

kuraray

Noritake

BOND

NEWSLETTER
FOR
PROFESSIONALS
IN DENTISTRY

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BORN IN JAPAN

40 YEARS

This year marks the 40th anniversary of Kuraray's entry into the commercial dental products market.

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Noritake**

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'state-of-the-art'**

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**Balancing translucency
and opacity**

in the direct reconstruction of anterior and posterior teeth

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2018

Color gradient.
763 MPa. For CEREC®
Katana Zirconia Block



2017

Rapid bond technology: new universal adhesive system
CLEARFIL Universal Bond Quick



2015

World's first multi-layered zirconia:
KATANA Zirconia ML



2000

Golden standard self-etching bonding systems:
CLEARFIL SE BOND



1993

First self-etching bonding system:
CLEARFIL Liner Bond II



1983

First adhesive resin cement with MDP: PANAVIA EX



1981

Invention of adhesive monomer MDP



1978

First "total-etch" bonding system:
CLEARFIL Bond System F

Celebrating 40 years of dental innovation

Many years ago, even before the advent of the internet, social media and bitcoins, Kuraray Noritake Dental was founded in Japan.

If you were around back then, however, this momentous event may have escaped your notice as you agonized over whether Lois Lane would guess Clark Kent's true identity, whether your shiny pants were as jaw-dropping as Olivia Newton-John's in Grease or whether Argentina would win the World Cup.

The year of course was 1978, exactly 40 years ago, and while flares and cheesecloth shirts gradually gave way to big hair and shoulder pads, Kuraray was busy developing the very first product in its portfolio: Bond System F, described as the world's first system enamel-bond system or total etch system.

In 1983 Kuraray launched PANAVIA EX, the first adhesive resin cement containing the world-famous MDP monomer (10-methacryloyloxydecyl dihydrogen phosphate). Today, after more than 35 years, Kuraray's MDP is still considered to be state-of-the-art.

With the development of adhesive systems, dentin bond strength increased and long-term results improved. The gold standard

Clearfil SE Bond confirmed the enhanced technological steps made by Kuraray over the years. Nowadays, with one-step systems, Clearfil Universal Bond Quick has already earned its place in the bonding industry by being the first system without waiting time.

Adhesive technology changed dentistry dramatically. Today it is still evolving as new advances are explored that allow for more tooth tissue to be preserved. Product quality is continuing to move forward, echoing the huge jumps that were made in the '80s and '90s.

The drive at Kuraray Noritake Dental over the past 40 years has been one of continuous commitment to developing better products for the dentist and for patient comfort.

Our major focus is to deliver products that ensure reproducible and long-lasting results. As a company we wish to inspire you with the most minimally invasive and bio-additive solutions both now and in the future. We believe that patients should be able to enjoy their own teeth for a lifetime, because a patient's smile means more than anything else.

Happy birthday Kuraray!



Joost Nederkoorn
Head of European Marketing

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Forty years of success in dentistry

In 1978, Kuraray shook up the dental market with the introduction of CLEARFIL BOND SYSTEM F, the world's first total-etch adhesive system. Having inaugurated the era of adhesive dentistry, we steadily introduced new dental products over the following years. In 1983, Kuraray introduced the PANAVIA EX resin cement. By utilising our patented MDP monomer technology developed in-house, PANAVIA EX enabled Kuraray to set the industry standard for adhesion—a position we have held in the decades since. This year marks the 40th anniversary of Kuraray's entry into the commercial dental products market, providing a perfect opportunity to reflect on how far we have come since.

Kuraray - Rooted from a true trailblazer

Founded in June 1926 by Magosaburo Ohara in Kurashiki in Japan, Kuraray has transcended our humble origins as a producer of rayon to become a leading global manufacturer of medical products, materials, textiles, chemicals, resins and much more. Our commitment to research and development in the fields of chemistry and engineering has led to many market firsts and a reputation as a pioneer of new products and technologies.

A history of innovation

From the very beginning, Kuraray has been focused on the manufacture of high value-added products. At the time of the business's birth, rayon was a new type of synthetic material, and over the ensuing years, Kuraray was able to master its production. In 1950, we became the first company in the world to develop the technology to mass-produce POVAL (polyvinyl alcohol), paving the way for the production of the new synthetic fibre Vinyon in the same year. CLARINO, a water-resistant synthetic leather substitute for shoes, bags and other items, was released in 1964 after extensive research and testing, and quickly collected international awards for its technology.

Kuraray's continued emphasis on independently developed proprietary technologies and techniques, rather than relying on imported alternatives, has enabled our company to provide original, high-quality products for a variety of different industries. High on this list is dentistry.



大原 孫三郎



Forty years of success in dentistry

The Kuraray Noritake Dental era

In April 2012, Kuraray Medical and Noritake Dental Supply merged to form Kuraray Noritake Dental. By bringing together the materials and technologies developed by each of these market-leading companies, Kuraray Noritake Dental has continued to deliver dental bonding agents, ceramics and other reliable products to over 90 countries worldwide. The KATANA Zirconia range, for example, employs our unique multi-layered zirconia technology to provide a ceramic restorative material with superior translucency and perfect blending properties, while rapid bond technology ensures that CLEARFIL Universal Bond Quick delivers a lasting bond faster and easier than ever.

Through a focus on research and production, Kuraray Noritake Dental is ideally positioned to continue providing leading-edge solutions to dental issues both now and in the future.

Picture: 1982, assembly of one of our first products 'Photo Clearfil'



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Clearfil A

From exotic to 'state-of-the-art': Single-retainer resin bonded fixed dental prosthesis

SOURCE: ZMK (32)10 2016, S. 650–656, SPITTA VERLAG

Prof. Dr. Claus-Peter Ernst

Single-retainer resin bonded fixed dental prosthesis (RBFDP) have developed from exotic treatment options into true alternatives for implants. The advantages in comparison to the classical two-wing metal-based 'Maryland bridge' can be presented on the basis of solid evidence. The patient benefits from the fact that the number of teeth that require preparation is significantly reduced by 50 % from two to just one, access for cleaning is easier, long-term prognosis better and in the end the costs are substantially less than implant treatment. In this article the relevant literature that is available on the subject is presented in order to provide more evidence to the clinician who wants to choose this treatment option. Application examples should give an idea about the various options of minimally-invasive prosthetic restorations using single-retainer RBFDPs. A case example has been selected which goes beyond the classical functional design of the single retainer RBFDP to demonstrate the stability of adhesive bonding even in instances of increased loads. The case presented here has, at the time of writing, been in clinical service for more than two years.

According to the DGPro (German Association of Prosthodontics and Biomaterials) single-retainer RBFDPs fabricated from all-ceramics are only recommended in the anterior region. Here, however, they should be seen as 'a treatment option should the correct indications exist'. The guideline considers a 'strong consensus of opinion' based on the cited literature, which accords with an approval of > 95 % from those involved in the consensus finding, and, with an evidence level of 2+ ('well conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal'), the medium level of recommendation 'B'. (The existing levels of recommendation are A, B and O).

These recommendations are deduced from study results on single-retainer RBFDPs with survival rates of 94% [10] after 10 years' observation of veneered alumina oxide ceramic and a survival rate of 100% after 5 years' observation of veneered zirconia ceramic [19,20]. In a recent study from 2017 the 10 years clinical results with a 98.2% survival rate for Zirconia all-ceramic single-retainer RBFDPs were published by Kern et al [24]. The Kiel studies are supported by another publication: Sailer & Hämmerle also showed a 100% success rate in 2014 [18] in a retrospective study on Zirconia single-retainer RBFDPs over a medium observation period of 4 years. However, a successful adhesive re-attachment was counted as a success here, which occurred twice in the cited studies.

Further impressive results have also been published in favour of the single-retainer variation of metal-based adhesive bridges: in the retrospective study by Botelho et al (3) on single and double retainer on single and double retainer adhesive bridges based on non-precious alloy, it was possible to document significantly improved success and survival rates for the single-retainer variations after a medium service time of 18 years compared with the double retainer variations based on the classic 'Maryland' principle.

Therefore it has been possible in the meantime to cite three high-quality studies on single-retainer adhesive bridges based on Zirconia which were able to report an almost 100% success rate over a medium observation time of more than 5 years. Such results, which are extremely rare in clinical studies, should make us curious regarding this minimally-invasive treatment option. In addition, we have two long-term studies [3, 10], which are both able to record the clinical superiority of the single-retainer adhesive bridges in comparison to the double-retainer bridges. From these studies, it was possible to state an evidence-based recommendation for their use. In a meta-analysis published in 2008 on the subject of adhesive bridges [17], the authors already clearly indicated that the retention loss due to failures of the



adhesive bond leads the list of complications with 19.2%. This paper [17] also reveals that single-retainer all-ceramic adhesive bridges might be superior to double-retainer metal-ceramic adhesive bridges. The authors clearly refer to the significance of the adhesive protocol and recommend that extra treatment time should be anticipated for such complex cementation scenarios. The study by Tanoue [22] also demonstrates the complexity involved in the establishment of a sufficient adhesive bond: the rate of failure is twice as much for inexperienced dentists as for experienced clinicians. For this reason, Sasse and Kern 2014 describe the complex treatment procedures in more in detail [21], and this description also serves as basis for the patient case presented here. The Prosthodontics department in Kiel headed by Professor Kern may to a large extent be responsible for the single-retainer adhesive bridge made from oxide ceramic developing from its experimental niche existence to become the favoured method for minimally-invasive, non-surgical treatment options for individual missing incisors. We recommend the literary overview published in 2015 by Passia et al. [16] in the DZZ for all those wishing to read up on this 'uncharted' prosthetic territory.

CASE 1: REPLACEMENT OF TOOTH 22 THROUGH A SINGLE-RETAINER RBFDP BONDED TO TOOTH 23

In the case of the 64-year old patient, the 2nd left upper incisor had to be removed some months ago for periodontal reasons (Fig. 1). After periodontal treatment of the remaining teeth *alio loco*, the two central incisors were periodontal stable, but with a degree of mobility of between 1 and 2. Due to this uncertain mobility of the central incisors, the two central incisors could not be used as the abutment teeth for the gap (Fig. 2). The upper left canine, on the other hand, was stable without any mobility, and had no pocket depth > 3 mm. Owing to the prerequisite of a bone augmentation in case of an implant treatment, the patient was unenthusiastic about the implant-supported prosthetic restoration offered to her as a valid alternative treatment option. It was agreed



Fig. 1: Missing tooth 22 in a 64-year old patient with periodontally-damaged anterior teeth.



Fig. 2: The canine 23 was stable, had no pocket depth > 3 mm and was therefore the only anterior tooth suitable as the abutment tooth.



Fig. 3 : The single-retainer veneered zirconium oxide adhesive bridge, labial view.



Fig. 4: The laboratory work, cervical view.



Fig. 5: The blended zirconium oxide adhesive bridge on the working model.



Fig. 6: Application of a universal primer containing MDP/silane (Clearfil Ceramic Primer Plus, Kuraray Noritake).



Fig. 7: Group rubber dam from tooth 14 to 26.

that the most expedient and least invasive method of treatment would be a single-retainer RBFDP, bonded to the canine instead of the central incisor as described in the cases referred to in the literature at the beginning of this text. The canine was prepared more extensively than described in the literature mentioned above [16,21]. The single-retainer, veneered Zirconia adhesive bridge (Katana HT, Kuraray Noritake, Figs. 3–5) was created by the Hildegard Hofmann Dental Laboratory (Mainz, Germany). The adhesive cementation protocol took place in strict compliance with the latest scientific consensus on the adhesion of zirconium oxide ceramic: because zirconium oxide adhesive bridges have generally been sandblasted with aluminium oxide at the laboratory, sufficient cleaning of the adhesive surface must be ensured after initial cleaning. In addition to special cleaning pastes (e.g. Ivoclean) [15], repeat sandblasting is a possible method. 'Cleaning' or 'conditioning' of the zirconium oxide material with phosphoric acid etch gel, on the other hand, is contraindicated [8].

Therefore, a fast repeated sandblasting in the sense of a cleaning process and simultaneous pre-treatment would appear to be the most expedient. A meta-analysis [6] was able to show that sandblasting with Al_2O_3 or tribochemical silicatisation (CoJet) is essential in order to adhesively bond zirconium oxide ceramic. This was also implemented in this case: the zirconium oxide adhesive surfaces were sandblasted chairside with CoJet (3M ESPE, Seefeld). Baybek et al. [1] showed that, through the use of tribochemical silicatisation (CoJet), significantly better bond strengths can be achieved on zirconium oxide compared to just sandblasting them with uncoated Al_2O_3 . Another study [2], in which CoJet in combination with an MDP-containing adhesive resin cement showed the highest bond strengths, came to the same conclusion. Therefore, Inokoshi and van Meerbeek [7] also recommend tribochemical sandblasting with silicon-coated Al_2O_3 powder with a grain size of 30–50 μm at a pressure of 1–2 bar as the optimum procedure. After sandblasting, a cleaning process should be carried out in an ultrasonic bath for 10 min. [7].

In the next step, a universal primer containing MDP/silane (Clearfil Ceramic Primer Plus, Kuraray Noritake, Fig. 6) was applied. This recommendation also results from the meta-analysis on the subject [6]. The study by Yang et al. [23] already confirmed the additional use of Clearfil Ceramic Primer after Al_2O_3 sandblasting as having significantly higher bond strengths after 150 days'

storage in water in comparison to the control group, onto which no separate primer had been applied. This study used a self-adhesive resin cement for bonding purposes. A different research group [8] was able to show that Monobond Plus and Clearfil Ceramic Primer displayed a significantly higher reliability in the establishment of a sufficient bond to zirconium oxide than Z-Prime and the universal adhesive Scotchbond Universal. Some universal adhesives function in the same way as primers on zirconium oxide [5] (The case reports published in 2013 [5] for the application of a universal adhesive as primer on the adhesive retainers have all been in situ up to now > 4 years, and reveal very good clinical results): the adhesion of a pure universal ceramic primer for indirect restorations, however, still appears to be superior and lead to more reliable results [7], and should therefore, from today's point of view, represent the preferred choice – if one wants to get the respective maximum of bond strengths. The single-retainer RBFDPs was therefore completely pre-treated, and stored to protect against contamination. Because the adhesive cementation had to take place under proper contamination control, a group rubber dam was placed from the upper 1st right premolar to the upper left 1st molar (Fig. 7), and was inverted on the upper left canine using a Heidemann spatula in the sulcus (Fig. 8). The discreet proximal caries detectable in Figs. 1 and 2 was consciously not integrated into the preparation, but rather was treated with a small adhesive filling in connection with the adhesive cementation, which then extended to the adhesive bridge.

The new Panavia V5 (Kuraray Noritake) was selected as adhesive resin cement. In this context, it is worth mentioning that Kuraray Noritake now also recommends etching of the enamel using phosphoric acid gel. The enamel surface was therefore conditioned for approximately 30 seconds with the K-Etchant-Gel enclosed with the cementation kit (Fig. 9). After thorough rinsing of the etching gel, the 'tooth primer' was applied, a single-component bonding agent which is carefully air-dried after application (Fig. 10) and with at least 20 seconds' impregnation time. Of primary importance here is the complete evaporation of the solvent (Fig. 11). In the case of the former well-known Panavia products, the primer had to be mixed from two components (Primer A and Primer B from Panavia 21 and Panavia F2.0). With Panavia V5, this is no longer required. Here the tooth primer hardens directly through contact with the



Fig. 8: Inverted rubber dam on tooth 23.



Fig. 9: Phosphoric acid conditioning of the entire adhesive surface.



Fig. 10: Application of the tooth primer.



Fig. 11: View after complete air blow drying of the primer.



Fig. 12: Lateral-oblique view of the integrated adhesive bridge during a subsequent inspection.



Fig. 13: Full face view of the integrated adhesive bridge during a subsequent inspection after three months.



Fig. 14: Situation from an incisal view via a mirror image.

mixed 2-component resin cement. The resin composite was applied onto the adhesive retainer using the Automix syringe, and then positioned with two fingers to the upper left canine. The excess removal was carried out using a clean Microbrush, which also made it possible to remove interdental excess material. There was enough time to avoid early polymerisation of the cement excess, which is a significant application advantage. Alternatively, a 'tack cure' would have been possible. Of course, one might immediately doubt the efficiency of the chemical curing; however, the manufacturer has external, as-yet unpublished data in their records according to which Panavia V5 is the only adhesive resin cement able to actually produce a sufficient chemical curing effect among solely chemical curing procedure.

In spite of the option of purely self-curing use of Panavia V5, a light polymerisation of the adhesive surfaces from labial and palatal direction was carried out for 60 seconds respectively. This permitted the timely release of seating pressure during cementation and optimised the excess removal and preparation using a scaler and an Eva-instrument as well as cleaning and inspection with dental floss. Figs. 12 and 13 show the adhesive bridge cemented with Panavia V5; furthermore, it is possible to see the supplementary small mesial filling on the canine. Fig. 14 shows the situation from an incisal view via a mirror image.

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40 YEARS OF DENTAL INNOVATION



EXCEPTIONAL KNOW-HOW, HIGH-END DENTAL PRODUCTS

Through a process of extensive research and development, we have been able to combine our MDP monomer with hydrophilic amide monomers to create rapid bond technology. Our new universal adhesive system CLEARFIL Universal Bond Quick relies on this technology to deliver optimal stability and resistance to moisture for a lasting result. By building on our past successes to deliver better solutions, this new technology embodies what Kuraray Noritake Dental does best—innovate and develop new and improved products.

BORN IN JAPAN

40 YEARS

Interview with Dr. Mayer

Dentist | Practice: Kelterstraße 10, 71717 Beilstein



Dr. Mayer was an early user of the most advanced adhesive products and technologies that were available during the early 90ies. He has still a good memory of the first self-etching bonding agent that was available at that time, Clearfil Liner Bond. Today he is the owner in the second generation of a large dental practice that his father founded in 1968 in Beilstein, Baden-Württemberg. The interview partner was Dr. André Rumphorst, Scientific Marketing Manager Europe.

Q1 Dr Mayer, you have a preference for Japanese products, whether in cars or dental specialities. Why?

That is a long story and can be traced back to a pleasant experience regarding my mother, who enjoyed a long pen-friend relationship with a very nice Japanese person. In this way, we were able to receive an insight into Japanese culture and mentality at an early age. I have thus developed a certain basic trust in the quality of Japanese products.

Q2 In your practice, you offer a very wide treatment spectrum; for example orthodontics, implantology, laser treatments, prophylaxis, periodontology and, of course, the classic filling treatment with composites. How would you rate your experiences with adhesive technology?

At the beginning of the 90s I focused on adhesive technology as I had learned it from Prof. Roulet and Dr Blunck in Berlin. Over the years and decades, I have familiarised myself with many products and adhesive generations, and have gathered all my experiences together. In general, I can say that adhesives have consistently increased in quality over the years.

Q3 Which product do you use today in your daily work and how do you evaluate the different adhesive generations?

For some time now, I use universal adhesive Clearfil Universal Bond Quick. Prior to this, I used a self-etching multi-bottle bonding agent. The simplification to skip the phosphoric acid etching, in particular when no enamel margins are available, is important to me.

Q4 What do you like particularly about Clearfil Universal Bond Quick?

In brief: first of all we have the time-saving factor. Time is money due to the extremely rapid application protocol with no waiting

times whilst the adhesive takes effect. Secondly, the large range of indications simplifies my work as a dentist. Thirdly, I have observed almost no postoperative complaints. For my patients, of course, this is of decisive importance.

Q5 No uniform description of the so-called universal adhesives exists. What would your definition be?

For me, a universal adhesive must, above all, work just as well as the established multiple bottle adhesives. I can say that these both work reliably with Clearfil Universal Bond Quick.

Q6 Are there any indications for which you would not use Clearfil Universal Bond Quick; for example, in case of large Class II restorations with cervical dentine margins?

No. We now only use Clearfil Universal Bond Quick for all direct filling treatments and all direct indications. We do not require an additional adhesive. Due to the very simple, short application protocol, you can't really go wrong. As with all adhesives, of course, it is necessary to closely observe the instructions and the individual working steps which are different for each product. Otherwise, we like to etch enamel margins using K-Etchant (Kuraray). I really love the exceptionally precise application precise application due to the very thin cannula, combined with great stability. In this way, it is possible to effectively implement the frequently-expressed wish for selective enamel etching.

Q7 Do you also use universal adhesives for indirect luting work?

In challenging situations, I either use Panavia V5 in areas where the adhesive bonding has to be really strong, or I use a self-adhesive resin cement together with Clearfil Ceramic Primer Plus (Kuraray) to insert ceramics. In this respect, Clearfil Universal Bond Quick hasn't yet replaced all my little bottles!

Interview with Dr. Harr

Dentist | Practice: Finkenstraße 1, 74906 Bad Rappenau



With the advantage of having his own dental lab included in the practice, Dr. Harr is able to offer a large spectrum of dental treatments to his patients including advanced tools for diagnosis and prevention, conservative and prosthodontic treatments as well as solutions in implantology and parodontology. Modern adhesive dentistry is an essential part of his daily work so that Dr. André Rumphorst, Scientific Marketing Manager Europe, was curious to learn about his experience.

Q1 Dr Harr, what springs to mind spontaneously when you hear the name Kuraray?

It's really the name Panavia which springs to mind. I connect this with quality and adhesive strength.

Q2 There are a lot of opinions regarding bond strengths. Why do you believe that Panavia can make a difference here?

Everyone talks about high bond strengths; these numbers are often misinterpreted. Over the course of time, I have used the various Panavia generations and wasn't really disappointed by any of them. The reliable adhesive effect is due to the MDP invented by Kuraray. Kuraray has certainly gathered much experience in the use of this adhesive monomer, which is why it is also used in other products.

Q3 Through Panavia and MDP, you have also discovered the universal adhesive Clearfil Universal Bond Quick. What were your experiences here?

Universal adhesives have also been around for a while now. Regarding the Clearfil Universal Bond Quick, my first thought was applying and processing it immediately; that's not really needed. In the meantime, I must say that it does make a difference. The application workflow is not interrupted and it isn't as hard to keep the area dry, as it is air-blown and light-cured directly after application. Kuraray's wealth of experience has obviously facilitated this super-quick application without compromising quality. The results of Clearfil Universal Bond Quick have, up to now, completely convinced me.

Q4 Do you use the Clearfil Universal Bond Quick bottle or single-dose?

I only use the bottle. I am a typical Swabian in this respect and consider the price-performance ratio.

Q5 In your experience, what is important and decisive for the successful application of bonding agents and adhesive technology?

First of all, the user and their clinical experience. Regarding the product, a certain error tolerance during processing and, here in particular, the moisture tolerance of an adhesive. During light-curing, variations can quickly occur, and then a good adhesive should still be able to cure effectively. The moisture tolerance is important so that a good wetting is always achieved. In any case adhesive pooling in preparation edges must be avoided. A little stronger air-blowing must be possible after the application in order to prevent adhesive excesses in the corners. To be certain of success, I only apply the additional, separate enamel etching when building up class IV incisal edges.

Q6 Are there any applications or indications for which you would not use Clearfil Universal Bond Quick? Or, to put the question differently, do you prefer multi-bottle bonding agents in certain cases?

No. Before Clearfil Universal Bond Quick was launched, I used a self-etching single component adhesive for many years and was basically always satisfied. I switched products some time ago due to a mixture of curiosity and because it was a Kuraray product. Eventually I don't see the need to work with multi-bottle bonding agents for direct filling therapy with composites anymore.

Q7 Would you also consider Clearfil Universal Bond Quick as a possibility when luting indirect restorations?

Depending on the indications, I either use a classic, conventional cement or the self-adhesive resin cement Panavia SA Cement Plus. And I also still require a Silane for the pre-treatment of glass-ceramic. Otherwise, of course, I always use Panavia V5 when maximum adhesive strength is required.

Interview with Dental surgeon Dr. Fabrice Gambier

With a career spanning over two decades and a profound interest in the use and possibilities of adhesives, dental surgeon Dr. Fabrice Gambier is the perfect person to speak with when looking back at the evolution of adhesives and the techniques in applying them. Brenda van de Watering, Sales and Marketing Manager of Kuraray Europe France met Dr. Gambier in Paris at the 2017 Association Dentaire Française meeting to discuss these topics, as well as the advantages of Kuraray Noritake Dental's latest CLEARFIL Universal Bond Quick adhesive.

Brenda Van de Watering:

Hello, Dr. Gambier. Perhaps you would like to introduce yourself and tell us a little about your career to date?

Dr. Gambier: Next year will mark 25 years since I joined a practice near Toulon, in Six-Fours-les-Plages, a fine surgery which has grown steadily. In January 2018, we will have 12 practitioners; when I arrived in '93, there were just four of us. Gradually, with increased patient numbers and patient loyalty, plus our continuous attention to the quality of patient care, the practice has indeed expanded.

As far as Kuraray is concerned, I have been using your products for a long time. I have known Christophe Commaux for some years and he has always provided me with excellent information on your products. And then, there is your literature and the scientific studies.

What has been your experience with "Universal" adhesives in general?

In my practice, I have always been a great devotee of adhesive techniques. Just quoting from memory, twenty years ago, I was even using bonding adhesives on amalgams when working on extensive reconstructions. I progressed to direct composite restorations, having abandoned silver amalgams at least fifteen years ago now, so I have certainly become familiar with various generations of

adhesives. The first of your products which I used was the first PANA VIA. At that time, I was also using CLEARFIL SE BOND.

Over time, again from memory, I moved on to Scotchbond, a 3-step total-etching system from 3M, to Excite F and Scotchbond 1, 2-step total-etching systems, then a 2-step self-etching system AdheSE from Ivoclar Vivadent, and finally, a 1-step self-etching system from Kuraray, CLEARFIL S3 Bond, which I found effective for fast enamel etching. For adhesive bonding in my indirect restorative work, I prefer to use your PANA VIA V5.

Recently, having finished my last bottle of CLEARFIL S3 Bond Plus, I finally moved on to CLEARFIL Universal Bond Quick, which is a very good product. The universal adhesives are attractive and efficient and that is why I use them with a carefully applied, specific technique.

In your experience, what are the most frequent mistakes found in the use of adhesives?

It's just where directions for usage are not properly followed. I think this is really important and, from time to time, even if I am very familiar with a product, I will re-read the directions for use. It is easy to make a change to one of the stages, believing it to be for the best, only to reduce the effectiveness

of the product. Although, I must admit that it is difficult to skip any of the stages now, as the method has been simplified.

As far as I am concerned, the simplified technique is an advantage and certainly, there is always the question of whether or not to use etching, depending on the surface. With CLEARFIL S3 Bond Plus, I used to etch for about two seconds on unprepared enamel. I have even adapted the application of the adhesive; instead of leaving it to act for 10 seconds, I massaged for 10 seconds and then I left it to act for 10 seconds. In my opinion, this optimised the bonding. With Universal, I have retained the etching application time, but for the adhesive, I massage for 5 seconds and then leave it to act for 5 seconds.

Do you think that universal adhesives represent the way forward for modern restorative dentistry?

Yes, of course, since current modern dentistry favours adhesive dentistry and whether it is direct or indirect, it is far preferable and less disfiguring orally.

CLEARFIL Universal Bond Quick is the latest version of adhesives from Kuraray Noritake. What do you see as the main advantages of this product?

There are many advantages. Firstly, with regard to ergonomics, the simplified



technique and the fact that it can be universally applied means you need fewer products, fewer bottles in our basins or in the fridge; speed of application with scientifically proven effective adhesion; the simplified technique avoids any mistakes in handling. Then, compared to your product, the MDP together with a hybrid monomer, this enables better dental impregnation and some tolerance to humidity. Having said that, some care must be taken; attention must be paid to eliminate any saliva. There is also the extended durability period. Finally, it is compatible with the dual-cure products from Kuraray, without the need for a dual-cure activator. There are really many advantages.

What kinds of restorative work do you use this adhesive for?

At the moment, mainly for direct restorations; I have not yet tried it for indirect work. I know that the CLEARFIL DC Core Plus is very good, but I have an indirect bonding technique with PANAIA V5 and I am still working with carbon fibre posts, because for the last 10 or 15 years, I have had no problem with them. When I have direct access for photopolymerisation, I use CLEARFIL PHOTO CORE, which enables polymerisation beyond 5 mm and, if not, I use LuxaCore. When I need an adhesive bond for zirconia,

I use the PANAIA procedure. For some time, I used PANAIA SA Cement Plus, even for inlays. Veneers are sintered and in such cases, my laboratory follows the Vivadent procedure.

I use CLEARFIL Universal Bond Quick for all classes of restoration and even for dental hybridisations. One of its advantages is also faster impregnation of the dentine and, therefore, the reduced application time.

CLEARFIL Universal Bond Quick combines the MDP monomer patented by Kuraray with hydrophilic amide monomers, enabling it to penetrate the dentine faster whatever the level of humidity. How does this fast bonding technology benefit the dentist?

The benefits lie in its speed and the improved bonding result, plus the tolerance to humidity which we have just mentioned.

What are the advantages to patients on whom you have used CLEARFIL Universal Bond Quick?

Patients are not really aware of the procedure. I could say the durability of restorations and a reduction in post-operative sensitivity, but this is something we have enjoyed for some time, thanks to the development of adhesives. I don't think this is something that "Universal" adhesives can add to.

Given the progress achieved in restoration materials and technologies, is post-operative sensitivity still something which dentists need to take into account? What has been your experience in this regard with CLEARFIL Universal Bond Quick?

Yes. I do pay special attention to this, aside from the quality of treatment, durability and the comfort of our patients. The satisfaction of our practitioners is dependent on our patients' satisfaction!

Do you think that there is more post-operative sensitivity when etching is carried out separately?

Personally, I have never felt this, but I do follow the instructions for use scrupulously. It is really a question of technique, whether rinsing the etching, applying the adhesive, intensive drying or not.

You have still not tried CLEARFIL DC Core Plus. Do you think you will start using it?

That's true, I have not used it yet, but I am very interested in the product and I shall review this.

Light diffusion technology

The intuitive shade matching feature of CLEARFIL MAJESTY™ ES-2 comes from Kuraray Noritake Dental's proprietary new LD Technology, a light diffusion technology comparable to millions of micro-sized prisms consisting of fillers all refracting and transmitting color and light from the surrounding dentin and enamel through the composite. Precise color blending that begins at placement and continues from one dental visit to the next.

Development of LD Technology

Development of composite resin has often aimed at increasing the translucency of cured resin to improve matching the color of the surrounding teeth. It was found from experience with past clinical cases that composite resins thus developed could not reproduce the intended shade under some circumstances. Filling restorations of natural teeth almost never begin with an even and consistent thickness of the cavity. In addition, the thickness of the restoration varies with the direction of observation of the dentist or others who look at the patient's teeth. Thus you can assume that you cannot evaluate color matching solely by using the results of transparency testing with, specimens of a certain thickness.

To clarify the reasons behind this phenomenon, Dr. Inokoshi divided natural tooth structure into enamel and dentin samples, and prepared thin sections of each separately, to determine the optical characteristics of the specimens. As a result, he found that there was a large difference in the light diffusion of enamel as compared

to dentin, when they were illuminated by parallel rays which were closely narrowed (Journal of the Japanese Society for Dental Materials and Devices, Vol.13 Special Issue 24,1994). That is, the enamel allowed the light to pass through without being scattered much, while the dentin scattered the light in almost every direction.

Fig. 1 shows the results of this experiment. The right sketch shows the measurement method used. Narrowly closed parallel rays were directed at a thin section. In the background, a goniophotometer was moved within a range of plus and minus 90 degrees to measure the intensity of the light emitted through the specimen. The results of the measurement are shown in the left sketch. (You can see a strong peak projecting vertically from the specimen. This peak varied from specimen to specimen; it was concluded that the intensity of the light from some specimens was stronger because some sections were prepared too thin.)

On the basis of this finding, the light transmittance of some composite resins manufactured at that time was measured. It

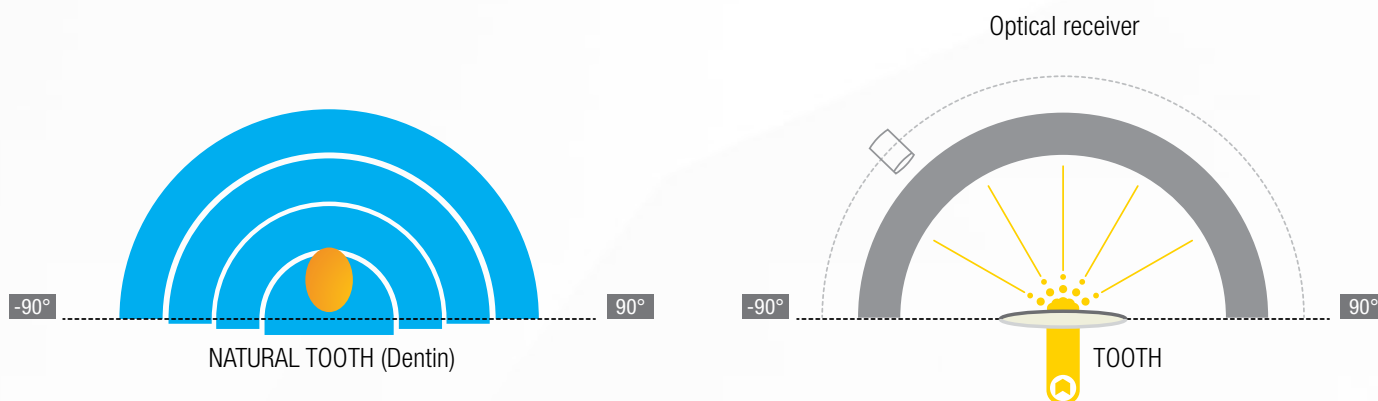


Fig. 1 Results of studying the light diffusion qualities of composite resins (Source: Kuraray Noritake Dental)

was found that they could be divided into two categories: those that transmit light well and those that greatly diffuse light. In addition, we found that the composite resins that could be used most successfully, without causing the above mentioned problems, were those with strong light diffusion characteristics. It is not yet clear why composite resins with strong light diffusion qualities are clinically favorable, but one can assume the following:

- 1 It is required that a certain amount of light can enter the restoration and then reflect from it, to ensure that the restoration has the color and light-texture of natural tooth structure;
- 2 In a natural tooth, light penetrates the tooth and is scattered by the dentine in all directions. It reemerges through the surface of the tooth. Therefore, it is desirable for the restorative material itself to have similar light diffusion properties, in order to attain the same effect as natural tooth structure when the background of the restoration is empty space.

Needless to say, composite resins with excellent light diffusion characteristics should also have conventional transparency. If they are not very transparent, a merely translucent restoration will result with low in value (brightness), similar to the situation when only opaque resin is used. On the basis of the results of Dr. Inokoshi's experiment, various types of matrix monomer and filler were combined in a variety of ways.

Kuraray Noritake Dental finally achieved excellent light diffusion in a composite resin by loading it with a filler that measured more than a certain size and had more than a certain level of difference of refractive index against the matrix.

Development of CLEARFIL MAJESTY™ Esthetic and ES-2

Due to findings on how to achieve excellent light diffusion in composite resins, the filler grinding method has been improved, so it has become possible to produce submicron filler that can be heavily admixed while high transparency is retained. Heavy admixture of submicron-sized filler improves polishability while the full transparency of the composite resin is retained. Even some organic-inorganic composite filler can be used. In addition, it was confirmed that mixing organic-inorganic composite filler into the composite resin helps improve the handling properties, which has been a problem of conventional products.

This is how CLEARFIL MAJESTY™ Esthetic and its successor product CLEARFIL MAJESTY™ ES-2 were developed. Fig. 2 shows differences in transparency and light diffusion between a high light-transmitting resin and CLEARFIL MAJESTY™ ES-2, when the background is in contact with the samples and when the background is a few centimeters away from the samples. The differences in the light diffusion of the materials can be judged at least roughly, using this method.

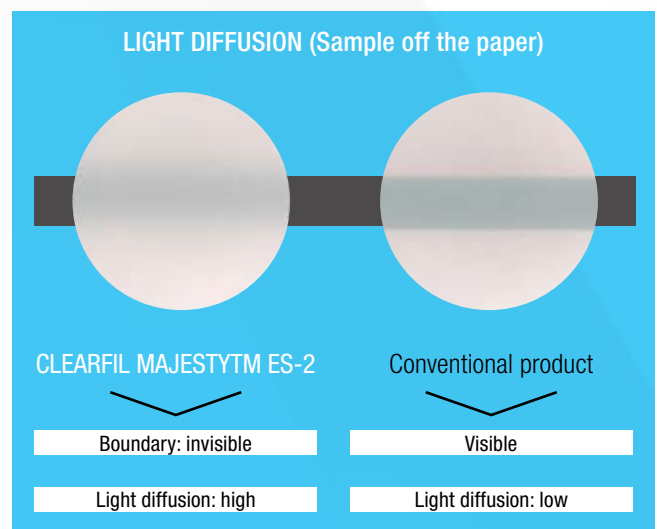
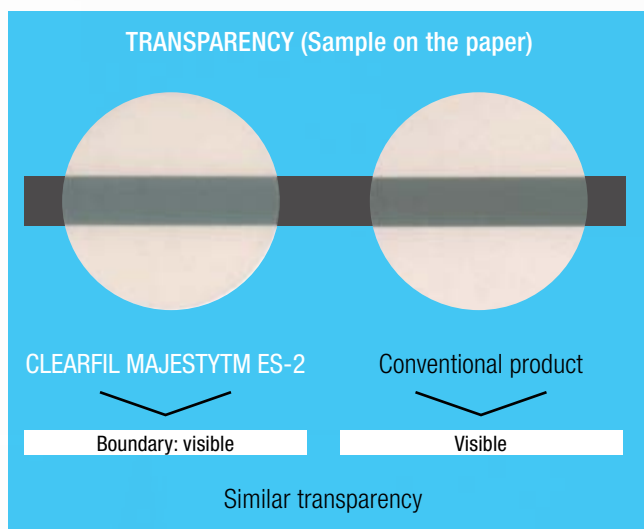


Fig. 2 Usual comparison of transparency (samples in contact with background) and comparison based on light diffusion (samples not in contact with background).

Dr. Salvatore Scolavino - Dr. Gaetano Paolone

Balancing translucency and opacity in the direct reconstruction of anterior and posterior teeth

Performing direct restoration requires in-depth knowledge of optical properties, of natural teeth and restoration materials, as well as the rigorous application of proven clinical procedures.

Performing direct restoration requires in-depth knowledge of optical properties, of natural teeth and restoration materials, as well as the rigorous application of proven clinical procedures. While the construction of a natural morphology requires knowledge of human anatomy, as well as observation skills and the ability to reproduce it, obtaining a perfect colour match depends on the clinician's ability to find the right balance between the translucency and the opacity of the material used within the complex shape/colour system of a dental element. Dentine determines the colour of natural teeth (opacity), but the final optical colour perception is mediated by vestibular enamel

(translucency) which exerts optical desaturation on the dentine. Despite efforts made by the dental industry in the construction of biomimetic materials with natural dental tissues, dental composites are basically translucent resin materials. Their translucency/opacity balance is determined by a fundamental parameter: thickness. In fact, the same composite mass will offer varying degrees of translucency if used with different thicknesses. Therefore, the final colour of the restoration depends on the balance created between the thickness and the shape of the dentine in relation to the thickness and shape of the enamel. In this case, we speak of a "shape-colour" combination.

The camouflage of the transition area from tooth to restoration is one of the variables that determine the success of a direct anterior restoration.

Material variability illustrates how composite masses of different brands and of the same colour can present substantial differences in terms of opacity/translucency balance.

An opaque dentine mass will require an enamel filter on the tooth/restoration interface; the thickness should then be calibrated according to the characteristics of both the dentine and the enamel. Because of the considerable variability in the thickness of



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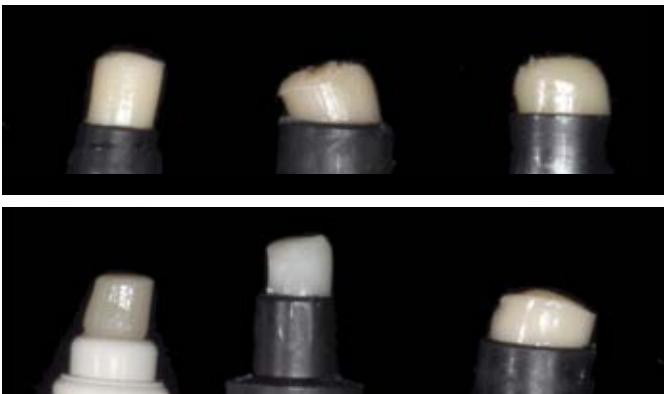


Fig. 3: 1 - A2-colour composite masses of different brands with clear differences in terms of opacity.

the enamel shell, it is difficult to achieve the ideal colour match. The current trend is to produce dentine masses equipped with a so-called active translucency, i.e. the capacity of an opaque composite mass with a reduced thickness to absorb the colour of the surface on which it is placed.

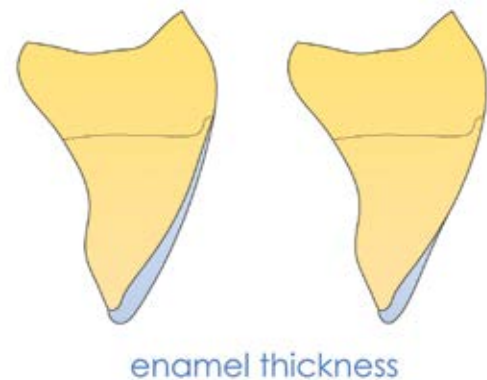


Fig. 3: 2 - Two different concepts for layering. A very opaque mass (the left tooth) requires coverage with enamel. The thickness of the enamel is calibrated to mask the tooth/restoration transition. A tendentially translucent dentine mass (on the right) is camouflaged on the tooth/restoration interface without using enamel.

Clinical evidence confirms that it is better to use a single dentine mass to camouflage the restoration on the interface with the preparation margin, without necessarily having to resort to the use of multiple masses.



Clinical case #1

Clinical case with direct restoration of tooth 1.1 in a 13-year old patient, following traumatic fracture due to recreational/sport activity. After X-ray examinations and vitality tests, we made tooth impressions; on the positive impression we performed a diagnostic wax-up in order to create a silicone matrix.

COMPOSITE MASSES USED FOR THIS CLINICAL CASE:

A1E for the construction of the palatal shield and the vestibular enamel filter only on incisal 1/3.

A1D for the box-technique, for shaping of the dentine structure and the construction of the incisal edge.

T-blue for incisal translucencies.



Figure 3 - Class IV fracture on tooth 1.1.



Figure 4 - Intraoral X-ray.



Figure 5 - The polarised image allows study of the dentine and mapping of opacities and translucencies.



Figure 6 - Waxed-up plaster model and the construction of the silicone matrix.



Figure 7 - Isolated operative field with the preparation of 1.1. A palatal butt-joint and a vestibular and proximal chamfer are performed.



Figure 8 - After having created the palatal plate and having employed the box technique, the dentine structure is created. The A1D dentine mass is essential for reconstruction because it seals the tooth/restoration transition area leaving room for the T-blue mass and the A1E enamel only in the vestibular area of incisal 1/3.



Figure 9 - X-ray of the restoration at 1 year.



Figure 10 - Clinical check at 1 year. The camouflage on the tooth/restoration transition margin is clinically well integrated and camouflaged.

Balancing translucency and opacity in the direct reconstruction of anterior and posterior teeth

Clinical case #2

The failure of a direct anterior restoration can result from many factors. In this specific case, in addition to the vestibular overshoot, the balance between the static and dynamic anterior joints was not evaluated; this determined the fracture of the restoration. The therapy involved closing the incisal diastema and reworking the IV class restoration on 1.1.

COMPOSITE MASSES USED FOR THIS CLINICAL CASE:

A1E for the palatal shield.

A2D for modelling the dentine and constructing the incisal edge.

T-blue for the translucence of the medial incisal.

Body A2 for proximal closing of the box-technique, as a vestibular filter replacing the enamel (in this case the enamel would lower the value) and as a single mass to close the diastema.



Figure 11 - Initial evaluation with clinical study of mandibular excursions and incisal guides.



Figure 12 - Incongruous Class IV restoration and fracture on 1.1; diastema between the two central incisors.



Figure 13 - Test simulation of the dentine mass chosen for this restoration. The masses chosen for this clinical case were A2D, A1E, T-blue, Body A2.



Figure 14 - Detailed image of the isolated operative field and preparation on 1.1.



Figure 15 - Restorations completed under a rubber dam.



Figure 16 - Check at 8 months.



Figure 17 - Detail of surface texture.

WHAT'S NEW IN TERMS OF LAYERING TECHNIQUE IN THE LATERAL POSTERIOR SECTORS?

In the lateral posterior sectors dentine/enamel layering is applied in single-mass restoration with the use of highly versatile masses that are obtained from the combination of enamel and dentine. This is the case of new Body masses. These masses offer dynamic optical behaviour and, in contact with dental tissues, they create a perfect camouflage through the balance of the chroma/value ratio.

Balancing translucency and opacity in the direct reconstruction of anterior and posterior teeth



Clinical case #3

Rework of incongruous composite restoration on tooth 1.6. After performing CBT, the restoration is carried out using the direct technique. We used a Body A3.5 mass and a simultaneous modelling technique.



Figure 18 - Pre-op image with incongruous restoration on 1.6



Figure 19 - Cavity preparation.



Figure 20 - Composite layers modelled using the simultaneous modelling technique.



Figure 21 - Check at 2 years.



Figure 22 - X-ray at 2 year.

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Photography © Stefano Corso

Clinical case #4

Multiple direct restorations on class II cavity on 2.4 and recurring class I cavity on 2.6 and 2.7. The restorations were made using a Body A3 mass.



Figure 23 - Pre-op image with evidence of incongruous restorations on 2.6 and 2.7



Figure 24 - Isolated operative field and prepared cavities, ready for hybridisation and restoration.



Figure 25 - General view of restorations.



Figure 26 - Check X-ray.

Clinical case #5

This clinical case refers to distal Class II 2.6.



Figure 27 - Pre-op image.



Figure 28 - Detail of the prepared cavity, hybridised and ready for CBT.



Figure 29 - Post-op image.



Figure 30 - General view of the restoration.

15 Years of Evidence for the Bonding Effectiveness of MDP to Zirconia Ceramics

"In particular, primers and composite cements that contain 10-methacryloyloxy-decyl-dihydrogen-phosphate (10-MDP) resulted in a relatively high bond strength and durability."

N.Nagaoka et al: "Chemical interaction mechanism of 10-MDP with zirconia" *Nature, Sci Rep.* 2017; 7: 45563.

"For most zirconia-bonding techniques, the use of an "MDP-containing primer" also appeared to have a positive effect"

B. Van Meerbeek et al: "Meta-analysis of Bonding Effectiveness to Zirconia Ceramics" *J. Dent. Res.* 93(4), 2014, 329-334.

"Based on the direct interaction of the phosphate-ester group of MDP with the metal oxides at the zirconia surface, a relatively favourable bonding effectiveness was recorded."

B. Van Meerbeek et al: "Durable bonding to mechanically and/or chemically pre-treated dental zirconia", *J. Dent.* 41 (2013) 170-179.

"Clinical data provide strong evidence that air-abrasion at a moderate pressure in combination with using phosphate monomer containing primers and/or luting resins provide long-term durable bonding to glass-infiltrated alumina and zirconia ceramic under the humid and stressful oral conditions."

M. Kern: "Bonding to oxide ceramics-laboratory testing versus clinical outcome", *Dent. Mater.* Vol. 31 (1), 2016, 8-14.

"A high and reliable resin bond to alumina and zirconia ceramics was also achieved with airborne particle abrasion and by using a phosphate monomer (MDP) containing resin composite luting cement."

M. Özcan et al: "Effect of surface conditioning methods on the bond strength of luting cements to ceramics", *Dent. Mat.* 19, 2003, 725-732.

"In the present study, the use of the MDP-containing bonding/silane agent resulted in significantly higher bond strengths before and after long-term storage and thermal cycling with two types of resin luting agents."

M.B. Blatz et al: "In vitro evaluation of shear bond strengths of resin to densely-sintered highpurity zirconium-oxide ceramic after long-term storage and thermal cycling", *J. Prost. Dent.* 91, 2004, 356-362.

"Dental zirconia can no longer be considered unbondable to tooth tissue (...) This also indicates that Al₂O₃ sandblasting is best followed by a chemical pre-treatment with an MDP containing primer"

M. Inokoshi et al: "Meta-analysis of Bonding Effectiveness to Zirconia Ceramics", *J. Dent. Res.* 93(4): 329-334, 2014.

"Airborne-particle abrasion of zirconia surface is one of the most-investigated methods, provides good bond strength to zirconia when combined with phosphate ester monomer"

M. Ferrari et al: "Effect of surface pre-treatments on the zirconia ceramic-resin cement microtensile bond strength", *Dent. Mat.* 27, 2011, 1024-1030.

"The data of the present work confirm the assumption of another study [13], that MDP bonds chemically to zirconia ceramic"

C.H.F. Hämmerle et al: "Effect of thermocycling on bond strength of luting cements to zirconia ceramic", *Dent. Mat.* 22, 2006, 195-200.

"An acidic adhesive monomer such as MDP shows chemical bonding to zirconia-based ceramics. The phosphate ester group of the acidic monomer results in chemical bonding to metal oxides (MxOy, oxidized surface of base-metal alloys), zirconia-based ceramics and other ceramics."

J.M. Powers et al: "Guide to Zirconia Bonding Essentials", New York, NY: Kuraray America Inc, 2009, 1-13





CLEARFIL™ CERAMIC PRIMER PLUS

One universal prosthetic primer for all cement and repair indications*

Optimal combination of ingredients

CLEARFIL™ CERAMIC PRIMER PLUS is a combination of the purest adhesive MDP monomer for reliably-proven bonding to various materials, including metal oxides. Due to γ -MPS silane; it also provides strong adhesion to glass containing materials. Together, these properties mean that CLEARFIL™ CERAMIC PRIMER PLUS is an exceptionally versatile product. By virtue of its unique combination of ingredients, CLEARFIL™ CERAMIC PRIMER PLUS ensures an optimal pre-treatment, resulting in the excellent long-term bonding of your restorations.

One procedure for all materials and indications

- 1 Apply CLEARFIL™ CERAMIC PRIMER PLUS.
- 2 Blow dry.

Intra-oral repair of fractured restorations



Surface treatment of indirect elements



* permanent cementation of all types of ceramics, metal, hybrid ceramics, metal oxide ceramics (zirconia oxide), glass fibre posts and composites

Practice-based research

Insight into the longevity of dental restorations in Dutch dental practices

In recent years, the dental profession has become more and more aware of the fact that society requires increasing transparency about the quality of dental care. In this context, it appears that the longevity of restorations carried out in general dental practices emerges as a potentially crucial quality indicator. However, little relevant information has come to hand so far, despite the fact that restorative work forms the bulk of a dentist's work as well as accounting for the lion's share of the financial budget for dentistry.

The longevity and quality of dental restorations should preferably be tested within a randomised clinical design, whereby evaluations are carried out by independent assessors in keeping with validated criteria lists.

Such an approach is not viable for routine dental work and, in addition, alternatives for this testing design have only been carried out on a limited scale, especially in the Netherlands. According to an alternative testing set-up, a restoration is followed from the moment of production in a database, which is composed of data from the patient file.

An independent assessor does not participate in this type of study; the practitioner, however, indicates when, and why, a restoration must be placed, replaced or repaired. These types of longitudinal study make it possible to include large numbers of restorations and practices, especially if it is possible to build up a database using the existing practice software programmes. Thus, this method of practice-based research provides the possibility of examining a wide range of factors that play a role in the success or failure of a restoration.

All kinds of patients, including patients at risk with active caries or bruxism, are then engaged in the study so that data is collected from 'real world dentistry'. The Netherlands provides an almost ideal environment for this type of study. The population is very loyal in terms of visits to the dentist and there are relatively few relocations that necessitate a change of dentist. Furthermore, dental practices are well-organised and digital patient files are available in most cases. In the context of my graduation pathway and in collaboration with the Radboud University of Nijmegen, I have started a longevity

survey in Dutch practices. An application has been developed, with the assistance of the obliging Vertimart software firm, for the collection of data through the software programme. A group of enthusiastic dental practices has made (anonymised) data available to us, making it possible to establish how long restorations carried out in Dutch dental practices last and which factors may play a role at the level of patient, practice and dental elements. Along that line, a practice-based research network has been set up which convenes annually to discuss results, and for reflection and ideas for follow-on studies.

For the first time in the Netherlands it was possible to collect data on over 150,000 fillings and 10,000 crowns retrospectively, with an observation time of more than eleven years and involving a large number of practitioners. The results of the practices studied showed that, on average, the Class II restorations had a survival time of approximately 12 years. There are, however, major differences between practices and dental operators while various factors in relation to patients and restorations also play a part. The causes for the big differences cannot be easily specified, and choices of material and the set-up of the practice could play a role, as could indication assessment by individual dental operators. In order to obtain more clarity about this, it turned out to be necessary to register more data in the patient files. Essential information includes, for example: the reason why a restoration is placed or replaced, the type of restoration material and adhesive or the type of crown that was used. The registration of risk assessments for patients, for example in terms of caries and bruxism, may also account for the reasons behind failing restorations.

Following on from this retrospective study (looking back in time) a prospective study (following on in time) has been set up. Within this

Curriculum Vitae of Mark Laske

- 2013: Graduated as a dentist from the Radboud University of Nijmegen
- 2013 - present: Graduate research into the longevity of dental restorations within Dutch dental care, Radboudumc Nijmegen
- 2013 - present: Dentist within the Centre for Specialist Dentistry, Radboudumc Dronten
- 2013 - present: General dental practitioner in a practice in Dronten



survey set-up, the above-mentioned recommendations have been included and, in collaboration with Kuraray Noritake, the restoration material and adhesives used were standardised for more than 12 months!

In addition to products (AP-X and Photobond) that are already frequently used by dentists, Majesty ES-2, SE Bond and SE Protect were made available as restoration material and adhesives. Once again, the results showed that there are major differences between various dental practitioners and that the newly studied patient and restoration variables do influence the survival of Class II restorations. The risk of failure is highest for a complex restoration of an endodontically treated molar in an elderly patient with a high-risk score for caries and bruxism. Given the fact that the preliminary observation period is 2.5 years, the first outcomes especially give an impression of the variables that impact on the survival of the restoration.

Over the coming years, our study group will be further following the restorations installed in order to ascertain the long-term effects and longevity of restorations. In addition, the search for new study topics will be ongoing within the practice-based research network. One of the most recent plans aims to investigate whether the antibacterial effect of SE Protect - found in-vitro - can also be demonstrated within the practice-based research for patients with a high caries risk. Other than that, it would be interesting to also evaluate patient satisfaction around a control or treatment visit, and to pair it with the longevity outcomes that have been established.

Mark Laske

SEE YOU AT OUR **KURARAY NORITAKE** SYMPOSIUM DURING THE GLOBAL IADR 2018 IN LONDON !

ZIRCONIA RESTORATIONS ARE CONTINUOUSLY ADVANCING DUE TO THE DEVELOPMENT OF HIGH-TRANSLUCENCY MULTILAYERED FULL-CONTOUR MATERIALS ALLOWING BOTH MINIMALLY INVASIVE PREPARATIONS AND HIGHLY AESTHETIC SOLUTIONS.

Basically Zirconia is a metastable ceramic that exists in different crystalline phases: monoclinic, tetragonal, and cubic. Depending on different amounts of doping agents like i.e. yttria and sintering aids like i.e. alumina one or the other crystalline phase can be stabilized and pronounced and accordingly very individual Zirconia characteristics can be achieved. That's why it's easy to lose the overview regarding the smaller and larger differences between the growing number of Zirconia brands that are available nowadays. A further consequence of the new possibilities with monolithic Zirconia is the decline of zirconia core structures layered with aesthetic feldspathic porcelain because of the inherent problem to achieve a strong connection between the two materials.

The often heard phrase "Zirconia is not alike" was never as true as today. The aim of Professor Beuer's presentation (Charité University, Berlin, Germany) is to demonstrate both the new aesthetic possibilities in the anterior zone with high translucent KATANA Zirconia ceramics as well as the more traditional applications in the posterior zone due to the well-known high mechanical strength.

Minimally-invasive options are directly correlated with adhesive performance and adhesive cementation protocols. Professor Kern (University of Kiel, Germany) will present insights and clinically relevant tips and tricks based on his rich, long-term clinical experience with PANAVIA cements for adhesively bonded restorations. A very interesting indication and focus of his lecture will be on the topic of cantilever resin-bonded fixed dental prostheses (RBFDPs) as a minimally invasive treatment approach to the replacement of single missing anterior teeth. Based on his clinical experience and numerous publications excellent clinical outcomes, high survival rates and great patient satisfaction are a matter of fact today.

Additionally, RBFDPs offer many advantages. Not only that they require a simple and conservative preparation. They are also low in cost, as treatment option reversible, with no risk of pulpal irritation, no need for anesthesia, and minimal risk of caries development; in addition, they are a valid option for young patients in order to avoid an implant.

In the third presentation the renowned expert in the field of adhesives and bonding agents, Professor Tagami from Tokyo Medical and Dental University will focus on direct bonding strategies for achieving high quality minimally invasive aesthetic restorations.

Based on his fundamental studies and research on the mechanisms of adhesion to tooth tissue that have greatly contributed to the development of the 'self-etch' bonding approach in the early 1990s he will cover a wide array of insights on direct and indirect applications with modern bonding agents up to the latest development, the so-called universal bonding agents like Clearfil Universal Bond Quick. Basically the latter category is very much related to self-adhesive formulations featuring a mild pH approach preferably with selective enamel etch application. State-of-the-art technologies, clinically relevant tips & tricks and an outlook of still potential topics for improvements will conclude the Symposium on direct and indirect adhesive aesthetic restorations based on minimally adhesive approach.

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SYMPOSIUM

FRIDAY, JULY 27, 2018, 3:45 P.M. - 5 P.M AT
THE EXCEL **LONDON** CONVENTION CENTER
ROOM N10, LEVEL 1

**DIRECT AND INDIRECT ADHESIVE AESTHETIC RESTORATIONS
BASED ON MINIMALLY INVASIVE APPROACH**



LECTURE:
PROF. DR. FLORIAN BEUER
Clinical Advantages and Aesthetic
Options of Monolithic Zirconia



LECTURE:
PROF. DR. MATTHIAS KERN
Minimally invasive Indirect Restorations
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