GC get connected Your product and innovation update



SPECIAL EDITION

Fall in love with your next restorative from GC



everX Flow™ Fibre-reinforced flowable composite for dentine replacement



G-ænial® Universal Injectable High-strength restorative composite



EQUIA Forte® HT Cost-effective, long-term restorative alternative





Since 1921

Contents

1.	From long fibres to nano fibres: evolution of the use of fibres in dentistry Interview with Prof. Pekka Vallittu, Finland	8
2.	The potential of fibre reinforcement By Dr Claudio Pisacane, DDS, Italy	12
3.	Restoration of an endodontically treated tooth using a composite bilayer approach By Dr. med. Dent. Katja Winner-Sowa, Germany	16
4.	Go with the flow: a cusp-by-cusp additive technique with injectable composite By Dr Mindaugas Kudelis, Lithuania	21
5.	Injecting instead of layering: How a composite became an all-rounder in my dental practice Interview with Dr. med. Dent. Frank-Michael Maier, Germany	24
6.	Injection moulding with composite to obtain a predictable aesthetic outcome Clinical step-by-step with G-ænial [®] Universal Injectable and EXACLEAR transparent silicone By Dr. Ali Salehi, France	27
7.	Challenges and treatment of the different levels of MIH Interview with Dr. Nina Zeitler, Germany	34
8.	An aesthetic and biomimetic approach with a glass hybrid fordirect restorations by Ass. Prof. Zeynep Bilge Kütük, Turkey	37
9.	Quick and effective restoration with glass hybrids: the stamp technique By Dr. Rosalía Marcano, Spain	47

Editors' note

Fall in love with your next restorative from GC

Three simple solutions to your posterior challenges.

Each time a new patient requires treatment in your operatory practice, the individual treatment plan will need adjustment optimized to deliver the highest quality, regardless of the starting situation. It is a difficult task GC aims to ease upon you by offering solutions that will enable you to work with confidence and efficiency. In this issue of GC Get Connected, we are happy to introduce ... facilitating to create direct restorations more intuitively and helping you to solve your most burning dilemmas.

While we hope you will enjoy discovering their clinical applications in the following articles, you will find below in a nutshell some characteristics that can make them unique and soon essential to your practice.

everX Flow: short-fibre reinforced flowable composite providing strength from within

Most dental restorations are made in a direct treatment approach, while indirect restorations are considered 'safe' for the largest defects.

However, the tipping point between direct and indirect is not always clear. In doubt? Use everX Flow! With its reinforcing and crack-stopping fibres, it gives peace of mind when restoring large cavities directly. It has a thixotropic consistency that ensures great adaptation to cavity walls and easy manipulation, and you have the option to apply it in bulk. Besides, due to these assets, it will soon become your favourite core build-up material as well.

Don't miss the interview pf Professor Vallitu, to find out why fibers are such an asset to bring strength to restorations.

G-ænial Universal Injectable: high-strength restorative composite to shape and contour as you inject

Despite this composite's flowable consistency, it is so strong that you can restore any cavity size with it if indications for direct restoration are met. It opens whole new ways of restoring that once you've tried it, you cannot think of working without it anymore! In the article of Dr Kudelis, you will see that shaping and countouring while you inject makes it so easy to create an occlusal molar anatomy in no time, with minimal efforts, with minimal effort. This material is also particulary adapted for Injection moulding, which has become a very popular semi-direct way of working as shown in the article from Dr XXX on page YYY has become very popular as a semidirect way of working. In the posterior region it is particularly interesting to treat complex situations such as a heavily worn dentition or multiple teeth at once.

Following the steps described by Dr Salehi, you will discover how this technique can also be of help in the anterior to create composite veneers in a semi-direct way.

EQUIA Forte HT: the cost-effective, long-term alternative

Cavities that are difficult to isolate, limited capabilities of a patients to cooperate, patients requiring a more frugal solution... these are only some of the challenges that can make placement of a composite cumbersome, if not impossible. The proven glass hybrid technology of EQUIA Forte HT is the smart and cost-effective solution that will make you feel a rush of relief when facing these issues. Placement can be done fast and without absolute isolation. Extra protection comes from its ion exchange with the tooth surface and the wear-resistant synergistic coat. This product features a large array of application, some of them like stamp technique described in the article of Dr Marcano make full use of its bulk application with no shrinkage.

Would you like to know more about these exciting products? Check the webpage for clinical cases, tips and tricks and other information: https://campaigns-gceurope.com

GC Europe N.V. Interleuvenlaan 33 3001 Leuven Fon +32.16.74.10.00 Fax +32.16.74.11.99 www.gceurope.com info.gce@gc.dental

Every patient is different... and yet the same.

Each time a patient takes place in your chair, your treatment plan needs to be adapted and optimized to deliver the highest quality, time after time, for each and every individual. It's a difficult task that we love to help you with.



one



The effortless

one



+ Proven glass hybrid technology with a synergistic protective coat

EQUIA Forte HT

- + Biocompatible and moisture-tolerant
- Bulk-fill and self-adhesive for quick and easy placement
- ion exchange

Simplified and efficient solutions for posterior restorations

GC products are created with the dentists and patients in mind. This means that we are committed to delivering efficient and easy-to-use products of the highest quality for every indication.





Strong to the core

everX FlowTM from GC

Short-fibre reinforced flowable composite for dentine replacement

The strength of fibres to reinforce your restorations, with amazing adaptation and without slumping - even in upper molars









Prof. Pekka Vallittu has earned his degrees in Dental Technology in 1988, Doctor of Dental Surgery and Doctor of Philosophy in 1994, received Adjunct Professorship in 1995 and specialized in prosthodontics and stomatognathic physiology in 2000. Presently, he is a Full Professorship and Chair of Biomaterials Science in the Faculty of Medicine, University of Turku (Finland) and works as Dean of the Institute of Dentistry at the University of Turku and as the Director of Turku Clinical Biomaterials Centre. He holds Honorary Professorship at the University of Hong Kong, Pokfulam and Visiting Professorship at the King Saud University in Riayadh (Saudi Arabia). His predominating research activity on fibre-reinforced composites has lasted over 30 years since 1980's. The first clinical applications of fibre-reinforced composites were found in clinical dentistry and thereafter in combination with bioactive component in bone surgical applications as non-metallic bioactive implants. He has over 540 ISI Web of Science Index original publications. He has established two companies for getting newly developed composite materials clinical use in dentistry and bone surgery.

From long fibres to nano fibres: evolution of the use of fibres in dentistry

Interview with Prof. Pekka Vallittu, Finland

Could you please shortly introduce yourself?

Professionally, I started as a dental technician and later became a dentist as well. During my undergraduate course, from 1988, I already started with research on the use of several types of fibres to reinforce dentures. In 1994, I completed my doctoral dissertation on this topic. Shortly thereafter, I stayed for almost two years at the Nordic Institute of Dental Materials where I had the chance to do research with Dr I. E. Ruyter, one of the most renowned experts in polymer chemistry for dental applications. Here, I gained deep knowledge on that topic. Then, I returned to the University of Turku and I was one of the founders of Stick Tech (spin-off of the University of Turku, red.) in 1997. However, I made the personal decision to stay at the university rather than

proceeding in the company, where I got governmental funding to continue research on fibre-reinforced composite. Through these many years of research, we had the chance to build a substantial amount of evidence and expertise in fibre-reinforced composites. In 2006 I became Professor and Chair of the Department of Biomaterials Science and in 2009, director of the Turku Clinical Biomaterials Centre (TCBC). I've been the Dean of the Institute of Dentistry of the University of Turku from 2004 to 2012 and after a short break, returned to that position in 2018.

In your opinion, what are the main advantages of fibres in dentistry?

Fibres are the only way to make large direct restorations with good mechanical properties and durability. Other durable strong materials, such as zirconia and metal can only be made indirectly, outside the mouth. This way we can provide more affordable restorations and allow a larger patient group to be treated. Another advantage is that the mechanical properties of fibrereinforced composites are very close to those of bone and dentine, which is not the case with metals or ceramics, which are very rigid. Fibre-reinforced composites are the only synthetic materials which meet the same biomechanical demands as dentine or bone.

What was the purpose of developing everX Flow?

Research started with long fibres, used in the everStick products, which are the most durable ones. However, length is also a matter of designation, and appliances and restorations like splints and bridges that cover a wide span need a different length compared to a single tooth restoration. The main purpose with which we started the development of everX Posterior was to find the optimal fibre length vs. the size of the tooth, so that the fibres would act as reinforcement. This resulted in an average fibre length of 0.7 mm to 1 mm in everX Posterior, which provided excellent mechanical properties, and in particular, increased toughness. However, the adaptation and placement were not always as easy to achieve as we ideally would like to. Meanwhile, the bulk-fill composites emerged onto the dental markets and became popular, not because of their properties but because of their ease of use. Hence, the idea arose to develop a flowable version.

On one hand, we expected that shortening the fibres would decrease the properties. But, from studying the literature, we knew that the fibre length should be proportional to the diameter. Thus we started searching for what is called the 'Optimal Aspect Ratio'. The fibres in everX Flow are shorter, but also thinner. With these smaller fibres, the viscosity could be changed; the fibres in everX Flow are about 0.1 mm in length but with a much smaller diameter. The amount of fibres could also be increased, maintaining the toughness - which is the main purpose of the fibre reinforcement. Most of the research is focused on the toughness because it has been shown to be the best indicator of longevity of a restoration.¹



SEM image of the glass fibres in everX Flow. Courtesy of Dr Lippo Lassila, University of Turku

What was your role in the development of this material?

I have initiated and coordinated the development of FRC materials. The key lab research has been mainly executed by Dr. Lippo Lassila who is the principal investigator in this particular project with Adjunct Professor Sufyan Garoushi and our skilled laboratory staff members. Dr. Garoushi wrote a PhD thesis on short fibre-reinforced composites. Further on, I have participated in the clinical test phase and directed the project form the clinical and material science perspectives. The entire project was a cooperation in which TCBC was in charge of the research and development of the research and Stick Tech – now a member of the GC group – transformed the research into an industrial project.

You often refer to fibrereinforced composites as biomimetic restorations. What exactly do you mean with this term?

When you analyse human tissue, dentine and bone are fibre-reinforced materials, based on collagen fibres and apatite minerals. Even though the chemical composition of fibrereinforced composites is different, they reproduce a similar structure. Moreover, the biomechanical behaviour of these composites mimics that of dentine.

Are there other differences between everX Posterior & everX Flow? Do they have the same indications?

The indications are very similar, but the main difference is in the handling, because of the viscosity. Basically, they are both base materials to reinforce restored teeth. everX Flow is now also indicated as a core build-up material for metal and ceramic crowns.

From long fibres to nano fibres: evolution of the use of fibres in dentistry





The material keeps its shape during placement (top), but flows when it undergoes shear stress or 'disturbance' (bottom).

There are 2 shades available in everX Flow. What are the differences & when are they indicated?

The 'Bulk' shade: is more translucent and can be cured in layers up to 5.5 mm, which widens the indications a bit. The 'Dentin' shade is more aesthetic and can be cured up to 2.0 mm.

What is the difference between traditional bulk-fill composites and everX Flow?

In indications, they are very close to each other. However, everX Flow is a base material, meant to reinforce the structures underneath and above it. It needs to be covered with a regular composite that can be easily polished. Even though many bulk-fill composites need to be covered as well, in its strict definition, it should mean that you can use one and the same material from the bottom to the surface, in one increment.

How much stronger is everX Flow? What is the impact on performance?

Its toughness, which the most important material property impacting the clinical success¹ is twice as much as any other kind of composite on the market, which is also the case for everX Posterior. Its impact on the restoration performance depends on the size and shape of the destructed tooth and the ratio of everX Flow and overlaying composite. The ratio between the short-fibre reinforced base and conventional composite in the restoration should be analogue to the dentine and enamel structure. This means that about 1-1.5 mm of the occlusal surface should be regular composite in order to give the best mechanical strength for the restored tooth as a whole²⁻³.

Less benefit is achieved if the layer of fibre-reinforced composite is not sufficiently thick⁴.

As a rule of thumb, you use everX Flow to replace dentine and regular composite to replace enamel, thus mimicking tooth structure.

Do you need to cover everX Flow with a last layer of composite, and if yes why?

By structure, everX Flow contains both micro and macrofill particles. Fibres are big particles that make it slightly less polishable even though the wear resistance in vitro is very good. Based on the wear behaviour, it could be exposed in approximal contact points. However, the official instruction remains to cover everX Flow on the proximal surfaces with regular composite as well. More research is needed to analyse the effect in the long term, but available data are positive.

What does the research say about the performance of the product?

There is already a large number of publications available on everX Flow. On everX Posterior, we have even more evidence available. Almost all studies show superior properties of the material, such as the toughness or other mechanical properties. In vitro, it has been shown that fracture propagation is prevented in a restoration with fibre-reinforced composite. This is also the case at the interface of composite layers⁵.

In those studies where no considerable reinforcing effect was found, the thickness of the fibre-reinforced layer was usually insufficient. Studies from other research groups have confirmed these superior mechanical properties and there are still many studies ongoing on this topic.

Could everX Flow be used to replace posts? If yes, in which indications?

At the TCBC, we have been looking in this topic a lot, in vitro as well as clinically, and many other research groups are doing so as well. Overall, more research on this topic is still necessary. In molars, it is possible to make a direct endocrown without post by making a base of everX Posterior and this can be extrapolated to everX Flow as well. This type of endocrown is analogue to lab-made ceramic endocrowns. The restoration only extends about 2-3 mm into the root canals, given that the walls are parallel and diameter is sufficient. The intraradicular part of the restoration should have the same height or be higher than the coronal part. The thickness of the occlusal veneer of the restoration should be more than 1-2 mm.

In anterior and premolars, studies have been done with very promising, but there is not enough evidence yet for clinical recommendation. However, it is possible to combine the pre-fabricated fibre post and use everX Flow in the coronal part of canal to replace cement and for the core. This is an improvement in comparison with a regular luting cement. Of course, results depend a lot on the remaining tooth structure. If there is considerable damage up to the gingival level a thick and well bonded fibre post is still needed for sufficient retention. Evidence might be available within 2-3 years.

What are your future research topics?

Tomorrow I'll be giving a lecture on the masticatory function of giant pandas and the evolutionary adaptation of the condyles to that function. In the field of fibre-reinforced composites, we strive to an even closer resemblance to natural dentine; among others we are investigating nanofibres, and compositions and structure closer to apatite minerals. We are also cooperating with another research group to extended indications in surgical applications, taking into consideration the biological aspect of bone forming cell lines. This is linked also to the bone regeneration materials used in periodontology and oral surgery.



- 1. Heintze SD, Hickel R, Reis A, Loguercio AS, Rousson V, Dent Mater 2017;33:e101-e114.
- 2. Omran TA, Garoushi S, Lassila L, Shinya A, Vallittu PK. Bonding interface affects the load-bearing capacity of bilayered composite. Dent Mater J . 2019; 38(6):1002-1011.
- 3. Garoushi S, Lassila LV, Tezvergil A, Vallittu PK. Load bearing capacity of fibre-reinforced and particulate filler composite resin combination. J Dent 2006; 34:763-769.
- 4. Rocca GT, Saratti CM, Poncet A, Feilzer AJ, Krejci I. The influence of FRCs reinforcement on marginal adaptation of CAD/CAM composite resin endocrowns after simulated fatigue loading. Odontology 2016; 104:220-232.
- 5. Tiu J, Belli R, Lohbauer U. Rising R-curves in particulate/ fiber-reinforced resin composite layered systems. J Mech Behav Biomed Mater. 2019;103:103537.



Dr Claudio Pisacane graduated in Dentistry in 1990 at the 2nd University of Rome "Tor Vergata", whereafter he immediately focused his professional activity on endodontics and restorative dentistry. He is dedicated to these specialties as a speaker at various courses and congresses, nationally and internationally, and as an author of scientific publications and book chapters. He's an active member of various scientific societies. Among those, the Italian Society of Endodontics (S.I.E.), where he has been a member of the Acceptance Commission and Vice-President. Since years, he takes part in the editorial board of several scientific papers. Currently he works in his private practice in Rome

The potential of fibre fibre for the potential of the pot

By Dr Claudio Pisacane, DDS, Italy

The composite everX Flow has, among its peculiarities, a glass-fibre reinforcement inside that improves its performance as a replacement for dentine that is subjected to biomechanical stress. The indications of these characteristics have been demonstrated in many clinical scenarios.

In case of endodontically treated teeth, for example, the benefit from this fibre reinforcement can be evident from a considerable substance loss in Class II when restored with a direct filling, or a longtime restoration of the tooth with normal occlusion contact points and anatomy. Effective and reliable core build-up of severely compromised tooth crowns can also be achieved. Consequently, a new provisional element can be obtained for a certain period of time awaiting the definitive prosthetic crown, if needed. In this situation the coupling between everX and fibre posts, in large and/or irregular canals, seems to be a simple and easy way of building up an abutment. Thus, with the potential addition of an adhesive post and careful layering of the composite, it can even replace a prosthetic temporary restoration for an adequate period of time (observation of the symptomatology in one-visit cases, lack of time to make a resin provisional crown, etc ...) as a sort of a "natural" crown. Its use is illustrated by means of some explanatory cases.

Clinical case 1

Endodontically treated molar with a large Class II cavity. The "basal" dentine of the endodontic cavity was restored with everX Flow (Bulk shade). A layer of Essentia Universal gave the necessary chromaticity and was subsequently covered with a layer of G-ænial Posterior (Shade A2) as enamel replacement. Everything was finalized with characterisations and meticulous finishing and glossing.



Fig. 1A: Initial case



Fig. 1C: After polishing



Fig. 1B: Cavity ready for layering



Fig. 1D: Occlusion control



.....

Fig. 1E: One-month follow-up

Clinical case 2

Paediatric patient after endodontic therapy and before orthodontic treatment. The long-term provisional was worked out with complex occlusal anatomy. The dentine body was restored using two different layers: the core and cuspal base with everX Flow, followed by a layer with medium translucency. G-ænial Posterior was used as an enamel layer.



Fig. 2A: Cavity preparation



Fig. 2C: Fine layering of the occlusal enamel



Fig. 2B : Dentine layering



Fig. 2D: Finished case

Clinical case 3

Post-endodontic cavity of a premolar with loss of the distal marginal ridge and the disto-buccal cusp support. The endodontic cavity and the basal dentine were filled with two applications of everX Flow, then a layer of Essentia Universal to give the correct chromaticity, which could be enhanced by an enamel layer with a medium translucency composite resin. The case was then finalized with characterisations and careful glossing.



Fig. 3A: Initial case



Fig. 3C: everX Flow layer and matrix positioning



Fig. 3E: Final case



Fig. 3B: Prepared cavity



Fig. 3 D: Realisation under rubber dam



Fig. 3F: Side view on the occlusal anatomy

14

Clinical case 4

The temporisation of a decoronated premolar, days before the appointment for its prosthetic finalization, was accomplished by compensating the oval endodontic cavity with fibrereinforced everX Flow (Dentin shade).

The restoration was then completed with a fibre post and dual-cured cement and direct composite to mimic a natural tooth crown temporarily.



Fig. 4A: Prepared cavity



Fig. 4C: Case completed with a post, awaiting prosthodontic finalization



Fig. 4B: First layer with fibre-reinforced composite





Dr. med. Dent. Katja Winner-Sowa first graduated as a dental technician in 2001. Soon after, she started her dental studies and graduated in 2007 as a dentist at the Johann Wolfgang Goethe University in Frankfurt (Germany). In 2012, she finished her Habilitation degree at the University of Westphalia (Germany). She works as a dentist in Münster, where she has her own private practice since 2012. In 2013, she obtained her Master degree in Endodontics from the DGZ/APW (Akademie Praxis und Wissenschaft) in cooperation with the KZVWL (Kassenzahnärztlichen Vereinigung Westfalen-Lippe).

Restoration of an endodontically treated tooth using a composite bilayer approach

By Dr. med. Dent. Katja Winner-Sowa, Germany

Endodontically treated teeth have often suffered substantial tooth loss due to extensive caries, previous restorative treatments and the endodontic access itself. Their outcome does not depend solely on the obturation of the root canals, but also on the quality of the coronal restoration. The residual sound tooth structure that remains is of utmost importance here. Consequently, the maximum preservation and conservation of enamel, dentine and the dentinoenamel junction, not only upon restoration, but also in the long term, deserve maximal attention. In this case report, a composite bilayer approach with a short-fibre reinforced composite is described as a modern postless adhesive alternative.

Restoration of an endodontically treated tooth using a composite bilayer approach.

After tooth 26 had undergone a root canal treatment because of irreversible pulpitis, a large and deep MO cavity was left. Even though there was considerable loss of tooth structure, the remaining walls were sufficiently thick to opt for a direct restoration. This is also the most minimally invasive approach, as no tooth substrate needs to be sacrificed to shape the cavity.

To support the remaining tooth structure and improve the durability of this restoration, a composite bilayer approach was used: the core of the restoration was filled with a flowable fibre-reinforced composite (everX Flow, GC), while at the surface, a universal composite with high wear resistance (G-ænial A'CHORD) was used.



Fig. 1: After sandblasting with alumina, clean cavity surfaces were left, ready for adhesive treatment.



Fig. 2: The enamel margins were etched for 30 seconds with phosphoric acid gel.



Fig. 3: The dentin was etched for 15 seconds.



Fig. 4: After application of G-Premio BOND (GC). This universal adhesive can be used in three etching modes (in this case: total etch).

.....



Fig. 5: To strengthen the remaining tooth structure, the deepest part of the cavity was restored with everX Flow (Bulk shade).

.....





Fig. 6-7: With a composite instrument, the matrix band was held to the adjacent tooth during curing to ensure a tight contact point.

Restoration of an endodontically treated tooth using a composite bilayer approach.



Fig. 8: The mesial wall was built up with G-ænial A'CHORD (shade A2). This composite has a fine, silky consistence and doesn't stick to the instrument, which makes it easy to apply. G-ænial Universal Injectable (shade A2; GC) was used as a liner at bottom of the approximal box.



Fig. 9-11: Undermining cavity areas were built up with everX Flow (Dentin shade) to increase the fracture toughness. The cusps were built up one by one with G-ænial A'CHORD.



Fig. 12: Finalised restoration. Note that the enamel is still dehydrated.

.....

Fig. 13: After occlusion check. Deflective contacts were removed.

Fig. 14: After polishing with EVE points (Comet). A remarkably high gloss could be obtained with minimal polishing and the shade blended in very well after rehydration

.....

Conclusions

When restoring posterior cavities, it's important to assess the loss of tooth substance and to select the right materials to assure a long-lasting restoration. In large, deep posterior cavities, the load-bearing capacity can be increased by using a fibre-reinforced composite (everX Flow) in a sufficiently thick layer, covered by a conventional composite. The function of the overlying conventional composite is to give a wear-resistant surface and to provide surface gloss and aesthetics. G-ænial A'CHORD with its simplified unishade system and good handling and mechanical properties is the perfect allrounder for this purpose.

References

Lassila L, Säilynoja E, Prinssi R, Vallittu PK, Garoushi S. Bilayered composite restoration: the effect of layer thickness on fracture behavior. Biomater Investig Dent. 2020 Jun 2;7(1):80-85.

Garoushi S, Tanner J, Keulemans F, Le Bell-Rönnlöf A-M, Lassila L, Vallittu PK. Fiber Reinforcement of Endodontically Treated Teeth: What Options Do We Have? Literature Review. Eur J Prosthodont Restor Dent. 2020 May 28;28(2):54-63.

Transform the way you Work

Start injecting with our strongest direct restorative ever

G-ænial[®] Universal Injectable

Dr. Mindaugas Kudelis graduated at the University of Health Sciences (Lithuania) in 2013. He is general dentist with expressed interest in esthetic dentistry, direct posterior composites, digital dentistry and guided implant placement. With the rise of social media dentistry era, he began an international teaching career - giving lectures and hands on workshops around the world. He is a member of the Ripeglobal educator team.

Go with the flow: a cusp-by-cusp additive technique with injectable Composite

By Dr Mindaugas Kudelis, Lithuania

Traditionally, dentists tend to limit the use of flowable composites to small or non-load-bearing cavities, or use it as a liner or base. Alleged inferior mechanical properties are often mentioned as a reason that we are reluctant to use flowable composite for moderate to large cavities. And that's a pity because a flowable consistency has many advantages: it's adapting well to the cavity walls and it has good handling properties. With current advancements in their development, it's time to shake off that reputation and embrace new re-

storative methods that make our lives much easier.

Some time ago, G-ænial Universal Injectable (GC) was introduced to the market, promising the same or even better strength and wear resistance as conventional composites. With advanced technologies, a high load of ultra-fine barium particles could be incorporated, while maintaining a low viscosity. The FSC-technology (full coverage silane coating) ensures that the particles remain strongly embedded in the matrix, resulting in an exceptional wear resistance. The first clinical studies with these types of flowable composites for posterior restorations, confirm their eligibility.¹

Restoring entire cavities with a flowable or injectable composite requires a change of mindset. But when you take your time to familiarize with G-ænial Universal Injectable's thixotropic consistency, you'll notice that it's easy to apply without the need for modelling instruments. Its shape remains without slumping, but when a little pressure is applied, it flows smoothly into every irregularity – a joy to work with! In the following case, a second molar was restored with this composite. There was a carious lesion on the mesial side of tooth 27 and the old composite restoration that was still in place showed some marginal defects (Fig. 1). The decay and composite were removed, the teeth were isolated with rubber dam and a transparent sectional matrix and wedge were placed (Fig. 2). After a selective enamel etching and bonding protocol with a universal, two step adhesive system (G2-BOND Universal, GC) (Fig. 3), a separation ring was placed to compensate for the thickness of the matrix when restoring the contact point. The proximal wall was then built first with JE shade (Fig. 4) and the matrix and ring were removed. With the thin,

Fig. 2: After removal of the carious tissue and old restoration, the tooth was isolated and a sectional matrix and wedge were placed.

bendable tip, the narrow and deep part of the Class II cavity could be easily reached. The cusps were built up in small layers (Fig. 5). The first base layers at the bottom were made with a fibre-reinforced flowable composite (everX Flow) in Dentin shade. Next, the primary anatomy was laid using G-ænial Universal Injectable (shade A2) (Fig. 6). By injecting from the bottom up, following the existing anatomy, air bubble inclusion was avoided. The bases of the cusps did not touch each other, which left free surface for shrinkage, thus avoiding that shrinkage stress could build up. A tiny amount of brown stain was sparsely applied in the pits and fissures (Fig. 7) before layering the more translucent JE shade on top to enhance the perception of the

Fig. 4: The mesial cavity wall was restored first (Shade JE), ensuring a tight contact.

Fig. 1: A carious lesion was detected on the mesial side of tooth 27, requiring direct restorative treatment.

Fig. 3: The enamel margins were selectively etched prior to adhesive application.

Fig. 5: Build-up of the restoration

22

occlusal morphology in a delicate way (Fig. 8-9). The cusps can be shaped simply by using the tip of the proper syringe, so no modelling instruments are used; it reminds of a wax-up technique, without the need to carve anything. This also makes it also a lot easier to switch between different shades than in a traditional approach where you are working with paste and instruments.

G-ænial Universal Injectable gives a 'glazed' appearance with rounded and soft shapes, reminding of ceramics, with an easy-to clean surface (Fig. 10). At the follow-up appointment after one week, the remarkable gloss retention was again confirmed (Fig. 11).

Conclusion

Dentists are always on the look-out for simplified approaches with less technique-sensitivity. In this regard, it is definitely worthwhile to familiarize with this new way of working – the easy manipulation of the thixotropic material grows on you and once you unleash its full potential, it will soon become your favourite! The cusp-bycusp additive technique truly offers a high-quality restorative option for a variety of clinical applications.

References

 Kitasako Y, Sadr A, Burrow MF, Tagami J. Thirty-six month clinical evaluation of a highly filled flowable composite for direct posterior restorations. Aust Dent J. 2016 Sep;61(3):366-73. doi: 10.1111/adj.12387.

Fig. 6: The primary anatomy was created using a dentin shade (A2). The injectable composite was simply shaped using the application tip of the syringe.

Fig. 7: Some brown stain was sparsely applied in the fissures to enhance the 3D-appearance

Fig. 8: The enamel shade (JE) was layered on top. Some highlights were added on the cusps in shade XBW.

Fig. 9: Final secondary morphology. When applied with care, there is hardly any need to finish the restoration.

Fig. 10: Result immediately after treatment. Note that the teeth are still slightly dehydrated.

Fig. 11: Follow-up, one week after the treatment, with the inconspicuous restoration on tooth 27

/ 23

Dr. med. Dent. Frank-Michael Maier specializes in implantology and implant prosthetics as well as aesthetic dentistry in his dental practice in Tübingen (Germany). With his various research, speaker and author activities, he is highly esteemed internationally among his colleagues. As a member of various working groups and professional associations as well as acting president of the Gnathological Working Group Stuttgart (GAK e.V.), he has been committed to high-quality aestheticfunctional dentistry for many years.

Injecting instead of layering: How a composite became an all-rounder in my dental practice

Interview with **Dr. med. Dent. Frank-Michael Maier**, Germany

In this interview, Dr. Maier discusses direct restorative techniques, which for him are an integral part of everyday practice and the basis for minimally invasive and defect-oriented clinical action. In the field of direct restorations, he pays attention to high-quality materials that are universally applicable to various process technologies (e.g. injection moulding, snowplow, tunnel preparation or stamp technique). At the same time, it should be possible to achieve reproducibly good results in an efficient way. In this interview, the dentist explains why he prefers the high-strength universal composite G-ænial[®] Universal Injectable (GC) and what advantages the thixotropic viscosity of the material has for everyday practice.

Dr. Maier, why do you prefer the composite G-ænial Universal Injectable (GC) as a direct restorative?

The decision is based on various reasons. One of them is universal applicability, although other materials also offer this. However, what immediately impressed me about G-ænial Universal Injectable is its excellent polishability. After many years of working with a composite of another manufacturer, I was pleasantly surprised by the simplicity and quality of the polish at G-ænial Universal Injectable. Without much effort and with just a few steps, the surface shines and more importantly, the gloss in the long term. That was the decisive aspect for me to switch. Soon I got to know and appreciate further advantages of the injectable composite. Especially for use in injection or stamp technology with transparent silicone keys as well as in terms of abrasion stability, the material offers clear advantages. For some time, I was looking for a composite with the appropriate viscosity that also allows me a comfortable handling. I found this in G-ænial Universal Injectable.

What does this mean in concrete terms for everyday practice?

The material composition makes G-ænial Universal Injectable universally applicable. I appreciate the fact that I can work with only a few materials in practice. On the one hand, this simplifies logistics and warehousing. On the other hand, it brings more calm to the treatment process. Thanks to the thixotropic viscosity, G-ænial Universal Injectable can be used efficiently in a wide variety of filling techniques and this significantly simplifies my everyday work. The material remains stable and dimensionally stable during application, but is still flowable during modelling. For example, I use the composite for the semi-direct injection moulding technique (IMT). For this purpose, a silicone key is made of crystal clear silicone (EXACLEAR, GC) based on a wax-up. The composite is then injected via small injection channels and light-cured through the transparent key. This technique works really well with G-ænial Universal Injectable due to the right thixotropic consistency.

For which indications do you predominantly use G-ænial Universal Injectable?

When I think about it, for a lot of different indications. I work with various restoration techniques, e.g. the stamp, snowplow or injection moulding technique and I benefit in all situations from the remarkable flow behaviour of the composite - very stable yet with a little pressure, a thin flow. Another example is the minimally invasive tunnel preparation, in which the material can be "pressed in" well. I also prefer the material for box elevation and as a fissure sealer, applied with a thin nozzle. In addition, I work in implantology with G-ænial Universal Injectable, e.g. I use the material for the individual shaping of the soft tissue or the fixation of screw cylinders in long-term provisionals. Experience has shown that the dense surface results in excellent tissue compatibility. Similarly, I use the material in the ovate-pontic technique for the step-by-step shaping of the emergence profile. This creates the impression of a tooth arising from the socket.

To what extent is the composite suitable for intraoral repairs?

Intraoral repairs of composite as well as glass-ceramic restorations work

well, with its success standing or falling with the surface conditioning. In my hands, the intraoral tribochemical roughening of the restoration and silanization have proven itself. Due to the good colour adjustment and polishability, inconspicuous repairs can be made.

And what experiences do you have in terms of the quality of results?

G-ænial Universal Injectable is very aesthetic, although I expect this from all modern composites. Thanks to the 16 shades and 3 translucency levels, almost any situation can be covered in everyday life and work in a highly aesthetic way. I particularly like the shades for imitating the natural enamel. And once again I would like to emphasize the excellent polishability with little effort; the basis for the longterm success of the care. With regard to the edge stability and the abrasion behaviour, I can only report positive things from the recalls.

What would you like to instil among your colleagues who are interested in G-ænial Universal Injectable?

Working with the "right" composite is not a primary success criterium, but an important building block for direct restorative restorations. In my opinion, the basis for success is the correct application of adhesive technology, the design and the knowledge of various process technologies. This way, one can act minimally invasively and based on requirements. The advantage of a composite like G-ænial Universal Injectable is the universal use and thus the ideal product for my everyday practice. Due to the injectability of the material, innovative processes as well as proven restorative techniques can be implemented first-class. The thixotropic viscosity of the material

ensures very good handling; the good, efficient polishability is simply fun and the quality of the results is excellent.

Thank you very much for this interview!

Application examples for G-ænial Universal Injectable

Deep Margin Elevation

Shaping the emergence profile in implantology

Injection technology with a crystal clear silicone key (EXACLEAR, GC)

Dr. Ali Salehi graduated in 2007 as a Master in Dentistry at the Faculty of Dental Medicine of Strasbourg University, France. During his Master course, he completed an Erasmus internship at the Faculty of Dentistry of the Johannes Gutenberg University in Mainz, Germany. From 2008 until 2015, he worked as a clinical consultant at the Department of Prosthetics of the University of Strasbourg. Since December 2015, he became a part-time Clinical-University Assistant in the same department. In parallel, he also works in his private practice in Strasbourg since 2011. His clinical work has been honored with several prizes, such as the 1st prize in the clinical category of the "European Talent Awards" of 3M ESPE (2015), the 3rd prize in the "Essentia European Facebook contest" of GC (2016) and the 1st prize at the Grand Prix of Aesthetic Dentistry of the French dental journal "Réalités Cliniques" (2017). Dr Salehi also actively participates in many trainings & conferences at various national and international events. His main topics of interest include dental photography, aesthetic dentistry, adhesive dentistry and minimally invasive dentistry.

Injection moulding with composite to obtain a predictable aesthetic outcome

Clinical step-by-step with G-ænial[®] Universal Injectable and EXACLEAR transparent silicone

By Dr. Ali Salehi, France

Using the injection moulding technique, composite restorations are created by injecting the composite into a silicone key that is directly positioned into the patient's mouth. The main advantage of this technique is that restorations can be first modelled in wax on a stone model, and then copied and transferred in detail to the natural teeth. **For complex morphologies, challenging aesthetic cases or cases requiring reestablishment of the occlusal vertical dimension, a predictable result can be obtained and chair time reduced with this relatively simple procedure. Adjustments can also be made afterwards if needed**. Because these restorative treatments usually comprise extensive surfaces, the composite used should be strong and wear resistant enough and also offer the desired optical properties. G-ænial Universal Injectable is an ideal product for this indication thanks to its great thixotropy and excellent mechanical & aesthetic properties.

Fig. 1-2: Initial situation.

A 34-year-old, pregnant woman came to the dental office with the request to improve the aesthetic appearance of her smile. Her chief complaint concerned the shape of the lateral incisors (Fig. 1-2). She had already undergone a bleaching treatment and two veneer-lays on the heavily discoloured teeth 14 and 15, due to endodontic treatments covered with voluminous amalgam restorations in the past. After explaining the different options, she decided to go for a treatment with direct composites because of financial reasons and the idea of the minimally invasive nature of the procedure.

A wax-up was made of the desired tooth morphology that had been defined in consultation with the patient (Fig. 3). Next, a non-perforated metal impression tray was filled with a transparent vinyl polysiloxane material (EXACLEAR, GC) and placed over the stone model with the wax-up (Fig. 4-5). The tray's only purpose being to be used as a mould to create the key, a full-arch tray with a smooth inner surface was selected so that the silicone could

Fig. 3: A wax-up was made in consultation with the patient.

be retrieved easily in its whole and without damage (Fig. 6-7). Care was taken not to press too hard, so that all incisal edges were covered with a sufficiently thick layer in order to avoid potential tearing or deformation which could lead to a bad reproduction of the wax-up in the mouth of the patient. The tray was sufficiently filled to cover all teeth, up to the second premolars.

Fig. 4-7: A metal impression tray was filled with transparent vinyl polysiloxane (EXACLEAR, GC) and used to copy the stone model with the wax-up.

Fig. 8: A needle-shaped bur was used to drill holes through the silicone key ending in the middle of the incisal edge.

Fig. 9: It was checked whether the holes were large enough to enable the tip of the composite syringe to pass easily and completely.

final result. In this regard, it should be

noted that in a more ideal situation, a

case, the teeth should be sufficiently

rubber dam could be used. In this

As a rule of thumb, the silicone key should always extend so far that it includes at least two teeth distally from the teeth to be treated on both sides; this ensures stability of the key when it is positioned in the mouth and a proper reproduction of the aesthetic project for a more predictable

Fig. 10: Neighbouring teeth 11 and 22 were isolated using Teflon tape.

Fig. 12: After etching, the enamel surface showed a matt appearance.

Fig. 13: The universal adhesive G-Premio BOND (GC) was applied in accordance with the manufacturer's instructions and light-cured.

allow proper seating without any tension between the key and the rubber dam.

A fine, needle-shaped bur was used to drill the holes in the key through which the composite will be injected (Fig. 8). These holes were positioned at the middle of the incisal edge of each tooth, half-way between the distal & mesial borders, and made as small as possible but large enough to enable the tip of the composite syringe to pass easily and completely (Fig. 9). Care was taken not to damage the vestibular part inside the silicone key with the bur, to maintain the information of surface texture that had been created during the wax-up. This will guarantee a proper transfer and respect the idea of a predictable final aesthetic result.

After cleaning, the procedure was started with a central incisor. The neighbouring teeth were isolated with Teflon tape (Fig. 10). Then, the enamel was etched (Fig. 11) to create extra micromechanical retention, carefully rinsed and dried. A frosty appearance of the surface was obtained (Fig. 12). A universal adhesive (G-Premio BOND, GC) was applied, left undisturbed for 10 seconds and thoroughly dried with maximum air pressure for 5 seconds before lightcuring (Fig. 13).

Injection moulding with composite to obtain a predictable aesthetic outcome

Fig. 14: G-ænial Universal Injectable (GC) was injected into the silicone key.

Next, the silicone key was positioned onto the teeth and the composite was injected (Fig. 14). G-ænial Universal Injectable (GC), shade A1 was selected for the procedure because of its high filler load and wear-resistance. The syringe was placed in the hole and slightly orientated towards vestibular. During the injection, a little bit of overflow is needed to ensure that all small voids at the margins and interproximal spaces are filled. This can easily be verified through the transparent key (Fig. 15). Next, G-ænial Universal Injectable was light-cured through the transparent silicone. After removal of the key, the excess was taken out with a surgical scalpel blade (blade #12, Swann-Morton; Fig. 16). Further finishing was done with a flame-shaped bur at the cervical margin, to correct any possible overcontouring, (Fig. 17) and with metal strips (New Metal Strips, GC) interproximally (Fig. 18). Metal strips are more rigid than transparent ones, which makes them more efficient and easier to use. Note that even though some bleeding might occur during this stage, finishing and polishing should be carried out thoroughly as smooth margins will help the gingiva to heal faster but also maintain the gingival health over time. The same procedure was repeated on the other incisors and the canines (Fig. 19-20).

Fig. 15: Due to the high transparency of the key, it can be visually checked if a sufficient amount of composite has been injected to cover the entire surface. The composite can also be easily light-cured through the key.

Fig. 17: A flame-shaped finishing bur was used.

Fig. 19: The same procedure as shown for tooth 21 was repeated for the other teeth. Application of G-Premio BOND on tooth 12.

Fig. 21-22: Result immediately after curing the composite.

Fig. 16: The excess was removed with a scalpel (blade #12). Due to the presence of the Teflon tape, the excess did not stick to the neighbouring teeth and it was easy to remove.

Fig. 18: Interproximally, the margins were finished with metal strips.

Fig. 20: Injection of G-ænial Universal Injectable (GC) into the EXACLEAR key.

Injection moulding with composite to obtain a predictable aesthetic outcome

Fig. 23-25: Gingival healing 3 days after the treatment.

Fig. 26-28: Final polishing was done at the recall session.

Immediately after, it can be seen that the surface texture of the wax-up was transferred in detail to the direct veneers in the oral cavity, which gives the teeth a very natural and lifelike appearance (Fig. 21-22). Three days after the treatment, the gingival tissue had healed entirely (Fig. 23-25). In the recall session one week later, the surface was polished again with soft rubbers and cotton wheels with polishing paste

(DiaPolisher Paste, GC) (Fig. 26-28), to enhance the gloss while preserving the texture (Fig. 29-30).

The injection moulding technique is an easy approach that allows to plan restorations with complex morphology in advance and copy them in a predictable manner to the clinical situation. Even the surface texture can be copied from the wax-up, which saves valuable chair-time. In order to have a long-lasting result, the composite needs to have good mechanical properties. **Considering the interesting properties of G-ænial Universal Injectable, being even stronger than many paste composites, it can be safely used for that purpose.**

Fig. 29-30: Result after final polishing.

Restorations that cross generations

EQUIA Forte[™] HT from GC

Bulk fill glass hybrid restorative system

"GC

Courtesy of Dr. Z Bilge Kütük, Turkey

Dr. Nina Zeitler studied dentistry at the University of Erlangen-Nuremberg (Germany) from 1996 to 2003. In 2005 she completed the implantology curriculum from eazf and in 2006 the curriculum for pediatric and adolescent dentistry from eazf/APW. In 2006 she started in a group practice. In 2016 she completed a Master's degree in Pediatrics and Adolescent Dentistry and in 2017 a Master's degree in Orthodontics. She has had her own practice since 2016: Seasmile - the dental practice for kids & teens.

Challenges and treatment of the different levels of MIH

Interview with Dr. Nina Zeitler, Germany

34

How do you currently diagnose molar incisional hypomineralisation (MIH) in your practice? What are typical features of MIH?

Dr. Nina Zeitler: It is currently a purely clinical diagnosis. For us, practically, MIH is divided into:

- a mild form: a sharply defined opaque-whitish to brownish colour change,
- a medium form: colour change with minor breakdown,
- the severe forms: with strong and dark colour changes and some accompanied by massive loss of hard substance (post-eruptive breakdown).
 Sometimes these teeth are no longer present.

The severity of MIH is not always congruent with the symptoms described by the patient. We have e.g. patients with slight colour changes yet severe hypersensitivity and vice versa.

What do you attach particular importance to in diagnosis and therapy, what is important to consider?

Dr. Nina Zeitler: The most important thing for us is to recognise MIH as early as possible and to make patients and parents aware of this problem. We have developed a concept that rests on two pillars: Prophylaxis (at home and in practice) and therapy. At the same time, it must be made

Mild MIH

Severe MIH with posteruptive breakdown

Incisors with MIH

clear to patients and parents that the MIH requires all three parties (patientparent-dentist) to work together. Prophylaxis sessions at the dentist alone are not enough.

However, it helps the parents a lot if we relieve them from their helplessness and feelings of guilt and provide them with tools with which they can improve the situation. Here I am thinking of tooth protection creams without acidic fluoride. The patients receive the most intensive training in oral hygiene and nutrition. The prophylaxis session in the practice also requires special empathy, techniques and materials. From a therapeutic point of view, you always have to consider how far the tooth has already erupted and if it can be kept dry for repair. There may also have to be a sedation or general anaesthesia option, because these teeth can react extremely sensitively despite local anaesthesia.

Which forms of therapy do you currently use and which ones are successful?

Dr. Nina Zeitler: If the MIH tooth shows no breakdown, we place a sealing and fluoridate with MI Varnish. With a complete breakthrough and a good possibility to isolate from moisture, a resin sealing with a 5th generation bonding agent is placed. Very sensitive and / or partially erupted teeth are sealed with e.g. GC Fuji Triage[®]. The latter leads to an immediate reduction of a possible hypersensitivity. In the event of partially erupted tooth, but with the breakdown of the tooth surface, we place a filling until the tooth is "big enough" to place a glass ionomer (GI)

GC get connected /35

Challenges and treatment of the different levels of MIH

or composite filling. We observe hypersensitivities with composite fillings, not with Gl.

However, GI should be used with a little caution: the "newer" GI (and glass hybrid, GH) have sufficient hardness for a filling with a good prognosis; the "old" GI usually start to fail after just one year. The manufacturers state for which filling areas and for which tooth types the respective GI is approved. If the defect is already large and the filling requirements no longer exist, we use preshaped crowns in metal or ceramic. Of course, an individual crown, e.g. made with injection moulding technique, is also possible.

Crowns of any kind, especially when cemented, instantly decrease pain symptoms. Sometimes one tooth or even several teeth cannot be saved, then we start a close cooperation with orthodontics and oral surgery. Are wisdom teeth in place and are they growing promisingly? Orthodontic or prosthetic gap closure? When should e.g. the first molar be removed so that the second molar adjusts itself as well as possible? Or does the first molar have to go and we plan a prosthetic solution? If so, when and which ones? Individual planning must be done here!

Sealed tooth with MIH

How often does MIH occur compared to early childhood caries (ECC)?

Dr. Nina Zeitler: We see almost twice as much MIH as ECC. The ECC appears to be stagnating in quantity, whereas the MIH seems to be spreading. The latter means that we see the MIH not only on the permanent central incisors and first molars, but also on the permanent canines and second premolars and on the deciduous second molars. Its severity also appears to be increasing.

Hypomineralisation of a premolar

Hypomineralisation of the second primary molar

How often do you recall the patients (and their parents)?

Dr. Nina Zeitler: Children and adolescents who have an MIH are followed up at least every 3 months. We do not differentiate whether hypersensitivities already exist or not. Our creed is here: Defy the beginning! If we see an MIH without hypersensitivity and without (posteruptive) breakdown, the patient must practise improved oral hygiene at home as well as take part in special prophylaxis sessions in the practice. In worse cases, i.e. when there are complaints and / or major collapses, the frequency is sometimes even monthly; usually the prophylaxis sessions alone are no longer sufficient.

Which recommendations do you have for your colleagues?

Dr. Nina Zeitler: MIH is THE dental problem of today's children and adolescents - you are more likely to encounter a child with MIH than one with caries!

We strongly recommend dealing with this phenomenon and establishing a prophylaxis and treatment concept.

36

Assistant Prof. Zeynep Bilge Kütük

graduated from Hacettepe University School of Dentistry in 2007 and started her doctoral studies at the Department of Restorative Dentistry from the same university in 2009. She went to the research laboratories of the Restorative Dentistry Department of Ludwig Maximillians University in Munich, Germany, with a scholarship of the Continental European Division (CED/IADR) of the International Association for Dental Research (IADR). She obtained her PhD in 2015. She received the title of Assistant Professor in 2017. She has been a member of the IADR since 2009. She has published several articles in international and national journals. She participated in several international trainings on minimally invasive aesthetic applications and is a trainer in hands-on courses on aesthetic restorations with current approaches.

An aesthetic and biomimetic approach with a glass hybrid for direct restorations

by Ass. Prof. Zeynep Bilge Kütük, Turkey

Glass ionomer (GI) was first introduced in the 1970s¹. Currently, it is extensively being used for cores, bases/liners, and the cementation of posts, crowns, and fixed bridges. Although, they have numerous advantages, the first GIs were thought to be too rough or unaesthetic due to their opacity for anterior restorations and not durable enough for posterior restorations. However, GIs have been greatly improved since they were first introduced. Many of those earlier concerns have now been fully addressed by manufacturers.

In 2007, EQUIA was launched, a restorative system comprising a GI and a synergistic light-cured nano-filled coating agent. It became the first GI-based system that was indicated for permanent Class II restorations, albeit with cavity size restrictions. Eight years later, the first glass hybrid system, EQUIA Forte, was launched, based on the success of EOUIA. Owing to the new glass hybrid filler technology, the indications for EQUIA Forte could be extended to loadbearing Class II restorations (without cusp involvement). While composite resins are often the first choice for direct aesthetic restorations, specific features of GIs may make them a better choice in certain indications.

The overall goal of this article is to provide the clinician with an overview of the information on a newly developed glass hybrid system (EQUIA Forte HT) and as well as to give useful application tips based on results from clinical cases.

Bulk-fill properties

EOUIA and EQUIA Forte restorative systems are both placed easily in 'bulk' directly in a cavity, very similar to amalgam, without limitations in depth of cure. Moreover, they can be placed in a short time (around 3 min) and without any adhesive procedure. For this reason, they are truly one of the best choices for bulk fill application method. They do not generate the shrinkage stresses that occur in composite restorations and their elastic modulus is very closed to dentine, which makes them a unique biomimetic dentine replacement material.

Gls and glass hybrids form an ionic chemical bond to the calcium found in the hydroxyapatite of both enamel and dentine. Though cleaning the cavity with a mild cavity conditioner (10 or 20% polyacrylic acid) is beneficial, no surface pretreatment is required. The adhesion of Gl to tooth structure is less technique sensitive than composite resins and its quality increases with time². In 2005, Peumans *et al.*³ reported that Gl restoratives exhibited superior retention and clinical performance than adhesive resin systems.

On the other hand, composite resins always require a clean field and should

ideally be placed under a rubber dam to prevent contamination during placement.

Favourable physical and biological properties

Reconstructions of posterior teeth with deep caries lesions are still a challenge for restorative dentistry because of the absence of sufficiently resistant restorative materials with favourable biological properties. Previously, Gls had their limitations in load-bearing areas due to their lower physical properties, and necessitated regular monitoring if placed as a permanent restoration⁴.

The light-cure resin coating application (EQUIA Coat and EQUIA Forte Coat) of the EQUIA and EQUIA Forte restorative systems makes them more aesthetic and gives a shiny appearance to the restorations, seals the margins, provides wear resistance and protects from early moisture sensitivity until maturation is completed, resulting in a high compressive strength.

Based on my clinical experiences I could express that the use of encapsulated forms GI and glass hybrid restorative systems minimises variations in handling and give satisfying outcomes in teeth with deep carious lesions, especially in young patients.

The best-known property of GIs is constant release of fluoride. Immediately after the contact of the acids to the surface of GI restoration, fluoride ions are release from the surface and neutralise them. The fluoride ions can be resorbed by the GI restoration and recharge it for the next acid challenge when teeth are brushed with a fluoride toothpaste, or a fluoride oral rinse is used. The polymer matrix of composite resins, on the contrary , does not allow ion exchange with the oral environment. When some soft infected dentine was left over the pulp wall by sealing the cavity with a bioactive material like GI, the caries progression arrested and sometimes even regressed. Besides their role in remineralisation, fluorides, calcium, phosphate and strontium ions transfer from GI into the deep demineralised dentine. So, the pulp can remain vital without any pulp capping agents and postoperative sensitivity⁵.

The benefits of glass hybrid technology

What differentiates glass hybrid from other conventional GI restoratives is its chemistry. The highly reactive fluoro-alumino-silicate (FAS) micronsized fillers (<4 µm) were added to the standard FAS glass filler particles of EOUIA Fil. The micron-sized filler particles release more metal ions, which improve the cross-linking of the polyacrylic acid matrix and the overall physical properties. Additionally, EQUIA Forte Fil liquid comprises a high-molecular-weight polyacrylic acid, which helps to improve the chemical stability, acid resistance, and physical properties of the set cement. The light-cured, nano-filled resin coating (EQUIA Forte Coat) was improved by incorporating a reactive multifunctional monomer that increases resistance to wear, has a higher

polymerisation conversion and thinner film layer, and also provides a smoother surface to the final restoration.

Long-term clinical trials

Long-term clinical studies of the EQUIA restorative system were reported, exhibiting clinically successful outcomes in Class I and Class II lesions⁶⁻¹⁰. Under the guidance of Professor Gurgan, we evaluated the clinical performance of EQUIA restorative system in conservative Class I and II cavities and compared it with a micro-hybrid composite (Gradia Direct Posterior/GC). Nowadays, this 8-year evaluation of this clinical trial has been completed. According to results of this trial, both tested restorative materials showed an acceptable success rate after 8 years. EQUIA restorative system has been used as a routine restorative in the treatment of permanent teeth in Hacettepe University School of Dentistry Restorative Dentistry Clinics, where I performed my clinical studies since 200911. In 2015, we started another clinical trial again under the guidance of Professor Gurgan and evaluated the clinical performance of EQUIA Forte restorative system in large Class-II cavities and compared with a microhybrid composite (G-ænial Posterior, GC). According to results of our clinical trial, EQUIA Forte restorations showed negligible retention failure and mismatch in colour, both restorative materials exhibited successful performances for the restoration of large Class II cavities after 24 months¹².

To improve the clinical success of these restorations, following elements are important:

- 1. To respect the cavity size indications
- 2. The use of preformed metal sectional matrix systems to restore multi-surface cavity preparations
- 3. To keep prepared surfaces moist (glistening). Do not dissicate!
- 4. Not to remove the matrix before setting of the restoration and be careful while removing it
- 5. To await disappearance of the lustre of the restoration before contouring
- 6. To round the edge of the proximal margin of the restoration and to check the occlusion after making sure that the restoration border is positioned correctly
- 7. To use hand instruments that are not sticking to the unmatured restorative for the adaptation to the cavity walls
- 8. To thermo-cure the restoratives with LED light curing units before polishing
- 9. To use the coating

Case 1

FOUIA Forte HT was used in a 34-year-old female patient for the emergency treatment of a vital lower first molar (tooth 36) with a deep, large carious lesion (Fig 1a). The vitality of the tooth was first determined by pulp testing and a radiograph was taken to check the depth of the lesion (Fig 1b). Local anaesthesia was applied and caries was removed using tungsten carbide burs (Busch "AU" Carbide Burr - TF1AU). Infected dentine was removed with an excavator (Fig 1c). The cavity walls were cleaned with 20% polyacrylic acid (Cavity conditioner, GC) during 10 s (Fig 1d), rinsed thoroughly with water (Fig 1e) and dried gently (Fig 1f). EQUIA Forte HT capsules were prepared and mixed for 10 s, then restorative was directly applied into the cavity in a sufficient quantity using a bulk-fill technique with a special applicator (Fig 1g). EQUIA Forte HT was condensed against the cavity with a plastic hand instrument and was allowed to set undisturbed for approx. 2.5 min (Fig 1h). This restorative does not require a special surface coating during the setting reaction. The finishing process was performed with the use of rotary instruments in 2 steps: a) tapered trimming & finishing tungsten carbide burs were used for forming the fissures and occlusal anatomy of the

restoration; b) flame-shaped rubber points (blue and gray) were used for polishing (Fig 1i). All burs and polishers were used under water irrigation to avoid over-drying the restorative. The occlusal contact points were checked (Fig 1j). A final layer of the coating agent (EQUIA Forte HT Coat) was applied on the surface of the restoration without air-blowing (Fig 1k), then it was light-cured for 20 s with a D-Light DUO LED curing device at 1400 mW/cm² (Fig 1I). The final clinical and radiographic views of the restoration are shown in Figures 1m-o, demonstrating excellent contour and aesthetics.

Figure 1. Treatment of a deep occlusal carious lesion with EQUIA Forte HT. **a.** Clinical view of a deep occlusal carious lesion with cavitation in a mandibulary left first molar is shown. **b.** Bite-wing radiograph of deep occlusal carious lesion in a mandatory left first molar. **c.** Clinical view of the cavity after removing the caries lesion. **d-f.** Application of cavity conditioner. **g.** Application of the EQUIA Forte HT to the cavity. **h.** Clinical view of the restoration before polishing. **i.** Clinical view of the restoration after polishing. **j.** Occlusion check with articulation paper. **k.** Application of EQUIA Forte HT Coat. **m-n.** Clinical view of the restoration. **o.** Radiograph of the restoration.

Case 2

Case 2 is shown in Figure 2 and 3. In addition to the procedures performed in the first case, a sectional matrix system was used for the restoration of the Class II cavities in this case and for contouring the marginal ridges of the restorations, coarse/medium (40 μ m) polishing discs were used. A 19-year-

old male patient presented with a history of a high caries rate and a high incidence of recurrent caries. In Figure 2, a failing composite restoration in a maxillary right first molar in need of replacement is shown. The old MO composite restoration was removed and secondary caries was excavated. To decrease the likelihood of further recurrent caries, EQUIA Forte HT was preferred instead of composite for the restoration replacement. In Figure 3, the treatment steps of primary proximal carious lesions in the maxillary left second premolar and first molar are shown.

Figure 2. Treatment of a deep proximal secondary carious lesion with EQUIA Forte HT. **a.** Clinical view of a deep proximal secondary carious lesion with cavitation in an upper right first molar is shown. **b.** Bitewing radiographic view of deep occlusal carious lesion in an upper right first molar. **c.** Clinical view of the cavity after removing the old composite restoration and caries lesion. **d.** Placement of sectional matrix to perform proximal contact. **e-g.** Application of cavity conditioner. **h.** Application of the EQUIA Forte HT to the cavity. **i.** Clinical view of the restoration after removing the sectional matrix metal band and polishing. **j.** Application of EQUIA Forte HT Coat to the restoration surface. **k.** Light curing of EQUIA Forte HT Coat. **I-m.** Clinical views of the restoration. **n.** Radiograph of the restoration.

Figure 3. Treatment of contacted proximal carious lesions with EQUIA Forte HT. **a.** Clinical view of two adjacent proximal carious lesions with cavitation in an upper left first molar and second premolar is shown. **b.** Bite-wing radiographic view of proximal carious lesions in an upper left first molar and second premolar. **c.** Clinical view of the cavities after removing caries lesions. **d.** Application of Cavity Conditioner. **e.** Placement of sectional matrix system to create the proximal contacts. **f.** Application of the EQUIA Forte HT to the cavities. **g.** Clinical view of the restoration after removing the sectional matrix metal band and polishing. **h.** Application of EQUIA Forte HT Coat on the restoration surfaces. **i.** Light-curing of EQUIA Forte HT Coat. **j.** Occlusion check with articulation paper. **k.** Clinical views of the restorations. **l.** Radiographic views of the restorations.

Case 3

Case 3 is shown in Figure 4. A 22-yearold female patient with a deep proximal caries lesion in the left maxillary first molar was presented. To eliminate the post-operative sensitivity and aesthetic disquiet it was preferred to restore the cavity with EQUIA Forte HT instead of composite. In Figure 4, the treatment steps of a deep proximal caries lesion in left maxillary first molar is demonstrated.

Figure 4. Treatment of a deep proximal carious lesion with EQUIA Forte HT. **a.** Clinical view of a deep proximal carious lesion in an upper left first molar is shown. **b.** Bitewing radiograph of deep proximal carious lesion in an upper left first molar. **c.** Clinical view of the cavity after removing caries lesion. **d.** Placement of sectional matrix to create the proximal contact. **e-g.** Application of cavity conditioner. **h-i.** Application of the EQUIA Forte HT to the cavity. **j.** Clinical view of the restoration after polishing. **k.** Application of EQUIA Forte HT Coat to the restoration surface. **l.** Light-curing of EQUIA Forte. **m.** Clinical view of the restoration. **n.** Radiograph of the restoration. **o.** Clinical view of the margin of the restoration from different side.

References

- 1. Wilson AD, Kent BE. A new translucent cement for dentistry. The glass ionomer cement. Br Dent J. 1972;132:133-135.
- 2. Davidson CL. Advances in glass-ionomer cements. J Appl Oral Sci. 2006;14 Suppl:3-9.
- 3. Peumans M, Kanumilli P, De Munck J, Van Landuyt K, Lambrechts P, Van Meerbeek B. Clinical effectiveness of contemporary adhesives: a systematic review of current clinical trials. Dent Mater. 2005;21:864-881.
- 4. Combe EC, Burke FTJ, Douglas WH. Clinical Dental Materials. Kluwer Academic Publishers; 1999.
- 5. Frankenberger R, Garcia-Godoy F, Kramer N. Clinical Performance of Viscous Glass Ionomer Cement in Posterior Cavities over Two Years. Int J Dent. 2009;781462. doi: 10.1155/2009/781462.
- 6. Gurgan S, Kütük ZB, Ergin E, Oztas SS, Cakir FY. Clinical performance of a glass ionomer restorative system: a 6-year evaluation. Clin Oral Investig. 2017;21:2335-2343.
- 7. Gurgan S, Kütük ZB, Ergin E, Oztas SS, Cakir FY. Four-year randomized clinical trial to evaluate the clinical performance of a glass ionomer restorative system. Oper Dent. 2015;40:134-143.
- 8. Diem VT, Tyas MJ, Ngo HC, Phuong LH, Khanh ND. The effect of a nano-filled resin coating on the 3-year clinical performance of a conventional high-viscosity glass-ionomer cement. Clin Oral Investig. 2014;18:753-759.
- 9. Basso M, Brambilla E, Benites MG, Giovannardi M, Ionescu AC. Glassionomer cement for permanent dental restorations: a 48-months, multi-centre, prospective clinical trial. Stoma Edu J. 2015;2:25-35.
- 10. Turkun LS, Kanik O. A Prospective Six-Year Clinical Study Evaluating Reinforced Glass Ionomer Cements with Resin Coating on Posterior Teeth: Quo Vadis? Oper Dent. 2016;41:587-598.
- 11. Kütük ZB, Ergin E, Yalcin FY, Gurgan S. 8-Year Clinical Evaluation of a Glass Ionomer Restorative System. J Dent Res. 2017;96B(0287).
- 12. Kütük ZB, Ozturk C, Soleimani R, Yalcin FY, Gurgan S. Clinical Performance of a Glass-Hybrid Restorative in Extended-Size Class-II Cavities. Int

Dr. **Rosalía Marcano** graduated in Dentistry in 2007 from the Santa María University in Venezuela, and completed her training in Aesthetic Dentistry in 2009. She moved to Spain and completed her studies in Clinical and Advanced Oral Implantology, as well as the Master's Degree in Implantology at the University of Seville in 2013, while working in private practices in Seville and Madrid. Since 2017, she represents the GC Ibérica Professional Services team and is contributing to the organization and development of training activities, courses and workshops designed for clinicians - an activity she is currently developing and combining with her clinical practice and PhD studies at the University of Valladolid (Spain).

Quick and effective restoration with glass hybrids: the stamp technique

By Dr. Rosalía Marcano, Spain

Glass hybrid restoratives offer a unique combination of advantages in dentistry. They are biocompatible and require neither the application of bonding agents for adhesion nor absolute isolation protocols. Their high viscosity and chemical setting makes them suitable to be applied in bulk, irrespective of the cavity depth, avoiding interfaces, and also makes them easy to mold with the help of an instrument or - as will be shown in the case presented here - a stamp. Moreover, the cost-effectiveness of this class of materials, even for load-bearing posterior restorations, has recently gained attention in the scientific literature¹.

Quick and effective restoration with glass hybrids: the stamp technique

EQUIA Forte HT is the newest material in this category. Its composition includes highly reactive, surface-treated fluoroaluminosilicate glass particles and high-molecular weight polyacrylic acid. The particle size distribution has been meticulously optimized. As a consequence, the handling has improved, compressive strength and wear resistance increased²⁻⁵. The system includes a synergistic coat (EQUIA Forte Coat) that seals the restoration, renders a smoother surface and reduces the wear, making the material adequate for long-term restorations. It also provides an aesthetic 'glazing effect' while protecting the material from early loss of ions and water, both important for optimal mechanical properties⁶. The material can be sculpted easily with a probe or a spatula and also enables easy application with the stamp technique, using a small copy of the tooth structure, based on the patient's own tooth or even a conventional wax-up.

A case report: Class-I restoration with EQUIA Forte HT and the stamp technique

Fig. 1: Non-cavitated carious lesions in tooth 46 and 47. The greyish aspect of the enamel and the hypersensitivity experienced by the patient of tooth 47 suggest an underlying dentine lesion requiring restorative treatment.

.....

A 16-year-old female patient, in good general health, got restorations in the molars of the lower jaw due to caries lesions in the recent past. Aware of her background, the patient requested a dental check-up at least once a year and tried to carry out good hygiene habits. When she came for a dental check-up, she mentioned new "black pigmentations" in the lower jaw molars and sensitivity in the last molar of the fourth quadrant (Fig.1). During the clinical examination, retentive areas were found in tooth 46 and 47. The composite restorations in the molars of the third quadrant were apparently in good condition.

Observing the lesions, the enamel of tooth 47 looked greyish, suggestive of an underlying dentine lesion in need of treatment. The occlusal surfaces were practically intact, without cavitation. Therefore, it was possible to make a copy of the anatomy using a ball instrument and a low-viscosity resin material. In this case, a blue-colored utility resin (LC Block-Out Resin, Ultradent) with good visibility and flow was used, but any resinous material with sufficient flow and strength can do the trick.

First, a thin layer of the resin was applied on the pits and fissures and polymerized (Fig. 2a). Then, a medium-sized ball instrument was placed on the occlusal surface already covered with the resin and a second layer of resin was added, enclosing the ball. The addition of layers was continued until both the surface and the instrument were sufficiently covered (Figs. 2b-c).

Figs. 2 a-c: The anatomy of the occlusal surface was copied with utility resin to create a stamp. The tip of a ball-shaped instrument was incorporated to give a handle to the stamp.

.....

Quick and effective restoration with glass hybrids: the stamp technique

Fig. 3: The stamp shows a detailed imprint of the occlusal anatomy

Fig. 4: The cavity after preparation

Fig. 5: The stamp was firmly pressed onto the cavity filled with EQUIA Forte HT when the material had reached a rubbery state.

Fig. 6: After removal of the stamp, the nicely shaped occlusal anatomy could immediately be seen.

.....

Fig. 7: EQUIA Forte Coat was applied and light-cured

.....

Fig. 8: Final result, easily obtained without the need for shaping or polishing.

Then, the stamp was separated from the tooth (Fig. 3).

Once the copy of the occlusal face was obtained, the lesion of 47 was opened with a small-sized, round diamond bur at high speed and abundant water irrigation. The resulting Class-I cavity (Fig. 4) was restored with a glass hybrid (EQUIA Forte HT, GC; Shade A2).

Once the relative isolation with cotton rolls was done, a very thin layer of GC Cocoa Butter (GC) was applied on the adjacent teeth and areas where the glass hybrid shouldn't adhere. Because of the good handling properties and the handy capsule format, EQUIA Forte HT from GC, the material can be homogeneously mixed and injected into the cavity fast and easily. By applying the content of a single capsule we managed to cover the cavity completely and then we placed the stamp (Fig. 5), previously obtained with the low viscosity resin, and press firmly on top of the tooth and restorative material.

The excesses were removed with the help of a spatula and probe, during the rubbery phase of the glass hybrid. The stamp was removed and the beautifully reproduced occlusal anatomy became present (Fig. 6). No separating agent such as glycerine or Teflon tape was required since the stamp does not stick to the glass hybrid material. On the contrary, when a resinous stamp is used, light-curing a resin composite restoration with the stamp *in situ* might cause issues – due to light attenuation as well as co-polymerization of the stamp with the restoration itself.

To finish the restoration, small excesses that remained were eliminated with a probe and a small diamond flame-shaped bur was only briefly used on the mesiolingual cusp to make a small occlusal adjustment. The EQUIA Forte Coat facilitates the final steps of the restoration as no polishing procedures are required. The field was again isolated with cotton rolls, a thin layer of EQUIA Forte Coat (Fig. 7) was applied with of a microbrush and light-cured for 20

Quick and effective restoration with glass hybrids: the stamp technique

seconds, leaving a smooth, shiny surface (Fig. 8). The coat is on average 35-40 µm thick and did not interfere with the occlusion.

Conclusion

Keeping in mind the patient's history and the cavity's properties, a glass hybrid restorative material was very well indicated in this case. The bulk-fill material with fluoride content enables to restore large and deep cavities in the posterior area, even those that are loaded during mastication, in a fast, durable and cost-effective manner.

References

- 1. Schwendicke F, Rossi JG, Krois J, Basso M, Peric T, Turkun LS, Miletić I. Costeffectiveness of glass hybrid versus composite in a multi-country randomized trial. J Dent. 2021 Apr;107:103614.
- 2. Brkanović S, Ivanišević A, Miletić I, Mezdić D, Jukić Krmek S. Effect of Nano-Filled Protective Coating and Different pH Enviroment on Wear Resistance of New Glass Hybrid Restorative Material. Materials (Basel). 2021 Feb 5;14(4):755.

- 3. Mori D. Comparison of compressive strength and fluoride release of GIC restoratives. J Dent Res Vol 99 (Spec IssA): 1856.
- 4. Navarro M, Fernandes P, Rafal R, Fernanda T, Baesso M et al. Compressive strength, microhardness, acid erosion of restorative glass hybrid/glass-ionomer cements. J Dent Res Vol 99 (Spec IssA):1310.
- 5. Shimada Y, Mori D and Kumagai T. Evaluation of mechanical properties of new GI-restorative (EQUIA Forte HT). J Dent Res Vol 98 (Spec IssA): 3662.
- Brzović-Rajić V, Miletić I, Gurgan S, Peroš K, Verzak Ž, Ivanišević-Malčić A. Fluoride Release from Glass Ionomer with Nano Filled Coat and Varnish.

G-ænial Universal Injectable

Syringe 1mL (1.7g)	Unitip 15x0.16mL (0.27g)	Shade
901471	10006910	XBW
901472	10006911	BW
901473	10006896	A1
901474	10006897	A2
901475	10006898	A3
901476	10006899	A3.5
901477	10006900	A4
901478	10006901	B1
901479	10006902	B2
901480	10006903	CV
901481	10006904	CVD
901482	10006905	AO1
901483	10006906	AO2
901484	10006907	AO3
901485	10006908	JE
901486	10006909	AE

everX Flow Syringe 2mL (3.7g)

012898 Bulk shade 012899 Dentin shade

EQUIA Forte HT

901574	Intro Pack, 20 capsules A2 + 20 unitdoses of coat
901575	Intro Pack, 20 capsules A3 + 20 unitdoses of coat
901576	Intro Pack, 20 capsules B2 + 20 unitdoses of coat
901577	Promo Pack, 100 capsules A2 + 1 bottle of coat, 4mL
901578	Promo Pack, 2x50 capsules A2-A3 + 1 bottle of coat, 4mL
901579	Promo Pack, 100 capsules A3 + 1 bottle of coat, 4mL
901580	Promo Pack, 2x50 capsules A3-B2 + 1 bottle of coat, 4mL
901581	Clinic Pack, 200 capsules A2 + 1 bottle of coat, 4mL
901582	Clinic Pack, 200 capsules A3 + 1 bottle of coat, 4mL
901583	Clinic Pack, 200 capsules B2 + 1 bottle of coat, 4mL

Related products

G-Premio BOND Universal bonding agent

G2-BOND Universal Two-step universal bonding agent

G-ænial A'CHORD Universal direct restorative

EQUIA Forte, everX Flow and G-ænial are trademarks of GC.

GC EUROPE

GC EUROPE N.V. - Head Office Researchpark Haasrode-Leuven 1240, Interleuvenlaan 33, B-3001 Leuven Tel. +32.16.74.10.00, Fax. +32.16.40.48.32, info.gce@gc.dental https://europe.gc.dental

