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HYBRID CERAMICS

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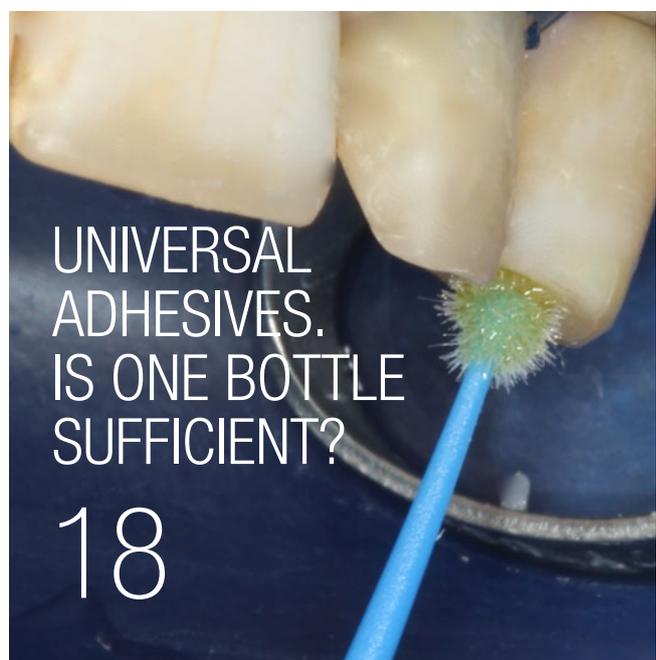
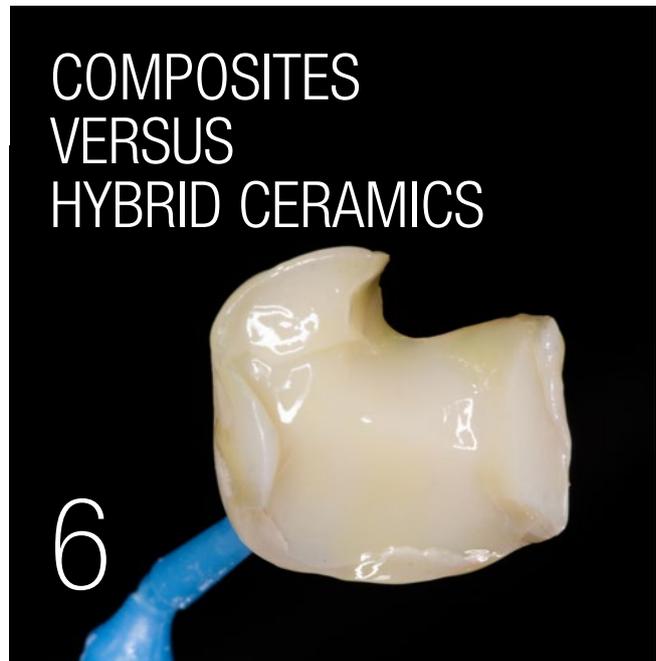
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LOOKING TOWARD A UNIVERSAL FUTURE

Dear reader,

It brings me great pleasure to welcome you to Volume 7 of BOND, Kuraray Noritake Dental's magazine for professionals in dentistry.

My name is Yusuke Fujimura, and I am the new Head of Scientific Marketing for Europe at Kuraray Noritake Dental. I bring almost two decades' worth of product development management to this role, and endeavor to use this scientific knowledge to collaborate with leading dental researchers throughout the EU to, ultimately, deliver better service and high-quality products to our customer base.

Having been a Technical Manager with Kuraray Noritake Dental since 2012, I have significant experience in developing many of our company's original and innovative technologies and products. These products, which include CLEARFIL™ Universal Bond Quick, PANAVIA™ SA Cement Universal, and the recently introduced KATANA™ Cleaner, have given confidence to clinicians worldwide and helped to drive the universal trend in dentistry.

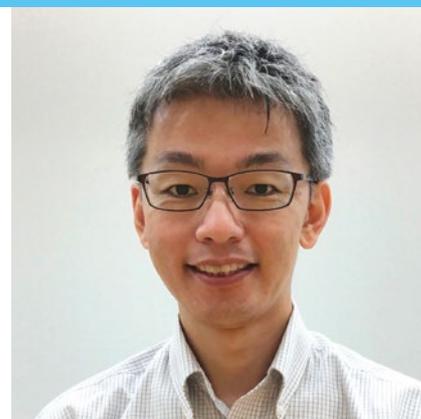
Now that I have properly introduced myself, let's have a look at what is contained within this edition of BOND.

Peter Schouten, Technical Manager at Kuraray Europe Benelux and a chemist with decades of experience in the dental industry, has contributed several articles that highlight some of the advancements and improvements

in Kuraray Noritake Dental's product portfolio. Read on to find out more about the light diffusing technology that powers the CLEARFIL™ MAJESTY™ ES-2 family, or to discover how the unique Filler Press and Monomer Infiltration method help the KATANA™ AVENCIA™ Block to achieve the perfect balance between strength, precision and polishability. Peter has also written an engaging, thought-provoking piece on the history of flowable composites and why CLEARFIL™ MAJESTY™ ES Flow delivers endless options as a truly universal solution.

A spirited roundtable discussion among several experts on the subject of universal adhesives can also be found in this issue of BOND. Prof. Roland Frankenberger, Director of the Department of Conservative Dentistry at the Philipps-University Marburg and the University Hospital of Gießen and Marburg, Dr. Adham Elsayed, Clinical and Scientific Manager at Kuraray Europe GmbH, and Drs. Friedrich Hey and Nils Elger Siems—two esteemed private practitioners—combine their expertise to offer guidance on the adhesive systems of today and tomorrow.

Dr. Cyril Gaillard, dental surgeon and CEO of the GAD-Center in Bordeaux, has provided a clinical case focused on the aforementioned KATANA™ AVENCIA™ Block and its use as the material for overlays for a 40-year-old patient suffering from sleep apnea. Another clinical case—this time featuring the CLEARFIL™ MAJESTY™ ES-2 Premium



YUSUKE FUJIMURA

Head of Scientific Marketing Europe

composite—comes to us from Dr. Jusuf Lukarcanin, a certified dental technician and Doctor of Dental Science based in Izmir, Turkey.

Finally, I am extremely proud to announce the launch of the official Kuraray Noritake Dental app. It's designed to keep you informed of the latest updates regarding our product range, and comes with features such as the KATANA™ Color Simulator and Cementation Guide to provide support for daily clinical practice.

With my best regards,

Yusuke Fujimura,
Head of Scientific Marketing Europe

CONTACT

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KATANA™ AVENCIA™ Block THE IDEAL BALANCE

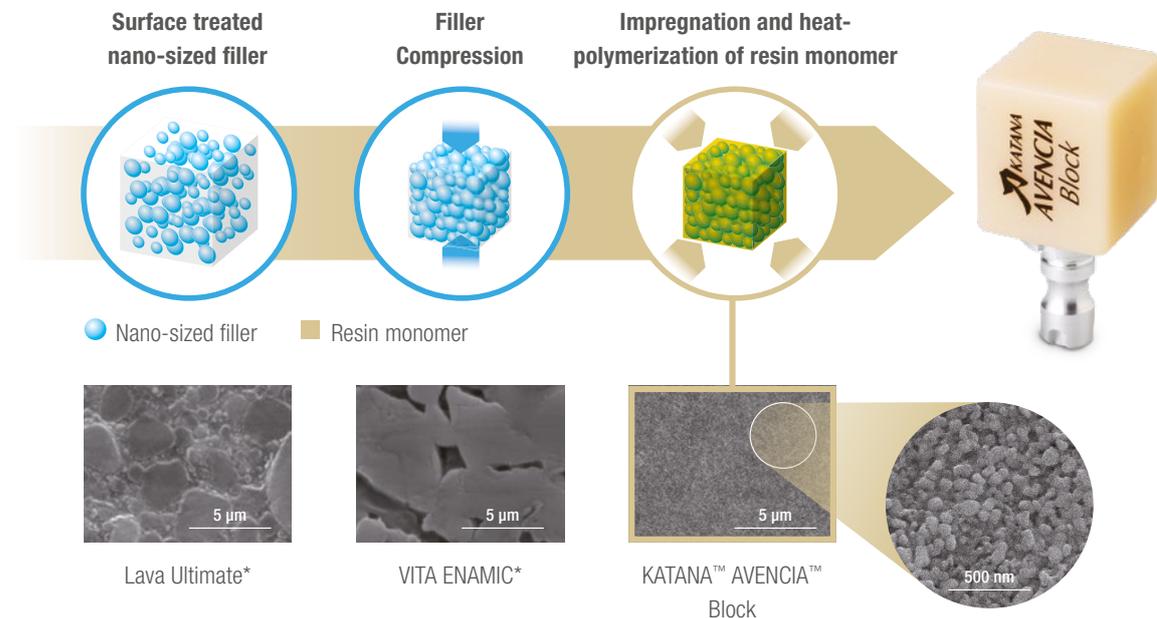
PRECISION - STRENGTH - POLISHABILITY

When creating KATANA™ AVENCIA™ Block for CAD/CAM, our goal was to develop a block that would be easy to grind while delivering a smooth surface. Of course, its mechanical properties had to be first-rate, and we aimed for excellent gloss retention. Finally, it goes without saying that KATANA™ AVENCIA™ Block restorations had to be durable as well as being suitable for adhesive cementing.

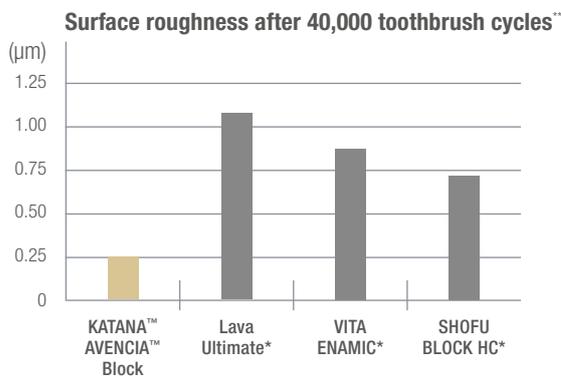
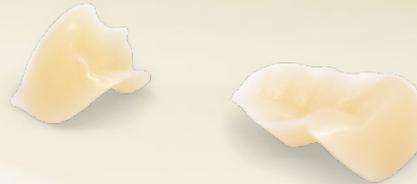
Existing hybrid ceramic blocks on the market (except for VITA™ Enamic) are produced in the same way as direct dental filling composites, namely, silanized filler mixed with synthetic resin. The composite is then formed into a block or a mold and polymerised. The disadvantages are a non-uniform distribution of the filler particles and an increased risk of trapped air which can result in voids. Instead, KATANA™ AVENCIA™ Block uses the unique Filler Press and Monomer Infiltration method, developed

by Koichi Okada et al. The treatment of the filler is what makes this method so unique.

Nano-sized silica fillers pre-treated with silane combined with nano-sized alumina fillers are densely compressed into a block which is subsequently impregnated with resin. Finally, the blocks are polymerized by heat to achieve a maximized degree of polymerization. Blocks manufactured in this way have a dense, homogenous and virtually void-free structure.

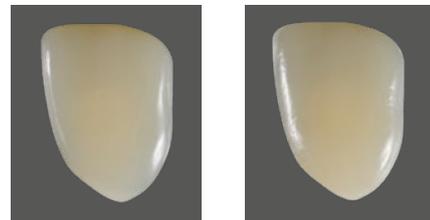


SEM photos show the microstructure of KATANA™ AVENCIA™ Block, in a comparison with other materials. KATANA™ AVENCIA™ Block is filled densely and uniformly with only nano-sized filler.



*Not a trademark of Kuraray Noritake Dental Inc. Source: Kuraray Noritake Dental Inc. ** Test Condition: Toothbrush wear test using tooth paste. Load: 250 g. Source: Kuraray Noritake Dental Inc.

Photos of KATANA™ AVENCIA™ Block before and after 40,000 toothbrush cycles



Before

After

Smooth

Owing to the high filler content with filler particles of up to a maximum of 40 µm, KATANA™ AVENCIA™ Block is not only strong but also extremely easy to grind. Thanks to smooth result the next step - polishing - is simplicity itself.

Strong

The KATANA™ AVENCIA™ Block is yet another example of how we have fully exploited our knowledge and expertise in the silanisation of fillers. The nano-sized, optimally silanised silica fillers establish tight connection between silica and resin-matrix. This is essential when aiming to achieve strong and stable prosthetics .

Polishability

The dense, homogenous, and void free structure of KATANA™ AVENCIA™ Block is the reason that the high gloss easily achieved with polishing only will be long-lasting. KATANA™ AVENCIA™ Block shows virtually no reduction of gloss after tens of thousands of brushing movements in the toothbrush test.

For optimum, long-lasting and durable results, it goes without saying that KATANA™ AVENCIA™ Block restorations should be affixed with one of the products from the PANA VIA™ family.

Peter Schouten

Technical Manager
Kuraray Europe Benelux

COMPOSITES VERSUS HYBRID CERAMICS



Photo: private

PROF. IVO KREJCI

Studied dentistry in Basel. Since 2014: Director of the Department of Preventive Dentistry and Basic Dental Care at the University of Geneva
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Today, composites are perfect for use in CAD/CAM technology. Neither crystallization nor sintering is necessary.

Prof. Ivo Krejci explains in this interview the advantages of the new material KATANA™ AVENCIA™ Block in placing inlays, onlays, fully anatomical crowns and veneers.

— Anne Barfuß —

Composites - ceramic-reinforced composite blocks - versus hybrid ceramics.

What exactly are the differences?

KREJCI: Both materials are a combination of ceramic components and organic monomers polymerized by heat. However, the respective blocks differ in their production technique, their micromorphology and the resulting clinical properties.

- Hybrid ceramics are produced from a relatively coarse-grained porous inorganic-ceramic framework which is penetrated by organic monomers. This makes the morphology of the blocks relatively inhomogeneous, which means, for example, that no durable surface luster can be achieved.
- In ceramic-reinforced composite blocks, inorganic-ceramic nanoparticles are first condensed by mechanical compression and then penetrated by monomers. The extremely fine morphology achieved in this way means very durable luster and should also provide adequate wear resistance combined with deep antagonist abrasion.

How do you decide which is the right material?

KREJCI: For me, composites are the material of choice for all indirect adhesive single-tooth restorations in the anterior and posterior region, i.e. for inlays, onlays, endocrowns and also for veneers. For bridge constructions, however, reinforced-ceramic blocks are my preference.

Composites are not new per se. What improvements does KATANA™ AVENCIA™ Block offer?

KREJCI: In principle, KATANA™ AVENCIA™ Block is a composite block, i.e. a mixture of an organic monomer matrix and inorganic fillers. Within the classical composite classification, it would be rated as an extremely highly-filled, homogeneous micro-filler composite. This is the dream of every composite expert, as it combines the advantages of a high-luster durable surface of the classic micro-filler composite with the benefits of the high mechanical properties of a hybrid composite.

The uniqueness of the KATANA™ AVENCIA™ Block lies in the very high packing density of the fine nanoparticles that serve as the filler. Besides this, the organic matrix consists of urethane dimethacrylate (UDMA), which means that bisphenol A glycidyl methacrylate (Bis-GMA) is no longer used.

How does the chairside workflow look with the new material?

KREJCI: The chair side workflow is extremely simple and time-saving.

- After grinding, the restoration is tried-in in the patient's mouth.
- After the successful try-in, the inner surfaces of the restoration are air-abraded with Al₂O₃ powder. The powder is then rinsed off the restoration surface with water spray.

“The chairside workflow with KATANA™ AVENCIA™ Block is extremely simple and time-saving.”

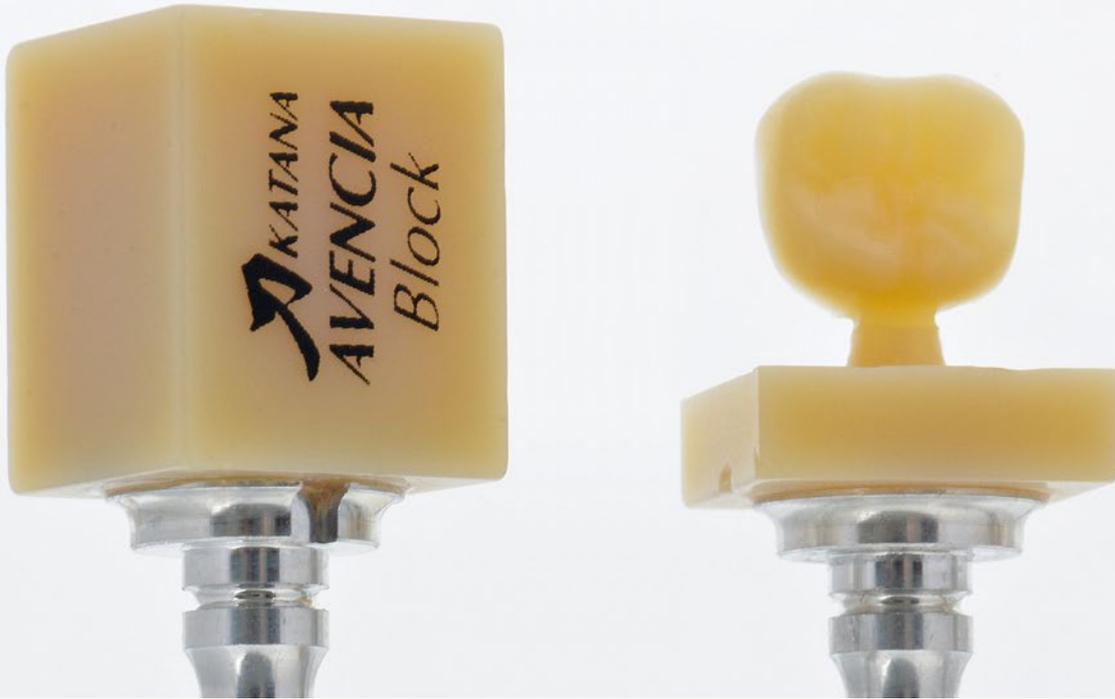


Fig. 1 Composites are suitable for tooth-supported restorations.

- After thorough drying with compressed air, the restoration is wetted with a one-component universal adhesive system and placed in a light-proof box to prevent pre-polymerization of the adhesive system.
- The patient has a rubber dam placed, and after the adhesive pre-treatment, light-curing composite is applied to the preparation, which serves as luting material.*
- The pre-treated KATANA™ AVENCIA™ Block restoration is taken out of the light-proof box and the adhesive system on the inner surfaces is blown out intensively with compressed air.
- The restoration is then placed on the preparation and the primary position is adjusted by hand. The excess luting composite is removed with a periodontal probe.

* Instructions of luting according to preferences of Prof. Krejci.



Fig. 2: Minimally invasive, defect-oriented preparation for restoration with KATANA™ AVENCIA™ Block

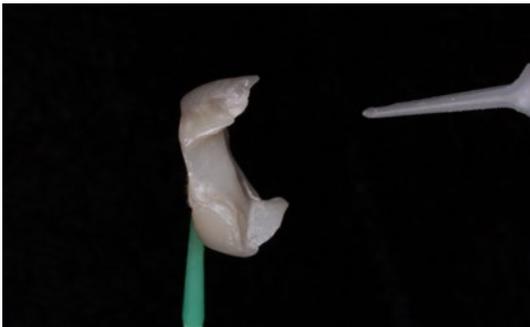


Fig. 3: Air-abrasion of the restoration with Al₂O₃ powder



Fig. 4: Application of a one-component universal adhesive system



Fig. 5: Restoration made of KATANA™ AVENCIA™ Block directly after grinding



Fig. 6: The restoration following individualisation

- In the next step, the restoration is placed in its final position using an ultrasonic tip and the excess luting composite is removed again with the periodontal probe. Super Floss is used in the interdental space.
- Only when all excess luting composite has been completely removed does light polymerization begin with a sufficiently powerful LED light source.
- The polishing is performed with the usual composite polishing instruments.

"Composites are far more antagonist-friendly than ceramics."

Many colleagues still prefer lithium disilicate glass-ceramics over composites for single-tooth restorations.

Do you expect a change in their opinion?

KREJCI: I can imagine this will change once the advantages of composites become more widely known. These include simpler adhesive pretreatment, quick and uncomplicated repair in the patient's mouth, highly durable luster and extremely easy grinding.

Do composites reduce the problem of chipping and abrasion?

KREJCI: Yes, definitely. Composites are less brittle and so enable grinding with significantly less chipping and lower

layer thicknesses than ceramics. And composites are far more antagonist-friendly than ceramics.

What studies are available with KATANA™ AVENCIA™ Block? Have you tested the material yourself?

KREJCI: Although KATANA™ AVENCIA™ Block has been available in Japan for several years, in Switzerland it has only been available for a few months. So until now, we only had the opportunity to study the structure of the material in the scanning electron microscope. This confirmed the high packing density and small size of the nanoparticles. Based on the data already available in the literature, the material should behave similarly to a composite block in the clinic for adhesive permanent single-tooth restorations - with the advantage of a very durable luster.



DO YOU SEE ANY CONTAMINATION?

Of course not!



KATANA™ CLEANER IS THE FIRST INTRA- AND EXTRA-ORAL UNIVERSAL CLEANER

During trial fitting your restoration might become contaminated with proteins reducing the bond strength. KATANA™ Cleaner removes contamination to optimise your adhesive procedures. Rub, rinse and dry - that's all you need to do.

CLEANERS COMPARISON

	KATANA™ CLEANER	OTHER BRANDS*
Extra-oral use	✓	✓
Intra-oral use on Tooth Structure	✓	✗
Intra-oral use on Implant Abutments	✓	✗
Application Time	10 sec.	20+ sec.
Handling	No shaking Single handed	Shake before use

*Ivoclean (Ivoclar Vivadent) and ZirClean (Bisco)

KATANA™ AVENCIA™ BLOCK MAKES MY DAILY WORK EASIER...

AND MY PATIENTS ARE HAPPY!



Dr. Cyril Gaillard
DENTAL SURGEON and
CEO of GAD-Center
Private practice, Bordeaux

In the past few years, the number of patients diagnosed with sleep apnea has increased. Fortunately, we can propose different options of treatments today, which can provide positive clinical results and improve the quality of life of our patients.

This clinical case presents the use of a new CAD/CAM material, KATANA™ AVENCIA™ Block, produced using the unique manufacturing method of Kuraray Noritake Dental, which offers remarkable mechanical properties.

The goals of the treatment are:

- Biological and minimally invasive, when it comes to teeth (non-invasive), periodontics, and occlusion (muscular and articular)
- to maintain health on the long-term (ease of hygiene)
- to re-establish an effective function (mastication) without compromising aesthetics

This article presents the rehabilitation of a patient suffering from sleep apnea, integrating the concept of minimally invasive and adhesive dentistry with most importantly, functional dentistry by identifying precisely the occlusal concept and mandibular position given to the patient.

The forty-year-old patient came to the office for his annual check-up. During initial examination, we discussed his problem of sleep apnea and the fact that he feels uncomfortable with his occlusion.

The extra-oral exam revealed a largely reduced lower face area. We noted the presence of a crown in the place of tooth #46 and amalgams on the molars and pre-molars. The crown had to be removed and the root extracted, one implant would be placed.

The patient told us he did not suffer from muscle spasms nor from articular pain, but conveyed an increasing discomfort during mastication and a constant search for the right position to his mandible.

Based on my diagnosis, it was judged that the treatment with KATANA™ AVENCIA™ Block is within the scope of indications since the occlusion problem is a minor issue.

TREATMENT PLAN:

To create the treatment plan, we always follow the same steps:

- discussion with the patient to identify his or her wishes and limitations in terms of treatment
- occlusal planning, search for the appropriate mandibular position in order to determine the quantity of destroyed dental tissue; this is done by a TENS machine.
- periodontic diagnosis and support teeth

We proceed in the following manner for the treatment:

- cleaning of all teeth
- complete in-mouth mock-up for the lower arch
- the mock-up will be left in the mouth in order to validate the new occlusion
- use of CAD/CAM technology to create the definitive prostheses, integrating the concept of minimally invasive dentistry. We will use KATANA™ AVENCIA™ Block as material for the overlays.



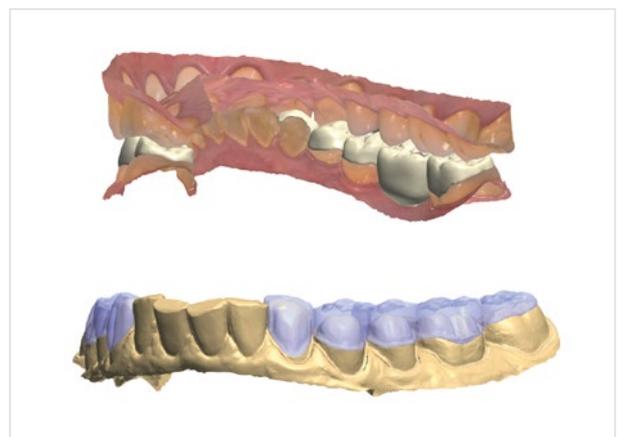
Initial situation with occlusion troubles causing discomfort during mastication.



Once the mock-up had been placed in the mouth, it was necessary to test the new occlusion and adjust if needed. The mock-up was milled in PMMA by Roland DG Corporation milling machine.



The teeth are prepared through the mock-up to be as minimally invasive as possible. The thickness is 1,5 mm for occlusal and 1 mm for buccal surface.



Overlays and crown(s) on implant were designed by 3Shape software (3Shape A/S) and milled by Roland milling machine. The final restorations were created using two digital impressions. On the impression of the preparations, the cervical limits were marked. Next, the software matched the two impressions by subtraction and proposed the shape of the restorations to be milled.



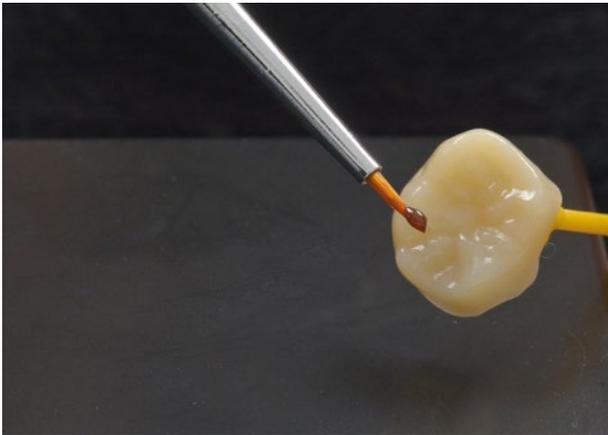
These restorations are the exact copy (morphology) of what the patient wore in his mouth for two months. If the work is done by section, it is easier for the computer to match the impressions.



KATANA™ AVENCIA™ Block was milled.



Polishing of the restoration.



After milling, the restorations were stained using a 3D staining technique. 3D staining requires a specific sequence to create 3D optical illusions.



Final esthetic results after staining.



A classic bonding procedure was followed with PANAVIA™ V5. To begin, all KATANA™ AVENCIA™ Block elements were tried one by one for validation and adjustment, then all together to check the contact points.



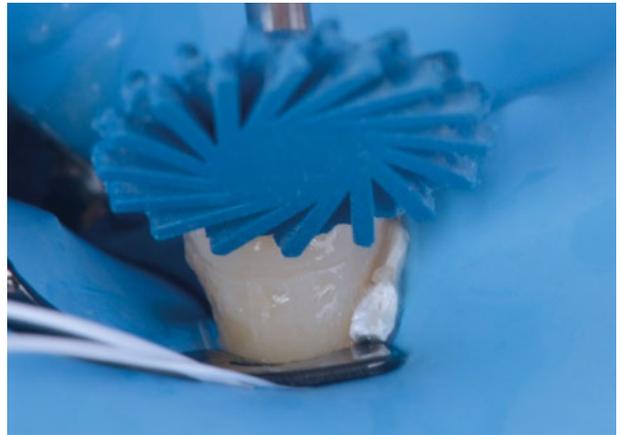
Rubber dam was placed on the mandible. The intrados of the elements were blasted with alumina power, then we applied K-Etchant gel, rinsed well and dried. A layer of silane was applied (CLEARFIL™ CERAMIC PRIMER PLUS) for 60 seconds* then dried.



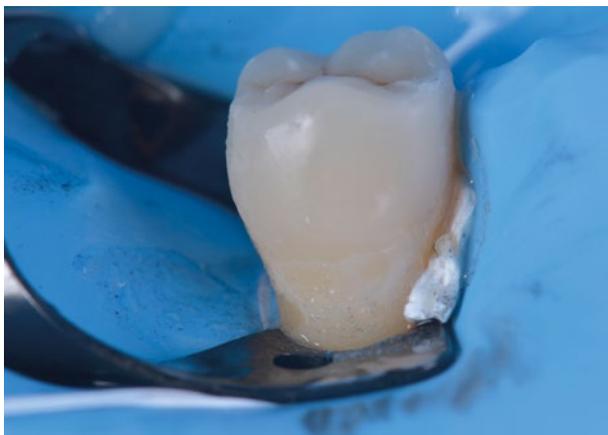
Application of K-Etchant gel for 10 seconds on enamel. Surfaces were rinsed, dried, and the adhesive PANA VIA™ V5 Tooth Primer was applied, left for 20 seconds, then dried.



Restorations were bonded one by one with PANA VIA™ V5 Paste. The excess was removed and the final photo-polymerization using glycerin was performed.



Final polishing.



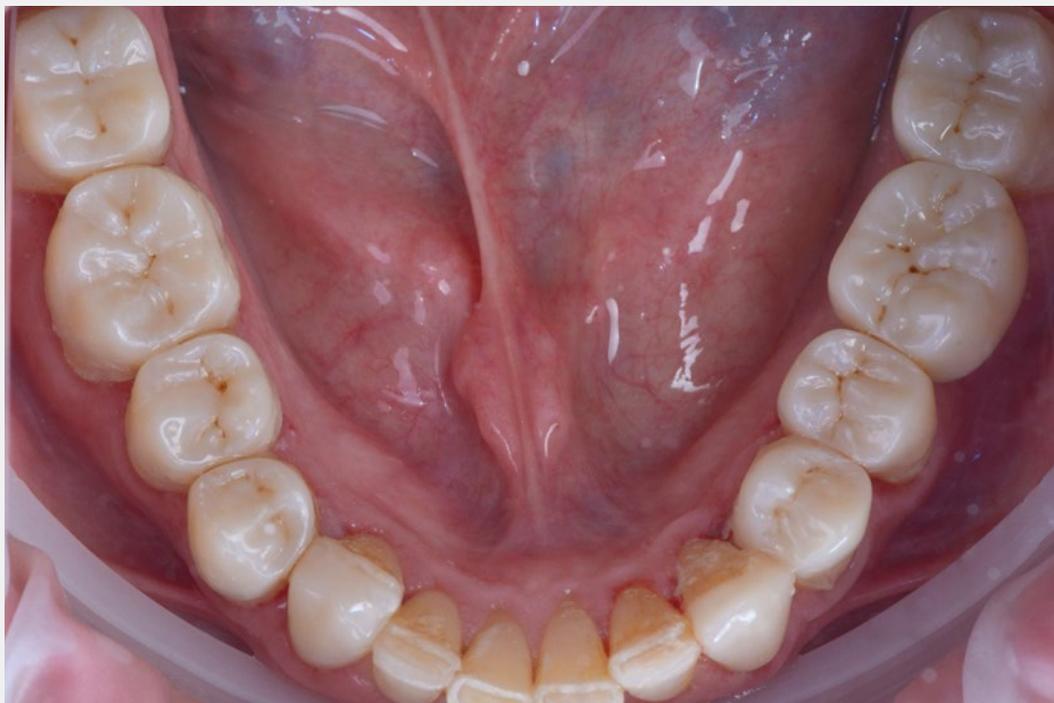
To conclude, the occlusion was verified in static position with cusp-fossa contact, then laterality, propulsion, and finally mastication.



Final situation. We can observe a good and esthetic integration of the restorations. A long term follow-up should be necessary to confirm the success of the treatment.

*The waiting time is not mandatory according to the product IFU

FINAL SITUATION



KATANA™ AVENCIA™ Block

VISIT THE PRODUCT PAGE ONLINE FOR MORE DETAILS

WHAT CAN YOU EXPECT TO FIND ONLINE

- ✓ General information about KATANA™ AVENCIA™ Block
- ✓ Full Product Assortment
- ✓ Safety Sheet
- ✓ IFUs



[KURARAYNORITAKE.EU/KATANA-AVENCIA-BLOCK](https://www.kuraraynoritake.eu/katana-avencia-block)

SPECIAL THANKS

We sincerely thank the laboratory Global Esthetic with Thomas Ernst, Jerome Bellamy and Clarisse Gabillard who contributed in this clinical case and for their work, providing excellent dental restorations for the patients.

FLOWABLE COMPOSITES. A UNIVERSAL SOLUTION?



The first flowable composites, or flowables, appeared on the dental market in the 1990s. The composition of these materials was entirely based on that of existing packable composites: They contained the same filler particles and resin matrix, but a reduced filler content. Hence, they had a lower viscosity, resulting in better flow characteristics for easy modelling and adaptability to the cavity, but weaker physical and mechanical properties than their packable counterparts. This made them not more than a useful addition to the existing portfolio of resin-based composites: They were widely used as, among others, filling material for Class V lesions and as a liner in large Class I and II cavities.

To broaden the initially limited range of indications, Kuraray Noritake Dental decided to focus on improving the mechanical and physical properties of flowables by developing an entirely new range of products: CLEARFIL MAJESTY™ ES Flow universal flowable composite. Although its predecessor; CLEARFIL MAJESTY™ Flow has higher filler loading and similar mechanical properties, the term universal indicates that the materials are universally applicable. Indeed, the potential indications are vast when compared with the range of indications of a flowable in the past. No matter whether the user wants to apply it as a liner or plans an extensive Class II restoration, CLEARFIL MAJESTY™ ES Flow is an ideal choice.

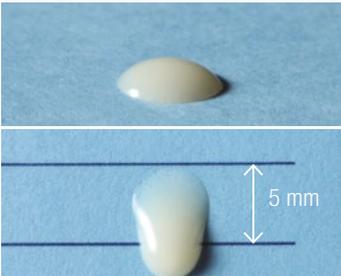
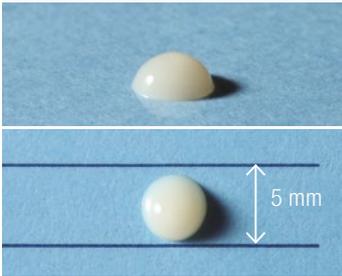
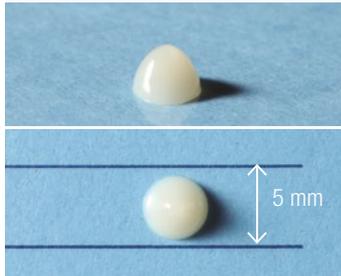
Three flowability options

As Kuraray Noritake Dental wanted to create a product that performs as desired in every indication, CLEARFIL MAJESTY™ ES Flow is available in three flowability variants. The high flowability material CLEARFIL

MAJESTY™ ES Flow High (with green label) was designed for use as a liner, the filling of small imperfections and the restoration of small lesions allowing for micro-invasive preparations. The medium flowability variant CLEARFIL MAJESTY™ ES Flow Low (with blue label) is the most universal of the series and can be used for most indications. The lowest flowability option is CLEARFIL MAJESTY™ ES Flow Super Low (with red label). It may be used in the context of creating larger posterior restorations and for cementing of inlays or onlays.

Appreciated by practitioners

The fact that the product works well in the hands of the dental practitioner was confirmed in the independent publication Dental Advisor: In the issue January-February 2019 (Volume 36, Number 1), CLEARFIL MAJESTY™ ES Flow won Dental Advisor's Top Product Award for the fifth year in a row. In the report, it was described as "Universal Highly-Filled Flowable", and this is exactly what it is!

High	Low	Super Low
FLOWABILITY		
		
HIGH FLOWABILITY	INTERMEDIATE FLOWABILITY	LOW FLOWABILITY
<ul style="list-style-type: none"> ✓ Excellent wettability and adaptation ✓ For small cavities ✓ As a liner 	<ul style="list-style-type: none"> ✓ For a wide range of anterior and posterior restorations 	<ul style="list-style-type: none"> ✓ Ideal for building posterior cusps and ridges ✓ Retains the given shape ✓ For class I and V cavities
1 min. after dispensing (horizontal & vertical)	1 min. after dispensing (horizontal & vertical)	1 min. after dispensing (horizontal & vertical)
		

CLEARFIL MAJESTY™ ES Flow won Dental Advisor's Top Product Award for the fifth year in a row.



Unlike the early generation flowables, CLEARFIL MAJESTY™ ES Flow has a high filler content and a flexural strength that is higher than that of most frequently used more paste-like composites.

All three variants are high strength. Compare this with your existing composite.

CLEARFIL MAJESTY™ ES Flow	FLEXURAL STRENGTH (MPa)	COMPRESSIVE STRENGTH (MPa)
HIGH (green)	145	358
LOW (blue)	151	373
SUPER LOW (red)	152	374

Data: Kuraray Noritake Dental

Given that the universal flowable composite offers so many beneficial properties, dental practitioners might be tempted to replace the packable composite they have been using so far with CLEARFIL MAJESTY™ ES Flow. For the majority of indications, this is indeed possible. Those who do so, will also find that application and modelling directly from the syringe works very well, eliminating the need for a separate instrument.

Unique technologies

What makes the material so unique? It is probably the combination of existing and new technologies that is responsible for superior mechanical properties, a high aesthetic potential and great handling characteristics. Kuraray Noritake's unique light diffusion technology utilized in the aesthetic composite range CLEARFIL MAJESTY™ ES-2 is also used in CLEARFIL MAJESTY™ ES Flow. Combined with proprietary filler technology,

this innovative ingredient is responsible for the fact that restorations made of CLEARFIL MAJESTY™ ES Flow are assimilated within the surrounding tooth structure almost automatically.

The third decisive component is silane technology. The long-chain silane used in CLEARFIL MAJESTY™ ES Flow provides for an optimum wetting capacity of the filler particles. This is a key reason why it is possible to increase the filler percentage to such a high level. After polymerization, the strong bond between the filler and the synthetic resin, brought about by the silane, creates a long-lasting bond. The water absorption is therefore also extremely low, a property any user of composites from Kuraray Noritake may be familiar with.

The unique composition of CLEARFIL MAJESTY™ ES Flow is also responsible for a great polishability and polish retention. Polishing is effortless. Even wiping with alcohol will give a quite nice gloss.

With all these benefits combined in one product, CLEARFIL MAJESTY™ ES Flow offers unparalleled convenience when it comes to creating composite restorations. Kuraray Noritake Dental is proud to have driven technological innovation and applied new developments them in the right way to give the user endless options with a universal flowable composite.

Peter Schouten

Technical Manager
Kuraray Europe Benelux

IS ONE BOTTLE SUFFICIENT?

CLEARFIL™ Universal Bond Quick Adhesive Technology

30 years of adhesive technology have spawned at least seven generations of enamel-dentin adhesive systems. The spectrum of the various products is broad.

What are the emerging trends? Are two-bottle and multi-bottle systems still in keeping with the times? When does the one-step system work?

And when is an additional primer indicated?

— Anne Barfuß —



DR. ADHAM ELSAYED

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Universal adhesives should be suitable without restrictions for direct and indirect restorations as well as for chemical, light-curing and dual-curing filling materials.

Professor Frankenberger, when do you use one-bottle adhesives?

FRANKENBERGER: For almost every indication. One-bottle systems, i.e. universal adhesives, have virtually superseded multi-bottle systems. The assertion that really good dentistry is only possible with multi-bottle adhesives is one I can no longer maintain on the basis of our data. We have completed far too many PhD theses that show that there is nothing to choose between the performance of single-bottle and multi-bottle systems.

But many dentists still prefer multi-bottle adhesives ...

FRANKENBERGER: Well, that's okay too. They can continue to use them. But if there are advancements that are useful and effective, one also has to be allowed to say it. Former critics have now also succeeded in switching to one-bottle systems.

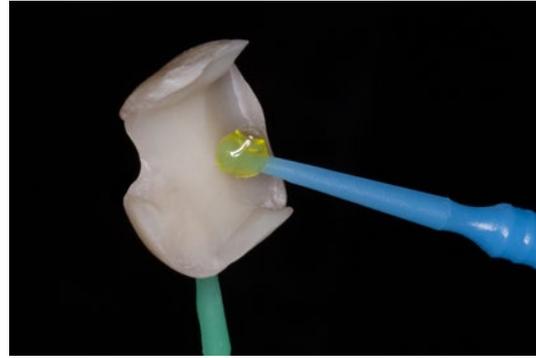
How does it look now in daily practice?

HEY: The trend is quite clearly moving towards universal adhesives. We also use them for almost all indications, from adhesive luting of crowns and bridges to adhesive core build-ups.

SIEMS: I prefer one-bottle systems, especially when it comes to difficulties in drainage such as with milk tooth fillings. Given that the conditions are safe for me, I rely



1.



2.

Fig. 1 and Fig. 2 The use of CLEARFIL™ Universal Bond Quick adhesives for bonding indirect restorations in combination with self-adhesive luting composites optimizes adhesion to the tooth hard substance (left) and high-performance composite blocks (right).

on the etch & rinse technique and multi-step adhesives. The additional primer step is a good investment for me - it ensures maximum adhesion, and there is hardly ever any post-operative hypersensitivity.

There are now also universal adhesives available that immediately penetrate the tooth surface. What benefit does this offer to the one-bottle systems?

ELSAYED: A reduction in work steps. Technique-sensitivity is reduced significantly. Whereby the quality of adhesion is consistently good, CLEARFIL™ Universal Bond Quick is suitable for the self-etch, selective or etch & rinse techniques. This gives a freedom of use. It is also indicated for all direct restorations, core build-ups and even for indirect repairs of restorations. Many other universal one-step bonding methods use monomers that only penetrate the dentin slowly. With CLEARFIL™ Universal Bond Quick, on the other hand, work can be continued immediately without any waiting time.

How can that be possible?

ELSAYED: With rapid bond technology. It combines the original MDP adhesive monomer with new hydrophilic amide monomer. This results in rapid penetration of the dentin. As a result of the moisture of the dentin, a highly hydrophilic adhesive is required for optimal penetration.

Are there still mandatory indications for multi-bottle adhesives today?

FRANKENBERGER: Hardly any. When treating high-risk groups for postoperative hypersensitivity – this mainly includes young women in puberty up to the age of 18 – we use multi-bottle systems, for example Syntac, which has proven effective in combating postoperative hypersensitivity, thanks to its high glutaraldehyde content. But these tend to be special cases. For daily routine work, whether the cavity is shallow or deep, I get by well with a one-bottle system.

HEY: I still use multi-bottle systems for adhesive inlay luting.

SIEMS: I use it for indirect and additive restorations such as incisal edge extensions, as we never experienced failures in that aspect with multi-bottle systems and phosphoric acid etching.

Originally, "universal adhesives" were only developed for direct composite restorations. Is this still "in the heads" of many users?

FRANKENBERGER: That may be the case. However, today's universal adhesives are also approved for indirect restorations, where they are advantageous too. After separate light-polymerization, they form thin adhesive layers that are easy to control in the indirect procedure and do not change the cavity geometry during adhesive luting. As a result, the inlay or partial crown fits into the final position without any problems, even with separate polymerization. This is a clear weakness of multi-bottle adhesives, with which a thin layer thickness cannot always be guaranteed with separate polymerization.

ELSAYED: I use CLEARFIL™ Universal Bond Quick in combination with a self-adhesive luting composite in some cases, for luting indirect restorations. As it contains bisphenol A diglycidyl methacrylate (bis-GMA) and silane adhesive monomer in addition to the MDP monomer, it is suitable for luting oxide ceramics, silicate ceramics and composites (Figs. 1 and 2).

RAPID BOND TECHNOLOGY

With the introduction of rapid bond technology, fast and strong adhesion to all required materials is possible. Especially on dentin, which is one of the most difficult substrates.

The performance of rapid bond technology in CLEARFIL™ Universal Bond Quick is proven. The result is dense and complete coverage of the dentin.

Both the self-etch and etch & rinse procedures create a close interaction zone between the adhesive and dentin. No air inclusions were found.



3.

Fig. 3 and Fig. 4 Application of a universal adhesive using the etch & rinse technique for direct build-up of canine guidance with composite (left) and with the selective-etch technique for class I cavities (right).



4.

Let's get on to self-etch systems ...

FRANKENBERGER: CLEARFIL™ SE BOND, as a two-bottle self-etch system for dentin, has always been one of the best in the world. But if a tooth also has enamel, I would prefer to etch it with phosphoric acid. If I can achieve selective enamel etching, that's fine. But soon the entire cavity is flooded with etching gel. Here, classic self-etch systems are clearly inferior to universal dentin adhesives.

Do self-etching systems perform as well, in terms of survival rates, as etch & rinse systems? Are there any studies on this?

FRANKENBERGER: Of course, there are studies on Class V cavities. Here, the survival rates are similar. For Class I and Class II cavities, however, etch & rinse systems perform better with regard to marginal discoloration.

Why?

FRANKENBERGER: Because there is still no way around the phosphoric acid on the enamel.

And what's the consequence?

FRANKENBERGER: The consequence for me: If I treat a cavity where there is some enamel, which is normally the case, I always etch with phosphoric acid, so I work either with an etch & rinse system or a universal adhesive, whereby the etch & rinse technique can also be successfully applied.

How much chair time can be saved with the "right" adhesive system?

FRANKENBERGER: I've always found that to be a tough question. The bonding step is extremely important: whether I need 1 minute, 1:15 minutes or 1:30 minutes is utterly irrelevant from an economic point of view. The quality of the bonding step is very decisive for the final result, so 30 seconds more or less is not essential in my opinion. The only reason why the time savings could be relevant is when you are working close to the contamination limit.

Like, the saliva is on its way?

FRANKENBERGER: Exactly, then of course faster application is more successful. But then there is also the rubber dam and controlled drainage.

Dr. Elsayed, working close to the contamination limit - is this a typical indication for CLEARFIL™ Universal Bond Quick?

ELSAYED: Yes, because it penetrates the tooth surface immediately.

So, there is no waiting period, nor the application of several layers and intensive rubbing is required. The rapid bond technology described above creates optimum adhesion, which is in no way inferior to other universal adhesives. We have tested this intensively, both internally and externally at universities. There are no significant differences between CLEARFIL™ Universal Bond Quick applications with no waiting time and conventional universal adhesives for which you have to wait 20 seconds. This offers many advantages for the practitioner.

When, for example?

ELSAYED: When reliable isolation is difficult, but also in several cases as in pediatric and geriatric dentistry. This is attractive for the workflow of course ...

HEY: Definitely! This saves between one and two minutes per adhesive bond.

FRANKENBERGER: I'm still a little cautious.

Why?

FRANKENBERGER: I always gain an impression based on our research work. Once this impression is complete I am pleased to give a positive statement. Studies on postoperative hypersensitivity are also needed. Because good dentin sealing and good enamel adhesion are as important as they ever were.

In general, are one-bottle systems comparable to multi-bottle systems in terms of adhesion, sealing and postoperative hypersensitivities?

FRANKENBERGER: Certainly, this has been the case for several years. We're good with that.

HEY: Good adhesion and above all no hypersensitivity for the vital tooth are essential, so I agree with Professor Frankenberg. In everyday practice, however, we have had the best experience in this regard with CLEARFIL™ Universal Bond Quick. But of course, studies would be beneficial.

What are the main causes of the postoperative hypersensitivities?

ELSAYED: There are many causes of postoperative hypersensitivity, a typical one being over-etching. This over-etching of the dentin can be avoided with universal adhesives, but not with classic self-etching adhesive systems. Self-etching systems should not be combined with the etch & rinse technique for dentin. Therefore, when selectively etching the enamel, dentin should not be involved. But this is often very difficult. Universal adhesives, on the other hand, can be used for all etching techniques. If phosphoric acid floods the cavity during selective enamel etching, CLEARFIL™ Universal Bond Quick can still be used without provoking over-etching of the dentin.

According to which criteria should the user now choose between the various adhesive systems?

FRANKENBERGER: To be honest, the difference is not that great anymore. Because today, practically all universal adhesives contain MDP monomers as adhesive monomers. Since the patents expired, chemical bonding and dentin sealing has improved for almost all providers. There are, of course, differences in the delivery systems—pen or bottle—and with regard to viscosity. On the whole, however, the universal adhesives have already become relatively similar to one another. Which is a good thing: because, of the adhesives we tested over the past few years, none were "total failures", but over 15 years there were always adhesives that came on the market which we tested and then said: "What is this, you can't be serious." But this is simply history now.

Dr. Elsayed, how do you explain this? Since the patent expired, shouldn't all providers have MDP monomers?

ELSAYED: Not all MDP monomers are equally good and achieve equally durable bonding. There are significant differences, which are attributable to the degree of purity and the production process. This is documented, among other things, by work from Yoshihara et al. The MDP monomer developed by Kuraray has a high potential to form a chemical bond with hydroxyapatite and is considered the most effective monomer for adhesion to the tooth hard substance and zirconia ceramics.

What does the practitioner say?

HEY: I opt for hypersensitivity-free systems that are also attractively priced. When 1 liter of the fluid costs well over 25,000 Euro, it becomes ridiculous for me.

Around ten years ago it was said: The success in adhesive technology is only 40 percent determined by the material, but 60 percent by the correct application. Has this changed today?

FRANKENBERGER: No, that hasn't changed. The two super-critical things in the adhesive technique are not so much the application of the adhesive, but rather the correct processing in terms of isolation, i.e. freedom from

contamination, and correct polymerization. This correct handling is and remains focused on the practitioner, not on the product. The argument that bottles could be mixed up in multi-bottles systems is irrelevant in my view. This is simply the minimum profile required for the personnel.

So, it's more a perceived simplification?

HEY: I don't think so. Application errors have been significantly reduced by one-bottle systems. The simple systems have contributed to greater safety in adhesive technology.

SIEMS: Multi-step systems are much more practitioner-sensitive, especially under time pressure.

ELSAYED: Correct application is of course a prerequisite for clinical success, independent of the product. That is and will remain true. However, the reduction of working steps and the higher error-tolerance of new materials and innovative techniques have helped to minimize the risk of application errors.

What about a rubber dam ...

FRANKENBERGER: The rubber dam was not invented for the adhesive technique, but for the gold filling, because the moisture in breath posed a huge problem for the cold welding of the gold foil. And only then was it realized that the adhesive technique with the rubber dam also works great. A rubber dam is not an absolute must for me, but the probability of something going wrong is definitely lower with a rubber dam. That is why I personally like to use a rubber dam, especially when it is helpful for me, and that is very often the case.

But not always?

FRANKENBERGER: No, there are situations in which the rubber dam only gets in the way and doesn't help me at all, for example when I work with a silicone key in the anterior region. So, if my experience tells me that absolute drainage with a rubber dam is a hindrance, then I'll leave it out. I always use a rubber dam for indirect restorations and in endodontics, otherwise it's too stressful for me or an imposition for the patient. The fact is: contamination-free application of adhesive and composite is crucial.

Is a rubber dam a must for successful application of the adhesive technique?

FRANKENBERGER: It's not a must, but it's nice to have.

HEY: In my opinion, however, a rubber dam can be dispensed with in many situations.

In which ones, for example?

SIEMS: If isolation cannot be safely ensured by means of a rubber dam - for example in the case of deep subgingival defects. Then I would consider visual monitoring of the saliva to be safer. We also often bond full crowns without a rubber dam, but still preferably with adhesive.

ELSAYED: I like to work with a rubber dam, especially when bonding indirect restorations, for example inlays and

adhesive bridges. Sometimes it is possible without a rubber dam, provided that controlled isolation can be achieved and contamination with saliva or blood is avoided. This can be difficult when etching with phosphoric acid.

With the etch & rinse technique you mean?

ELSAYED: Right. Because after etching, the tooth has to be rinsed and dried. Without a rubber dam this may be difficult to do without contaminating the tooth. The risk of contamination is minimized using self-etching systems, irrespective of whether two-bottle systems or universal adhesives are used. If the phosphoric acid step is omitted, rinsing and drying with air is also omitted, and then the risk of contamination is low even if a rubber dam is not placed.

Is "over-etching" avoided with one-bottle systems?

FRANKENBERGER: If a pure self-etching technique without phosphoric acid is used, then over-etching is impossible. But today we know how to deal with phosphoric acid responsibly. In fact, if the dentin is etched for no longer than 15 seconds, this can always be controlled. This has nothing to do with one- or two-bottle systems.

So over-etching is no longer an issue today?

HEY: Unless you additionally etch the dentin with phosphoric acid, "over-etching" is certainly no longer an issue.

SIEMS: I've never experienced over-etching as a problem, our postoperative complaints are in one-in-a-thousand range.

What's the procedure in your practice? Do you always treat carious lesions with adhesive?

FRANKENBERGER: Yes, whenever possible, I try to work minimally invasive with composite, and for large restorations with ceramic, also adhesive. Unless a temporary is intended. I do the subsequent permanent filling exclusively with the adhesive technique.

HEY: I agree that if we don't go for a temporary fillings, for example in the case of indirect or direct capping, we only use adhesive.

Which improvements would you like to see? What should tomorrow's adhesive achieve?

HEY: In combination with blood and saliva, it should have an antiseptic effect while displaying consistent adhesive power.

ELSAYED: Research on this topic is already underway. The focus is on bioactive bonding, i.e. bonding systems that offer therapeutic advantages, such as remineralization of dentin, without compromising the original adhesive properties.

SIEMS: The adhesion values to enamel and dentin should be as good as the current gold standard systems.

FRANKENBERGER: Universal adhesives form a relatively thin film layer. This offers advantages for indirect restorations because they can be cured separately without changing the cavity geometry. But if the adhesive layer becomes very thin as a result of blowing, there is a risk that oxygen prevents proper polymerization. There is definitely still room for improvement with universal adhesives.

But overall, I'm really very satisfied with the performance, especially as I've experienced different times over the 26 years of my research in this field. It must therefore also be emphasized that the industry has really done a good job here and that adhesive technology is now on a much higher level than it 15 years ago. My conclusion: The one-bottle systems have proven themselves!

SUMMARY

For daily routine work, whether the cavity is shallow or deep, a one-bottle system (universal adhesive) is now sufficient.

Modern universal adhesives are also approved for indirect restorations where they certainly have advantages as well.

For cavities with some enamel, the etch & rinse technique, which can also be successfully used with a universal adhesive, is recommended for enamel.

Correct application is still essential for the success of the adhesive technique - regardless of the product.

Contamination-free application of adhesive and composite is crucial for success. But placing a rubber dam is not a must.

New universal adhesives that immediately penetrate the tooth hard substance accelerate the workflow. Especially when working close to the contamination limit they show their advantages.

As initial research indicates - there are no significant differences between CLEARFIL™ Universal Bond Quick applications with no waiting time and conventional universal adhesives for which you have to wait 20 seconds.

Further studies, also looking into postoperative hypersensitivity, are still pending.

The manufacturers' R&D departments are currently focusing on bioactive bonding. Tomorrow's adhesive is expected to offer therapeutic advantages such as remineralization of dentin while retaining the same adhesive properties.



PREMIUM
DENTIN



CLASSIC



PREMIUM
ENAMEL



CLEARFIL MAJESTY™ ES-2

CLEARFIL MAJESTY™ ES-2 is the composite that allows intuitive creation of natural-looking restorations.

The combination of its self-adaptive capacity, thanks to the use of light diffusion technology, its natural fluorescence, high filler content, fine workability and exceptional polishability provide outstanding aesthetic results.

CLEARFIL MAJESTY™ ES-2 is a forgiving composite. It blends seamlessly with the adjacent tooth structure. This is because CLEARFIL MAJESTY™ ES-2 incorporates light diffusing technology. This makes it possible to cover the entire VITA range using only VITA A shades.

In our endeavors to reproduce nature, we need to step away from the notion that artificial materials do all the work for us. Especially enamel is a difficult kind of tissue to replace with artificial materials like composite. When you replace natural enamel with translucent composite you almost never reach the desired goal! Why is this? The most determinant factor is the difference in value. Natural enamel increases in value in proportion to its thickness, while for (translucent) composite the value decreases.

In certain situations, for instance for the reproduction of the incisal edge of a central incisor, where a translucent zone is naturally present, the use of a more or less translucent composite is needed. However, it is often the opacity of a composite that we wish to harness in order to cover up underlying (irregular) discoloration. To do this, the use of a translucent composite is clearly not desirable. In this situation, the most opaque variant is your first choice of composite.

You've probably been there: applying anatomical layering techniques with a composite system, only

to arrive at a somewhat disappointing result that looks too gray. This can be explained by the fact that, as a manufacturer - and we're certainly not alone here - we have created some confusion by giving composites names such as Dentin and, worse still, Enamel. These names suggest that these materials can be used as a replacement for natural dental tissue. Due to the totally different optical properties of each dental tissue and composite, this can only be achieved within a frequently too narrow spectrum. Therefore, when it comes to the use of the more translucent composite variants, I recommend a cautious approach. Only use such variants where transparency is required.

...it is often the opacity of a composite that we wish to harness in order to cover up underlying (irregular) discoloration. To do this, the use of a translucent composite is clearly not desirable. In this situation, the most opaque variant is your first choice of composite.

Kuraray Noritake Dental offers three basic opacities within the CLEARFIL MAJESTY™ family. These three variants enable you to create transparency where necessary, or indeed to

avoid it in zones where greater coverage is required. The most opaque variant within the CLEARFIL MAJESTY™ ES-2 family is Premium Dentin. The semi-opaque variant Classic and the semi-translucent variant Premium Enamel.

The challenging class IV restoration as an example. The tendency exists to use dentin composite up to the dentin-enamel junction. Don't do this, but instead apply it right up to the outermost edge of the restoration. This means also covering the beveled enamel. Depending on the desired end result, you should only use the more translucent variants, Classic or Premium Enamel, in the incisal third.

Working with different variants of CLEARFIL MAJESTY™ ES-2 in one restoration where more than one variant end at the surface the transition from one type to the other is totally seamless. Since all three variants have virtually the same high filler percentages and filler type. During finishing you won't even notice the transition between the different variants. The polishability of all the variants is also identical.

All these qualities make CLEARFIL MAJESTY™ ES-2 your aesthetic composite for the effortless creation of natural-looking restorations. Both anterior and posterior.

Peter Schouten,
Technical Manager Kuraray Europe Benelux

DIRECT COMPOSITE APPLICATIONS IN ANTERIOR TEETH

by Dr. PhD. Jusuf Lukarcenin

Is it possible to fulfil high aesthetic demands by restoring anterior teeth with composite resin? It is – provided that several important factors are respected. One of these factors is the faithful reproduction of the natural tooth morphology, which has a decisive impact on aesthetics and function. Moreover, success is determined by the selection of the right shades of high-quality composite resin and their purposeful combination using proper layering techniques.

Introduction

The aesthetic appearance of direct anterior restorations is affected by proper shade selection on the one hand and the creation of a natural shape and texture on the other¹. Hence, the dental practitioner's own artistic skills play a decisive role. According to Fahl, information about the tooth morphology and function, and the optical properties of the tooth should be taken into consideration when the most suitable restorative material and shade are selected².

These minimally invasive composite restorations have become long-term highly predictive treatments for the anterior region. Instead, they are regarded as an adequate alternative to indirect restorations, as they are both durable and able to closely imitate the natural tooth structure^{3,4}.



Fig. 1: Pre-operative image.



CLINICAL CASE EXAMPLE 1

This 45-year-old female patient presented with a diastema and a disproportion in the size and shape of her maxillary central incisors (Fig. 1). In the first step, a detailed case history was taken and an intra-oral examination was carried out. Subsequently, the initial situation was recorded by taking intra-oral photographs, which would allow for a computer-aided morphological evaluation and treatment planning (Fig. 2).



Fig. 2: Digital mock-up.



Fig. 3: Treatment outcome immediately after polishing.



Fig. 4: Clinical situation at the one-year recall.

The patient's second visit started with a professional tooth cleaning procedure followed by isolation of the maxillary anterior teeth. Afterwards, the tooth shade was determined and appropriate composite shades were selected. In this case, the shades A2E, Amber Translucent and A3D of CLEARFIL MAJESTY™ ES-2 Premium (Kuraray Noritake Dental, Japan) appeared to be most suitable based on my criteria. In addition, a mock-up was created using mock-up resin in order to produce a silicone key.

Opting for a minimally invasive procedure, no mechanical tooth preparation using drills was performed after removal of the mock-up. Instead, the enamel was merely etched with 35% phosphoric acid gel (K-ETCHANT Syringe, Kuraray Noritake Dental) for 8-10 seconds to increase surface roughness. After rinsing and drying, the adhesive agent (CLEARFIL™ Universal Bond, Kuraray Noritake Dental) was applied to the etched surfaces. Composite layering started with the build-up of palatal shells with the aid of the silicone key. Following light-curing of the shells, a small amount of composite in the dentin shade A3D was applied to the proximal surfaces using a thin spatula and a brush. The aim was to reduce light transmission in the area of the dentin core. The restoration was completed with a combination of the composite shades A2E (enamel) and Amber Translucent, which were applied using a modelling brush.

Finishing and polishing was accomplished using flexible rubber polishing discs containing diamond particles with a low-speed handpiece. No additional finishing and contouring was necessary due to the use of a brush during layering, which contributed to the creation of a natural shape and surface texture. Figure 3 shows the outcome of the restoration procedure.

Oral hygiene training was provided and follow-up examinations were performed after three, six and twelve months (Fig. 4). Healthy hard and soft tissue conditions were observed during these visits.

CLINICAL CASE EXAMPLE 2

This 30-year-old female patient had a diastema, irregularly shaped anterior teeth and showed signs of abrasive tooth wear (Fig. 5). Following a detailed anamnesis and intra-oral examination, the tooth shade was determined and the composite CLEARFIL MAJESTY™ ES-2 Classic selected in the monochromatic shade A1.

Following the isolation of the working field, 35% phosphoric acid etchant (K-ETCHANT Syringe) was applied to the enamel of all teeth between the maxillary right canine and the maxillary left first molar. The surfaces were then treated with a universal bonding agent (CLEARFIL™ Universal Bond) as recommended by the manufacturer.

Modelling was carried out with a thin spatula and a modelling brush for composite. Neither a silicone key nor any wetting or modelling resin were used in the procedure. For polishing, the flexible polishing discs were used at low rotational speed. Thanks to the use of a modelling brush, no additional finishing with diamond-coated instruments was necessary. Figures 6 and 7 show the final restoration at baseline and one week after completion of the restorative procedure.



Fig. 5: Pre-operative clinical situation.



Fig. 6: Treatment outcome on the day of the restorative procedure.



Fig. 7: Clinical situation after one week.



Fig. 8: Clinical situation one year after the restorative treatment.

This patient also received oral hygiene training and presented for recalls three, six and twelve months after the treatment. The patient maintained an exemplary oral hygiene behaviour, so that it came as no surprise that the soft tissues were healthy and no problems were found after one year (Fig. 8).

Discussion

Nowadays, direct composite restorations are becoming increasingly popular. Especially for young patients and all those who do not want to sacrifice large amounts of healthy tooth structure, the technique is an ideal treatment option⁵. In many cases, aesthetic outcomes are possible without mechanical tooth preparation, but a selective etching procedure only⁶.

The clinical lifetime of these restorations depends on many factors. Important prerequisites for high-quality outcomes include the selection of a suitable composite material with the required surface hardness, appropriate finishing and polishing, a good oral hygiene behaviour, and proper maintenance measures during periodical follow-up visits.

As a matter of course, the manual skills of the dental practitioner and the use of selected materials according to the manufacturer's instructions for use also have a direct impact on the long-term success of the restorations^{7,8,9}. A user's inability to meet one of these requirements and failure to carry out all working steps correctly may have a direct impact on the quality of the restoration.

Conclusion

Composite resin is a popular material class for the production of aesthetic anterior restorations due to their straightforward use and rapid application, good repair options and high aesthetic potential when used properly^{10,11}. The two case examples illustrate that a treatment with composite resin is often the best treatment option when a non-invasive procedure completed within a single visit is desired.

About the author

Dr. Jusuf Lukarcanin is a Certified Dental Technician (DCT) and a Doctor of Dental Science (DDS). He studied dentistry at the Ege University Dental Faculty in Izmir, Turkey, where he obtained a Master's degree in 2011. In 2018, he received a PhD degree from the Department of Restorative Dentistry of the same university, where he also worked as a researcher for six years. Between 2012 and 2019, Dr. Lukarcanin was the head doctor and general manager at Ozel Gen Dental Clinic (OZEL GEN Ağız ve Diş Sağlığı Polikliniği) in Izmir.

Currently, he works at Tinaztepe GALEN Hospital in the Tinaztepe Health Group of Tinaztepe University and in the Department of Research & Development of GULSA Company in Izmir.

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No waiting, No multiple layers, No extensive rubbing.



CLEARFIL™ UNIVERSAL BOND QUICK

Unlike traditional dental bonding agents that require waiting time, extensive rubbing and multiple layers in order to deliver an optimum result, with CLEARFIL™ Universal Bond Quick your restorative procedures are carried out to the exceptionally high standards. Exceptional levels of adhesion result in a bond that lasts with minimal risk of remedial work. And, because there's no need to wait before you proceed, procedures take less time than with most other available bondings, benefiting both patient and practitioner.

BORN IN JAPAN

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*read Instruction for Use of the product before usage.