range of CAD/CAM materials has expanded tremendously in recent years. Apart from traditional ceramics, dentists can now also use hybrid ceramics or highly filled composites for definitive prosthetic restorations. In this article, Dr. Sebastian Horvath (Jestetten, Germany) discusses the systematic classification of traditional and new tooth-shaded CAD/CAM materials.

What distinguishes hybrid ceramics from traditional composite?

Ceramics are inorganic mineral materials that are molecularly structured and feature covalent/ionic bonds. They are usually characterized by high mechanical bending strength. However, when force is applied, traditional ceramics react with a brittle behavior and are prone to cracking. Composites are multi-phase materials. They consist of a resin matrix in which mostly ceramic filling material is embedded in order to improve the mechanical properties.

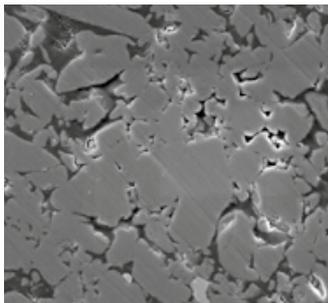


Fig. 1a Polished surface of VITA ENAMIC hybrid ceramic material.

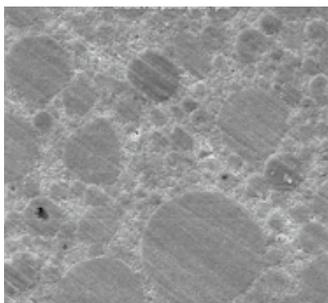


Fig. 1b Polished surface of CAD/CAM composite material.

Source Fig. 1a-b: SEM images of polished material samples, VITA R&D, 5,000-fold magnification, created with a scanning electron microscope EVO MA 10 by Zeiss, 08/16

What are typical representatives within the respective material classes today?

Everything started in 1985 with VITABLOCS feldspar ceramics. This was followed by reinforced glass ceramics, including lithium disilicate, and the hybrid ceramic VITA ENAMIC, which has been available since 2013. Recently more composites and high-performance polymers are becoming available, such as GC CERASMART, for CAD/CAM use on the market.

How is hybrid ceramic different from traditional composite?

The hybrid ceramic is a fundamentally new combination of ceramic and polymer. The ceramic provides for mechanical stability, the polymer for elasticity. In composites, ceramic fillers are embedded in a polymer network. The hybrid ceramic, in contrast, has a ceramic network infiltrated with polymer. It contains a high percentage of ceramic (approx. 86% by weight), which contributes to the high durability of the material.

What advantages can be expected from the new hybrid ceramic for a clinic?

Thanks to the high load capacity and elasticity, hybrid ceramics exhibit a high absorption potential in relation to chewing forces. VITA ENAMIC is significantly less brittle than pure ceramics and has similar mechanical properties as dentin. This leads to a uniform distribution of stress. If any cracks are formed, the cracks are deflected or stopped at the polymer-ceramic interfaces. The elasticity of the material allows the CAD/CAM process to have thin yet precise restoration edges.

How are ceramics, hybrid ceramics, and composites fixed?

Due to the ceramic structure, hybrid ceramics such as feldspar ceramic are pretreated by etching with hydrofluoric acid and silanization. Studies show very good adhesion values. According to current data, CAD/CAM composite materials should be corundum blasted and silanized prior to cementation, which results in comparatively lower adhesion values according to laboratory tests.

What is the decisive practical advantage of VITA ENAMIC?

The original goal of accomplishing esthetic and long-lasting single-tooth restorations using the CEREC process with just only one session, is revitalized with hybrid ceramics because no crystallization firing is necessary with this material. For this reason, I use the material for standard single tooth restorations in the posterior area.

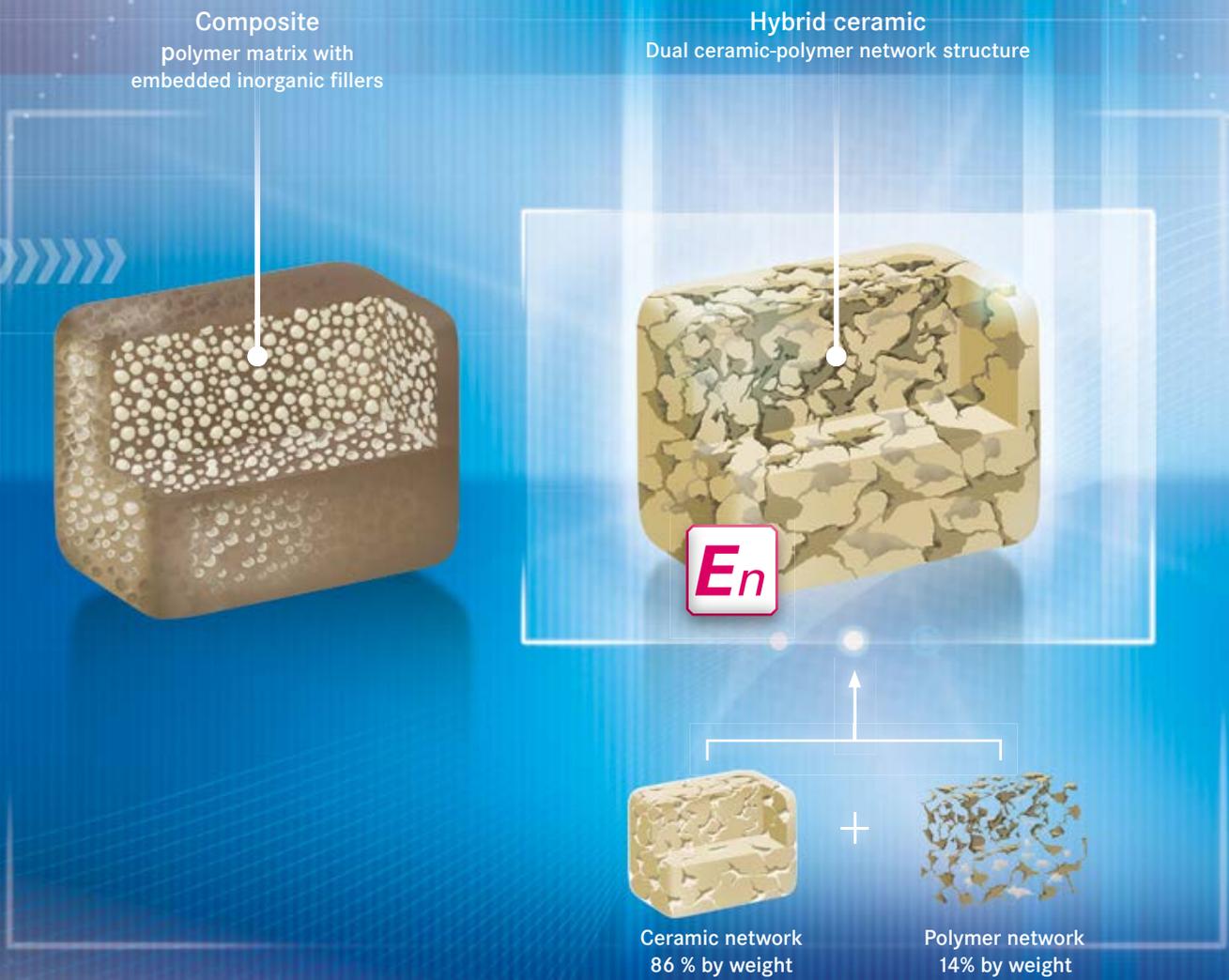


Photo documentation of inlay restoration of VITA ENAMIC hybrid ceramic



Fig. 1 Insufficient amalgam filling in tooth 16.



Fig. 2 Condition of tooth 16 after excavation, dissection, and adhesive build-up filling.

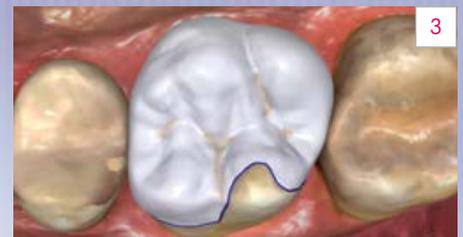


Fig. 3 The virtual partial crown created with the CEREC software.



Fig. 4 Final polishing with the VITA ENAMIC high brilliance polisher.



Fig. 5 Finished restoration before adhesive fixation.



Fig. 6 Final adhesive-cemented VITA ENAMIC crown in situ.

Source: Dr. Sebastian Horvath, Jestetten, Germany

Clinical research on VITA ENAMIC IS: A first case report

In a clinical study, the University of Geneva investigates the performance and durability of screwed implant-supported crowns made of hybrid ceramics (VITA ENAMIC IS, VITA Zahnfabrik, Bad Säckingen, Germany), lithium disilicate (IPS e.max CAD, Ivoclar® Vivadent, Schaan, Liechtenstein), and metal ceramics. In this interview, Prof. Dr. Irena Sailer (Clinic for Prosthetics and Biomaterials, Dental Clinic, University of Geneva, Switzerland) reports on her initial clinical experience with the new VITA IMPLANT SOLUTIONS (IS) blanks.



*Prof. Dr. Irena Sailer, Dentist
Geneva, Switzerland*

DV: Are comparatively elastic restorative materials, such as VITA ENAMIC IS, expected to produce clinical advantages in implant-supported restorations?

Prof. Dr. Irena Sailer: Because these materials have some flexibility, a lower chipping rate is expected than with conventional ceramics. In addition, it can be expected that the restorations will feel "softer" to the patients. These people actually report a very pleasant wearing comfort.

DV: In your study, biological parameters such as bleeding indices and plaque deposits, among other things, are determined. What have been the first insights on these parameters with VITA ENAMIC IS?

Prof. Dr. Irena Sailer: It's entirely too early for very concrete statements. Up to now, however, no abnormalities have been observed. How much surface wear and tear there is after a few years of wear, and to what extent the pH value changes, etc., remains to be seen. All of this may change the indices.

DV: The fracture and complication rate is often comparatively high in implant prosthetics. What kind of clinical stability does VITA ENAMIC IS show with regard to recall?

Prof. Dr. Irena Sailer: The earliest we will have any significant results is at the 1-year mark. Up to now, however, we have not observed anything noticeable. No cementing losses have occurred, for example.

DV: What should dentists and dental technicians pay particular attention to when installing and processing VITA ENAMIC IS for the fabrication of implant crowns?

Prof. Dr. Irena Sailer: In general, it is important for this indication to create a correct emergence profile for the CAD (Computer Aided Design). In regard to material, special care must be taken to prepare very carefully for bonding with the titanium adhesive base or the abutment assembly and to follow the manufacturer's instructions precisely.

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"With VITA ENAMIC, a lower chipping rate is expected than with conventional ceramics."



Fig. 1 Example: Abutment crown made of VITA ENAMIC IS.

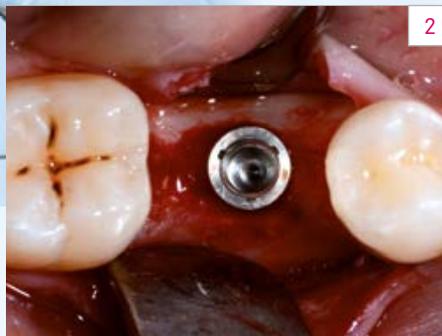


Fig. 2 We planned the restoration of the implants with a directly screwed crown of hybrid ceramic.



Fig. 3 For the CAD/CAM fabrication, it was necessary to digitalize the situation with scan posts.

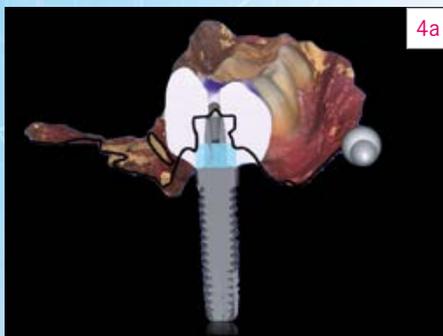


Fig. 4 The implant crown was constructed virtually...



Fig. 4b ...and the milling preview prior to the CAM process.



Fig. 5 The crown of VITA ENAMIC has already been screwed on, and the screw channel must still be sealed.

INFORMATION: WHAT ARE VITA IMPLANT SOLUTIONS (IS)?

VITA IMPLANT SOLUTIONS (IS) are blanks which have an integrated interface to an adhesive/titanium base (e.g., TiBase) and are used for the CAD/CAM fabrication of implant-supported dental restorations. VITA IMPLANT SOLUTIONS are available in three variants: VITA CAD-Temp IS composite blanks for temporary restoration and shaping of the emergence profile, as well as VITA ENAMIC IS hybrid ceramic and VITA SUPRINITY IS glass ceramic for the fabrication of the final superstructures.

The blanks are suitable for the CAD/CAM fabrication of mesostructures (two-element solution) and/or abutment crowns (single-element solution) for tooth-colored implant-supported superstructures.

VITA IMPLANT SOLUTIONS are compatible with the implant systems of many manufacturers (e.g., Nobel Biocare, Straumann, Biomet 3i, Dentsply, and many more) via the integrated interface for the adhesive/titanium base (TiBase, Sirona Dental, Bensheim, Germany).



To achieve the best bond strength – what should be taken into consideration?



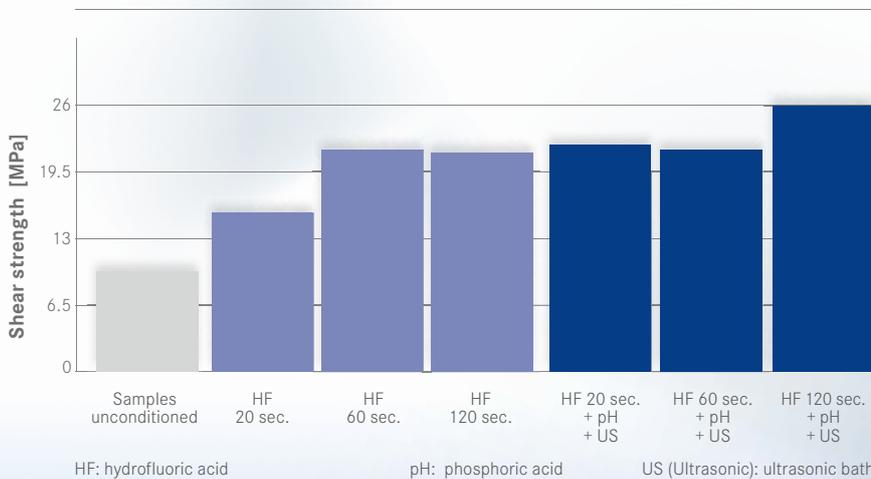
Prof. Dr. Markus B. Blatz, Dentist (left) Philadelphia, USA
 Dr. Julián Conejo, Dentist (right) Philadelphia, USA

The restoration must be conditioned for a reliable adhesive bond between the luting composite and the hybrid ceramic.

Dr. Julián Conejo (University of Pennsylvania, School of Dental Medicine, Philadelphia, USA) investigates, in a current in-vitro study under the leadership of Prof. Dr. Markus B. Blatz, how different conditioning types/protocols may influence the bond strength to the hybrid ceramic VITA ENAMIC (VITA Zahnfabrik, Bad Säckingen, Germany). In the following interview, he reports his scientific results.

DV: Please explain the study method and what parameters were modified in the conditioning and pretreatment of the hybrid ceramic?

Dr. Julián Conejo: 70 test specimens of the hybrid ceramic VITA ENAMIC were etched for 20, 60, or 120 seconds with 5% hydrofluoric acid. The etched surfaces were cleaned with either phosphoric acid or in an ultrasound bath. For the study, including the control group with no pretreatment, seven different subgroups were formed. After the application of the bonding agent and the composite application, the test specimens were stored in distilled water. The final shear strength was determined and the data was statistically evaluated.



DV: Based on your discoveries, how important is the etching with 5% hydrofluoric acid for a reliable adhesive bond of the luting composite to the ceramic restoration?

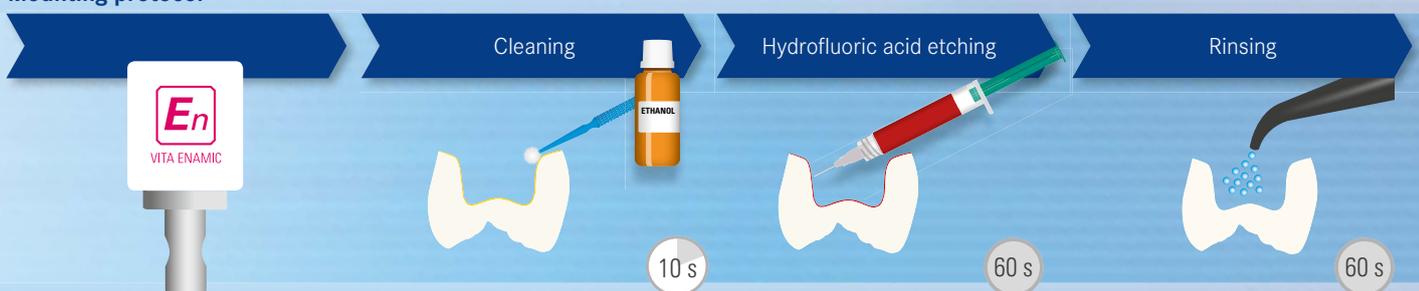
Dr. Julián Conejo: It is very important to apply hydrofluoric acid to create a roughened surface for a good micromechanical retention. All etched sample specimens showed a significant increase in bonding strength to the luting composite. In order to ensure a sustained clinical success of the restoration, hydrofluoric acid is a critical process step for the treatment provider.

Graph: Shear bond strength of Bifix QM luting composite (VOCO GmbH) to VITA ENAMIC (VITA Zahnfabrik) after pretreatment of VITA ENAMIC with different conditioning types/protocols.

Source: Research Report of the University of Pennsylvania, Dr. Julián Conejo, School of Dental Medicine, Philadelphia, USA, 02/2016

DV: How can the exposure time to the hydrofluoric acid affect the bonding strength of the luting composite to VITA ENAMIC?

Mounting protocol



Dr. Julián Conejo: Different etching patterns on the test specimens were generated with different exposure times to the hydrofluoric acid. In our study, a short etching time of 20 seconds resulted in significantly lower adhesion values. The adhesive force increases with longer etching times. However, there was no difference for etching times between 60 and 120 seconds.

DV: How important is it to carefully observe the manufacturer's conditioning protocol when applying hydrofluoric acid and bonding agents?

Dr. Julián Conejo: That is very important. Our results show that the current surface conditioning recommended by VITA Zahnfabrik enables the greatest adhesion and is also the simplest. According to the instructions for use, hybrid ceramics should be etched for 60 seconds and then the silane bonding agent (primer) massaged in for 60 seconds.

DV: According to your experience, can the treatment provider have a positive influence on the adhesive bond with further or additional steps?

Dr. Julián Conejo: Not really. That was one of our hypotheses. Now we know that additional cleaning steps after the etching with hydrofluoric acid does not produce any significantly higher values. Neither the additional surface treatment with phosphoric

acid nor the ultrasonic bath has improved the adhesive strength values compared to the hydrofluoric acid etching. For a reliable bond, a clean, pre-treated surface of the restoration is always important after the try-in.

DV: Besides the conditioning of the restoration, what is important in the pretreatment of the tooth substance in order to achieve a good adhesive bond?

Dr. Julián Conejo: Isolation with a rubber dam allows absolute dryness and a clean working field. The surface of the dissection should also be conditioned with an adhesive system prior to attachment. This in turn makes a perfect connection between the hard tooth substance and the luting composite possible.

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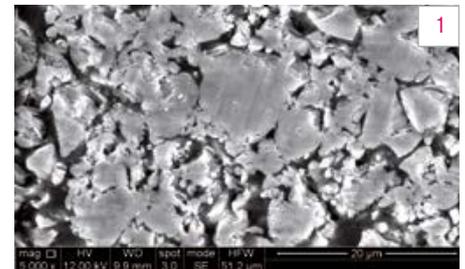


Fig. 1 Control group: unetched hybrid ceramic surface

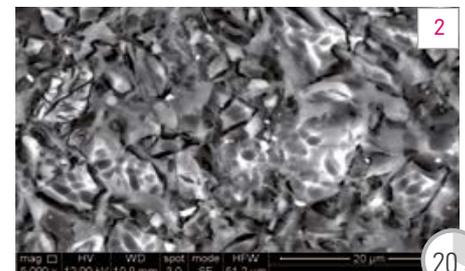


Fig. 2 Hybrid ceramic surface after hydrofluoric acid etching for 20 seconds

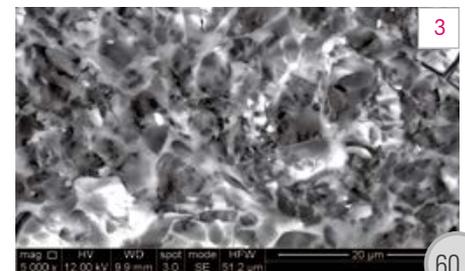


Fig. 3 Hybrid ceramic surface after hydrofluoric acid etching for 60 seconds

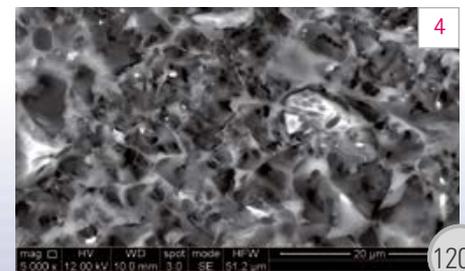


Fig. 4 Hybrid ceramic surface after hydrofluoric acid etching for 120 seconds

Source: SEM images of VITA ENAMIC material samples, Dr. Julián Conejo, School of Dental Medicine, Philadelphia, USA, 02/2016





VITA IMPLANT SOLUTIONS: The implant prosthetic restoration concept

For implant prosthetic crown reconstructions with VITA IMPLANT SOLUTIONS (IS) blanks (VITA Zahnfabrik, Bad Säckingen, Germany), there is a 3-step restoration concept. It begins with the implantation and leads to the final ceramic reconstruction via the temporary restoration for the optimization of the emergence profile. All blanks have an integrated interface to a titanium/adhesive base (e.g., Sirona TiBase, Bensheim, Germany) and enable an efficient restoration. Dr. Andreas Kurbad (Viersen-Dülken, Germany) explains the individual steps in a case report.



→ FINDING Status after root tip resection 36.



→ FINAL RESULT



Dr. Andreas Kurbad, Dentist
Viersen-Dülken, Germany

1. The patient case

20 years after the endodontic treatment of tooth 46, a 39-year-old patient had recurrent acute complaints. Mesial and distal periapical brightening in the X-ray showed evidence of bone resorption. After a root tip resection did not result in the desired therapeutic success,

the tooth should be extracted in a manner that protects the bone. Because of the intact bone below the resection area, the gap was to be provided with an immediate guided implantation.

STEP 1 Implantation

STEP 2 Temporary superstructure

STEP 3 Final superstructure

VITA IMPLANT SOLUTIONS



Implant

What?

- > Temporary abutment crown (AC)

What for?

- > For healing phase / creation of chewing function
- > For design / optimization of emergence profile

With what?



What?

- > Single-element solution final abutment crown (AC)
- > Two-element solution final mesostructure (MS)

What for?

- > For posterior superstructure: AC type
- > For anterior superstructure: MS type + crown

With what?





Fig. 2 Virtual implantation enables a guided drilling protocol.



Fig. 3 Status post implantation region 36.



Fig. 7 The temporary abutment crown stabilizes and shapes the emergence profile.



Fig. 8 Optimally shaped and inflammation-free soft tissue.

Shaping and preserving the gingival structures for the best red-white esthetics.

2. Prosthetic planning

The entire dentition was initially scanned with the CEREC Omnicam, and the crown was then designed and functionally optimized with the CEREC software V 4.4 (Sirona Dental, Bensheim, Germany). A plaster model etched for 46 was used to create an X-ray template. After a bone-protecting extraction, a DVT was created with the X-ray template used. The intraoral scan with crown planning was imported into the image data and virtually implanted with the Galaxis software (Sirona Dental, Bensheim, Germany). The data was used to grind an insert that converted the X-ray template into a drill template through perfect fitting.

3. Gingival shaping

The drilling template made possible a positionally stable implantation with optimal use of the bone. Digital forming was performed with a scan post screwed on. A temporary abutment crown made of VITA CAD-Temp IS could be virtually designed to the exact implant position. The focus was on the formation and maintenance of the gingival structures. Occlusal and approximal interferences were still consistently avoided here for the sake of undisturbed healing. The blank was ground while keeping the interface in mind. After completion, the completed crown was adhesively fixed and integrated on the titanium base.



VITA CAD-Temp IS blank for the gingival shaping



Fig. 4 Post-operative screwed-on scan body for the digital determination of the implant position.



Fig. 5 The virtual design of the emergence profile stabilizes and shapes the gingival structures.

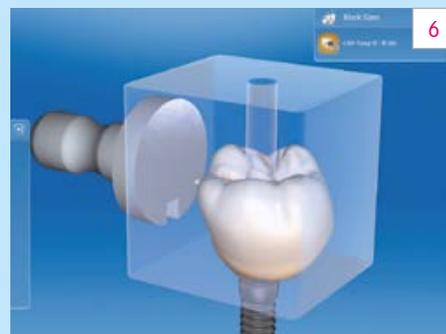


Fig. 6 Virtual position of the abutment crown in the VITA CAD-Temp IS blank.



Fig. 9 Final abutment crown with occlusal and approximal contacts.



Fig. 10 Characterization of the ground restoration with VITA ENAMIC STAINS.



Fig. 11 Closure of the screw channel of abutment crown 36 with composite.

4. Final restoration

An ideal gingival emergence profile appeared after four months of the healing phase. The missing cement joint of the abutment crown contributed to the absence of inflammation. After a new scan, the final abutment crown could be fabricated from "VITA ENAMIC IS". The dentine-like modulus of elasticity of the hybrid ceramic allows for the absorption of the chewing force, providing long-term relief of the bony structures around the implant. After elaboration and individualization, the restoration is harmoniously integrated into the gingival structures and residual dentition. Immediate implantation and VITA IMPLANT SOLUTIONS (IS) have enabled an efficient treatment protocol.

Report 08/16



Fig. 12 Red and white harmony following the integration of 36.

Partially veneered, implant-supported bridge of VITA YZ HT



*Vincent Fehmer,
Master Dental Technician
Geneva, Switzerland*

Complex, implant-supported whole-jaw restorations are a particular challenge for dentists and dental technicians. In the current case, a vestibularly partially veneered bridge restoration was made for the edentulous upper jaw from the highly translucent zirconia VITA YZ HT and the veneering ceramic VITA VM 9 (both VITA Zahnfabrik, Bad Säckingen, Germany) and screwed to six implants. Vincent Fehmer, Master Dental Technician (Geneva, Switzerland), explains the fabrication of the restoration step-by-step, which was created in collaboration with the dentist, Dr. Eric van Dooren.



*Creating the foundation for
highly esthetic results using
VITA YZ HT SHADE LIQUIDS.*

A functional and optical contribution to the quality of life of patients: A restoration that makes a noticeable and visible difference.



➔ **INITIAL SITUATION** Functional and esthetic deficits of the old restoration.



➔ **RESULT** Highly esthetic veneering of the vestibular framework portions.

1. Initial situation

A 72-year-old patient presented with insufficient total prostheses in the upper and lower jaw. For esthetic and functional reasons, he desired new, secure restorations. Six implants were inserted into the upper and lower jaw bones as prosthetic pillars. The lower jaw could be rehabilitated with a screwed-in resin restoration. The opposing jaw was now to be supplied with a highly esthetic, partially veneered zirconia bridge.

INFORMATION: WHAT IS VITA YZ HT?

VITA YZ HT is a highly translucent zirconia that is particularly suited to monolithic restorations due to its immense strength (approx. 1,200 MPa) and effective light-transmitting properties. The material is a cost-effective and esthetic alternative to non-precious metal and partially veneered metal ceramics. Practices and laboratories benefit with VITA YZ HT due to precise results thanks to high edge stability and precision-fit sintering. This includes excellent potential thanks to high translucency.





Fig. 2 An initial setup provided for the necessary prosthetic orientation.

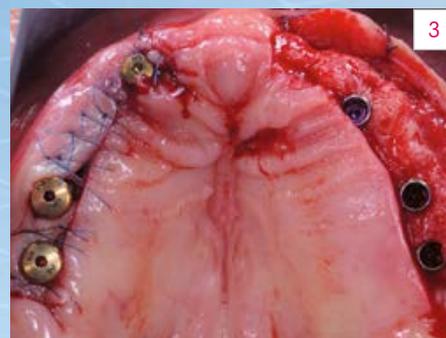


Fig. 3 The six inserted implants in the upper jaw.



Fig. 6 Vestibular view of the virtual framework planning.



Fig. 7 Old types made from opaque zirconia with greatly reduced framework.



Fig. 10 Prestained VITA YZ HT framework after sintering.



Fig. 11 Veneering of the tooth facettes with BASE DENTINE A2 and A3.

2. Planning and design

An initial setup with an idealized tooth arrangement was fixed by means of a silicone key and provided the required prosthetic orientation during the course of treatment. After scanning the maxillary mandibular setup, a trial milling of temporary resin intraorally revealed the occlusal relations to the integrated mandible. After the bite registration, the functional contacts only had to be reinforced by wax-up in the molar area. The optimized arch was scanned and served as the basis for computer-aided design with the inLab software 15.1 (Sirona Dental, Bensheim, Germany).

3. CAM fabrication and veneering

"Previously, frameworks made of opaque zirconia had to be completely veneered in order to achieve an esthetic restoration. Today, the highly translucent zirconia VITA YZ HT, in combination with the staining fluids VITA YZ HT SHADE LIQUID, allows me to create a 'fully anatomical' milled bridge restoration in 80% to 90% of cases," explains Vincent Fehmer. Only a minimal vestibular veneering with VITA VM 9 should be necessary for a true-to-nature color and light play. The functional advantage: "Thanks to the thin veneering layers, the chipping risk is automatically reduced."

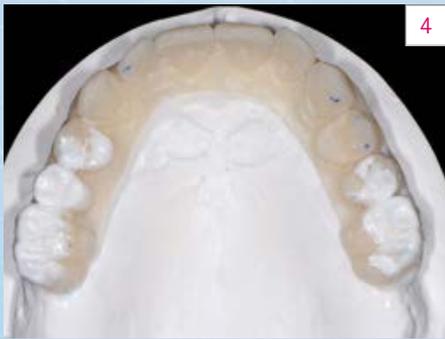


Fig. 4 Fitting and correction of the sample milling before final implementation.



Fig. 5 Computer aided design of the upper jaw framework.



Fig. 8 New, anatomically preformed variant of highly translucent zirconia.



Fig. 9 Staining of shade gradients in tooth and gum areas.



Fig. 12 Final layering with veneer (ENL, E01) and gingiva materials (G3).



For a true-to-nature color and light play, a minimal veneering with VITA VM 9 was only necessary for the vestibular area in this case!

4. Integration and conclusion

The completed bridge construction was screwed into the upper jaw, and the screw channels were sealed with composite. The anatomically minimized substructure made of highly translucent zirconia facilitated fast and esthetic fabrication. The upper and lower jaws harmonized with each other despite the different materials. The patient was delighted with his new, securely-positioned restoration, and along with the dental technicians and the treatment provider, was completely satisfied with the result.

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Fig. 13 Highly esthetic veneering of the vestibular framework portions.



Fig. 14 Results that let you smile again.

ZIRCONIA	
Sand blasting:	Aluminum oxide
Application of bonding agent:	MDP primer
Bonding:	Adhesive/conventional

FELDSPAR CERAMICS	
Etching:	Hydrofluoric acid etching
Application of bonding agent:	Silane primer
Bonding:	adhesive

HYBRID CERAMIC	
Etching:	Hydrofluoric acid etching
Application of bonding agent:	Silane primer
Bonding:	adhesive

GLASS CERAMIC	
Etching:	Hydrofluoric acid etching
Application of bonding agent:	Silane primer
Bonding:	Adhesive/conventional

Conditioning and bonding of different ceramic materials in overview

Photo documentation of a crown restoration of VITA ENAMIC hybrid ceramic



Fig. 1 Insufficient composite and amalgam filling of tooth 16.



Fig. 2 Stump construction and dissection of tooth 16.



Fig. 3 The virtual model of the dissection.



Fig. 4 Computer aided design of the full crown.

Source: Dr. Julián Conejo, Philadelphia, USA

Secure bonding of CAD/CAM materials: A compact clinical guideline

For the clinical long-term stability of full ceramic restorations, a resilient and reliable adhesion after adhesive fixation is essential. However, different materials must be conditioned and adhered appropriately for the material. Dr. Julián Conejo (University of Pennsylvania, School of Dental Medicine, Philadelphia, USA) explains step-by-step the material-specific protocols for feldspar, glass, hybrid, and zirconia ceramics and demonstrates the differences.



Dr. Julián Conejo, Dentist
Philadelphia, USA

Selection of the bonding system

"An adhesive bonding is indispensable for feldspar and hybrid ceramics," according to the recommendations of clinicians. Although full crowns of zirconia-reinforced lithium silicate glass ceramics and zirconia can also be conventionally cemented, Julián Conejo recommends this procedure only in the case of a retentive dissection form and in treatment situations with suboptimal drainage.

Conditioning the tooth substance

Julián Conejo performs the clinical conditioning steps as follows: "If the dissection is mainly in the enamel, I allow the phosphoric acid to act for 20 seconds. After that, I apply the adhesive components." If the dissection is in the dentine, he recommends a self-etching bonding system. "No phosphoric acid is required for these adhesive systems, which prevents sensory disturbances after the adhesive conditioning," says Julián Conejo.

Conditioning the restoration

"To obtain friction, feldspar and hybrid ceramics must be etched with hydrofluoric acid for 60 seconds, and zirconia-reinforced lithium silicate glass ceramic for 20 seconds," reports the dentist and scientist. He further explains, "A rough surface of the ceramic restoration is

"Everything must be bonded harmoniously, specific to the material!"

necessary for a good micromechanical retention. If this step is omitted, it can lead to adhesive failure." The silane bonding agent should be massaged in for 60 seconds to achieve a chemical bond to the restoration material.

Protocol for zirconia

Julián Conejo points out the deviating conditioning protocol for zirconia: "This material should be sandblasted for 20 seconds with an alumina grain size of 30 to 50 micrometers and less than 2.8 bar." A primer (bonding agent) with the phosphate monomer MDP is recommended for a high adhesion to zirconia.

Summary

"Every step is of great importance for the adhesive incorporation of ceramic restorations," according to Julián Conejo's conclusion on adhesive bonding. The flawless surface of the restoration should be properly conditioned. The instructions for use of the adhesive and bonding systems have to be followed, and only a careful drainage of the working field allows a reliable adhesive attachment.

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Fig. 5 The virtual restoration placed in the block.



Fig. 6 The final cemented VITA ENAMIC crown.



Fig. 7 Palatal view on the dissection margins.



Fig. 8 X-ray control after final cementing.



*VITA ENAMIC is the material for
enamel and tooth-like restorations.*

Minimally invasive inlay restoration from the hybrid ceramic VITA ENAMIC



*Dr. Gerhard Werling, Dentist
Bellheim, Germany*

Inlay restorations using CEREC procedures have been an established process in digital dentistry for decades. However, due to the required minimum wall thickness, a lot of tooth substance frequently had to be dissected in reconstructions of traditional ceramics. Due to reduced minimum wall thicknesses, VITA ENAMIC (VITA Zahnfabrik, Bad Säckingen, Germany) allows minimally invasive restorations and can be precisely ground in thinly tapering edge areas. In the report, Dr. Gerhard Werling (Bellheim, Germany) explains the clinical procedures for an inlay-restoration of hybrid ceramic in region 24-26.



→ INITIAL SITUATION

1. Initial situation

Figures 1 and 2 show the initial situation. On the basis of the patient's history and according to the patient's request (male, 38 years), he was not treated with alternative methods (infiltration technique, fluoridation, regular controls, etc.). Instead, a filling cavity was carefully dissected on the tooth in which the caries had already penetrated the approximal enamel in the X-ray image. Surprisingly, in the clinical image, the caries had penetrated deep into the dentine, so that after extensive excavation, a considerable defect in the substance was present.



Fig. 2 X-ray status – do the recognizable caries have to be treated, or can they be processed with alternative methods?



Fig. 3 Care was taken with the careful dissection of a filling cavity, but in the course of the excavation there were clinically extensive undermining defects.



Fig. 6 The chewing surfaces were reconstructed using the biogeneric software.

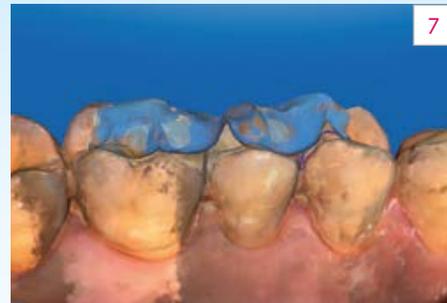


Fig. 7 By overlaying the counterbite, the contact points can be checked.

2. Material selection

Since the patient wanted a permanent enamel-like and tooth-like restoration, composite could not be used as a restoration material. It was decided to proceed according to the "extension for prevention" rule - but as minimally invasive as possible. The hybrid ceramic VITA ENAMIC is very advantageous in this case. The unique network structure in which ceramic and acrylate polymers interpenetrate, provides for enormous resilience and offers more freedom than traditional restoration materials.

3. CAD/CAM workflow

Three VITA ENAMIC inlays were fabricated using the CEREC System (Sirona Dental, Bensheim, Germany). The intraoral scan was done using the CEREC Omnicam. With the biogeneric software, the reconstruction was done analogously to the missing chewing surfaces. In the grinding preview, the inlays were placed in the material blanks. The geometry EM-10 (8 x 10 x 15 mm) was chosen according to the shade determination with VITA Easyshade (VITA Zahnfabrik) in the color 1M2-HT. The hybrid ceramic can be processed very simply and quickly by machine as well as manually. Thanks to the high load-bearing capacity and edge stability, constructions with comparatively small wall thicknesses and thin-running edges are also feasible. Edge chipping, which can occur in traditional ceramics, are rare with this material.



Fig. 4 "Extension for prevention" – but as minimally invasive as possible.

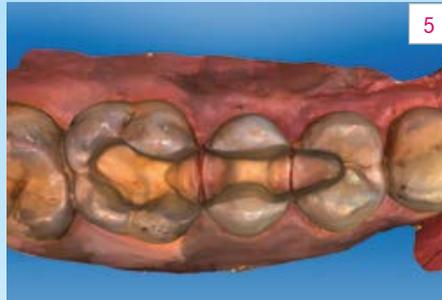


Fig. 5 The digital impression was made with an intraoral scanner.

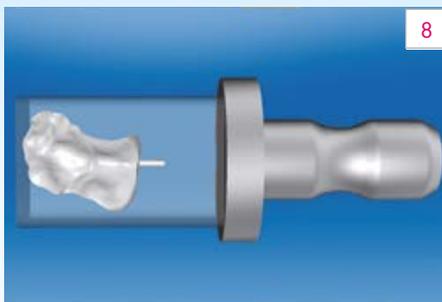


Fig. 8 In the grinding preview, the designs were placed optimally in the blank (the inlay for tooth 26 is shown).



Fig. 9 For the adhesive bonding, absolute drainage is ensured with a rubber dam.

Thanks to their high load-bearing capacity and edge stability, small wall thicknesses and thin-running edges can be achieved.

4. Processing and integration

It is advantageous that there is no firing process, and a shade characterization is possible if desired. The available shade selection (0M1 - 4M2) in two translucent steps, plus the good light transmission of the material allow for esthetically pleasing results. The inlays have been polished to a high gloss with the VITA ENAMIC Polishing Set in the clinic. The hybrid ceramic can also be easily polished intraorally. With VITA polishing instruments, the restoration edges can be polished in a unique, fine manner so that virtually no transition between the tooth and the restoration remains visible. Bonding is performed adhesively.

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➔ **RESULT** A defect-oriented restoration with composite fillings was planned. The result was a minimally invasive restoration with VITA ENAMIC inlays.



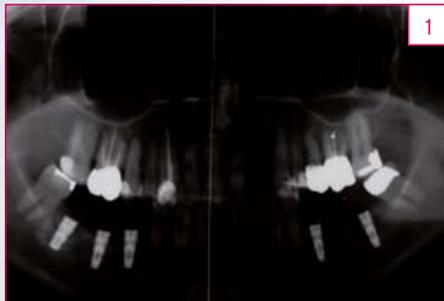
The VITA Rapid Layer Technology opens up an efficient fabrication alternative to the traditional layering technique for dental technology laboratories.

Digital composite bridges of VITA YZ and VITA ENAMIC



*Hans Jürgen Lange, Master
Dental Technician
Darmstadt, Germany*

Using VITA Rapid Layer Technology (RLT), a fully anatomical composite bridge consisting of a substructure and veneer structure is fabricated in a digital fabrication process. One advantage of this technology is that different materials and their specific properties can be combined with one another. For example, VITA YZ zirconia can be used for a stable substructure, and the relatively elastic hybrid ceramic VITA ENAMIC (VITA Zahnfabrik, Bad Säckingen, Germany) can be used for the veneering structure. In the following report, Hans Jürgen Lange, Master Dental Technician (Dental-labor Teuber, Darmstadt, Germany), explains the restoration steps with a comprehensive implant-supported reconstruction in the lower jaw using individual crowns and a composite bridge.



→ X-RAY STATUS of the initial situation.

1. Initial situation

The patient was scheduled to be provided with a bridge on implants in regions 35 and 37, as well as with individual crowns on implants in regions 45, 46, and 47. Thanks to the shock-absorbing properties of VITA ENAMIC's integrated elasticity and high wearing comfort, it was decided to manufacture the superconstructions from hybrid ceramics. VITA ENAMIC IS blanks have an integrated interface including screw channel with an adhesive/titanium base. As a result, implant-supported restorations with the inLab MC XL system (Sirona Dental, Bensheim, Germany) can be created very simply. Since the hybrid ceramic is only approved for single tooth restorations, it was only possible to produce a bridge restoration using a digital composite solution.



Fig. 2 Implants were present in regions 35 and 37 as well as 45, 46 and 47.

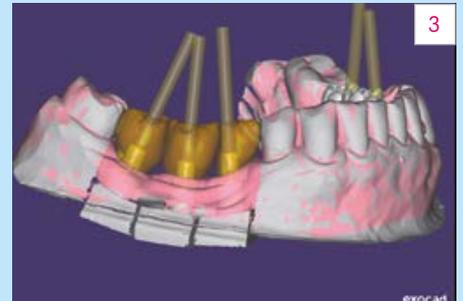


Fig. 3 Construction of the implant crowns in regions 45, 46, and 47.



Fig. 6 After scanning the framework, veneer structures are constructed on it.



Fig. 7 Implant crowns as well as a bridge framework of VITA YZ, all with veneer shells of VITA ENAMIC.

2. Fabrication of the substructure

3. Fabrication of the veneer structure



**Digital composite bridges:
Zirconia framework plus tooth-colored veneer structure.**

In the software exocad DentalCAD (exocad, Darmstadt, Germany), the titanium bases were initially designed fully anatomically, then were followed by a design that was reduced to almost a thimble framework (similar to the jacket crowns). The orientation of the screw channels, the space relations to the antagonists, etc., can be checked virtually at any time. After completion of the design for the substructure, this was milled from pre-stained VITA YZ zirconia, sintered, fitted, and provisionally fixed on the titanium bases.

In contrast to the classical RLT method which requires only one scan, the framework was scanned again for an even more precise design of the veneer structure. In the case of the CAD, the positions of the screw channels were set according to the specified axis and later manually opened with the veneer structures from VITA ENAMIC. Emergence profiles and basal contact surfaces were made from zirconia to reach a high gloss polish that currently offers the greatest possible biocompatibility in contact with the gingiva. The bridge components are produced with the 5-axis simultaneous milling machine vhf S2 Impression (vhf camfacture, Ammerbuch, Germany).



Fig. 4 Design of the substructure.



Fig. 5 The substructure is milled from pre-stained zirconia.



Fig. 8 The blanks for single-element VITA ENAMIC IS crowns have an integrated interface, including screw channel.



Fig. 9 Situation after securing all restorations in the patient's mouth.

Composite bridges are very well suited for implant restorations!

4. Production of the composite bridge

The bonding followed the usual protocol for VITA ENAMIC, which has a good microretention after etching with 5% hydrofluoric acid. The zirconia is conditioned with a bonding agent. In addition, prior to the sintering process, we worked with a thin cutting disc in the horizontal plane for the restoration of micro-slits in the adhesive surfaces. The crowns were characterized with the stains of the VITA ENAMIC STAINS KIT, and the surfaces were sealed. In order to obtain the accentuations in the surface structure, the glazing should be as thin as possible.

5. Recommendation

For the reliable implementation of VITA RLT, the space relations must allow the minimum wall thicknesses for the restoration materials to be used. Implant situations are therefore very well suited. Thanks to the composite bridge solution, this patient was able to achieve a uniform, harmonious restoration result for the entire lower jaw.

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➔ **RESULT** immediately after incorporation.



NT + PT5

EE2

EE1

EE9

EE5

EE9

ENL

NT

VITA VM LC flow: Artful and multi-faceted individualization with composite



*Urszula Mlynarska, Master
Dental Technician
Warsaw, Poland*

VITA ENAMIC can be customized with VITA VM LC flow (VITA Zahnfabrik, Bad Säckingen, Germany) for esthetic reconstruction in the front. Urszula Mlynarska, Master Dental Technician (Warsaw, Poland), describes the entire process of a crown restoration of teeth 11 and 12 in her case report, starting with planning, followed by wax-up and cut-back, then individualization. In addition, the author explains how natural, multi-faceted results can be achieved with the veneer composite.



➔ **INITIAL SITUATION** Clinical situation after veneer preparation on 11 and 21.



➔ **RESULT** A smile with a natural play of color and light.

1. Status following trauma

The female patient, who is now 23 years old, originally had a bicycle accident at the age of 16. The result was a traumatic crown fracture on 11 and 21 without involvement of the pulpa and dislocation. The vital teeth were restored immediately with composite. However, the reconstruction did not allow long-term stability or a natural appearance, which the patient did not like. It was her desire to have the incisors restored in a highly esthetic and stable manner. In order to restore them as desired, VITA ENAMIC in combination with VITA VM LC flow were selected as the restoration materials.

2. Shade determination, preparation, and crown fabrication

The visual tooth shade determination was done with the VITA linear guide 3D MASTER. The result was checked with VITA Easyshade V. A VITA ENAMIC blank in the shade 1M2-HT was selected. A wax-up on a situation model helped to define the final treatment result. Preparation and impression followed. The produced master model was scanned with the aid of the 3Shape D850 (3Shape A/S, Copenhagen, Denmark). A fully anatomically crown was then digitally constructed and milled. After the try-in, a cut-back was conducted incisally and centrally.



Fig. 1 Situation model with idealized wax-up and palatal silicon key.



Fig. 2 Clinical situation after veneer preparation on 11 and 21.



Fig. 3 Try-in of the restorations of the hybrid ceramic VITA ENAMIC on 11 and 21.



Fig. 4 Both restorations after the individual, incisal cut-back using diamond tool.



Fig. 5 Layering using silicone key.



Fig. 6 Veneering with VITA VM LC flow (e.g., with EE1, EE2, EE9, ...).

3. Individualization of the reduced crowns

INFORMATION: WHAT IS VITA VM LC FLOW?

The low-viscosity VITA VM LC flow veneer composite is ideal for delicate and esthetic individualization in the cutting area as well as the intensification in the cervical area of the tooth. Dental technicians and dentists can apply the materials either with an instrument, a brush, or directly from the syringe.

The indication spectrum includes the veneering of reduced crowns as well as framework and bridge constructions. The following materials can be customized with VITA VM LC flow: hybrid ceramics, metal, zirconia, and composite. Furthermore, the veneer composite is also suitable for individualizing VITA prosthetic teeth made from MRP composite.



"I then used VITA VM LC flow for individualization. The flowable veneer composite stays exactly where I have applied it. This makes it simple to maintain control during the veneering," reports Urszula Mlynarska. Thanks to the warm basic color of the hybrid ceramic, a combination of warm and cold shades could be used. In order to create a three-dimensional effect, the dental technician recommends the interplay of opaque and translucent layers. Urszula Mlynarska's summary of the veneering composite: "Millions of combinations are possible. We are only limited by our imagination."

With VITA VM LC flow, practices and laboratories achieve brilliant results.



Fig. 7 Final restoration on 11 and 21 with juvenile translucence.



Fig. 8 Red and white harmony in the esthetic zone.

4. Elaboration and bonding

After the final polymerization of the veneer, the morphology and texture of the surface were shaped with fine-grain diamond tools. To obtain natural reflections, the final polishing was done with a cotton buff and diamond polishing paste. For a reliable adhesive bond, the lumen of the crowns was etched with 5% hydrofluoric acid and then silanized. The end result shows a highly esthetic restoration which integrates perfectly with the juvenile neighbors teeth. The young patient was very satisfied with the "invisible" reconstruction.

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Fig. 9 A smile with the natural play of color and light.

Esthetic anterior tooth reconstruction using VITA YZ HT and VITA VM 9



*Chia Heng Chung,
Dental Technician
Kaohsiung, Taiwan*

In order for a single anterior crown to blend harmoniously into the oral appearance, the special features of the natural neighboring teeth must be reproduced. In the current case, tooth 11 was restored with a crown. The challenge was to replicate distinct individual characteristics of the natural dentition, such as calcifications. Chia Heng Chung, Dental Technician (Kaohsiung, Taiwan), explains how he was able to achieve a natural result using VITA VM 9 veneering ceramic (VITA Zahnfabrik, Bad Säckingen, Germany).



➔ **PREVIOUSLY** Full crown dissection on tooth 11 after endodontic treatment.

1. Intraoral situation

After the filling therapy of an advanced carious lesion on tooth 11, the soft pulpal tissue of a 37-year-old patient showed signs of irreversible infection. A root canal treatment was performed to prevent pain and bone resorption. The tooth had to be functionally stabilized after this invasive therapy. To enable a highly esthetic and natural restoration, a zirconia crown made of VITA YZ HT with a VITA VM 9 veneer was planned.

2. Shade determination and substructure fabrication

The tooth shade determination with the VITA Toothguide 3D-MASTER was a critical step for the successful veneering of the crown. 2M1 was determined as the base shade. A black and white photo helped to select the correct lightness and color saturation. The preparation for a full crown was carried out with a pronounced hollow shape in order to create space for the restoration. A master model was produced using an impression. A wax framework was modelled on 11 and then digitalized with a laboratory scanner. The constructed zirconia framework was milled and sintered from a VITA YZ HTwhite blank (VITA Zahnfabrik, Bad Säckingen, Germany).



Fig. 2 Reproduced basic tooth shade with AKZENT PLUS ES15 in the cervical area, ES06 in the upper 2/3 and BASE.



Fig. 3 Perfect conformity of VITA Toothguide 3D-MASTER and the cap shade.



Fig. 4 Cervical fluorescence (reddish/brownish) was created with EL3, a lighter incisal effect with EL1.



Fig. 5 CHROMA PLUS 2 was layered for a warm hue and control of the lightness.



Fig. 6 Complete crown layering with DENTINE 2M1 prior to the cut-back.



Fig. 7 EE1 (whitish translucent) was added in points to integrate thin, white lines.



Fig. 8 Restoration after the first firing, followed by internal staining for precise shade control.



Fig. 9 Halo effect from EE2 and BASE DENTINE. Finalization with thin layers of ENL, END and WIN.



Fig. 10 The finished full ceramic crown on the master model after glaze firing and polishing.

3. Veneering

"Even after the first firing, the basic shade and lightness of the veneered framework should correspond to the determined tooth shade. In this case, I used a combination of VITA AKZENT Plus EFFECT STAINS and VITA VM 9 BASE DENTINE," Chia Heng Chung describes as the first, important step. In his opinion, the correct lightness is 60 percent of the success. "By controlling shade intensity and hue, we can already achieve 80 percent of the natural appearance. The remaining 20 percent depends on the individual abilities of the technician," explains Chia Heng Chung.

4. Treatment result

The finished restoration is integrated harmoniously into the esthetic zone. The full ceramic crown exhibited a natural play of color and light. Thanks to the precise determination of the basic tooth shade and the perfectly matched veneer ceramic VITA VM 9, a simple and structured approach was possible. The patient was very happy with the esthetic result. For Chia Heng Chung, CAD/CAM and craftsmanship complement each other: "The synergy between technology, art and beauty is the key factor for successful full ceramic crown and bridge restorations."



→ **AFTERWARDS** The final restoration on tooth 11; the patient was pleased with the highly esthetic result.

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