

# GC get connected<sup>2</sup>

Your product and innovation update



2014

./'GC,.'

Stay in touch with  
the most innovative  
and trending topics  
in dentistry.





# EQUIA

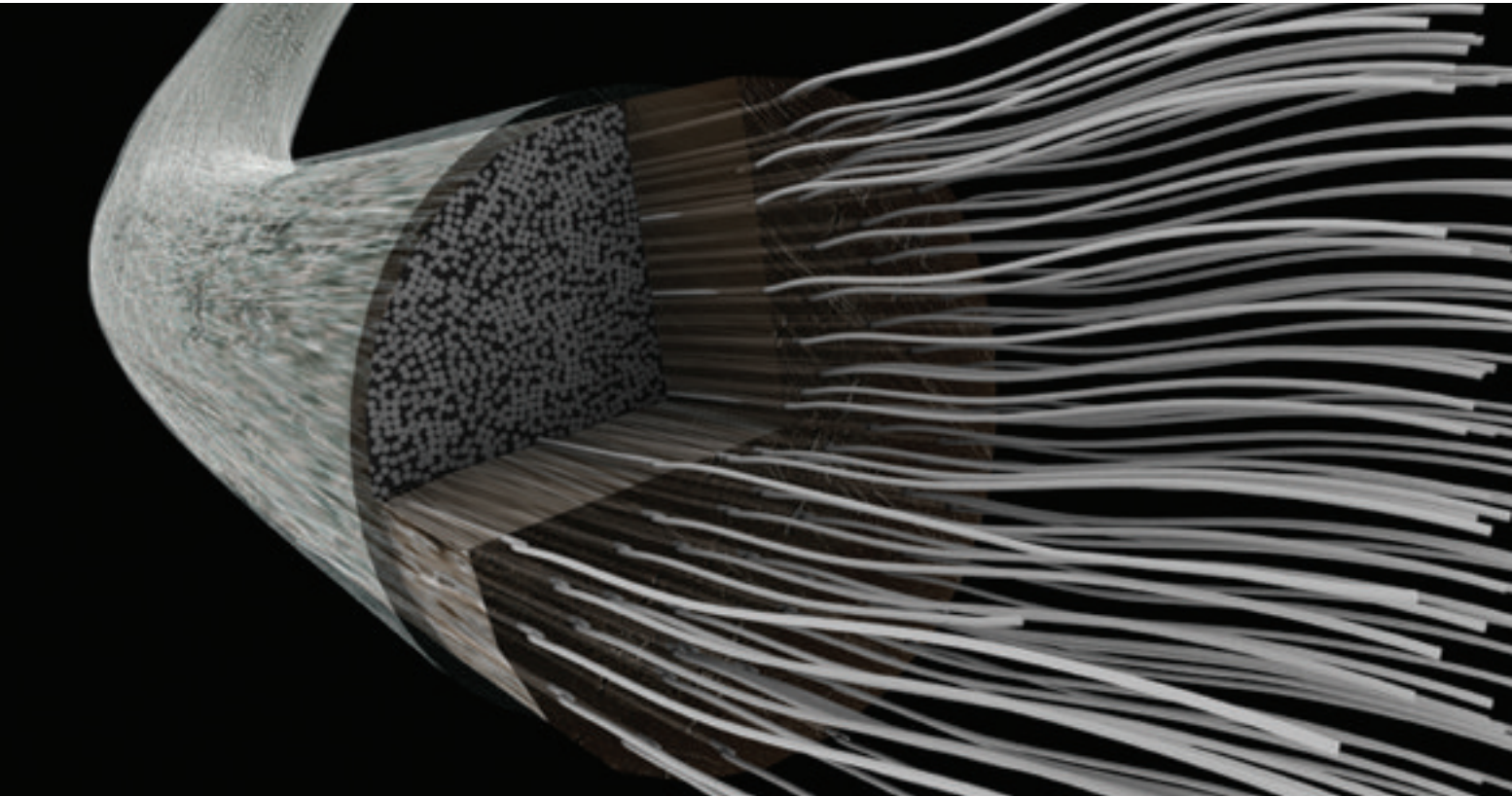
## A whole new LEVEL in Glass Ionomer Technology



Over the last 5 years, the clinical performance of **EQUIA** has been highly appreciated by clinicians worldwide. Together with various ongoing studies worldwide, **EQUIA** is proving itself as a long lasting restorative alternative for your daily, routine practice\*. This is only one of the impressive strengths of **EQUIA**. Find out more about the new dimension in restorative dentistry on [www.gceurope.com](http://www.gceurope.com)

\*in the given indications

# Contents



- 4 Welcome
- 6 News
- 8 Fibres (un)limited  
By Dr Filip Keulemans
- 15 Tips and strategies for restoring large cavities using fibre-reinforced material  
By Drs Stephane Browet and Javier Tapia Guadix
- 21 Clinical efficiency of one-step self-etch adhesives versus etch-and-rinse systems  
By Professor Jan van Dijken
- 26 Success with luting cements: material and technique tips  
By Dr Frédéric Raux
- 32 10 years INITIAL: the birth and evolution of a highly innovative ceramic class  
By MDT Michael Brusch
- 40 Step by step: Using everX Posterior



Welcome to our second issue of GC Get Connected and thank you for reading! Since we launched the publication last year, the response has been overwhelmingly positive. We are proud to have this new channel through which to reach out, and indeed connect with, our customers around Europe. Be sure to share this with your friends and colleagues!

Highlights of 2013 for GC Europe so far include another excellent exhibition at the IDS in Cologne in March, followed by the official opening of our new administrative building at our headquarters in Leuven, as well as being a finalist in the European Excellence Award of the EFQM. These are all wonderful achievements that demonstrate how we continuously strive for progress.

## **Expanding our facilities**

Our new building houses all the GC Europe headquarters departments, namely Quality Assurance, Regulatory Affairs & Legal, IT, Sales & Marketing, Product Management, Human Resources, Finance, and Management. This 2-storey building has been designed to enhance communication and productivity between the various departments. This state-of-the-art facility incorporates elements of the architecture from its neighbouring GC Campus building that have been strategically repeated and reinterpreted as a way to illustrate harmony, synergy and looking into the future.

This continuum between the two buildings demonstrates GC Europe's role in making GC a global healthcare company – seamlessly communicating within the company as well as outwards to customers through the training hub.



## **International Excellence Award**

GC Europe is proud to have become one of the official 10 champions for the 2013 EFQM Excellence Award. From 30 000 organisations implementing the EFQM Excellence Model worldwide, GC Europe is the first dental company in the world to reach the top 10 finalist status.

The EFQM assessors were particularly impressed by the main purpose of GC: GC's strong customer and end-user orientation, which is echoed in our mission statement: "to improve the dental health of patients around the world with high-quality dental products". This mission has not been changed in 92 years. GC Europe wants to reach more patients in



Welcome to GC 'get connected', GC Europe's newsletter that showcases our latest product innovations, techniques and trends in restorative dentistry.



Europe with innovative, high-quality and minimal-intervention products. Furthermore, our 'GC No Kokoro' philosophy guarantees that profit and growth will never overtake the original mission that is clearly focused on the health of patients. This approach and the fact that GC is family-owned, clearly distinguishes the company from its main competitors. We are delighted to be recognised for our great efforts and we are convinced it will inspire others. This award will give additional strength to our resolve to continue on our journey to excellence.



#### About the EFQM Excellence Award

The objective of the EFQM Excellence Award is to recognise Europe's best performing organisations, whether private, public, or non-profit. It recognises industry leaders with an indisputable track record of success in turning strategy into action and continuously improving their organisation's performance. To identify the finalists, a team of 6 to 9 internationally experienced managers spend one week on the applicants' site, and an average of 500 hours per applicant; reviewing documents, interviewing and analysing the organisation against the EFQM Excellence Model.

I would like to invite you to read the rest of the articles in this issue and feel free to contact us should you have any questions or comments. Connect with us via [marketing@gceurope.com](mailto:marketing@gceurope.com)

Best regards,

*Eckhard Maedel*

President, GC Europe

# EQUIA announced as material of choice at international symposium

**Italy:** Key opinion leaders from around Europe convened at a symposium held at the 46th meeting of the Continental European Division of the IADR to discuss and present evidence on the latest trends in glass ionomer science. GC's EQUIA glass ionomer restorative system was applauded and recognised

for its superior properties and clinical success. The symposium was presented by prominent dental researchers who shared their scientific data on EQUIA, highlighting the evolution of glass ionomer materials in recent years, paving the way for modern dentistry. Themes included glass ionomer



*Glass ionomer technology symposium presenters (left to right) Dr Uli Lobhauer, GC Europe President Mr Eckhard Maedel, Professor Avijit Banerjee, Professor Servil Gurgan, GCI AG Executive Vice President Mr Henri Lenn, Dr Thomas Klinke and GC Europe product manager Dr Piyush Khandelwal.*

and composite in perfect harmony and practice-based research yielding promising results with far-reaching consequences.

The evidence presented on EQUIA's advantages included:

- When coated with highly filled resin coating, GIC shows improved mechanical strength
- A perfect seal of surface porosities, cracks and improved acid resistance is attainable with EQUIA Coat
- 48 month clinical trial results show EQUIA is a durable material for class I and II restorations
- Randomised control trial (RCT) shows survival rate for EQUIA restorations was 99.5% after 12 months and 96.3% after 24 months

**For more information about EQUIA, click here**

**[www.gceurope.com/products/detail.php?id=127](http://www.gceurope.com/products/detail.php?id=127)**

Check our YouTube channel to watch the interview with the different lecturers and to see the complete presentations

<http://www.youtube.com/user/GCEuropeProducts>

# Let's get social

As part of its continued dedication to connect with our customers, GC Europe has implemented a social media initiative as part of its marketing strategy. You can now follow and interact with us on the following channels



## Get in touch!

How did you find GC Connect?

We want to hear from you! Please send your comments and feedback to [marketing@gceurope.com](mailto:marketing@gceurope.com)

# Fibres (un)limited

By Dr Filip Keulemans

The use of glass fibres for the reinforcement of dental polymers was already proposed in the early 1960s. At that time, the response was that the process to reinforce polymethyl methacrylate dentures with weaves of glass cloths was far too slow for everyday use. Although prefabricated carbon and glass fibre-reinforced posts were introduced in the mid-1980s, a major breakthrough came with the development and introduction of continuous, unidirectional pre-impregnated glass fibre-reinforced composites (FRC preregs) in the early 1990s. Key features of this new group of FRCs are:

1. High fibre fraction ( $\geq 50$  vol%)
2. Excellent wetting and impregnation of the fibres by the resin matrix
3. Available as an uncured prepreg (a fibre reinforcement that is pre-impregnated with resin)

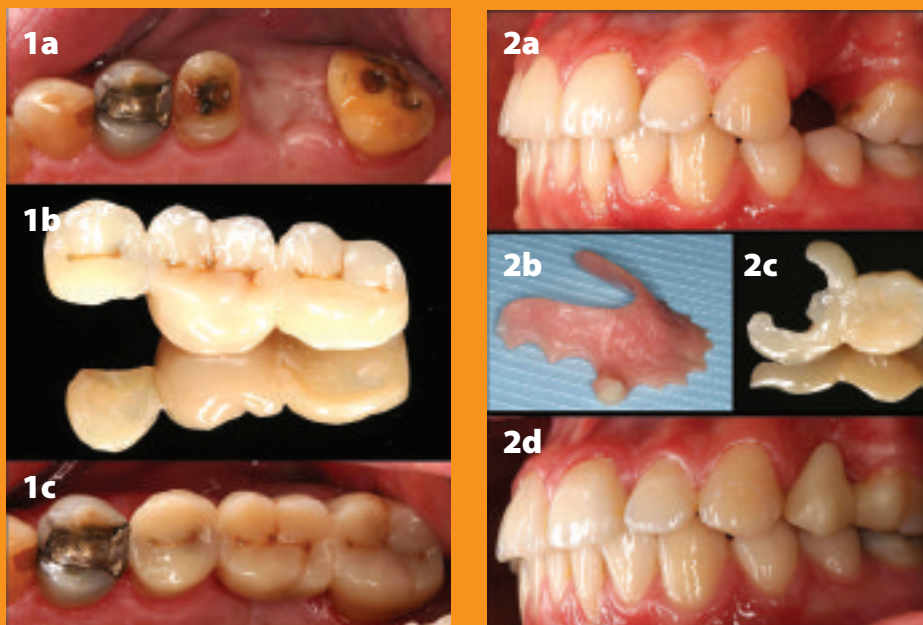
From that moment on, FRCs became

more accessible for dentists and dental technicians and rapidly gained popularity. This was not only because they blend perfectly with contemporary treatment approaches such as tooth tissue preservation, metal-free and tooth-coloured restorations, but also due to the versatile fabrication procedure of FRC restorations. They can be fabricated immediately into the mouth of the patient (direct approach) or chairside (semi-direct approach) by the dentist and at the dental laboratory (indirect approach).

The resin matrix of most dental composites and FRCs comprises a cross-linked polymer such as Bis-GMA, TEGDMA or UDMA. A special group of FRCs polymer formulations are those that form an Interpenetrating Polymer Network (IPN). An IPN is a network formed by combining two or more polymers, which do not merge by chemical reaction but by interpenetration. For dental FRCs only



**Figure 1:** Three-unit onlay-retained FRC-FDP (Fibre-reinforced composite fixed dental prosthesis) replacing a missing molar in the upper jaw: (a) Onlay preparations on teeth 25 and 27, (b) FRC-FDP before cementation, and (c) intra oral view of FRC-FDP after cementation.



**Figure 2:** A patient with a missing upper first premolar (a) presented himself at the Oral Diagnostics Clinic of ACTA with a Removable Partial Denture (b). Due to the patients' new job, he requested a more comfortable fixed solution. Since he refused a conventional FDP and an implant because of financial implications, we provided him with a cantilever FRC-RBFDP (c and d).



**Figure 3:** Single-tooth replacement of a missing upper lateral incisor with three-unit surface-retained FRC-RBFDP: (a) pre-operative view, (b) placement of unidirectional fibre framework, (c) pontic reinforced with everX Posterior, (d) post-operative view.

semi-IPNs are utilised, which means that one or more polymers are cross-linked and one or more polymers are linear. In the case of a dental semi-IPN, the cross-linked part is formed by a thermoset polymer (dimethacrylate), while the linear part is formed by a thermoplastic polymer (monofunctional methylmethacrylate). Commercially available examples of semi-IPN-based FRCs are everStick and everX Posterior (GC), that contain a PMMA/Bis-GMA matrix. The semi-IPN resin matrix is used in favour of cross-linked resin matrix because it exhibits increased toughness, improved handling properties and superior bonding with other materials.

### Applications in dentistry

Prepregs gradually expanded the applications for FRCs in various dental fields. Some of these include the splinting of mobile or traumatised

teeth, lingual retainers and tooth anchorage in orthodontics, space maintainers in paediatric dentistry, repair and reinforcement of removable dentures, fabrication of implant- and tooth-borne restorations (permanent and temporary crowns and bridges and resin-bonded bridges), repair of metal-ceramic restorations and post-and-core restorations.

Although I used FRCs occasionally for the reinforcement of long-term provisional and autologous tooth replacement, my interest in FRCs was sparked during my PhD. My research focused on the mechanical properties and the use of FRCs for the design and fabrication of resin-bonded fixed dental prostheses (RBFDP) (Figure 1 a,b,c) in general and cantilever resin-bonded bridges (Figure 2a,b,c,d) in particular. During the spring of 2007 I spent several months at the Turku

### Fiber-reinforced composites (FRCs) at a glance



#### everStick

#### Unidirectional fibre reinforcement

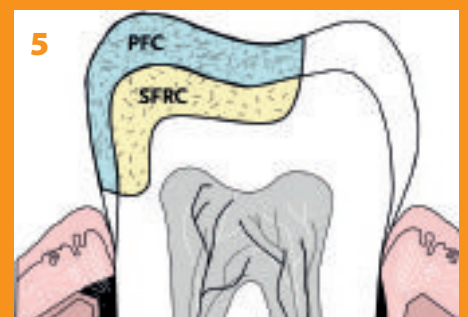
The material consists of unidirectional fibers embedded into a resin matrix (IPN network). Indicated for C&B, orthodontic and periodontal splinting, posts.



#### everX Posterior

#### Short fibre-reinforced composite

The material is a composite that contains short fibres (1-2mm) that act as a reinforcement. Indicated as a dentine-replacement sub-structure for large cavities.



**Figure 4:** Periodontal splinting of mandibular anterior teeth.

**Figure 5:** Schematic representation of a biomimetic composite restoration: lost dentine is replaced by high toughness SFRC (everX Posterior) and covered by a wear-resistant enamel-replacing posterior hybrid composite.



Clinical Biomaterials Centre in Finland with Professor P. Vallittu and L. Lassila, where we addressed a frequently encountered clinical complication with FRC-RBFDPs, namely delaminating and chipping of veneering composite. In order to overcome these kinds of failures, the FRC framework should be modified to support the veneering composite. At that time we started to use a short FRC, the precursor of everX Posterior, to eliminate those complications (Figure 3 a,b,c,d).

#### **Current limitations of composites in large restorations**

From when I first came in contact with it, this new FRC material fascinated me. At the same time I became interested in biomimetic dentistry. Both topics started to amalgamate in my mind, so I started to explore the clinical possibilities of everX Posterior. Extending the indications and increasing the long-term performance of large resin

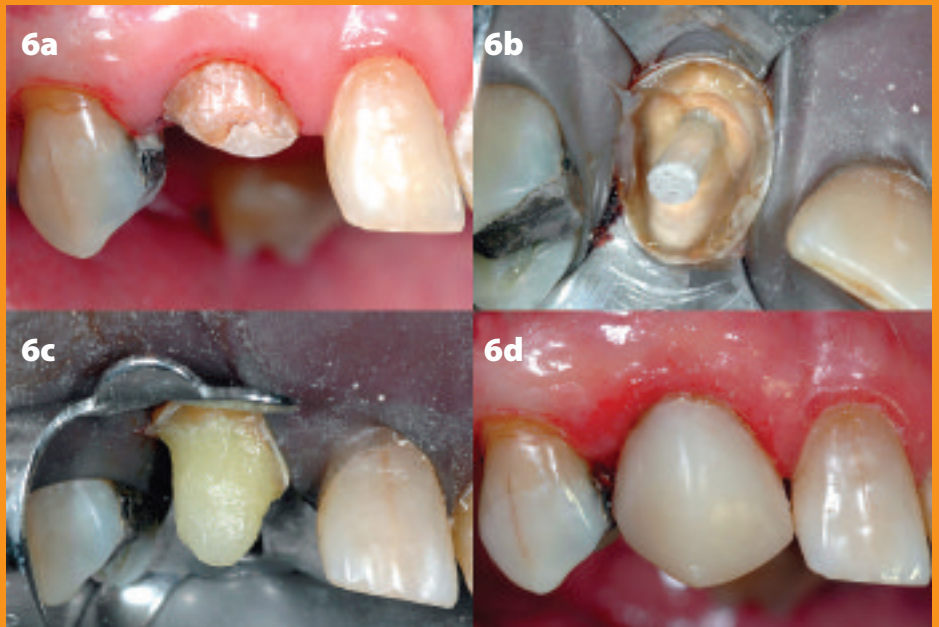
composite restorations in stress-bearing situations was the driving force behind this exploration. We all know that resin composite restorations have shown good overall clinical performance in posterior restorations with annual failure rates between 1-3% and that secondary decay and fracture are among the most important reasons for clinical failure.

In contrast, annual failure rates of endodontically treated teeth restored with resin composite restorations increased up to 2-12.4%. Not only endodontically treated teeth, but also large multiple-surface restorations showed to be more prone to fracture-related failures, including composite bulk fracture and tooth fracture, resulting in decreased longevity. It is clear that contemporary resin composites still demonstrate limitations due to their insufficient mechanical properties when used in large restorations.

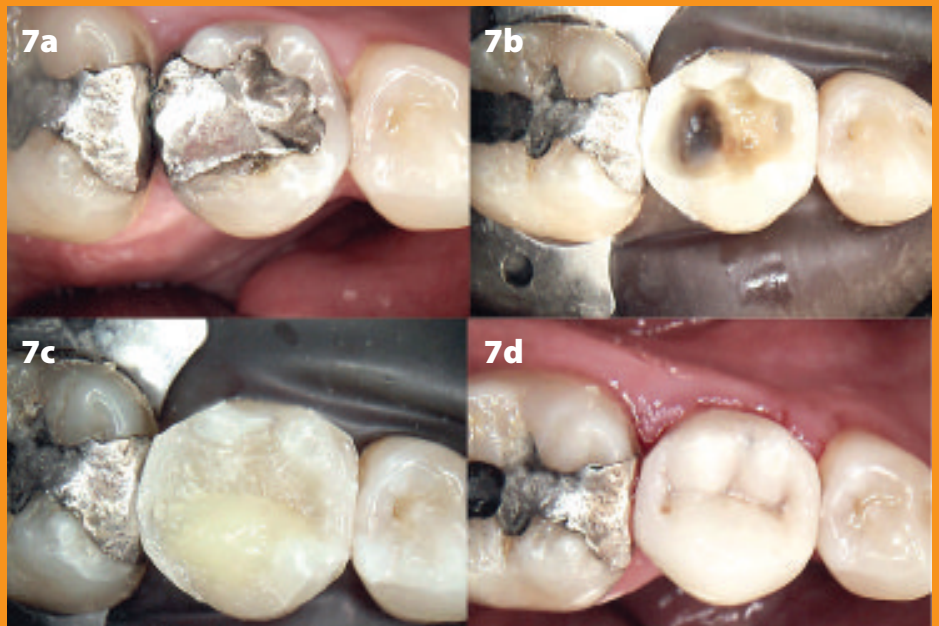
From a biomimetic point of view, we strive to replace lost tooth tissue by biomaterials with similar physical properties, especially with reference to elastic modulus, strength and thermal expansion coefficient. A well-accepted biomimetic restorative approach advocates replacing dentine with hybrid composites. Although such an approach seems more or less effective, there are still relevant mechanical properties, such as fracture toughness, that are not taken into account. The fracture toughness of hybrid composite is still half that of dentine.

“Fibre-reinforced composites such as everX Posterior give me the opportunity to replace missing tooth tissue in a more biomimetic way”

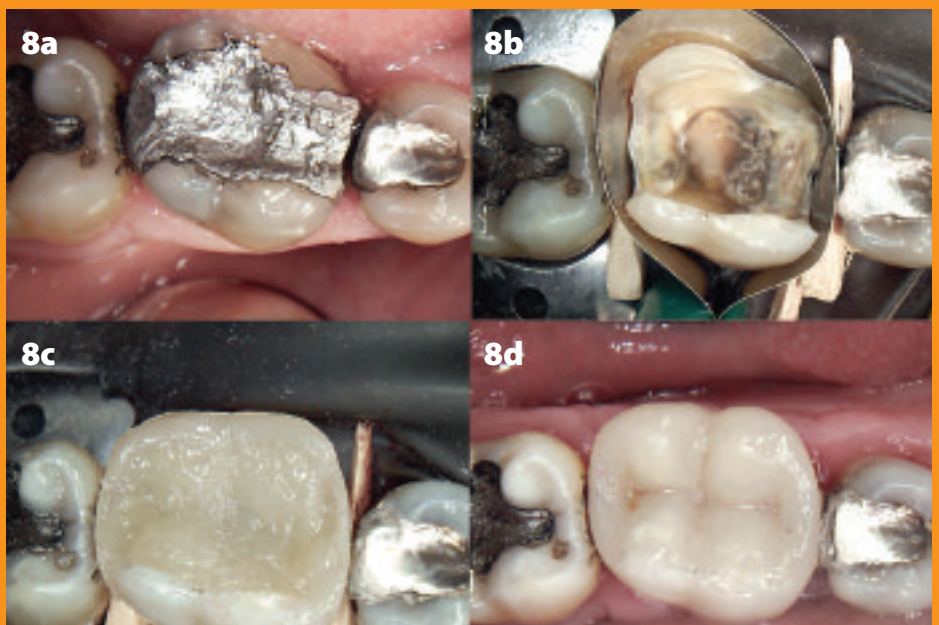




**Figure 6:** Post-and-core restoration of a maxillary canine: (a) pre-operative view, (b) cemented fibre post, (c) dentine replaced by everX Posterior, (d) post-operative view.



**Figure 7:** An MOD composite restoration of a mandibular second premolar: (a) pre-operative view; (b) interproximal walls build-up by conventional composite according to a centripetal filling technique, (c) dentine replacement with everX Posterior (notice protruding fibres from the SFRC surface), (d) post-operative view.



**Figure 8:** Cusp-replacing composite restoration of a mandibular first molar: (a) pre-operative view; (b) cavity outline, (c) dentine replacement with everX Posterior, (d) post-operative view.

### Opening new restorative options

As a short fibre reinforced composite (SFRC), everX Posterior exhibits improved mechanical properties not only relating to strength, elastic modulus and polymerisation shrinkage in comparison to hybrid composites, but especially regarding fracture toughness. We now have a dentine replacement material that is tougher than dentine and able to arrest crack propagation in a similar way to dentine. Therefore, everX Posterior can be beneficial in large stress-bearing restorations as a dentine replacing biomaterial, eventually resulting in less fracture-related failures and improving the overall longevity of large direct resin composite restorations.



#### About the author:

**Dr Filip Keulemans is an Assistant Professor in Restorative Dentistry and Endodontology, at Ghent University, Belgium, where he is responsible for Dental Material Sciences course**

**and pre-clinical training in Restorative Dentistry. His research interest are mainly Dental Materials (characterisation, evaluation and development of fibre-reinforced composites) and Adhesive Dentistry (biomimetic restoration of natural teeth). He received his PhD in 2010 from the University of Amsterdam with the thesis entitled "Exploring the limitations of fibre-reinforced composite fixed dental prostheses" (promoter: Professor Albert Feilzer). From 2000 until 2012, he worked in part-time private practice with a special interest in adhesive and restorative dentistry. From 2000 until 2004, he was a part-time Assistant in Restorative Dentistry and Crown & Bridge work at the VUB. From 2005 until 2009 he was a researcher at the Dental Materials department of the ACTA.**

In the past few years I have noticed that the interest for and the use of FRCs has started to decrease with general practitioners, but I'm convinced that everX Posterior will be able to revive the interest in FRCs. Today I use FRCs not only for the fabrication of post-and-core restorations, periodontal splints (Figures 4a to 4i) and resin-bonded bridges, but also for the fabrication of adhesive restorations. FRCs such as everStick and everX Posterior give me the opportunity to replace missing tooth tissue in a more biomimetic way. It is particularly the design and properties of everX Posterior that make this material suitable as dentine replacement in biomimetic restorations (Figure 5). In my opinion, everX Posterior can be used for direct and indirect biomimetic composite restorations, which are indicated for:

1. Restoration of endodontically treated teeth, including core build-ups, post-and-core restorations (Figure 6) and endocrowns
2. Medium to large Class I and II restorations (Figure 7)
3. Cusp-protecting and cusp-replacing restorations (Figure 8)
4. Crown build-ups
5. FRC-RBFDPs

# Tips and strategies for restoring large cavities using fibre-reinforced material

By Drs Stephane Browet and Javier Tapia Guadix

Evidence has shown that one of the biggest challenges facing dentists today is restoring severely damaged teeth. In order for these restorations to be long lasting, certain biomechanical and biochemical criteria need to be met.

Even the smallest of cavities can result in dramatic failure due to poor material choice and incorrect biomechanical interaction between the tooth and the material. We often see cases where a small cavity was restored with amalgam a few years prior. The amalgam itself meets the material criteria but the biomechanical issues are clearly evident and cause severe cracks to develop. These cracks could lead to complete failure of the restoration with loss of vitality of the tooth, and possibly even loss of the tooth. Amalgam has long been relied

upon as a durable restorative material. But what value is a restoration itself that lasts for 20 years if the tooth fails? The final objective should be preservation of the tooth and not necessarily preservation of the restoration.

## **Cavity design**

When it comes to restorations of this nature there are two goals: to stop crack propagation and stopping new cracks from forming. To achieve this you will need a good material and a sound approach. When it comes to cavity preparation, the sharper the angles, the higher the stress created in the cavity. The difficulty today is that as dentists we often have to redo restorations with existing cavity designs for amalgam but restore those cavities with another



material. In addition, the tooth will also be damaged to some extent. Our challenge is to minimise this damage by making good choices in cavity design and material.

The principles of cavity design are well established: the width of the cavity should not exceed half of the intercuspal width. This means the surrounding tooth structure is strong enough to function with the restorative material inside. It is recommended that you need between 2 -2.5 mm of wall thickness in order to maintain good intrinsic strength. It is clear that if we don't respect these criteria and the cavity ends up with very thin and undermined walls, biomechanical failure will occur.

Our biggest problem here is that we get cavities like this to start with. It's not necessarily our choice to drill a cavity like this for caries removal. Often times an old amalgam restoration can lead to this type of cavity and the temptation is to keep the remaining tooth structure to enable a direct

restoration. The tendency is to keep those

cuspal tips, as references for occlusal morphology and to preserve as much tooth tissue as possible. Because the walls are clearly not thick enough the load bearing forces will create fatigue within the cusps. Even with a bonded restoration, this fatigue will eventually cause the wall to fracture.

### Restorative guidelines

The following clinical situations call for cuspal coverage:

1. A wide isthmus and thin walls
2. If there is no dentinal support and cusps are undermined - blocking out the unsupported enamel will not solve the problem because curing a composite inside a shell will fracture it
3. A horizontal crack in the undermined base of the cusp
4. A longitudinal MOD crack
5. Any crack inside the pulp chamber
6. An endodontically treated tooth with MOD restoration requires coverage for all cusps
7. An endodontically treated tooth with a crack in the pulpal floor requires all cusps to be covered

### everX posterior

What is needed for these restorations is a material that will bond to the tooth. This is not a guarantee that the restoration will work, but some sort of adhesion is required that is not mechanically retained like





amalgam. What is needed is a material that behaves like tooth structure, something that resists fatigue and also increases the load bearing capacity of the total restorative complex of the tooth with the restoration.

everX Posterior (GC) fibre-reinforced composite material offers many solutions to the type of problems we have discussed in this article. everX Posterior is made up of three sections: an interpenetrating polymer network (IPN) resin matrix, e-glass fibres and fillers, initiators and inhibitors. What is really important in a material like this, is the way in which the e-glass fibres and the IPN matrix interact with each other because this makes it possible to absorb the loading forces. This transfer of pressure from the matrix to the fibres on a microscopic scale means that crack propagation can be stopped while at the same time giving the restoration the capacity to resist very high loading forces.

The maximum bite force for humans is about 1000 N. A conventional composite has a similar resistance. However, if you compare a combination of everX Posterior, which is a base material that should be covered with an overlaying composite, the total load bearing capacity is much higher than with composite alone, even "almost double".

### **Fracture prevention**

Some dentists are misguided when they think that a tooth can be saved

**"When it comes to restorations of this nature there are two goals: to stop crack propagation and stopping new cracks from forming"**

by using a very strong material. In actual fact, when using such a strong material, the tooth inadvertently becomes the weaker part of the restorative complex. This means that if failure occurs, the tooth will be lost. With this everX Posterior, in the case of failure, the damage can be contained. Cracks can be deviated along the material inside the tooth, resulting in fractures which are more above gum level, instead of running through the entire tooth leading to catastrophic failure. It will still lead to failure, but will allow for further restoration because the fracture line is still visible and accessible.

Fracture toughness is another physical property which is twice as high in everX Posterior than in conventional composites. The flexural modulus is closer to that of natural dentine, so it behaves like natural tooth structure.

While the build-up procedure of the material allows for a well-functioning

## Restoration of a posterior cavity using everX Posterior as a dentine replacement



1: Preoperative



2: Preparation



3: Bonding



4: Enamel wall



5: everX build up



6: Enamel build up



7: Staining final



8: Polishing



9: Final

restorative complex, it's how the material shrinks that matters. The volumetric change and shrinkage stress of the material after and during setting is similar to that of conventional composite, but a very big difference is the presence of the fibres. By placing the material in the cavity and by pushing it down you are able to align the fibres into a more longitudinal direction which reduces linear shrinkage. With the vertical shrinkage you can expect the entire restoration to shrink down, but this won't create the same stress as a regular composite. The linear stress and shrinkage on the walls is lower, giving you a more predictable outcome and minimised damage.

By using everX Posterior as dentine replacement and layering it with a regular composite, the total load bearing capacity of the tooth complex will increase significantly. Therefore it makes sense in both direct and indirect approaches to have the support from a fibre-reinforced composite underneath.

## Additional tips for using everX Posterior

- everX Posterior should be completely enclosed by the other material
- First close the proximal, then the occlusal
- Use a ball plugger or microbrush to adapt the material to the floor and take your time
- Light-cure in layers of 2mm thickness
- When adding the final layer of regular composite, use air block during the final light-cure to create a surface with a good finish and without an oxygen inhibited layer
- Always respect manufacturer guidelines for maximum rotation speed for polishing points - avoid heating because it will change the properties of the material
- For final lustre a goat hair brush with diamond paste will create a glossy result for surface polishing

## About the authors



**Stephane Browet** attended dental school at the Free University of Brussels in 1995 and completed the Post Graduate programme Aesthetic Dentistry. From 1999 he has taught rubber dam techniques and adhesive dentistry. From 2002 till 2005 he was active in the Scientific Board Conservative Dentistry

at the Institute for Continued Education of the Society of Flemish dentists. He also is a past board member of the Belgian Academy of Esthetic Dentistry and the Academy of Microscope Dentistry, as well as a member of the European Society of Microscope Dentistry. Nationally and internationally he lectures on rubber dam isolation, microscope dentistry, posterior and anterior composites, indirect restorations. He combines this with a private practice focused on microscope aided restorative dentistry.



**Javier Tapia Guadix** obtained a Bachelor of Dental Surgery from the European University of Madrid (UEM). He became an Associate Professor at Department of Prosthetics at UEM in 2004. He is the Co-founder of Bio-Emulation group and founder of Juice - Dental Media Design. He is a member of the GC Restorative

Advisory Board. In addition, he is a professional CG Artist, specialising in medical - dental animations and illustrations. He was the Collaborator of the Spanish Dental Council and the Spanish Dental Foundation between 2007-2009. In 2005 he was awarded the Collegiate Merit Award by the Spanish College of Dentists from the 1st Region. He currently owns a private practice in Prosthetic and Restorative Dentistry in Madrid, Spain and frequently presents lectures on topics such as Composite Stratification Techniques, Dental Photography and Computers in Dentistry. He is widely published in Restorative Dentistry, Dental Photography and Computers in Dentistry.



## DIRECT RESTORATION

1. Pre-operative view



2. Occlusion and articulation should be considered, they guide the layering for final morphology. Isolation with rubber dam is recommended for a controlled protocol, optimal view and access



3. Cavity after removal of the old restoration shows decay



4. Another view of the decay under the old amalgam restoration



5. Caries removal and cavity preparation finalized



6. Cavity after bonding procedure



7. Sectional matrix placement and separation ring, a wedge adapts the matrix to the tooth in the cervical area



8. Build-up of the mesial wall in two consecutive, separately light cured layer



9. Internal build-up with Ever-X Posterior

10. Finalized occlusal morphology

11. Final result

12. Follow-up





# Clinical efficiency of one-step self-etch adhesives versus etch-and-rinse systems

By Professor Jan van Dijken

## The rise of self-etch bonding agents

In recent years, the trend with bonding agents has been one of simplification, as evidenced by the development of one-bottle self-etch adhesives (SEA, 7th generation) that combine etching, priming and bonding in a single clinical step. The ultimate aim of these modifications was to reduce the number of steps needed, as well as the technique sensitivity of the process [6].

Nowadays, self-etching adhesives are recognised for their quick application and are considered to be more user-friendly than their multi-step counterparts [3]. However, -3-step etch-and-rinse systems (4th generation) are often still considered to be the gold standard in bonding.

Moreover, not all self-etch adhesive systems have the same composition,

which causes differences in their effectiveness. One example of this is whether a system contains HEMA or not. In fact, HEMA (2-hydroxyethylmethacrylate) is a well-known allergenic substance, but is widely used in dental adhesives to reduce viscosity, enhance the bond strength to dentine and prevent phase separation. Therefore, the launch of HEMA-free adhesives (G-Bond and G-ænial Bond) has triggered considerable interest. At the same time, the clinical reliability of these new HEMA-free bonding systems has been challenged by some universities and is currently under debate.

## Long-term clinical data

The problem today is that many new systems have no independent clinical

evaluations, and many lack long-term studies. The majority of bond strength tests are performed immediately after bonding and only a few studies mimic, and then only partially, the chemical and physical stress factors occurring within the oral environment. In vitro tests tend to indicate that etch-and-rinse systems have a better performance than SEAs [1] and are less technique-sensitive [6]. However, recent clinical trials [1-4] show that the annual failure rates of SEAs have been constantly improving and can

now compete with traditional bonding agents.

When choosing a bonding system, it is important to see which products are supported by good clinical results rather than to simply rely on a particular generation of adhesives. In fact, the clinical failure rates of products within the same generation of adhesives can vary dramatically (Table 1). In any given generation, some products will have very high success rates while others will lead to many failures.

Classification	Adhesive system (reference)	Lost restorations after 5 years (%)	AFR (%)	Manufacturer
4 step etch & rinse	Syntac classic [37]	23.4	4.7	Ivoclar/Vivadent, Schaan, Liechtenstein
3 step etch & rinse	cfm (buffered phosphoric acid)	8.3	1.7	Saremco AG, Rebstein, Switzerland
	Optibond [37]	13.8	2.8	Kerr Corp, Orange, USA
	Clearfil LB [36]	14.0	2.8	Kurary Co. Ltd., Osaka, Japan/Cavex, Holland
	Allbond 2 [36]	14.6	2.9	Bisco, Schaumburg, IL, USA
	XP Bond	27.1	5.4	DeTrey/Dentsply, Konstanz, Germany
	Scotchbond MP (Maleic acid) [37]	40.0	8.0	3M, St. Paul, MN, USA
	Permagen [37]	52.3	10.5	Ultradent Prod Inc, South Jordan, Utah, USA
	Denthesive(EDTA) [36]	89.5	17.9	Hereaus-Kulzer GmbH, Wehrheim, Germany
2 step etch & rinse	PQ 1 [72]	37.7	7.5	Ultradent Prod Inc, South Jordan, Utah, USA
	Denthesive 2 (Maleic acid) [36]	68.6	13.7	Hereaus-Kulzer GmbH, Wehrheim, Germany
	Gluma 2000 (Oxalic acid) [36]	73.0	14.6	Bayer Dental, Leverkusen, Germany
2-step self etch	Clearfil SE [72]	12.7	2.5	Kurary Co. Ltd., Osaka, Japan/Cavex, Holland
	ART [36]	16.7	3.3	Coltène, Altstätten, Switzerland
	PUB3 [36]	38.1	7.6	DeTrey/Dentsply, Konstanz, Germany
1-step self etch	G-Bond	7.9	1.6	GC, Tokyo, Japan
	Xeno III [42]			DeTrey/Dentsply, Konstanz, Germany
	Tetric Ceram	9	1.8	
	Dyract	19.1	3.8	
	PSA [37]	16.0	3.2	DeTrey/Dentsply, Konstanz, Germany
RMGIC	Fuji Bond LC [38]			GC International, Tokyo, Japan
	Tetric Ceram	5.9	1.2	Vivadent, Schaan, Liechtenstein
	Hytac	21.2	4.2	ESPE, Seefeld, Germany
RMGIC	Vitremer [36]	16.3	3.3	3M, St. Paul, MN, USA

**Table 1** – Published annual failure rates of adhesive systems tested in Umea in similar dentin-only cervical non-carious lesion studies after 5-year follow-up periods. AFR= Annual Failure Rate. For most etch-and-rinse systems, 35-37% phosphoric acid has been used, while in other cases the acid is given between brackets. JWV van Dijken. A randomized controlled 5-year prospective study of two HEMA-free adhesives, a 1-step self etching and a 3-step etch-andrinse, in non-carious cervical lesions. Dental Materials 2013; 29: e271-e280

For this reason, clinical trials are vital to evaluate each product's performance, rather than to argue the superiority of a certain generation of bonding agents.

**Can a one-step self-etch adhesive have the same clinical performance as a traditional etch-and-rinse system?**

The most recent clinical study on class V non-carious lesions [1] compares the clinical bonding durability of a 1-step HEMA-free SEA (G-Bond, GC), a 3-step HEMA/TEGDMA free etch-and-rinse (cfm, Saremco) and a 2-step HEMA-containing etch-and-rinse adhesive (XP Bond, Dentsply). All adhesive restorations were done on non-carious cervical lesions, as they are considered to be the ultimate performance proof for adhesive systems. Moreover, no enamel bevel was created in order to specifically focus on the bond strength to dentine. The restorations were evaluated at baseline 6, 12, 18, 24 months and then annually for five years, by both the operator and the examiners.

The results at five years show that the clinical success of both HEMA-free adhesives was significantly higher than for the HEMA-containing 2-step etch-and-rinse adhesive. Another study carried out at the Catholic University of Leuven, Belgium (KU Leuven) [5], showed equally favourable clinical effectiveness at three years for a HEMA-

“New clinical studies show that one-step self-etch adhesives clinically perform as well as etch-and-rinse bonding systems after five years.”

free adhesive (G-Bond, GC) and a HEMA-rich adhesive (Clearfil Tri-S Bond, Kuraray).

Excluding HEMA from the composition of bonding agents could also lead to other advantages, such as lower allergenic risk, improved mechanical strength and lower hydrolytic degeneration. The conclusion of my study [1] was that the durability in non-carious cervical lesions of the HEMA-free adhesives (G-Bond and cfm) was successful after five years. In addition, G-Bond was one of the most clinically effective in dentine bonding.

Additional clinical results in Class II cavities [2] showed that the durability of G-Bond in Class II cavities was successful after 6 years. This research also clearly indicated that the clinical effectiveness of G-Bond was highly acceptable and in line with the etch-and-rinse adhesives. Another clinical

study by KU Leuven in non-carious cervical lesions corroborates these findings by concluding that a similar clinical success rate was observed for G-Bond and the 'gold standard' etch-and-rinse Optibond FL, both after three [3] and five [4] years. Significantly more incisal marginal defects were observed with the SEA than with the etch-and-rinse adhesives, but these could be easily removed with polishing. The performance of G-Bond was clinically acceptable after five years.

### **What are the conclusions from these clinical studies?**

Etch-and-rinse systems are always described as the top performers when compared to self-etch adhesives in laboratory tests. However, the results obtained during the recent clinical trials clearly show that the SEAs perform well clinically.

Overall, there is a consensus that

---

## **References**

- 1 JWV van Dijken. A randomized controlled 5-year prospective study of two HEMA-free adhesives, a 1-step self etching and a 3-step etch-and-rinse, in non-carious cervical lesions. *Dental Materials* 2013; 29: e271-e280.
- 2 JWV van Dijken. A 6-year prospective evaluation of a one-step HEMA-free self etching adhesive in Class II restorations. *Dental Materials* 2013; 29: 1116-1122.
- 3 KL Van Landuyt, M Peumans, J De Munck, MV Cardoso, B Ermis, B Van Meerbeek. Three-year clinical performance of a HEMA-free one-step self-etch adhesive in non-carious cervical lesions. *Eur J Oral Sci* 2011; 119: 511-516.
- 4 KL Van Landuyt, J De Munck, B Banu Ermis, M Peumans, B Van Meerbeek. Five-year clinical performance of a HEMA-free one-step self-etch adhesive in non-carious cervical lesions. *Clin Oral Invest* DOI 10.1007/s00784-013-1061-9, published ahead of print 2013
- 5 SG Moretto, EMA Russo, RCR Carvalho, J De Munck, K Van Landuyt, M Peumans, B Van Meerbeek, MV Cardoso. 3-year clinical effectiveness of one-step adhesives in non-carious cervical lesions. *J Dent* 2013 Aug;41:675-682.
- 6 MF. Burrow & MJ. Tyas. Comparison of two all-in-one adhesives bonded to non-carious cervical lesions - results at 3 years. *Clin Oral Investig.* 2012;16:1089-1094



self-etch systems have advanced significantly in the past few years and can achieve clinical success rates similar to those of the gold standard 3-step etch-and-rinse adhesives such as Optibond FL [3-4]. Burrow & Tyas [6] conclude that “the restoration of non-carious cervical lesions with the newer all-in-one adhesives appears to be a viable alternative technique to more complicated adhesive materials.”

The clinical studies mentioned [1-5] imply that the absence of HEMA has no negative effect on the failure rate of the restorations. This is echoed by Burrow & Tyas [6], who state that “it seems that the absence of HEMA has not had any adverse effect on restoration retention or marginal staining”, in a study comparing G-Bond (GC) and S3 Bond (Kuraray). According to the class V study conclusions, there could even be a positive effect on the bond strength to dentine, due to reduced water uptake and gradual hydrolytic polymer degradation. However, more long-term clinical studies are needed to investigate whether the HEMA-free adhesives could enable a better bonding durability. Finally, we concluded that the durability in non-carious cervical lesions of the HEMA-free adhesives was successful after 5 years. Despite concerns which have been raised, the 1-step SEA (G-Bond, GC) demonstrated one of the best clinical effectiveness in dentine bonding.

### About the author



**Professor Jan van Dijken is Professor in Cariology at the University of Umeå in the northern part of Sweden. He has been working at the Dental School in Umeå for the last forty years educating both post graduate students and dentist, dental technician and dental hygienist students in Cariology and restorative dentistry. His research interests are mainly Dental Materials and Adhesive Dentistry. Long term clinical evaluation of resin composites, ceramics and adhesive systems and biocompatibility evaluation in vivo are the main issues of the research in Umeå. He became dentist at the University of Amsterdam (ACTA) in 1973. After working as private dentist and school dentist he moved to Sweden and received his PhD in 1987 from the University of Umeå studying in his thesis longevity of resin composites in vivo. Part of this research was performed at NIOM, the Scandinavian Material Institute in Oslo. Collaboration research with Umeå has been performed with several other universities in the world like Copenhagen, Turku, Nijmegen, Amsterdam, Helsinki, Oslo, etc, and also with many PDHS clinics in Sweden. From 2000 he has been head of the Biomaterial Research group Umeå and the Dental Hygienist Education Umeå.**

# Success with luting cements: material and technique tips

GC Get Connected recently spoke with Dr Frédéric Raux, a dentist based in France, about the use of luting cements in his practice.

## **As a clinician, what are the most important features that you look for in a luting cement?**

Dr Frédéric Raux: In my opinion, there are three important criteria that I use to guide my choice for the best luting cement in every clinical situation:

- Retention: Is my preparation retentive enough? Do I need to bond the restoration or simply lute it?
- Aesthetic requirements: Will the luting cement influence the final aesthetic result of the restoration?
- User-friendliness: Is the cement fast and easy to use, saving chair-time and avoiding varied and complicated steps?

For example, if I am cementing a metal-based crown, the cementation margins are not visible and my preparation is retentive enough, I do not need to use a resin-based luting cement. In this case, I'd rather opt for a glass-ionomer or resin-modified glass ionomer luting cement which is economical, easy to use and moisture tolerant, besides providing excellent marginal sealing, significant fluoride release and reliable clinical results. On the other hand, whenever the preparation is not retentive enough and/or aesthetics is a key factor, resin cements are required. Classic adhesive resin cements present separate bonding agents, requiring several

1. No need to keep the G-CEM LinkAce syringes in the refrigerator.



2. Preparations on the 11 and 21 after the removal of temporary restorations.



3. Cleaning with nylon microbrushes under spray.



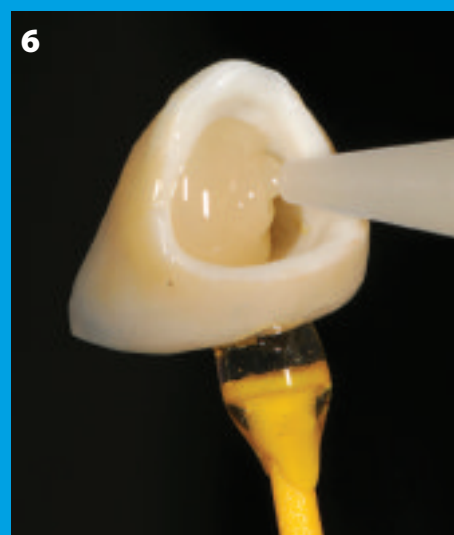
4. Etching of the inside of the e.Max crowns with hydrofluoric acid (5%) and rinsing with a water/air spray. For the luting to be successful, any contamination of the surface should be avoided after etching.



5. Application of GC Ceramic Primer.



6. Extrusion of G-CEM LinkAce inside the crown. Always check the opening of the two barrels of the syringe before placing the mixing tip, to ensure that both pastes are at the same level. Bleed the syringe if needed. Always discard the first mixed paste extruded from the mixing tip (the size of a pea is enough) to ensure that the correct proportioning of pastes A and B is delivered.



7. Cementation of crown on tooth 21.



adhesive steps before the cementation itself. With the new generation of self-adhesive resin cements (SARCs), both aesthetic and adhesive requirements are fulfilled without the need for time-consuming and complicated steps. For me, this is the easiest way for luting my indirect restorations!

**When did you first start to use G-CEM LinkAce and what were your initial thoughts about it?**

Dr Frédéric Raux: I started using it about 8 months ago, because I wanted to try a different self-adhesive resin cement than the one I was using. Technology has evolved quickly and I knew I could expect better properties with the newest generation in this category. G-CEM LinkAce firstly attracted me for its properties, combined with the tradition that GC pursues in the area of luting cements. And immediately, I found it easy to use, ergonomic and aesthetic. So, my choice was for the better one: G-CEM LinkAce is a very good SARC!

**What results have you had since using the material?**

Dr Frédéric Raux: Absolutely no problem! The colour match is always perfect and for the first year of follow-up, I haven't seen any change of colour. G-CEM LinkAce is HEMA-free and shows very low water uptake, therefore delivering very good colour stability. I have not experienced any loss of retention or complaints from patients in terms of post-operative sensitivity. For the moment, I am 100% satisfied!

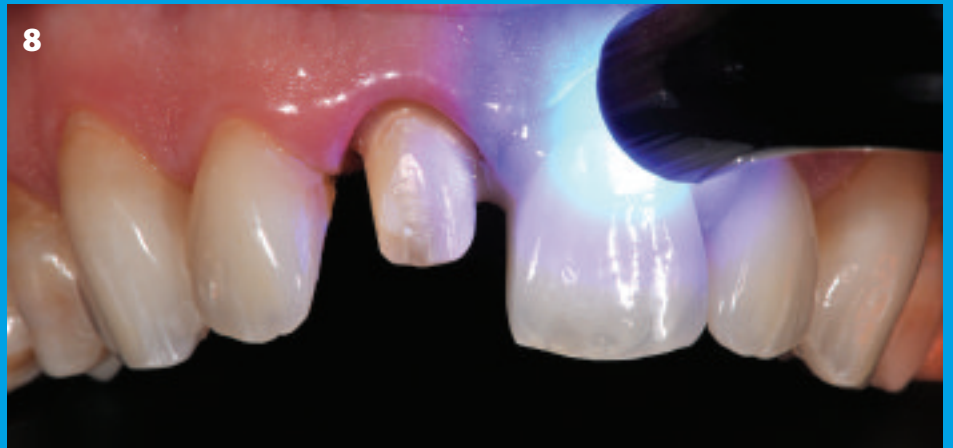
**What do you enjoy most about using G-CEM LinkAce?**

Dr Frédéric Raux: G-CEM LinkAce is easy to use, ergonomic and aesthetic. It has a very good working time, allowing it to be used even for extensive bridges or simultaneous cementation of several crowns. The fact that I do not need to store it in the refrigerator is also a great advantage. The disadvantage of refrigeration is that the dentist has to remove the syringe from the refrigerator way before the treatment itself, so that it can reach room temperature. Studies have shown that the use of a cement at lower than room temperature leads to a considerable decrease in physical properties(1). G-CEM LinkAce is in my drawer and always ready to be used.

Moreover, its non-runny viscosity and low film thickness are ideal. It is important for me to know that such a low film thickness will provide me with an excellent fit of my restoration

"G-CEM LinkAce is in my drawer and always ready to be used."





**8.** Tack-cure with a light-curing device for 1 second before removal of excesses. Alternatively, wait between 1 and 2 minutes until the cement feels rubbery.



**9.** Removal of excess with a probe. Removal of excess in the proximal area can be done with floss. Care should be taken all time to avoid movement of the crown in this early stage.



**10.** Cementation of the second crown on tooth 11.



**11.** Final light-cure of 40 seconds per face (here in vestibular face) with a light-curing unit in high-intensity mode.



**12.** Final result immediately after cementation.



**13 a-b-c.** Ergonomic and very thin tips for post cementation.



#### About the author

**Dr Frédéric Raux is a dentist based in France. He is also a lecturer in the area of Restorative Dentistry and current President of the French Academy of Adhesive Dentistry. The dental technicians that he collaborated with on the cases presented in this article are Hélène and Didier Crescenzo, owners of Esthetic Oral in Cogolin, France.**



without the need for further occlusal adjustments after cementation. Recent studies support my view: its mechanical and optical properties are very good, compared to other SARC. When cementing zirconia-based crowns the main concern is how to ensure good retention. Bonding to zirconia is a real challenge nowadays. With specific phosphate monomers, G-CEM LinkAce seems to provide a stable bond to zirconia without the need for additional primers(2).

Its good wear resistance is also an interesting point, especially in cases of inlays and onlays with the margins located on the occlusal aspect of the tooth. A cement with poor wear resistance will cause marginal gaps. The clinical consequences are plaque accumulation, marginal discolouration and chipping of the ceramic margins. G-CEM LinkAce presents high wear resistance(3).

Finally, the other potential source of failure for dual-cure luting cements lies in a poor self-curing mode. Light-curing is important, but studies have shown that light may not reach the cement line, even in ceramic and zirconia-based crowns. Therefore, it is essential that the cement has an efficient self-curing mode to ensure adequate polymerisation, even in places where the light cannot reach the cement line. The self-curing ability of G-CEM LinkAce seems to be faster and higher(4) than other SARC, which gives me confidence and peace of mind. However, every clinician should

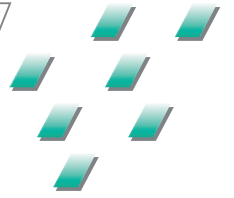
observe the golden rule for all cements: wait for 4 minutes before making any occlusal adjustments. When removing the excess, you have to make sure that the crown doesn't move.

#### **Do you have any advice for dentists who want to start using G-CEM LinkAce?**

Dr Frédéric Raux: Try it. Trust me, you will like it! Don't forget that you can never bond on dirty surfaces. So always ensure that the tooth and restoration surfaces are clean before cementing any crown. This can be achieved with simple clean-up procedures using a brush and pumice slurry on a low speed. Etching solutions, conditioners and solutions like alcohol and hydrogen peroxide are not recommended as they can negatively influence the adhesion of SARC to the tooth. Finally, make sure that you follow the indicated surface treatment on your prosthesis.

#### **References**

- 1 Effect of pre-cure temperature on the bonding potential of self-etch and self-adhesive resin cements, Cantoro et al., Dent Mater 24(5):577-83, 2008.
- 2 Shear Bond Strength of Auto-mixing Self-adhesive Resin Cements to Zirconia, Yoshida et al., J Dent Res 91 (Spec Issue B): Abstract 242, 2012.
- 3 In Vitro Wear of Five Cements Against Enamel, Suyama et al., J Dent Res 92 (Spec Issue A): Abstract 1686, 2013.
- 4 Conversion and acid-base reaction in modern self-adhesive cements, Kournetas et al., J Dent Res, in press.



A quartet of aces :  
**Innovation, Simplicity,  
Versatility and Reliability**



New  
G-CEM LinkAce™  
from GC

...with new innovative  
technology bringing  
reliable solutions for  
a broad range of indications.

# 10 years INITIAL: the birth and evolution of a highly innovative class

By MDT Michael Brüschen

The Initial Ceramic line is celebrating its 10 year existence this year, with success by the millions and, above all, countless enthusiastic devotees.

The idea of such a ceramic range was obviously born much earlier. In late 2001 a very small team of experts, comprising five representatives from industry and dental technology, came together with the aim of gauging the possibilities for a new, all-embracing ceramic system. At the time, the prevailing European dental market

was already more predatory than a growth market, so a highly exceptional concept was called for.

Meticulous analysis of the veneering ceramics market revealed a shortcoming of all the ceramic materials hitherto developed: they were not suitable for universal use. There was no ceramics manufacturer at that time providing dental technicians with a system for all possible framework materials (MC,AL,ZR,LT,Ti, etc.) that was cohesive, practical and, above all, user-friendly.







Ceramists were often compelled to process materials from a wide variety of suppliers which each needed to be handled differently. The expenditure in terms of time, money and failure management was correspondingly high. The aim and the necessity was to change this very situation as a matter of urgency. The time when practitioners needed to rethink and switch products constantly for the purposes of handling, layering, colour, fluorescence and opalescence was finally to be brought to an end.

### The idea is born

The vision for Initial was to be a ceramic system that offers ceramists the possibility of applying a consistent, uniform layering and colour strategy regardless of what substructure is being veneered. Everything – literally everything – was to be achieved with Initial. Starting from a conventional 2-3 layering technique, through to a lifelike, bio-aesthetic build-up, Initial, while working across systems was to meet every requirement!

The bio-aesthetic layering method, analogous to the make-up of a natural tooth, should be highlighted. It was and



still is today a unique selling point of the Initial ceramic range. At the time it was a very brave decision and, with hindsight, it was the correct decision by GC to implement my proposal.

In theory it was a very forward-looking, visionary project. In practice we were brought back down to earth very quickly. Despite this or precisely because of this – we were all obsessed by this vision of Initial by then. For us there was simply no alternative, there was no turning back!

### The problem-solving stage

The synchronisation of the vastly different ceramics posed by far the greatest problems for us. Colour, handling, shrinkage, opalescence, fluorescence, etc. everything had to be the same in the system of all six types of ceramic. Ceramists needed to be able to rely on achieving an absolutely comparable result with a metal-ceramic, for example, as with a zircon-ceramic by using an almost identical layering technique. However, there





were secondary concerns, the 'side-shows' around the main attraction, which took up a huge amount of time.

The bio-aesthetic layering method had to be easy to understand, standardised and reliable, yet be matched individually to the natural tooth, prepared and processed for the user. Somehow we had to square the circle.

Simply to establish the colour foundations of the bio-aesthetic layering technique (the Inside materials), over 2500 tooth shades identified in patients were evaluated and the essence of these was transferred to the Inside ceramics. We also engaged enthusiastically in the never-ending skirmishes about size/scope, packaging and container design of such a range. Naturally opinions differed considerably on these points.

Simply put:

The trade and manufacturers wanted as little as possible, leaving us with a rather sparse kit!

While the users wanted as much as possible, making it a rather representative kit!

In addition, a great deal of our own mistakes and imponderables from

outside jeopardised the already tight schedule. This meant that a very small team of experts (5 people!) for a project of this magnitude constantly had to re-organise and rediscover itself. At all costs we wanted to meet the planned launch deadline of the end of March 2003 at IDS.

### Testing and troubleshooting

By the end of 2002 all the variables had been finalised or at least decided and commissioned. The manufacturer had managed to produce and deliver all the materials required in the desired excellent quality (material science properties). Nevertheless, how would the Initial system prove its worth in everyday use in what can sometimes be harsh reality?

All six types of ceramic were pushed to their limits and beyond based on a previously established, complex 'stress programme'. Every conceivable handling error in the laboratory was taken into consideration so that, after market launch, users could be offered expert support as quickly as possible.

We felt sure we had thought of everything, but reality caught up with us time and again, bringing us back



down to earth with a bump. Initial Ceramic therefore continued to be put under enormous pressure, while at the same time marketing strategies, product brochures and especially the directions for use still had to be designed, written and illustrated for all six ceramics. One team member took charge of these jobs and was released from all other responsibilities concerning Initial.

It is well known that euphoria can move mountains. I cannot remember how many mountains we all had to move in those 14 months in the run-up to IDS 2003, but what suddenly stood in our way in January 2003 seemed insurmountable. The team member appointed to deal with the directions for use disclosed to the other team members in early January 2003 that he could not finalise the six directions for use in time for IDS. This threatened to burst our grand dream like a soap bubble.

The market launch at IDS had effectively become impossible. Everything we had worked on day and night seemed to have been in vain. Suddenly all hopes were concentrated on me. After the colleague gave up, I was the only dental technician in the team and hence the only one who could still rescue things. I did not have long to think about it. Action was needed quickly. We absolutely wanted to launch Initial at IDS 2003. But how on earth could we – or could I – do it in the short amount of time left?

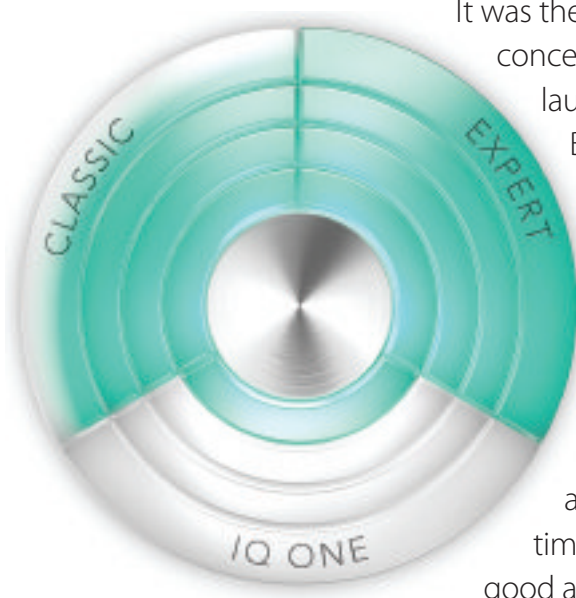
“The vision for Initial was to be a ceramic system that offers ceramists the possibility of applying a consistent, uniform layering and colour strategy regardless of what substructure is being veneered”

It was high-risk, but I said goodbye to my wife, my laboratory, my business partner, my lab team, my dentists and friends for two months to take advantage of the slight chance that we might still be able to finish the manuals.

All the other remaining team members divided the outstanding jobs between them as best they could. Our mood had plunged to an absolute depth, but we continually psyched each other up and that feeling ‘when the going gets tough, the tough get going’ gave us wings. And we achieved the almost impossible! By mid-March 2003 (nearly) everything was ready.

### The vision becomes reality

The launch at IDS far exceeded all our expectations. We were able to proudly present to amazed and astounded trade fair visitors our unique ceramic concept with utmost conviction. Without much publicity, yet very successfully (which is always an indication of a very good system) Initial was launched gradually after 2003, first in Europe, then the USA. Since then, Initial has also been marketed throughout Asia.



It was the right decision to concentrate the European launch initially on the Benelux countries, Austria, Switzerland and Germany. In the first two years post-launch we first became painfully aware how important and especially how time-consuming good and fast support is, how important immediate troubleshooting is to users. This kept the small team more than busy and often enough pushed the team to its limits. At the same time, lectures in 3D imaging were being prepared, articles were being written and naturally practical workshops and seminars were being held, as well as training sessions for trade technical advisers.

Fortunately, the positive experiences with Initial far outweighed the

negative and the small team gained renewed energy time and time again in order to tackle the maintenance and necessary expansion of the system. The US market launch in May 2005 saw the Initial line expanded with a new bleaching set for MC, LF, TI, AL, ZR. The small founding team was gradually expanded, which greatly relieved everyone's workload and enabled us to turn our attention again to implementing new Initial projects.

### Continual evolution

In November 2006 a Gum Shades Set for MC / ZR was presented and brought onto the market. This set – very important for implant techniques – was developed in close cooperation with the newly formed Inner Circle, a dental technology working group centred on Initial.

Four years post-launch we realised that we had set new standards in the high-end veneer sector, but, looking at the system as a whole, we were rather too complex for the world market with its different trends and demands. Commercially, Initial was a great success for GC. This made it even more important to address the question of whether Initial should position itself more broadly in order to cover the sector below high-end as well.

Pricing pressures increasingly dominated the market and people were seeking alternatives. It was important to provide laboratories under time and cost pressures with a



fabrication method that would enable them to produce high-quality and aesthetically convincing restoration work without major investment and at an attractive price for patients.

Whenever GC wants to bring something new onto the market, it is also expected to be something special. The ONE BODY System-IQ was developed and first introduced in 2007 as PRESS-over Metal / Zircon: a very small system with a few special features and great potential.

Like the two products launched later – One Body LAYERING over Metal (May 2009) and One Body LAYERING over Zircon (February 2011) – the base materials have a certain degree of light dynamics and can therefore be used even for the anterior teeth without additional layering, a unique selling point, just like the ingenious Lustre Paste also launched in 2007 with IQ-One-Body. This unique three-dimensional ceramic stain made it possible to produce restorations with just one glaze firing. In 2007 there were still two Lustre Paste Sets, one for high-CTE and for low-CTE ceramics.

This situation was changed in 2010 and the new IQ-One-Body, Lustre Paste NF was launched in June of that year. Now there was just one paste for all ceramics. The Lustre Paste is extremely popular and is also used by many non-users of Initial every day for refining aesthetics.

In the past ten years, a great number of different innovative materials have

“It is well known that euphoria can move mountains. I cannot remember how many mountains we all had to move in those 14 months in the run-up to IDS 2003”

been developed, e.g. the Reflective Liner for IQ Layering Zircon, Special Liquids, Fluo Crystals, which are integrated into a special working system. It is not possible here to name everything. Of course, improvements in the system should be highlighted, such as the ZR-FS zircon veneering ceramic launched in 2008. The much higher feldspar content than the ‘old’ ZR provides far higher depth effect and brilliance when veneering and is rightly seen as the benchmark in the field of zircon veneering.

For now, the last measure to make Initial accessible on a broader basis was presented at IDS 2013 with the Initial Classic Line. This range is mainly aimed at production laboratories which predominantly employ the 2 to 3-layer technique but on no account want to compromise on material quality. As the worldwide market works over 70%



### About the author

**Michael Brusch** trained as a dental technician from 1976-1979, after which he was employed as a dental technician working mainly with gold and ceramics. In 1986 he completed his Master dental technician degree in Düsseldorf and then became a laboratory director

focusing on all-ceramic restoration work. In 1989 he set up his own, privately based dental laboratory specialising in functional and aesthetic prosthetics with a focus on multichromatic-additive veneering techniques for composite and porcelain, precision fabrication methods for crowns, inlays, onlays and veneers made from composite and all-ceramic materials. Brusch is an international adviser and course presenter for workshops on system-coordinating all-ceramic restorations. He has become well-known for his exceptional 3D presentations. He is an active member of the German Association for Aesthetic Dentistry (DGÄZ) and the Dental Excellence-International Laboratory Group and has been a specialist in Dental Techniques at EDA since 2008. He is considered to be an authority on the subject of all-ceramic and biomaterials and functional restoration work and regularly presents workshops and publishes papers.

with non-precious alloys in this sector, the Classic Line was provided – a Paste Opaque CL specially adapted to non-precious metals.

The Initial System has always kept moving and will continue this in the future. Cautiously, without distorting the character of the system, it is constantly being adapted to the current prevailing market needs. New projects for Initial are planned to ensure that this innovative classic always remains relevant.

### Postscript

Having consciously omitted to mention anybody by name in this article, I would like to take this opportunity here to thank all my companions on this journey for their endless patience, commitment, support and devotion that enabled us to create something quite wonderful and real out of our shared vision of Initial. Vision requires courage and we certainly had courage.

I would also like to thank the many, many users. Through your enthusiasm and your input, you have made a huge contribution towards Initial being what it is today.

And last but not least, my thanks of course go to GC, who for ten years have put extraordinary trust in me, opened up lots of new avenues and smoothed the way for me.

In conclusion, I would do it all over again!!!



# initial



Master all your challenges.  
The all-round ceramic system.



flexibility

*initial*  
classic

individuality

*initial*  
expert

productivity

*initial* IQ one

**Whether flexibility, individuality or productivity** is your biggest challenge at work, with Initial we provide a system that enables everything. If you want to work in a very fast economical way or for a perfect harmony of aesthetics and individuality: Initial from GC is the all-round ceramic system for each and every indication.

Step by step:

# everX Posterior

## Discover the power of fibres

Evidence shows that fracture of restorations is one of the main causes of restoration replacement. Modern composites offer perfect features for enamel replacement: high wear resistance and aesthetics. However, they are not able to equal dentine when it comes to resistance to fracture. everX Posterior is a fibre-reinforced composite designed to replace dentine and to be used in conjunction

with a conventional composite such as G-ænial Posterior as the enamel replacement layer. Using the combination of both materials enables a biomimetic restoration of teeth.

everX Posterior reinforces large posterior restorations.

The short fibres used in everX Posterior provide a fracture toughness equal to collagen-containing dentine and almost double that of a conventional composite. This makes everX Posterior the strongest possible sub-structure to reinforce any composite restoration in large preparations





## CLASS I CAVITIES



## CLASS II AND LARGE CAVITIES



### BENEFIT FROM AN EASY 4 MM LAYER APPLICATION

1. Prepare cavity.
2. Bond and light-cure.
- 3a. Build first the missing wall(s) with composite.
- 3b. Apply everX Posterior in layer up to 4mm.
4. Light-cure 10-20 seconds.
5. Cover with composite.

### **Fibres prevent crack propagation**

Cracks are a common issue, often starting as a result of thousands of repetitive bites, at the surface of the material and propagating through the filling and the teeth. The short fibres prevent and arrest crack propagation that often starts from the surface of the composite material and slowly propagates through the filling and the tooth structure.

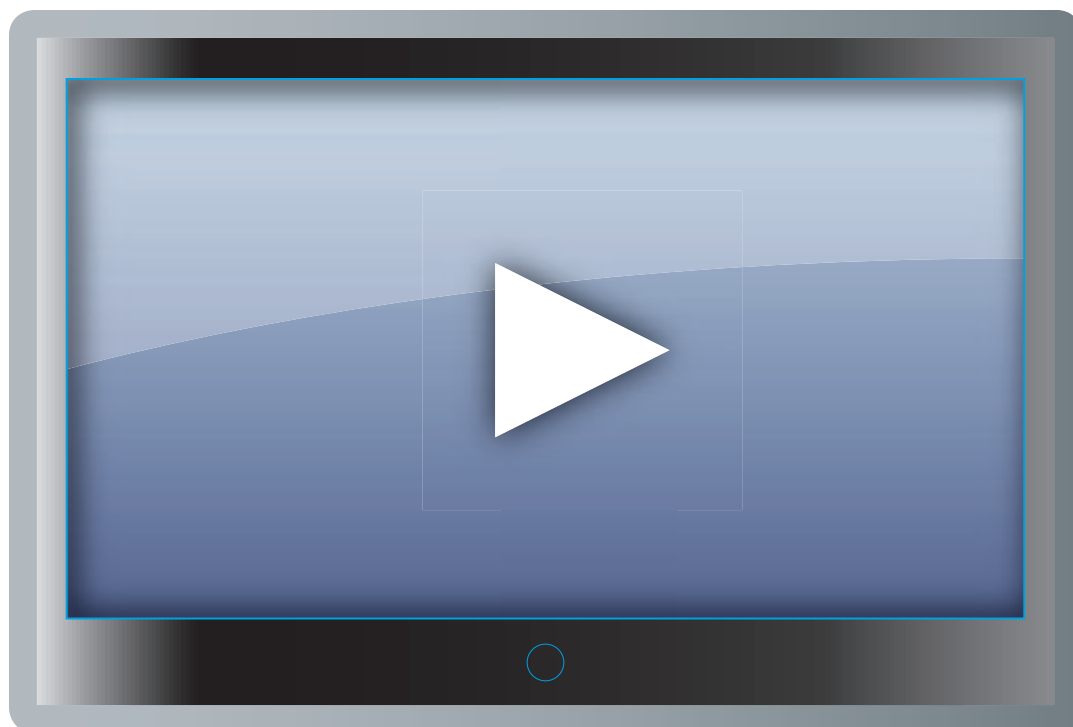
Fracture toughness equivalent to dentine and almost double that of other composites shows that the cross-linked fibres bring unsurpassed strength to the restoration. This makes

everX Posterior the ideal dentine replacement, especially in large preparations.

### **Optimal bonding**

Bonding different materials is a key factor in the layering technique. Since everX Posterior is used in the sandwich technique, the bonding between the 2 composites will be important to ensure the homogeneity of the whole restoration. On top of chemical adhesion, fibres will bring mechanical retention to ensure a perfect bond to any overlaying composite and to the tooth structure.

## Watch the technique in action here





# Discover the power of fibres



## everX Posterior from GC

The strongest\*  
composite sub-structure.

everX Posterior from GC is the first  
fiber reinforced composite designed  
to be used as dentin replacement  
in large size cavities.

Extending the limits  
of direct restorations.

\* data on file

# Product Family



## everStick

from GC

fibre reinforcements  
for daily  
dentistry

- Reliable • Easy to use • Minimally invasive • Extra strong
- Aesthetic • Scientifically proven • Cost effective

**everStick®**  
GIANT OF FIBRES

# GC

GC trademarks: everX Posterior, G-ænial Bond, G-CEM LinkAce, G-ænial Posterior, EQUIA