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MANAGER, SCIENTIFIC MARKETING

Dear reader,

Over the past decades, restorative dentistry has evolved rapidly: Dental technicians no longer produce porcelain-fused-to metal crowns and bridges, but rather focus on the production of minimally invasive, thin-walled full-wrap veneers and partial restorations made of tooth-coloured, high-translucency ceramics. Dental practitioners no longer need to rely on a self-retentive cavity design in the context of placing amalgam restorations, but restore cavities with tooth-coloured composite materials and high-performance adhesives. Both types of restorative materials – ceramics and composites – have seen continuous improvements, resulting in solutions with exceptional mechanical and optical properties that allow for excellent outcomes in terms of aesthetics and function.

At the same time, leading manufacturers of dental materials such as Kuraray Noritake Dental Inc. identified procedural simplicity as a primary need of their customers. Consequently, the products they developed were designed to support great results with fewer work steps, less effort and less time involved. Renowned experts in the field started using them in their own ways, thereby developing groundbreaking techniques, which are rapidly gaining popularity worldwide.

Some of the most popular and highly innovative techniques are described in this 12th issue of the BOND Magazine. The first article is dedicated to the achievements of Ms. Kiyoko Ban, a legacy in the field of dental technology, who has been a driver of innovation in dental porcelains for more than 45 years. Dental technicians may also want to take a deep dive into the art of restoring a single central incisor and the evolution of zirconia in dentistry. For dental practitioners, we compiled articles about simplified shade concepts, anterior reconstruction with composite using incremental and innovative hybrid techniques, and posterior restorative concepts such as the flowable injection and the stamp technique. They all have one thing in common: The striving for perfection through simplicity, true to the motto “Perfection is achieved, not when there is nothing more to add, but when there is nothing left to take away.” – Antoine de Saint-Exupéry

Enjoy reading!

With my best regards,

Mathias Fernandez Y Lombardi
Manager, Scientific Marketing
Kuraray Europe GmbH.

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A LEGACY IN THE FIELD OF DENTAL TECHNOLOGY

KIYOKO BAN

BY MANABU SUZUKI, DIRECTOR OF DENTAL DIVISION, KURARAY AMERICA, INC.

Kiyoko Ban, a prominent figure in the dental technology field, has made a lasting impact as a researcher, developer, and founder of the Noritake Dental Supply Co., Ltd. (now part of Kuraray Noritake Dental Inc.). Renowned for her contributions to dental porcelains like Noritake's CERABIEN™ ZR and Super Porcelain EX-3™, and KATANA™ Zirconia, Ms. Ban stands as a pivotal force in the global advancement of dental technology, earning her the esteemed reputation of developer and marketer within the dental technology community.

After completing her university education in Nagoya, Ms. Ban initially assisted in her family's gas station business. However, driven by a desire for a career change, she enrolled in a newly established dental technician college in Nagoya at the age of 30. Her aspiration was to enter a field where gender distinctions held no sway, offering the potential for worldwide recognition based on technical mastery.

In 1977, a college-sponsored tour to American dental laboratories ignited Ms. Ban's dream to work in the United States. However, she delved into research across various fields such as chromatology (the science of colour), ceramics and metals, finding a newfound passion for research over clinical work after graduation because she was offered a "Curriculum Chief" position from the college when she graduated.

Ms. Ban, a curriculum chief at the Dental Technicians College, devoted her evenings to material research.

Ms. Kiyoko Ban, renowned for her contributions to dental technology.

In the 1990s, Ms. Ban actively engaged in promoting Super Porcelain EX-3™ through sales efforts in Italy.

Her teaching career spanned from the age of 34 to around 40, during which she pioneered porcelain training sessions for technical improvement and arranged lectures over weekends by famous speakers such as Masahiro Kuwata.

At the age of 40, she resigned teaching career and pursued her research career. The opportunity to conduct full-scale experiments led her to the discovery of a company with advanced ceramic technology “Noritake Co., Limited”, renowned for its tableware. In 1986, Cusp Dental Supply, a research institute, was established by Ms. Ban in Nagoya, focusing on the development of materials for PFM crowns. The commercialization of Super Porcelain EX-3™ in 1987 marked a significant milestone, addressing issues prevalent in porcelain materials of that time, such as cracks, greening, and fluorescence.

She began traveling all over Japan and around the world to sell the products she had developed and went on to develop new products that were needed by dental technicians worldwide (Fig. 3). She continued to develop new products such as CERABIEN™ ZR, CZR Press, and KATANA™ Zirconia - the word’s first multilayer zirconia.

Ms. Ban has been actively involved in mentoring students and graduates seeking opportunities to work overseas. During summer vacations, she took students and professionals interested in working abroad to countries like Australia, Germany, and the United States. The aim was to visit dental clinics, dental technician schools, and laboratories, fostering exposure and learning in an international context.

Simultaneously, Ms. Ban delved into researching non-precious dental technology. Inspired by her exposure to the term “non-precious” during her time in the United States, she anticipated its potential in Japan. Her research presented at lectures and events highlighted the shift in the landscape as the price of gold surged, rendering precious alloys containing significant amounts of gold impractical for PFM crowns.

Capturing the essence of ISC 1996 - the International Symposium on Ceramics in Orlando, FL.

As the demand for their developed products grew, the need for global acceptance became apparent. In 1990, Cusp Dental Research was established in Manhattan, New York, marking Ms. Ban’s foray into establishing a company overseas. Despite the unfamiliarity with legal procedures and the challenges of setting up a foreign company, Ms. Ban, driven by determination, overcame these hurdles. The establishment of the company in the United States expanded their presence internationally.

Noritake Dental Supply Co., Limited was established in 1998 by the Noritake Co., Limited, which aimed to further expand its dental business. Despite the absence of a capital relationship with Noritake at the time of establishing the research laboratory, Ms. Ban played a key role in joint research efforts with Noritake. Then she was invited to this company as the position of president, owning 60% of the stock, while Noritake held 40% (Fig. 5).

Besides Noritake Dental business, she continued expansion with the establishment of a dental laboratory in Boston in 1995. Despite the challenges posed by the September 11, 2001 World Trade Center incident, they acquired their building in Boston, integrating their New York laboratory into the Boston operations.

Ms. Ban’s tenure as president of Noritake Dental Supply persisted until 2009, but organizational changes following the merger with KURARAY CO., LTD. in 2011 led to her transition into an advisory role (Fig. 6). Despite the shift in responsibilities, her commitment to the dental technician profession remained steadfast.

Noritake Dental Supply Co., Ltd. Inauguration Party, 1998

Kiyoko Ban’s path encapsulates not just a career but a legacy in the field of dental technology. From her early struggles in a tooth carving class to establishing and expanding international laboratories, Ms. Ban’s story is one of determination, innovation, and a deep-rooted commitment to advancing the dental technician profession.

Kiyoko Ban - Legacy in the Field of Dental Technology” article was published in the Journal of Dental Technology (JDT) April 2024

A scene from Ms. Ban’s retirement celebration as Noritake Dental Supply Co., Ltd. president, surrounded by esteemed dental technicians from around the world.

THE ART OF RESTORING SMILES:

MASTERING THE CHALLENGE OF A SINGLE CENTRAL INCISOR

A CASE REPORT BY VASILIS VASILIOU

Restoring a single maxillary central incisor is possibly the biggest challenge a dental technician can face in everyday work. Especially when a patient is young, it is extremely important to restore her or his smile to its original beauty. Any restoration that is perceivable as such might have a negative impact on their self-confidence and quality of life even in the long term.

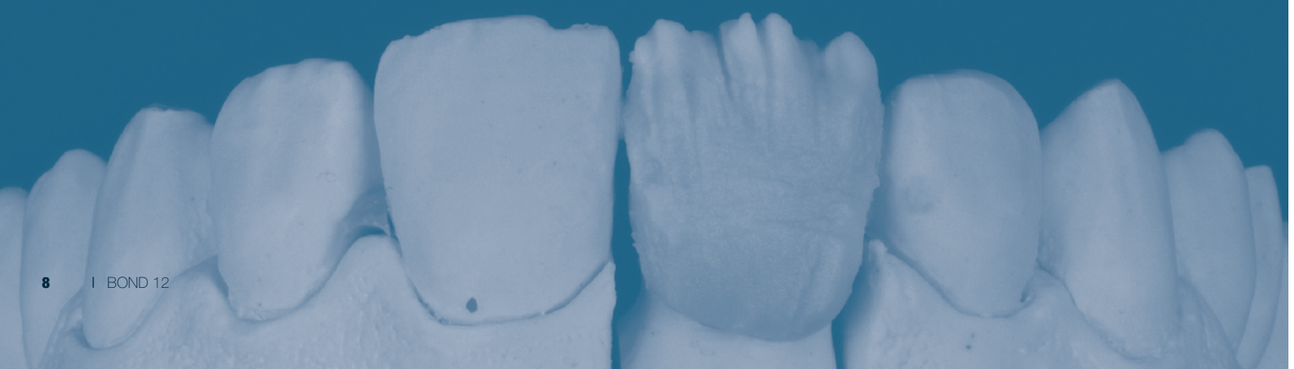
A story of joy and desperation

Take Ioanna, a 14-year-old girl who presented to dental office in a state of desperation. In the hours before, she had been floating on cloud nine - her favourite band performed in Cyprus for the first time and she had managed to buy tickets for herself and her best friend. Thrilled, they had arrived at the concert, the band started playing and the crowd danced to the music. It felt like this was going to be the best day of her life. At the time the band played its most popular song, people were delirious, jumping up and down in ecstasy. Between all the exuberant dancing and laughing, however, Ioanna suddenly was hit by a strong push. She fell, her face hitting something hard – a seat in front of her. Pain froze time and it took a few seconds before she understood what had happened: Tasting blood in her mouth, she explored her teeth with her tongue and realised that one of her front teeth (tooth 11 (red.)) had fractured.

Affecting the quality of life

This is one of the many touching stories we listen to every day. A fall during a concert, a push at somebody's birthday party, a car accident. There are many incidences that can ruin a young, beautiful smile. By paying attention to the involved patients and their stories, one will come to realise how strongly some of them are affected by all this. They cover their mouths when they laugh or hold back their smiles.

Any dental technician who is committed to restoring their lost smile in the best possible way is probably aware of the impact his or her work can have and the responsibility coming with it. A Beautiful result will restore not only their smile, but also their self-confidence, allowing them to laugh again, expressing themselves comfortably and simply to enjoy social interaction (Figs. 1 to 5). Compromised outcomes, on the other hand, might have the opposite effect. Being aware of this role should be every technician's motivation to become better day by day. Evolve for these moments, when our work brings tears of joy to our patients.



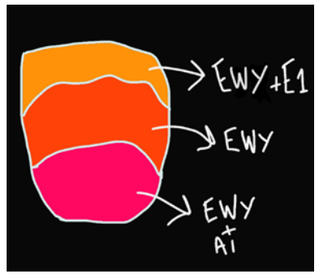


Fig. 1: Layering sketch for the restoration of a fractured central incisor in three layers: Layer one.

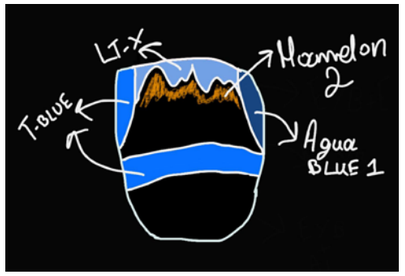


Fig. 2: : Layer two.

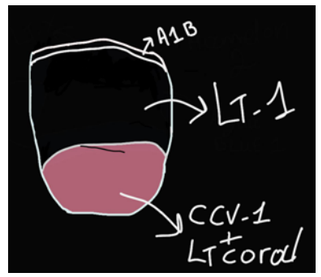


Fig. 3: Layer three. After the first bake, small details were integrated, followed by a second bake. Finally, the restoration was finished with CERABIEN™ ZR FC Paste Stain and Glaze.

Fig. 4: Treatment outcome able to restore not only the smile, but also the self-confidence of the young girl.

Aspects to be considered

But how to proceed in restoring single central incisors in the best possible way? The success of this type of restoration is hidden in the shape, which is the most difficult part. Managing to create a natural morphology is more than half the battle. The other important part is colour. The key to reproducing colour is in understanding how the utilised porcelains work. It is all about light reflection, absorption, translucency and opalescence, value and characteristic details. The more you gain experience and understand the optical properties of teeth and ceramics, the better your outcomes will be. Support is offered by a camera, a macro lens and a twin flash, which are used to capture and analyse the intraoral situation. For an initial analysis and understanding of shape and colour, I like to see the patients in my dental laboratory. Feeling the colour helps to develop the most realistic picture of what needs to be created. The key to successful realisation of the plan just developed is the use of reliable, easy-to-handle materials – in my case KATANA™ Zirconia and CERABIEN™ ZR Porcelains (both Kuraray Noritake Dental Inc.).

Fig. 5: Immediately after cementation of the restoration, the restoration is barely identifiable, only the soft tissue needs some time for recovery.

Possible steps

The first thing to focus on when starting to produce an anterior restoration – like in the case presented in figures 6 to 14 – is the correct value of the tooth. As soon as the framework or base is produced in the right value, you need to place what you see. Does the adjacent tooth show mamelons, traces of blue and orange? Those characteristics simply need to be observed and copied. There is no need to create something fancy. The tricky part is to use the available space reasonably. When there is plenty of space for the porcelain, it may be challenging to keep the value of the framework and avoid a greyish appearance. Depending on the die colour, age of the patient, natural surface texture and space available, an appropriate layering approach and finishing technique may be selected.

Fig. 6: Replacement of an anterior crown: Prepared tooth with severe discolouration. The adjacent central incisor has a specific shape and vivid inner colour structure.

Fig. 7: Framework made of KATANA™ Zirconia YML in the shade A3. The target shade being A3.5, a fairly opaque material was selected in a slightly brighter shade to achieve the required masking effect.

Fig. 8: Single-bake layering procedure: Application of CERABIEN™ ZR Opacious Body, …

Fig. 9: … Cervical Body, …

Fig. 10: … Body and Transitional Body.

Fig. 11: Incisal cut-back …

Fig. 12: … and creation of the mamelon structure.

Fig. 13: Application of Aqua Blue 1 …

Fig. 14: … followed by T Blue …

Fig. 15: … and Luster Porcelains.

Fig. 16: Halo effect created with Body.

Fig. 17: Treatment outcome. (After a first bake followed by minor adjustments, a second bake, surface texturing and glazing with CERABIEN™ ZR FC Paste Stain Clear Glaze.)

Conclusion

Creating a single central takes us out of our comfort zone. By paying attention, observing the adjacent teeth carefully and using materials we really understand, it is possible to meet or exceed our patients' expectations. While specific tools like cameras and experience with the utilised materials offer support in producing predictable outcomes, my main credo is "If you want things around you to change, you must first change yourself". For continued improvement, it is thus necessary to focus on professional growth and advancement. With the right mentors who will teach us the secrets of stratification and inspire and motivate us to continue advancing, it becomes easier to restore the smiles and self-confidence of our patients every time they need us to.

Vasilis Vasiliou

Vasilis Vasiliou was born in Nicosia, Cyprus, and graduated from the Technical School for Dental Technicians in Athens in 2004. He has furthered his education by attending several advanced seminars led by mentors and experts in the field, such as Ilias Psarris and Nondas Vlachopoulos.

Throughout his career, Vasilis has made significant contributions to the dental community, including presenting at various conferences in Greece and publishing articles in Greek dental magazines. Since 2020, he has been a key opinion leader for the MPF Brush Company and, since 2022, a HASS Ambassador. Vasilis has been an active member of the International Team for Implantology (ITI) since 2019.

Together with his father, Vasilis runs a successful dental laboratory in Nicosia, specialising in all-ceramic and implant restorations. His extensive experience and commitment to excellence have established him as a respected professional in his field.

Acknowledgements

Special thanks go to the dental practitioners who treated the patients presented above – Andreas Skyllouriotis DDS, MSD, Surgically-Trained Prosthodontist, and Theo Odysseos, DDS, Diplomate, American Board of Oral Implantology / Implant Dentistry.

TRIPARTITE TALK

HIGHLY TRANSLUCENT MULTI-LAYERED ZIRCONIA DEVELOPED BY A PROPRIETARY MATERIAL AND MANUFACTURING METHOD FROM JAPAN

CURRENT STATUS AND FUTURE PROSPECTS OF ZIRCONIA RESTORATIONS

In this issue, we asked Markus B. Blatz, Professor at the University of Pennsylvania, USA, Aki Yoshida (Gnathos Dental Studio) and Naoki Hayashi (Ultimate Styles Dental Laboratory), both dental technicians active in the USA and international instructors for Kuraray Noritake Dental Inc., to give their views on zirconia restorations and their outlook for the future.

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With the introduction of zirconia, the mainstream of prosthetic treatment has shifted from metal ceramics[1] to zirconia ceramics[2]. What changes have occurred with the introduction of zirconia?

Blatz: My mentor for my first Ph.D. in dental materials was in the group that developed lithium disilicate and glass-infiltrated alumina. Therefore, I have seen the evolution of dental ceramic materials, including zirconia, which is the subject of this presentation, up close and personal.
Early zirconia was white, opaque, and not as esthetic as today. However, there is no doubt that zirconia ceramics were much more esthetic than metal ceramics. At the same time, however, we often heard the opinion that bilayer zirconia ceramic restorations were problematic, and this provoked much discussion. We conducted a large study in collaboration with a Boston laboratory to compare more than 1,000 posterior porcelain-fused-to-metal crowns and 1,100 posterior porcelain-fused-to-zirconia crowns and found no difference in chipping or fracture rates after about seven years. This proves that bilayer zirconia ceramics are safe when used with the proper veneering materials and the proper sintering and cooling protocols. The fact that zirconia became established as it is today is a major change for dentistry in general.

Yoshida: I also switched from metal ceramics to zirconia ceramics, and now I don't use metal anymore. It used to take a lot of time and effort to invest and cast metal, observe it with a microscope, and fit it. Considering the recent rise in metal prices, it has also become more cost-effective. In addition, I am allergic to metal and have a skin rash every time I have a prosthetic processed, so the shift to zirconia ceramics as the mainstream prosthetic is a welcome change. Of course, the use of zirconia has also improved esthetics. The translucency of zirconia is its greatest advantage that metal does not have.

Hayashi: Yes, that's right. The big advantage of zirconia is that if the abutment is not strongly discoloured, it no longer needs to be treated with an opaquer. It was not easy to control the reflection of light from the operative tooth when fabricating metal ceramics. In addition to the esthetic advantage, the prosthetic space can be thinner than that of metal ceramics.

1. Metal ceramics: Prosthetic made of metal frame with porcelain.
2. Zirconia ceramics: Prosthetic made of zirconia frame with porcelain.

The year 2023 marked the 10th anniversary of the first multi-layered zirconia – KATANA™ Zirconia ML. Since then, how do you think highly translucent multi-layered zirconia has revolutionized prosthetic device manufacturing?

Yoshida: I feel the ability to extend the zirconia frame to the occlusal surface and the incisal edge is the greatest advantage of using highly translucent multilayered zirconia. This allows us to provide crowns of both esthetics and strength, even for patients with para function. I have also made a zirconia Maryland bridge using highly translucent multi-layered zirconia, and it is doing very well. There are some cases where it is not possible to use zirconia, but still, it is wonderful to have a wider range of options.

Blatz: Many people still have the impression that zirconia cannot be bonded to tooth structure, but resin cement can be used to bond zirconia to tooth structure after proper pretreatment. Clinical studies of resin-bonded zirconia bridges have shown very high success after 10 or 15 years. Currently, resin bonding is recommended for very thin, highly translucent zirconia, rather than cementation. However, it should be added that this requires the dentist and technician to understand the proper bonding technique for zirconia.

In addition, Kuraray Noritake Dental Inc.'s multi-layered zirconia has revolutionized monolithic zirconia without the need for veneering porcelain. However, this has also resulted in the need for dental technicians to shift to a different approach: instead of building up the restoration as with veneering ceramics, esthetic features are created on the outer surface in each case.

Maxillary 6 anterior monolithic crowns (Markus B. Blatz)

Fig 1a and b: Initial examination.

Fig 1c: Simulation of final prosthetic restoration.

Fig 1d: Completed prosthetic on model (monolithic crown using KATANA™ Zirconia STML)

Fig 1e and f: Final restoration (Dr. Julian Conejo and Sean Han, CDT).

Two cases of Maryland bridge and laminate veneers and a mandibular canine single crown implant superstructure (Aki Yoshida)

Fig. 2a and b Case 1: A case of a congenital defect of a lateral incisor was restored with a Maryland bridge. Since the proximal and distal width of the defect was greater than the central incisor, a non-prep veneer was fabricated on the central incisor to balance the proportions. KATANA™ Zirconia STML was used for the Maryland bridge. Note the harmony between the zirconia frame extended to the incisal edge and the transparency of the laminate veneers made of Super Porcelain EX-3™ on the central incisors. This case demonstrates the characteristics of zirconia, which combines strength and esthetics.

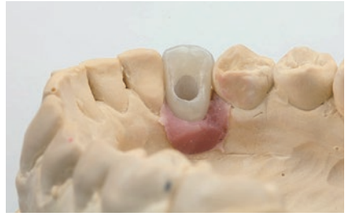


Fig. 3a to c Case 2: A case of a screw-retained crown restoration of an implant placed in a mandibular canine tooth. Extension of the zirconia frame from the entire lingual side to the incisal margin prevents fracture of the porcelain by the screw access hole edges and canine guides. KATANA™ Zirconia STML provides natural transparency even when zirconia is exposed at the incisal edge.

Maxillary 4 Anterior teeth implant bridge (Naoki Hayashi)

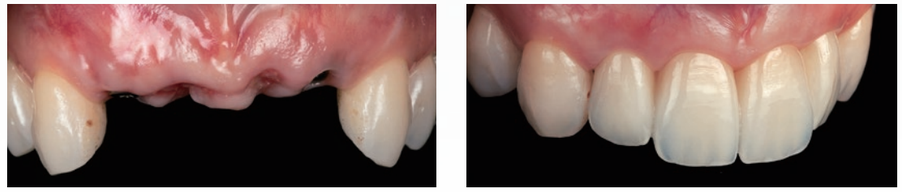





Fig. 4a to f: Implant bridge of maxillary four anterior teeth using implants placed in the maxillary bilaterallateral incisors as abutments and maxillary bilateral central incisorsaspontics.
The lingual side is fully backed with zirconia and the labial side is minimally layered with CERABIEN™ ZR.

Hayashi: Indeed, the highly translucent multilayered zirconia has expanded the possibilities of monolithic crowns. For patients with high occlusal forces, monolithic crowns are suitable in terms of strength, and with the use of highly translucent multilayered zirconia, it is possible to achieve a certain level of esthetics with monolithic crowns. In fact, some patients are happy with it. However, at least in the current situation, we believe that if patients and dentists want high-end esthetics, then porcelain buildup is necessary, and monolithic crowns are only an option.

Blatz: The variety of options available is the advantage of zirconia. The dentist and the technician can work together to provide the best possible outcome for the patient.

Yoshida: In terms of options, zirconia of Kuraray Noritake Dental Inc. can be sintered in a short time (approximately 90 minutes) in addition to the normal sintering time (7 hours) using a zirconia raw material and manufacturing method developed by Kuraray Noritake Dental Inc., which is an advantage in that it can be used for immediate restorations, remanufacturing and other unexpected situations.

Finally, do you have a message for the new generation of dentists and dental technicians?

Blatz: I encourage my students and colleagues to always do their best. This leads to good results, makes you happy, and makes you feel satisfied with your life. Some people only try to get rich, but just accumulating wealth is never happiness. The second is to keep an open mind. Nowadays, we are inundated with information through social media. Some of it is very stimulating and wonderful, but there is also a lot of it that is wrong. On the other hand, there are those who believe that everything one leader says must be done. I would like to tell them, "Make sure you get your information from reliable sources, and then choose reliable information for yourself. Dentistry is changing, so let's keep an open mind. The most important thing is that the patient is ultimately satisfied with the results.

Hayashi: I would like the future generation to learn more about tooth morphology, occlusion, and fit. Colour is the essence of the quality of the final prosthetic device, but we need to learn tooth morphology, occlusion, and fit before we learn colour. We are all about creating a prosthetic device that will function in the patient's mouth for the long term, and that is our goal. There will be new technologies and materials in the future, but their essence will never change. I hope that you will always remember what is important in your clinical practice. This is why basic knowledge of anatomy and function is necessary.

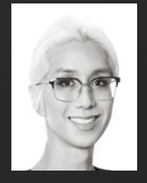
Yoshida: New technologies and materials will continue to emerge. But human teeth will not change. The most important thing is to provide the best possible care to the patient. I hope that you will accumulate such experiences, and that when you reach the end of your life, you will be able to say that you are glad you chose this profession.

Thank you very much for the meaningful discussion today.

The source of the information: QDT Vol.49/2024 April

SIMPLIFYING ESTHETIC COMPOSITE RECONSTRUCTIONS

USING CLEARFIL MAJESTY™ ES-2 UNIVERSAL



BY DR CLARENCE TAM
HBSc, DDS, FIADFE, AAACD

A CHAMELEON SUPERCOMPOSITE

Introduction

The name of the game in modern-day esthetic and restorative dentistry is that of Responsible Esthetics. The goal of treatment typically strives to correct any structural and cosmetic shortfalls in both biologically-driven and trauma-affected teeth with the precise, artistic placement of various replacement layers, all whilst respecting and retaining the maximum volume of residual tooth structure. Anterior teeth can be affected by enamel and dentin dysplasia, caries and sclerotic conditions and are characterized by a laundry list of genetically-derived and environmentally-acquired conditions with an esthetic deficit that often threaten an individual's functional and psychosocial integrity if not restored to the seamless picture of health.

Missing and defective tooth structure must be categorized into its attendant enamel and dentin components. Both substrates are distinctly different in composition, with enamel being highly inorganic in nature and dentin proportionately more collagenous in nature. The latter stratum is responsible for the refraction of light, the expression of the true colour of the tooth, namely the hue and the endowment of fracture toughness or resilience in functional performance. The value and chroma are the other elements of colour and are modified by the thickness of enamel. The replacement of enamel has been found to be best substituted from a biomechanical perspective by adhesively-bonded indirect porcelain restorations, and dentin using both composite resin and short fiber reinforced composite (SFRC), the latter imparting increased fracture toughness in large volume replacement restorations, especially those with pericervical structural deficits.

In adolescent patients, the gold standard of treatment involves direct composite resin, as often zero to minimal tooth structure preparation is required as a foundation to the bonded restorative. It would be impractical to use bonded indirect restorations when the development of the dentition in puberty is continuous, especially with the retraction of gingiva as one progresses to young adulthood. Resin composite allows prescience in the opportunity to predictably modify and/or add to the existing restoration if dental bleaching for the other teeth is desired or if a further traumatic incident is encountered. The ability to modify bonded porcelain is not predictable and frequent marginal failures occur due to a lower shear bond strength to bonded composite, especially after thermocycling. This is despite our ability to establish a chemical linkage via silane coupling agents from silicate ceramics to resin composite especially at a blended interface.

The Problem

Dental shades in clinical dentistry have long been classified using the VITA Classical A1 – D4* shade guide. Despite being ubiquitous in dental practices, composite resin systems with corresponding shade systems do not satisfactorily match to their purported shade[1]. Floriani et al found that various mixtures of different shades in one system was required to achieve an acceptable colour match with the VITA* Classical shades using the CIEDE2000 formula. Testing another composite resin, they found that none of the A1, A2 or A3 shades matched acceptably to the standard shade guide2. Indeed, even with indirect ceramic layering systems, a wide range of unacceptable discrepancy was noted between VITA* labeled porcelain shades and the actual shade guide[3].
The VITA* Classical shade guide became the standard in dental shade classification with the release of its A1-D4 shade guide in 1985. The majority of human-tested dental shades has been found to be in the A-family (78.5%), followed by C (13.2%), D (5.2%) and B (3.1%)1. As such, the shade accuracy of a given composite system must be important if they are to be visually naturomimetic.

Chameleon effect development

There are myriad composite resin systems featuring a simplified shade Universal system that have acceptable chameleon effects due to their balance of translucency, light transmission, diffusion and refractive index properties. There is a concern over how these optical properties may change after both thermocycling and wet storage, potentially compromising the excellent initial esthetic blend[4]. Refractive index (RI) is best optimized when the RI of the inorganic fillers match closely with the RI of the cured organic matrix, typically in a range between 1.47 and 1.525. If the match is dissimilar, this drives up the opacity of the restoration due to heightened refraction and reflection at the filler/matrix interface[6].

Layering of composite to mask an intraoral defect is complicated by the need to mask any linear defects such as fracture lines superimposed over the shadowing of the dark intraoral cavity in addition to regional colour variations. It is confounded by the requirement to recreate natural maverick and translucent effects particularly in the incisal window region of upper and lower incisors and canines, giving the illusion of a virgin, healthy tooth. This has been historically difficult to accomplish in anterior teeth given the need to block out restorative interfaces with natural tooth structure and recreate a seamless internal structure and details.
This detailed layer belies a well contoured enamel layer with realistic translucency, polishability and accurate primary and secondary anatomy.

Adding to the complexities previously described, the histoanatomical approach to composite layering dictates that missing enamel is replaced by enamel shades, and dentin by the corresponding dentin shade in the appropriate shade. This shade must be selected at the very start of the appointment, as often even a minute of dehydration has a negative effect on both the perceptibility threshold and acceptability threshold of teeth[7], resulting in the incorrect shade.

Development

CLEARFIL MAJESTY™ ES-2 is a value-based super-nanofilled composite system that covers 15 VITA* shades in just 4 shade options with its Universal series. This Universal series provides a chameleon effect and has 4 variants: Universal (U), Universal Light (UL), Universal Dark (UD) and Universal White (UW).
It is the VITA*-approved shading concept relative to colour accuracy. Incorporating nano-fillers that consist of silanated barium glass fillers and slanted silica nanoclusters, its wear resistance is high and features minimal abrasiveness against the functional antagonist. The RI of both inorganic filler and organic matrix are well-matched, and the high refractive index of the composite mimics and is extremely similar to natural enamel (1.613) and dentin (1.540), thanks to an innovation labeled Light Diffusion Technology (LDT), which distorts light in a similar way dental tissue does[8].
There is comfort that the stability of refractive index and other optical transmission properties remains statistically stable even after artificial thermocycling and water-storage aging studies[4]. The colour stability of CLEARFIL MAJESTY™ ES-2 has been proven over time, where a direct comparison to competitive product showed CLEARFIL MAJESTY™ ES-2 to feature significantly less colour variation from baseline and marginal functional wear over a three to four year period in teeth featuring amelogenesis imperfecta[9]. This colour substantivity is important as dietary and environmental stressors applied over time should have as minimal effect on the restoration to ensure continued esthetic integration.

Clinical protocol

CLEARFIL MAJESTY™ ES-2 Universal is a monochromatic solution that covers the five key shades featured in the CLEARFIL MAJESTY™ ES-2 Premium. As such, it exhibits the most significant LDT relative to all five shades, as its ability is equal when blending to higher value translucent shades as it does to cervical chromatic shades. In a Class IV restoration with a defined fracture line, the challenge is to restore the tooth in a minimal volume of available space. The alchemy requires a complete visual occlusion of the fracture line

Fig. 1: Pre-operative unrestricted smile 1:2 ratio view, teeth 1.1 and 2.1 with old, defective composite restorations with excessive chroma

Fig. 2: Pre-crimped Mylar matrix repeated on the DIBP aspect of tooth 2.1 to close the available space. CLEARFIL MAJESTY™ ES-2 Universal UL is used here.

Fig. 3: Both horizontal and vertical dentin composite increments are demonstrated mimicking the contralateral tooth.

Fig. 4 & 5: Final immediate post-operative result after finishing and polishing.

position, and recreation of internal and external opaque and translucent anatomy along with maverick staining, craze lines and effects. In anterior teeth, the idiom of "the less you see, the less you notice" is not true, especially due to the presence of incisal edge window effects as above, however, materials with the best light diffusion and structure transference properties should be utilized to ensure the highest probability of success.

A 15-year-old ASA I female presented to the practice exhibiting aged, chromatic composite restorations with poor marginal integration and gross axial overhangs; essentially a gross failure of primary anatomy and esthetics. She had been involved in a bike accident where she high-sided off braking sharply in a face-meets-concrete scenario, resulting in an uncomplicated moderate enamel-dentin fracture with blushing, affecting both the facial and palatal aspects of tooth 1.1 and a mild uncomplicated enamel dentin fracture affecting the distoincisobuccolingual aspect of tooth 2.1. The restoration overhangs were significant, extending into the proximal contour zone, thus obviating effective interdental cleaning. Vitality tests were confirmed along with radiographs to exclude the presence of apical pathology. The patient accepted the option of pre-prosthetic whitening, to improve the value characteristics of the adjacent teeth, allowing the selection of a brighter value shade combination. Intraoral digital scans were acquired and custom bleaching trays with a no-reservoir, cervical seal-priority design were fabricated. The patient was instructed to bleach overnight for a 2 week period using a 10% carbamide peroxide solution (Opalesence, Ultradent Products, UT) until her maximal value was reached. Her baseline shade of the incisors was a 1M1/2M1 combination in the upper incisors and a 2M1 in the lower incisors. On final post-bleach assessment she exhibited a lightened shade of VITA* 0M3 in all incisors. The patient was instructed to use a fluoride-containing, amorphous calcium phosphate complex (ToothMousse Plus, GC America) during the following 2 weeks after cessation of whitening whilst the residual oxygen radical species dissipated from the teeth.
On the day of the procedure, the pre-dehydrated shade was assessed using the supplied "real composite" shade guide tabs featured in the CLEARFIL MAJESTY™ ES-2 Premium system, with the enamel shade being WE (White Enamel) and the dentin shade WD (White Dentin). It was assessed that both white maverick effects as well as a moderate halo effect was desired along with moderate to strong translucency in the incisal window.

The patient was anesthetized using 1.5 carpules of 2% Lignocaine with 1:100,000 epinephrine (Septodont) before a rubber affixed with individual ties for the central incisors (NicTone Medium). Excavation of the old restorative material was undertaken, and the residual natural incisal edge was found to be undermined by a through-and-through fracture.

In a dental world with myriad composite options, we are looking for precision

Thus, the preparation was converted into a true Class IV design, with the facioincisal cavosurface margin subjected to an infinity bevel. The maxillary central incisors were isolated from the lateral incisors by way of a serrated metal strip (Komet) and the prepared surfaces subjected to micro particle abrasion using a 29 micron aluminum oxide powder in 17.5% ethanol carrier (Aquacare). The surfaces were subsequently treated with a calcium sodium phosphosilicate powder (Sylc, Aquacare) to increase the inorganic content of the prepared surface especially extending into the exposed tubules. The teeth were etched using a 33% orthophosphoric acid before a 1 minute 2% chlorhexidine scrub (Vista Products). The surface was reduced to a moist dentin surface before the bond applied, air thinned and cured.

A Mylar strip was pre-crimped in the palatoproximal line angles and positioned on the linguoaxial surface of both teeth 1.1 and 2.1. There is no shade guide for the CLEARFIL MAJESTY™ ES-2 Universal U shade, as it bears a significant chameleon effect however it does come in a light (L) and dark (D) variant. The UL shade was deemed the most suitable for the palatal or lingual shelf, with an average thickness of 0.3mm. This layer was applied in a freehand fashion with a focus on establishing the desired outline form of the tooth relative to the contralateral 2.1. The Mylar matrix setup was removed and a precurved metal matrix (Garrison Slickband**, Garrison Dental) was oriented in a position perpendicular to its normal placement interproximally, and the end of the curved band tucked into the sulcus before being secured by a wedge. In this way, there is light separation of the central incisors and an intimate contact between the matrix band and the mesial edge of the freshly applied lingual shelf. A 0.5mm frame extending more than halfway through the contact point was created and cured. The process was repeated on tooth 2.1 with the goal of recreating both lingual and proximal walls of the restoration, leaving only the facial volume to be replaced. Block-out of the composite extensions against the natural tooth structure was achieved by opacification using an opaque composite resin (WD, CLEARFIL MAJESTY™ ES-2 Premium, Kuraray Noritake Dental Inc.) layered in both horizontal and vertical increments. Note that the restorative join line must be completely obscured at the end of layering the dentin volume, otherwise the case will have almost certain esthetic failure. The internal dentin anatomy and its inherent variation was created to mirror that of the 2.1, which had minimal compromise of its incisal window with details intact. A supertranslucent composite resin (Clear, CLEARFIL MAJESTY™ ES-2 Premium, Kuraray Noritake Dental Inc.) was placed between the lobes of the dentin layers and cured.
A 9:1 ratio of white:orange tint was mixed and placed on the incisal edge and proximoincisal corners to recreate the halo effect. A pure white tint was placed in gentle dentin mamelon-connecting spider legs up to the incisal edge to impart the realism. This was layered in a manner consistent with the appearance of the 2.1.

Discussion

The esthetic merit of this case is foundationally-supported by composite resin technology on multiple levels. The colour and physical stability over time needs to be proven in order for the clinician to have faith in its prognostication. Specifically, the material needs to have an excellent and well-matched refractive index, and one that is unaffected by both water and thermocycling stressors.

The palatal shelf was fabricated using a new-generation super nano-filled universal composite system that boasts a strong chameleon effect. If it is our intention to fool the eye, to obscure, then this first layer works well to start the blockout process of the darkness of the mouth behind the fracture line of the restored tooth. Following this, the chroma and value of the tooth are corrected using the dentin, simultaneous to its continued opacification of the fracture line and intraoral darkness. Both dentin and enamel layers are applied histoanatomically, that is, in a manner respecting the various thickness zones observed in nature.

Ultimately, esthetic success in direct composite resin is not dictated on the first day post-operatively. Factors are in play, from dehydration to occlusal wrinkles that need to be ironed out and corrected. The win depends on what material is used, along with how that material was developed to what standards, and why shade accuracy is so important in a world of variety. In a dental world with myriad composite options, we are looking for precision. Precision in technology leads to efficiency and physicoesthetic maintenance in clinical results. This ultimately results in a boost to clinician-patient confidence and an optimal prognosis.

*VITA Classical A1 – D4 is a trademark of VITA Zahnfabrik, Bad Sackingen, Germany. **SlickBands is a trademark of Garrison Dental.

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BEST.FIT

A HYBRID TECHNIQUE FOR AN EFFICIENT AND AESTHETIC RESTORATION OF ANTERIOR TEETH

BY DR. ENZO ATTANASIO

The introduction of new-generation composites, equipped with nanofillers and highly loaded, has opened doors to new techniques for managing direct and semi-direct restorations. In particular, over the last ten years, there has been a significant revolution in the world of flowable composites. Nowadays, these materials offer a filler percentage very similar to packable composites through precise interventions in resin matrix management. They come in various viscosities, offering numerous advantages both in terms of handling and clinical use, as well as beneficial mechanical and physical characteristics.

Flowable Injection Technique

This new era of flowable composites has seen the development of a technique known as the Flowable Injection Technique (also referred to as injection moulding). It enables dental practitioners to reproduce anatomical forms created by a dental technician in the laboratory through a diagnostic wax-up. The shapes planned on the model are transferred directly to the patient's mouth using transparent silicone matrices or indexes, into which the composite is injected through specific injection holes.

The main difference compared to traditional mock-ups is that the reproduced teeth remain separate from each other. This technique provides predictable results identical to those developed on the technician's wax-up, requiring less chair time than direct veneering and offering a longevity similar to traditional composite restorations.

Benefits and challenges

The major benefit of this technique is the faithful reproduction of morphological details that the technician creates on the diagnostic wax-up, which the clinician can reproduce with minimal effort. The restoration produced through the Flowable Injection Technique, if all steps are followed correctly, requires minimal finishing by the clinican, who only needs to focus on polishing.

However, one limitation is the difficulty in isolating the operative field, often requiring a split-dam technique or labial retractors, with all the associated adhesive challenges. The use of a rubber dam is only feasible if the peripheral dental tissues around the restoration are euchromatic, allowing the technician to create a wax-up with supragingival preparation margins.

Another compromise with the Flowable Injection Technique is the management of the composite as a single mass. This makes it only possible to reproduce natural incisal translucencies typical of young patients by performing complex cutbacks and subsequent incisal addition of low chromatic composite resin. Without specific operator skills, the outcomes of this time-consuming manual procedure are unpredictable.

Convenient and useful, especially in situations requiring complex rehabilitations with large restorations.

Hybrid technique: BEST.FIT

To leverage the advantages of both classical direct anterior restoration and flowable injection techniques and eliminate the limitations, a hybrid technique known as BEST.FIT (Buccal Enamel Shade Through Flow Injection Technique) has emerged. This technique allows the operator to manage the delicate phase of reproducing the buccal enamel layer of the anterior restoration through the flowable injection technique, keeping certain aspects in mind during the injection phase.

Procedure

The transparent silicone key used for the creation of the buccal enamel layer is similar to the one used in the original flowable injection technique. The initial phase of restoration management follows all the classical steps of direct technique, requiring isolation with a rubber dam. The palatal enamel layer is recreated with a highly translucent packable composite, and the palatal portion of the interproximal walls is produced using a suitable matrix system. Next, the core of the restoration is defined with opaque masses, creating mamelons and adding incisal effects. It's crucial to control the residual enamel thickness using a vestibular silicone index, aiming for about 0.3 mm of space. The buccal portion is finally reconstructed during the injection phase. The transparent silicone index created on the wax-up should be tested after each reconstruction phase to ensure passive insertion.

After creating the restoration core, the tooth to be restored by injecting the flowable resin is separated from the contiguous ones with thin PTFE tape. The transparent mould is then inserted, and flowable composite is injected through the injection holes to precisely reconstruct the buccal thickness. The composite tip should be positioned at least halfway through the buccal surface, and the injection should be slow and controlled to avoid air bubbles in the restoration.

Finishing

Following a 40-second polymerisation vestibularly and incisally, the transparent matrix is carefully removed, and excess interproximal composite above the PTFE tape as well as any remaining composite from the injection holes are removed. After completing all restorations, the rubber dam is detached, and any remaining excess is removed. After checking the occlusion, the composite is polished, usually requiring no further intervention.

CASE EXAMPLE

Fig. 1: Female patient with discoloured anterior restorations desiring a smile makeover.

Fig. 2: Close-up of her maxillary anterior teeth.

Fig. 3: Restorations in need of replacement: Lateral view from the right.

Fig. 4: Restorations in need of replacement: Lateral view from the left.

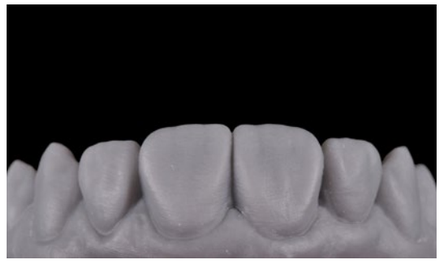


Fig. 5: Printed model based on a digital diagnostic wax-up based on a digital impression.

Fig. 6: Palatal silicone index produced for the conventional direct restoration steps.

Fig. 7: Transparent matrix with injection holes produced for the build-up of the buccal enamel layer using the flowable injection technique.

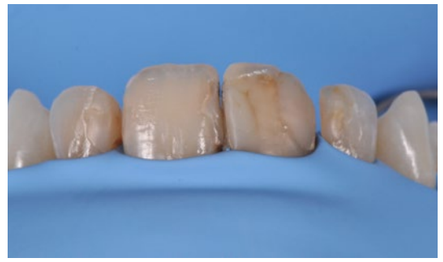


Fig. 8: Operative field isolated with rubber dam.

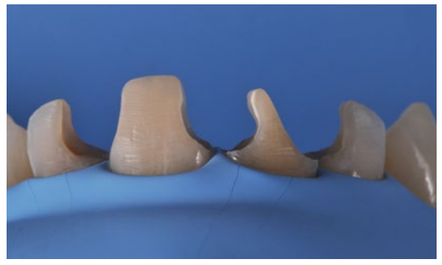


Fig. 9: Existing restorations removed and tooth surfaces roughened at the start of treatment.

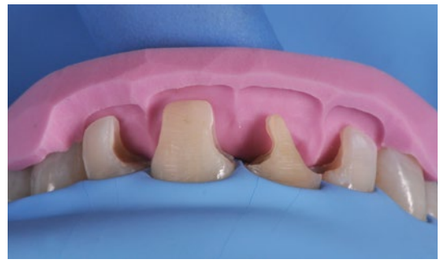


Fig. 10: Palatal silicone index positioned intraorally for the build-up of the palatal wall.

Fig. 11: Checking of the space available in the vestibular area with a second silicone index.

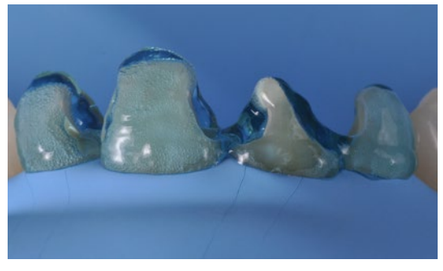


Fig. 12: Etching with phosphoric acid etchant.

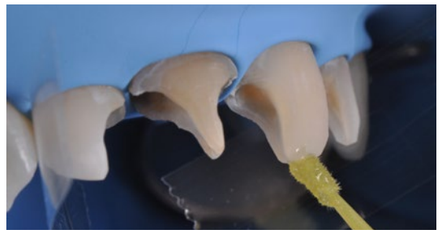


Fig. 13: Application of a universal adhesive (CLEARFIL™ Universal Bond Quick, Kuraray Noritake Dental Inc.).

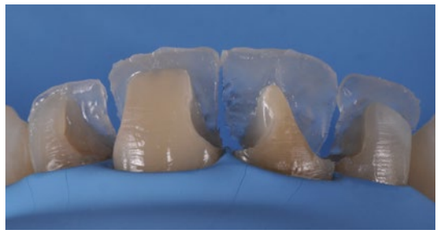


Fig. 14: Palatal walls built up with CLEARFIL MAJESTY™ ES-2 Premium in the shade A1E with the aid of the palatal silicone index.

Fig. 15: Build-up of the interproximal walls with CLEARFIL MAJESTY™ ES-2 Premium in the shade A1D and establishing of the contact points using anatomical sectional matrices for the posterior area placed vertically.

Fig. 16: Dentin core built up with CLEARFIL MAJESTY™ ES-2 Premium in the shade A2D. CLEARFIL MAJESTY™ ES Flow Super Low in the shade XW was applied on the mamelons, while CHROMA ZONE™ COLOR STAIN Blue (Kuraray Noritake Dental Inc.) was used to reproduce incisal translucencies in the spaces not covered by the dentin core.

Fig. 17: Try-in of the transparent matrix for flowable injection.

Fig. 18: Isolation of the adjacent teeth with PTFE tape for a one-by-one injection.

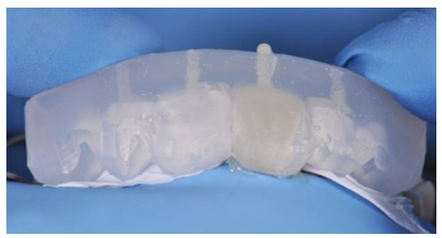


Fig. 19: CLEARFIL MAJESTY™ ES FLOW Low in the shade A2 (Kuraray Noritake Dental Inc.) injected for the anatomical shaping of the maxillary right central incisor.

Fig. 20: Situation after flowable injection for all four anterior teeth, light curing through the matrix, final matrix removal and excess removal.

Fig. 21: Treatment outcome …

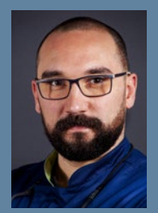
Fig. 22: … with visible mamelons, natural incisal translucencies …

Fig. 23: … and a lifelike anatomical shape …

Fig. 24: … of the restorations.

Conclusion

Each work phase must be executed with extreme care to lay the foundations for a passive linking of all subsequent steps without creating difficult management situations. The BEST.FIT technique is a convenient and useful method for dental practitioners to manage multiple direct anterior restorations simply and predictably, especially in situations requiring complex rehabilitations with large restorations.



Enzo Attanasio

Enzo Attanasio graduated in 2008 in Dentistry and Dental Prosthetics from the Magna Graecia University of Catanzaro. In 2009, he went on to specialize in the use of laser and new technologies in the treatment of oral and perioral tissues at the University of Florence. That year he also attended Prof. Arnaldo Castellucci's course in Clinical Endodontics at the Teaching Center of Microendodontics in Florence where, in 2012, he went on to complete his training in Surgical Microendodontics. In 2017 he attended a course on Direct and indirect Adhesive Restorations at Prof. Riccardo Becciani's Think Adhesive training center in Florence where he later become a tutor. Today, as a member of the Italian AIC and based in Lamezia Terme, Italy, Dr Attanasio has a special interest in Endodontics and Aesthetic Conservative.

RESTORING TEETH IN THE POSTERIOR REGION

FLOWABLE INJECTION AND STAMP TECHNIQUE

BY DR. MICHAŁ JACZEWSKI

Restoring the occlusal surface of posterior teeth while preserving the natural morphology and re-establish correct occlusal contacts has always been challenging for dental practitioners. Free-hand layering requires knowledge of tooth anatomy, composite handling skills and experience. When the occlusal surface of a tooth is damaged at the start of treatment (as is usually the case in teeth with large MOD cavities) or an increase of the vertical dimension of occlusion is planned (e.g. in severely worn teeth), the use of the flowable injection technique may be a suitable alternative. It truly speeds up and facilitates the process of building up the restoration to a natural shape, but requires thorough planning and preparation. In cases with an intact occlusal surface, the stamp technique might be the first choice.

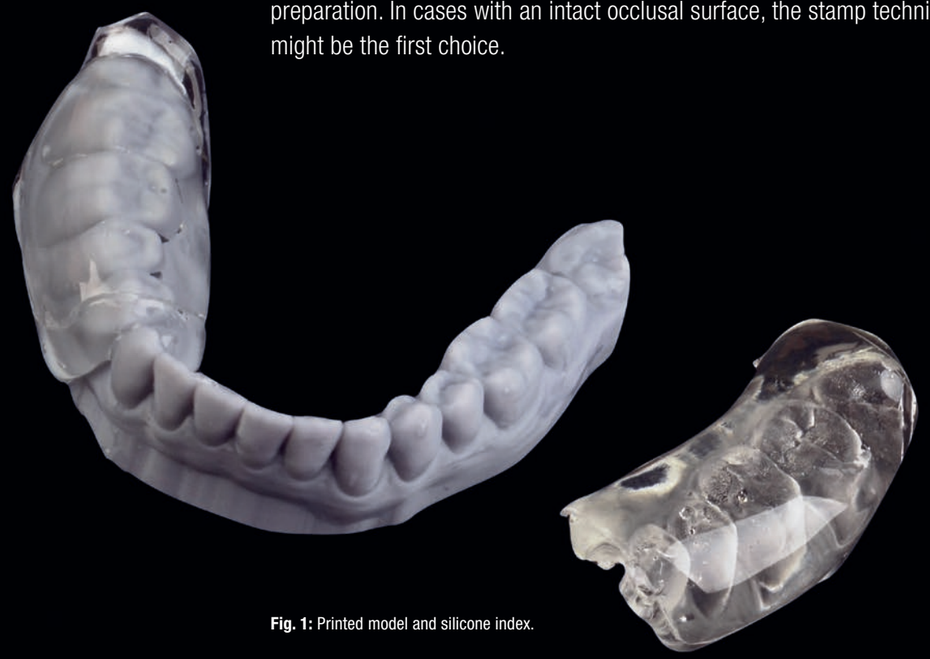


Fig. 1: Printed model and silicone index.

Flowable Injection Technique: General considerations

It is up to the user how exactly the restorations, to be built up by flowable injection, are planned and how the plan is implemented. One can either opt for a conventional wax-up or make use of digital tools in the planning phase. Dedicated design software offers the benefit of facilitating the creation of a natural shape and morphology of the desired restoration and allows for the establishing of an ideal occlusal relationship. Once the wax-up is ready, it needs to be transferred into the patient's mouth. This is accomplished via a printed or classical model with wax-up, which forms the basis for the production of a matrix or silicon index. This index is then used intraorally for the injection of the flowable composite. To enable proper light curing through the index, the index material should be as transparent as possible.

Area-specific considerations

In the posterior area, an index made of two different materials – a soft inner silicon structure and a hard outer shell – may be advisable. Due to its higher dimensional stability compared to a soft silicon index, it is possible to put pressure on it for proper adaptation to the isolated teeth and soft tissue without the risk of altering the shape of the tooth. Figure 1 shows such an index on and next to a printed model. It consists of a hard shell made of acrylic and a soft inner structure made of a transparent silicone material. For production, a high-capacity hydraulic pressure curing unit designed for use with self-curing resins (Aquapres™*, Lang Dental) has proven its worth. It ensures a highly accurate reproduction of the (digital) wax-up.

Reconstruction of posterior teeth with the flowable injection technique requires prior removal of all carious lesions and reconstruction of the proximal surfaces to restore the contact points. Hence, the injected composite serves the exclusive purpose of restoring the occlusal surface. When several teeth are treated, a two-step procedure with an alternating technique is recommended to provide for proper separation of the teeth. Blocking the proximal surfaces below the contact point with PTFE tape will reduce the amount of excess material in these areas and make it easier to clean and to prepare the proximal surfaces after flowable injection. Proximal and deeper occlusal lesions should be restored with the aid of a matrix, wedge and ring.

Clinical protocol

A possible clinical protocol is illustrated in Figures 2 to 5: After caries excavation and tooth preparation, sectional matrices, wedges and rings were placed to allow for simultaneous treatment of the mesial and occlusal cavities. Following etching and application of the universal adhesive CLEARFIL™ Universal Bond Quick (Kuraray Noritake Dental Inc.), the cavities were restored with CLEARFIL MAJESTY™ ES Flow Super Low A1 shade and CLEARFIL MAJESTY™ ES-2 Universal in shade U. The distal cavity of the first molar was filled in the last step of the free-hand modeling procedure. In order to restore the occlusal surfaces in their original vertical dimension, every second tooth was isolated with a rubber dam and the exposed molar etched (total-etch technique with phosphoric acid (K-ETCHANT Syringe, Kuraray Noritake Dental Inc.). The alternating index was positioned with some pressure and the flowable composite (CLEARFIL MAJESTY™ ES Flow Super Low) injected. Once light curing was completed, the index was removed and excess chipped off followed by finishing and polishing the restoration before repeating the procedure for the adjacent molar.

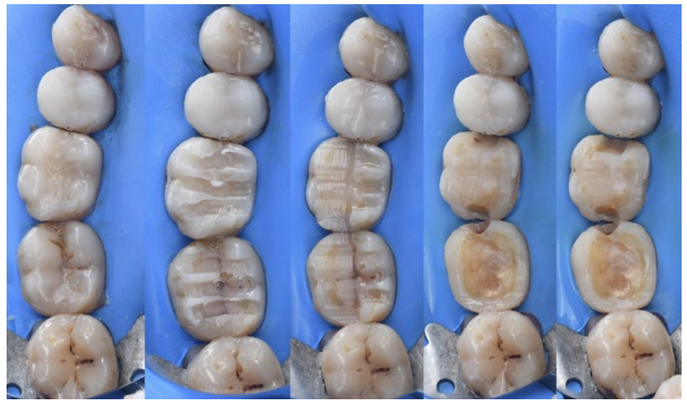


Fig. 2: Restoration of two molars: Teeth preparation and caries excavation.

*Aquapres is a trademark of Lang Dental

Fig. 3: Restoration of two molars: Filling of the proximal and occlusal cavities.

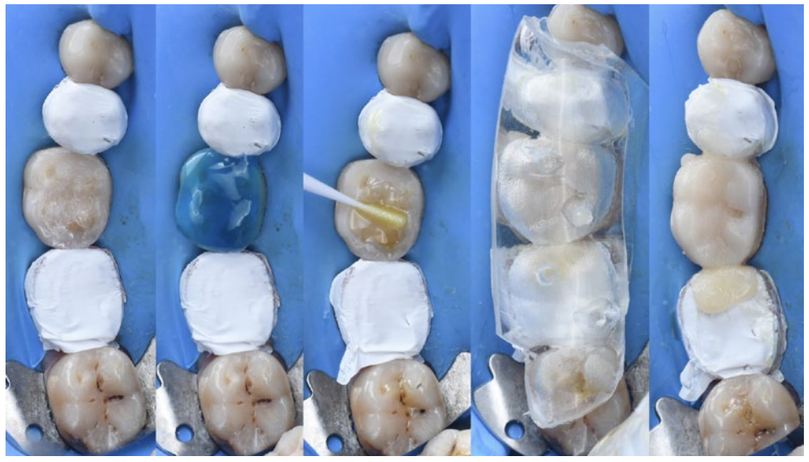


Fig. 4: Restoration of two molars: Re-establishing the occlusion with the aid of the flowable injection technique.

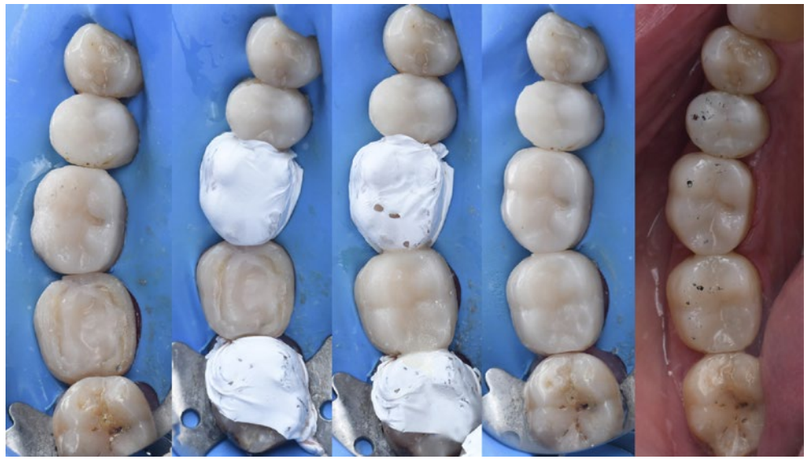


Fig. 5: Alternating approach: Restoration of the second molar by injecting flowable composite.

Discussion

The use of the flowable injection technique allows for rapid restoration of teeth and the establishment of precise occlusal contacts. This reduces the time spent on occlusal surface modelling and minimises the risk of prolonged treatment due to a repeated need for occlusal adjustments. In addition to saving time, it is possible with this technique to restore a greater number of teeth in a single appointment. The aesthetics of this type of restoration may be somewhat limited: A skilled practitioner is able to achieve better aesthetic results on the occlusal surface. However, with a detailed wax-up and high-quality model, great outcomes can be obtained. The surface quality of printed models can be increased by adjusting the printing parameters including the layer height (Fig. 6). The use of a hydraulic pressure curing unit for silicone index production further increases the quality of the occlusal surface.

When planned and implemented correctly, the established occlusal surface and contacts reflect the natural anatomy without the need for adjustments (Fig. 7). Especially when restoring an entire quadrant, it is possible to increase the efficiency by opting for the flowable injection technique. Doing so reduces the number of appointments and the chair time decisively (Fig. 8).

Stamp technique: Considerations

If the occlusal surface of the tooth is intact, a wax-up may not be necessary. In this case, the better strategy is to duplicate what is still available before initiating treatment. A flowable composite or liquid rubber dam can be used for this purpose. It is important to coat the tooth surface with glycerin gel before applying the material. This will facilitate separation of the stamp from the tooth. It is always advisable to create a stamp that covers not only the details that need to be recorded and duplicated, but is extended over the cusps. This offers better stability in the restoration phase.

Clinical protocol

Figures 9 to 14 illustrate a possible clinical procedure. In this case, a molar with an occlusal carious lesion needed to be restored. The tooth surface was cleaned and a thin layer of glycerin gel applied, followed by a thick layer of liquid rubber dam, which covered the entire occlusal surface. Then, a micro applicator was immersed into the material and the stamp cured. After preparation, etching and application of the bonding system, the cavity was restored with flowable composite (CLEARFIL MAJESTY™ ES Flow Super Low in the shade A2). When the cavity is larger, and depending on personal preferences, a paste-type composite (CLEARFIL MAJESTY™ ES-2 Universal) may also be used. Prior to light curing of the composite, the occlusal surface was covered with PTFE tape and the stamp pressed onto it. After firm pressing, the tape and excess material were removed and the restoration polymerised. This restoration faithfully reproduces the occlusal surface and did not require any occlusal adjustments.

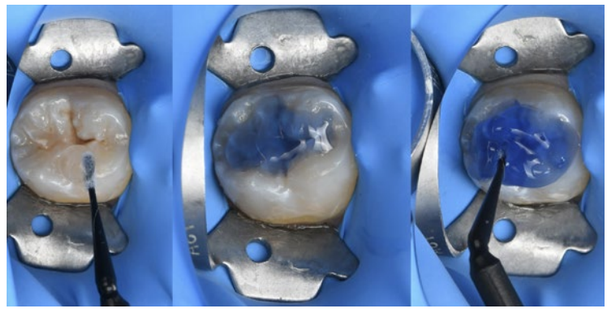


Fig. 6: Stamp production with liquid rubber dam.

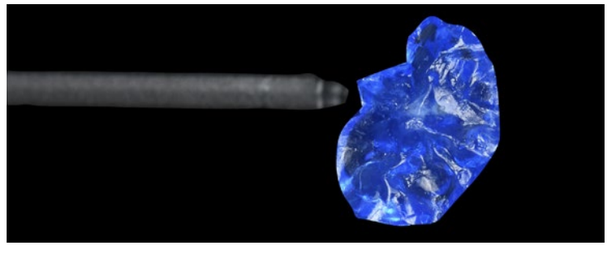


Fig. 7: The stamp.

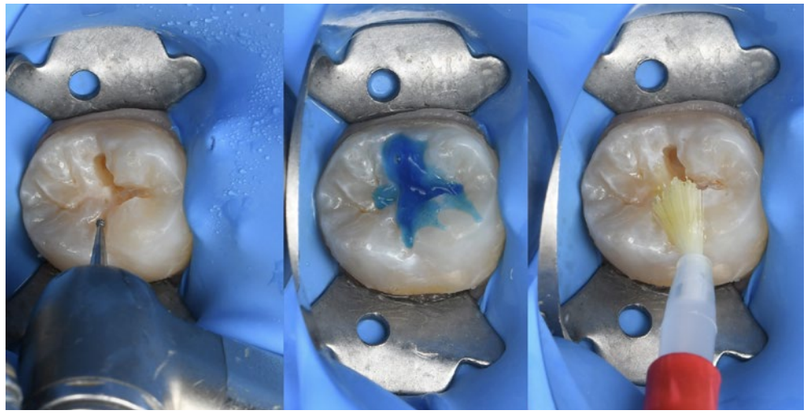


Fig. 8: Restoration procedure: From preparation to bonding.

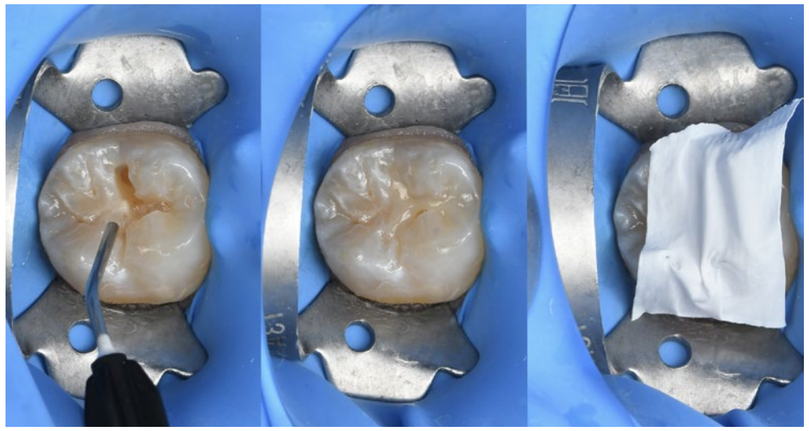


Fig. 9: Restoration procedure: Application of flowable composite.

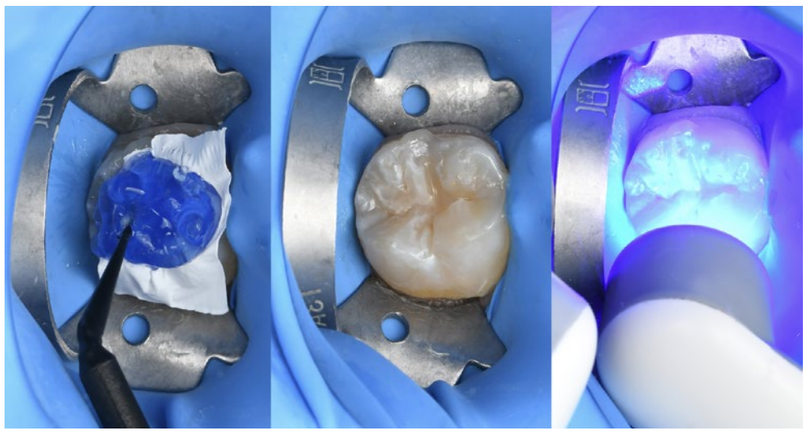


Fig. 10: Restoration procedure: Duplication the original occlusal surface with the stamp.

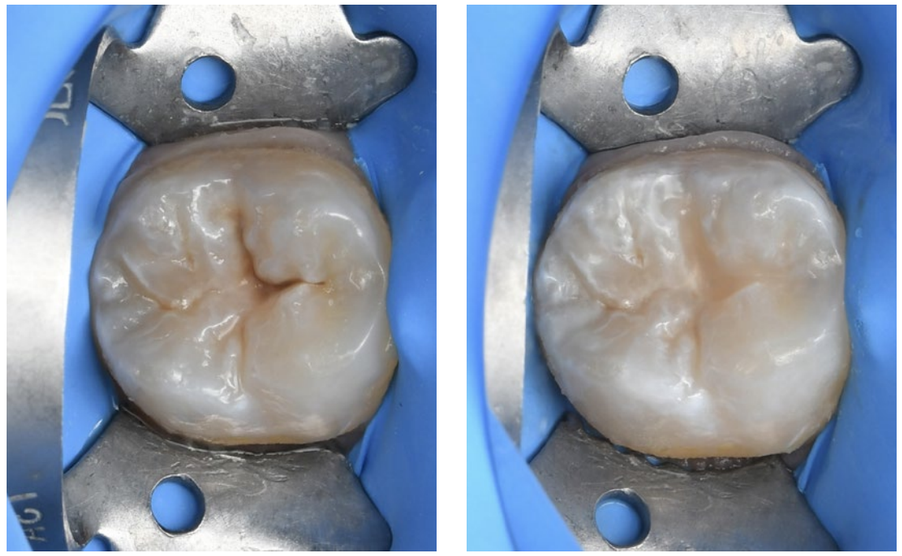


Fig. 11: Tooth before and after treatment using the stamp technique.

Conclusion

Techniques that add simplicity and efficiency to clinical procedures are always welcome in the busy practice environment. Depending on the information available at the start of treatment and the number of teeth to be restored, the flowable injection or the stamp technique may be an ideal choice. They are easily implemented and speed up the clinical procedure, but most importantly support predictable outcomes. This saves time in the finishing phase and minimises the risk of repeated adjustments, hence protecting everyone involved from additional appointments and frustration. Especially for practitioners with limited routine in free-hand modelling and for those with maximum patient comfort in mind, both techniques are worth being integrated in their clinical procedures.

D. Michał Jaczewski
Michał Jaczewski graduated from Wroclaw Medical University in 2006 and today runs his private practice in the city of Legnica, Poland. He specializes in minimally invasive dentistry and digital dentistry and is the founder of the Biofunctional School of Occlusion. Here he lectures and runs workshops with focus on full comprehensive patient treatments.

A/PROF ALAN YAP
BDS (SYD), MDSC HONS (PROS)(SYD), FAANZP

PERFORMANCE AND PRACTICALITY

WITH PANAVIA™ VENEER LC

Since 1983 PANAVIA™ by Kuraray Noritake Dental Inc. has been the gold standard for dental cements throughout the world. Their latest cement, PANAVIA™ Veneer LC, sets a new standard for porcelain veneer cements through incredible performance and ease of use. The following clinical case demonstrates the use of PANAVIA™ Veneer LC.

A 31-year-old female (**Fig. 1**) was referred for porcelain veneers to replace lost tooth structure and to improve aesthetics. The patient exhibited moderate attrition of her anterior and bicuspid teeth (**Fig. 2**), the result of nocturnal bruxism and a tendency to an edge-to-edge occlusion.
She had a Class I malocclusion on a Skeletal Class I tending III base with the right maxillary canine in cross-bite.
The treatment plan included orthodontic treatment, porcelain veneers, and an occlusal splint.

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Orthodontic treatment (by Dr Nour Tarraf) included full-fixed appliances with TADs and IPR of mandibular anteriors, and arch retractions to reduce protrusion (**Fig. 3**, post-orthodontic treatment). A preliminary digital design (**Fig. 4**) was performed to guide the diagnostic wax-up and a digital mock-up (**Fig. 5**) was utilised to verify the diagnostic wax-up prior to carrying out the intra-oral mock-up.
The patient was unable to afford the restoration of the maxillary bicuspids until a later stage so the reconstruction was limited to the maxillary anterior teeth.

Fig. 6

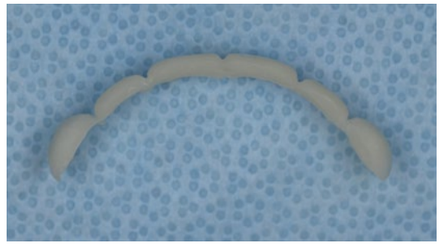


Fig. 7

Fig. 8

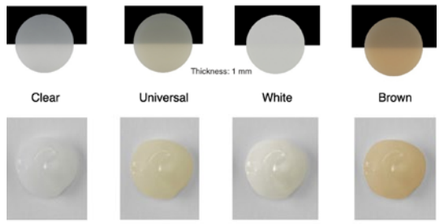


Fig. 9

Fig. 10

Fig. 11

Using the diagnostic wax-up, silicone keys were fabricated to guide tooth preparations. Orthodontic treatment allowed prosthetic treatment to be additive in design which meant that tooth preparations could be conservative. Labial reductions were limited to 0.3 mm and incisal reductions were performed only where needed to create an incisal butt joint for the veneer (**Fig. 6**). Minimal preparations allowed the veneers to be bonded almost entirely to enamel, which is important for the long-term survival of porcelain veneers (Ref 1). There was no need to significantly mask the colour of the cervical region of the tooth and non-carious cervical lesions were absent, so fine chamfer margins were prepared at equi-gingival level.

Splinted provisional veneers (**Fig. 7**) were fabricated using bisacryl ensuring sufficient interdental space to allow hygiene access for small interdental brushes. The labial surface of the provisional veneers were glazed with a unfilled resin and cemented using the spot-etch technique, ensuring all excess flowable composite was removed prior to curing (**Fig. 8**). Twice daily interdental cleaning of the provisional veneers and thorough brushing of labial margins during the provisional phase maintained soft tissue health, important for the try-in and cementation of the definitive veneers.

A dry try-in of the definitive veneers was performed to check the fit of the veneers and a wet try-in was performed using try-in paste to assess aesthetics. The PANAVIA™ Try-in pastes accurately mimic the cement shades. Four useful shades are available (**Fig. 9**). The White and Brown shades are useful to correct small discrepancies in shade requiring subtle increases or decreases in shade value respectively. Conveniently the try-in pastes are the same as the PANAVIA™ V5 range of try-in pastes (excluding opaque). Following the try-in procedure the teeth were isolated using rubber dam and the floss ligature technique. KATANA™ Cleaner (**Fig. 10**) was used to clean the veneers prior to silanating with CLEARFIL™ CERAMIC PRIMER PLUS (**Fig. 11**).

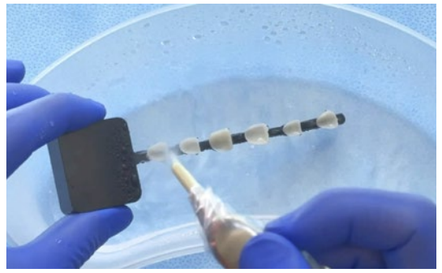


Fig. 12

Fig. 13

Fig. 14

Veneers that have not been pre-etched should be etched with hydrofluoric acid prior to silanization. The use of the ProsMate™* Baton allows the cleaning, etching and silanization of all veneers simultaneously (**Fig. 12**). The veneers are arranged systematically on the ProsMate™* Tray ready for the cementation procedure (**Fig. 13**). Tooth surfaces were pre-treated with phosphoric acid (K-ETCHANT Syringe) and PANAVIA™ V5 Tooth Primer (**Fig. 14**).

The newly designed cement applicator tip reduces air bubbles and the wide 16-gauge tip (**Fig. 15**) allows light and easy control of cement extrusion while also providing efficient wide coverage during application. PANAVIA™ Veneer LC has excellent handling because of its ideal paste consistency. It is non-sticky and its viscosity prevents the cement from flowing beyond the veneer margins until the veneer is seated. It is not runny or stringy. Furthermore its thixotropic properties results in lower film thickness during seating of the veneer. These excellent handling properties are due to the development of new filler technology which consists of spherical silica and nano cluster fillers (**Fig. 16**). The "touch-cure" mechanism of PANAVIA™ V5 Tooth Primer importantly seals the bonding interface while the extended working time and stability of the cement under ambient light allows the simultaneous cementation of multiple veneers. In this case all six lithium disilicate veneers (technical work by Yugo Hatai) were cemented simultaneously with PANAVIA™ Veneer LC Paste (Clear).

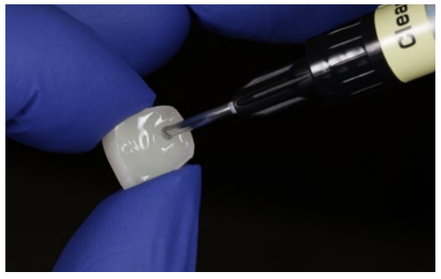


Fig. 15

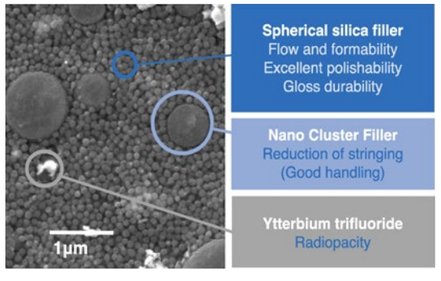


Fig. 16

Tack-curing each veneer for one second allowed smooth and easy bulk removal of excess cement with an explorer (**Fig. 17**). Remaining excess of uncured paste was removed with brushes. Final curing was performed by light curing lingual and labial surfaces.

Fig. 17

The optical characteristics of PANAVIA™ Veneer LC, use of fine chamfer margins, and well-fitting translucent restorations produces a gradual and smooth transition of colour from tooth to veneer where margins disappear and soft tissues respond in a healthy way (**Fig. 18**). The color stability, excellent abrasion resistance and high gloss durability of PANAVIA™ Veneer LC preserves integrity and aesthetics at the margins over the long term. The extraordinary bond strength of PANAVIA™ products, so familiar to our profession over the last 20 years, is still second to none (**Fig. 19**).

Fig. 18

Fig. 19

References: 1. Layton DM, Walton TR. The up to 21-year clinical outcome and survival of feldspathic porcelain veneers: accounting for clustering. Int J Prosthodont. 2012 Nov-Dec; 25(6):604-12. PMID: 23101040.

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At Kuraray Noritake Dental Inc., we understand the demands of modern dental practices. Balancing complex procedures, tight schedules, and patient needs is no easy task. That is why we have been on a relentless journey to streamline, enhance, and refine every step of your work for decades.

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- 2 shades for anterior
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- Excellent polishability and gloss retention
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Discover
Universal Excellence

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