minimum intervention, maximum return

Solution found: the evolution of glass ionomer cement technology





EQUIA versus amalgam: Minimum intervention dentistry for the 21st century dentist



A 360° tour of the EQUIA restorative system



Resin-modified glass ionomer cements versus resin-based materials as fissure sealants: a meta-analysis of clinical trials



EQUIA from GC.

The solution for aesthetic bulk fill posterior restorations.

A new standard in restorative technology that offers you an additional option to meet all your patient's expectations.

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MID worldwide

Global amalgam ban trends

With global concern about the long-term effects on health on patients with mercury or amalgam dental fillings, several countries have already banned the practice entirely. Many of these countries have argued that dental composites have been proven to be an appropriate filling material, therefore negating the need for mercury fillings. Apart from the health issues related to mercury fillings the disposal of mercury and its impact on the environment is another area of for many countries who are becoming more eco-friendly. Below is an overview of where amalgam fillings have been banned and restricted around the world.

Norway The first country to completely ban the use of amalgam fillings in 2008

Sweden Amalgam fillings were banned in Sweden in January 2008

Denmark Amalgam fillings were banned in April 2008 Switzerland

Amalgam fillings are banned in pregnant women and young children

USA

Many states are undertaking both regulatory and non-regulatory activities to ensure proper management of mercury-containing dental amalgam. In 2009 the Food and Drug Administration (FDA) officially classified amalgam and its component parts as a class II medical device. This new regulation places encapsulated amalgam in the same class of devices as most other restorative materials, including composite and gold fillings. At the same time, the FDA also reaffirmed the agency's position that the material is a safe and effective restorative option for patients. Source: American Dental Association

Austria

The use of amalgam fillings are currently restricted

Australia

The Australian Dental Association policy remains, on the basis of the research available, that the use of dental amalgam produces no harmful effects. The association states that composite materials offer an aesthetic solution to fillings in visible areas of the mouth adding that these materials have not been in use for enough time to test their long-term comparison with amalgam but results are encouraging. In 1983-4, amalgam was used in 68% of all fillings in Australia. By the late 1990's this had reduced to less than 30% (NHMRC 1999). Source: Australian Dental Association

MID Advisory Board



The MID Advisory Board was established by GC Europe in partnership with some of the top dental academics and researchers specialising in minimum intervention dentistry to drive the concept forward in the profession and dental trade. Dr Michel Blique, an advisory board member based in Luxembourg, is a lecturer and practice owner.

What led you to be interested in MID as a concept and subject?

I have been involved in practicing and teaching this approach since 1989 and sharing that experience with European dentists has been a thrill.

How do you see your role as member of the GC MID Advisory Board?

I am feeling more like a daily MID practitioner, I have limited my practice to MID both for general dentistry and periodontal treatment.

Why is MID important to you?

Conventional practice is no longer viable in an aggressive high caries risk context, and I do not want to work in a hopeless context!

What aspects do you enjoy most about your involvement in the GC MID Advisory Board?

Sharing clinical experiences (dentist usually feel isolated), getting information and stimulation to evolve to new solutions.

Pay attention! It's an amazing evolution of practice, very rewarding for both the dentist and the patient.

Where and how do you see MID progressing over the next 5-10 years?

I think the concept will continue to develop but slowly, due to different habits and medical/dental insurance rules that force practitioners to keep doing 'good old evidence-based filling and extractions'.

tespérange

The changes can be more rapid due to the demand by better informed patients. We have to create a link between the patient looking for MID and dentist who wants to practice MID. But professional regulations do not permit this in a lot of European countries.

What are the biggest challenges in the adopting of MID principles in dentistry worldwide?

Dentists having to accept they have to spend more time with patient to prevent invasive dentistry or to fill smaller cavities than usual, while asking more money from the patient.

Do you think there are enough tools to help dentists to understand and adopt MID? Definitively no

What are your thoughts on the role of the dental team (not only the dentist) in implementing and practising MID?

Sound advice is useful in helping patients to change their oral health regimes: more motivation in daily home treatment, changes in eating and drinking, paying more for less reimbursed techniques: the team can be of great help in this task.

If there is one message you would like to convey to dentists about MID, what would that be?

Pay attention! It's an amazing evolution of practice, very rewarding for both the dentist and the patient. But it's difficult in a context of junk food adverts on television. Changes are to be made within the practice but also outside!



Remi



Expert perspectives: the EQUIA phenomenon

Dr Piyush Khandelwal, GC Europe, Belgium

"While striving for an evenly-weighted solution for posterior fillings, in creating EQUIA GC have struck an ideal balance between economical, aesthetic and straightforward application."

Gert Fecht, dentist, Germany

"In my practice I have found EQUIA to be faster, easier, and more durable."

Professor Ivana Miletić, University of Zagreb, Croatia

"The EQUIA system by GC includes EQUIA Fil and EQUIA Coat and is the first glass ionomerbased material that can be used for permanent posterior restorations involving load-bearing occlusal surfaces."

Dr Steffen Mickenautsch, University of the Witwatersrand, South Africa

"The clinical application of EQUIA utilizes all listed clinical merits of a high-viscosity GIC restoration and is based on the evidence that resin coating improves the physical properties of the resultant final restoration. In addition, EQUIA offers patients who are unable to afford composite fillings a cost-effective, mercury-free and aesthetic tooth restoration."

Dr José Zalba, Specialist in Oral and Dental Health Prevention Programmes (UCM)

"...people are now more educated and informed than ever before, and are active participants who are increasingly involved in taking decisions about their treatment and materials used - key issues behind the involvement of patients in health issues and successful treatments. High-viscosity glass ionomers (EQUIA) are therefore set to play a leading role in minimally invasive treatments, as they offer suitable aesthetic and mechanical properties, as well as low toxicity, an absence of environmental contamination, etc, which are all arguments to induce patients to select these ionomers over other materials."

Frank Rosenbaum, GC Germany

"I think we can all agree that there is an urgent need to offer an alternative filling concept as part of basic services, for the sake of both dentists and patients. With EQUIA, we are on the right path."

Professor Roland Frankenberger, Philipps University, Marburg, Germany

EQUIA "yields significantly better results" than all other tested products "thanks to the coating", with regard to abrasion as well as catastrophic clinical fractures



The question below was sent to Dr Graham Mount in response to his article in MID 2



QUESTION:

Who has the biggest responsibility in promoting and advancing MID: dentists, national dental associations or dental manufacturers or universities?

ANSWER – Dr Graham Mount

Logically it is the profession, including dental hygienists and anyone who has direct contact with patients, who have the greatest responsibility for the introduction of changes such as these. It is only through face to face contact that our 'consumers' can be educated and therefore converted to a new way of thinking. At the same time we need considerable support from those behind us.

National Dental Associations

We need the National Dental Associations to understand and support the concept because it will require a number of modifications to the reporting and recording of dental disease states and the

"No one body holds full responsibility for the evolution of this new paradigm. All those involved must make a contribution, especially the practising professionals"

> acceptance of new ways of controlling them. A variety of factors need to be taken into account. In 1908 the profession accepted a method for the classification of caries lesions and this has been universally

used ever since. This classification is now out of date and a modified system needs to be introduced if there is to be proper recognition of the full potential for MID principles to be applied to the control the disease. Such a change must come first through organised dentistry. The profession has managed such change before and the debate has already begun. There have been discussions at a number of national meetings and further meetings are scheduled. However, change will require consensus and this will only be achieved through debate.

Once the organised profession has reached consensus it will be necessary for the legally constituted registration boards to agree and formally recognise the changes. For example, amongst other things they will need to approve the new classification for recording caries lesions as well as the proposed cavity designs. They will also need to approve the concept of leaving radiolucent demineralised dentine behind under a restoration on the understanding that these areas have been subjected to the correct treatment and will remineralise and heal.

Insurance companies

Once the organised profession has accepted change it will be necessary to educate and persuade the third parties who are involved in providing supporting funds to the profession. Governments and

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insurance companies will need to recognise the changes and modify their levels of reimbursement accordingly. The profession cannot be expected to fully endorse the principals of MI Dentistry unless they properly rewarded for implementing them.

University research

Research within the university environment is an essential precursor of most change within the professions. It is only within these laboratories that gifted scientists can allow their concepts to develop and lead them to significant developments. However, so often there are serious financial limits within these environments which means that the full potential for such discoveries is often not available. Pure scientific thought and investigation is often necessary in evolving new techniques and universities will often initiate these lines of discovery. However, in many cases it is the manufacturers who take these concepts to the market.

Dental manufacturers

Dental manufacturers must therefore join the discussion because it is they who carry out a large part of the research and development into new and modified restorative materials and techniques. Whilst much of the initial research will be carried out within the universities it is generally the manufacturers who refine the original discoveries and evolve further changes to make restorative material 'user friendly'. The glass-ionomer cements for example, required 10 years of pure research to allow them to evolve. Subsequently a number of manufacturers have refined them into more effective, bioactive, clinically efficient materials with simpler and more effective methods of clinical application.

Finally, all of the above organisations will need to band together to provide the publicity and education that will convince our patients that there have been changes within this profession and that the changes are valid and acceptable. We already rely heavily on the manufacturers to supply us with educational material directed to both the professions and our patients. Our universities must ensure that all members of the teaching faculty are well educated in the changes because permanent change will only grow through the education of our new undergraduates. The universities also provide continuing education courses for their graduates and these should be modified and enlarged to ensure that the changes are correctly implemented.

No one body holds full responsibility for the evolution of this new paradigm. All those involved must make a contribution, especially the practising professionals. It is they who must collect the data and publish the results so that further teaching can be 'evidence based' and therefore acceptable to all concerned. Only the front line profession can effectively gather the evidence that will become the teaching and practice of the future.

Graham Mount, Australia

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EQUIA versus amalgam

Minimum intervention dentistry for the 21st century dentist

By Professor Ivana Miletić, DDS, PhD and Anja Baraba, DDS

Operative treatment is unavoidable when the hard dental tissue has become demineralised beyond the possibility for remineralisation and arrest of caries lesion or cavitated, allowing ingress of bacteria 1. However, once an operative treatment has been chosen, the preventive approach should still be employed. Cavity preparation should be minimally invasive, as well as the selected restorative material. The decision about the material for reconstruction of lost hard dental tissues should be made keeping in mind the characteristics of the restorative material. Factors to consider are: biocompatible and bioactive materials with good mechanical properties, the ability to bond chemically, good retention to tooth structure and materials which perserve hard dental tissues.

Since the 19th century, one of the materials that has been traditionally used for tooth restoration in the posterior region is amalgam. Amalgam has been used as a material for filling according to the classic macro-retentive principles of GV Black. Disadvantages of amalgam restorations are2:

- the need for retentive cavities at the cost of healthy tooth substance
- weakening of the tooth's strength by cutting through the tooth crown's ridges
- the risk of fracture of remaining tooth substance (mostly buccal and lingual surfaces) as the result of the cavity design
- the lack of adhesion between amalgam and tooth substance
- lack of aesthetics

Furtermore, amalgam fillings may have adverse biological effects, both locally and systemically3. Locally, amalgam can cause an erythematous lesion on the adjacent oral soft tissues while systemically, free mercury in the amalgam may give rise to a hypersensitivity reaction3. Although amalgam has a good durability in large load-bearing fillings, after a certain lifespan, many amalgam restorations need to be replaced as they are exposed to the physico-chemical challenges of intraoral conditions4. Secondary caries is the main reason for failure of amalgam restorations5. Failure of an amalgam filling (Figure 1) requires replacement with new materials which are available nowdays.

Alternative solution

Improvements in the properties of glass ionomer cements have made them a material of choice for final coronal aesthetic restorations. The EQUIA system by GC includes EQUIA Fil and EQUIA Coat and, according to the manufacturer, is the first glass ionomer-based material that can be used for permanent posterior restorations involving load-bearing occlusal sufraces. The EQUIA system is available in eight different shades, allowing better selection to match the tooth colour (Figure 2).

This restorative material is moisture tolerant and is chemically bonded to tooth structure, which facilitates the placement of the restoration. The mixed material from the capsule is placed in the cavity in bulk technique, which makes it easy and quick to use. EQUIA Fil has special glass fillers which give the material its aesthetic results. At the same time, the material has all advantages of glass ionomer materials, regarding chemical bonding to tooth structure and bioactivity.

The preparation of the cavity for EQUIA restoration does

"Improvements in the properties of glass ionomer cements have made them a material of choice for final coronal aesthetic restorations."

not require removal of healthy hard dental tissue (Figure 3). Prior to placement, cavity can be conditioned with dentin conditioner (10% polyacrylic acid for 20 seconds), (Figure 4) or with cavity conditioner (20% polyacrylic acid for 10 seconds), to remove smear layer and activate ions in hard dental tissue for chemical bonding, but this step may also be omitted because of polyacrylic acid in the composition of the glass-ionomer. Only 2 minutes and 30 seconds after mixing of EQUIA Fil capsule, the final contour with drills and polishing disc can be given to the filling. In the end, the restoration is covered with EQUIA Coat, nanofilled self adhesive light cured coating (Figure 5).

The dispersion and infiltration of the nanofillers of the coating will protect the restoration and the margins over a long period of time, enabling it to reach the surface hardness over few months similar to that of posterior composite materials (Figure 6). The coating also enhances the aesthetic result of the EQUIA restoration. After the restoration is placed, the patient is advised not to eat for one hour, in order to allow incipient hardening of the material. The EQUIA system has several advantages in comparison to amalgam fillings:

- preservation of healthy hard dental tissues
- easier and quicker placement of the restoration
- chemical bonding to tooh structure
- release and intake of fluoride ions
- finishing the restoration in one visit
- aesthetic restoration









Figure 1. Old amalgam filling on tooth 16 with marginal gap **Figure 2**. Selection of a colour of Fuji IX GP Extra using self-made shade guide (A3 shade) **Figure 3**. Cavity after removal of amalgam filling and caries excavation

Figure 4. Conditioning of the cavity with dentin conditioner (10 % polyacrylic acid) for 20 seconds **Figure 5**. Final restoration with EQUIA after contouring and placement of G-Coat.

Figure 6. Replacement of an old composite resin filling with EQUIA and control during the period of one year.





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About the author

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EQUIA: a material suited to present-day needs

Dr José Zalba

At the start of the 21st century our profession is faced with major challenges in terms of the social realities of today's world: we are now experiencing a period of change and our profession needs to adapt to new minimally-invasive and preventive techniques to treat oral diseases. The static types of treatment previously used have been superseded by a number of advances in terms of the technology and materials used; moreover, we have also developed new ways of communicating, because we have been forced to change the way we deal with current demands.

Dentistry is changing

Improved patient hygiene levels combined with the hardening of enamel due to preventative measures (with the help of Fluoride and products such as MI Paste) mean that we now see different types of lesions. Not only have rates of tooth decay declined, but the pattern has changed given that today's societal pressures have an influence on the morphology and progression rate of decay. This

"Our profession needs to adapt to new minimally-invasive and preventive techniques to treat oral diseases"

situation has resulted in a need to focus on alternatives to traditional treatments which place a greater emphasis on preserving as much of the biological tooth structure as possible. It is therefore worth re-examining the new highviscosity glass ionomers (for example, EQUIA) to provide an adequate clinical response to the type of lesions currently seen which require a different approach, as much less or even no - preparation is required. EQUIA's improved mechanical and optical properties, its ability to bond to the tooth's structure, its hydrophilic nature, its greater biological compatibility and its anticariogenic properties due to the release of fluoride mean it is a highly versatile material and, for these reasons, is suitable for preventative restorations or minimally invasive work.

Patients are changing

In a society of mature consumers, who decide for themselves the treatment they want, minimally invasive treatment has become the dentistry of demand (they ask for it) and not merely of supply (we offer it). We need to establish a relationship of trust with patients, as maintaining good relationships will benefit patients. Indeed, a good relationship with patients has a positive impact on dental clinical practice. It is always better to involve people in their own health issues and get them to take their own decisions about their treatment and the materials used; something that gives even greater added value to EQUIA.

Materials science is changing

Biomaterials are, by definition, materials that act as natural tissue and closely imitate the properties of tissue in its biological environment. Biomaterials must combine functional feasibility, biostability, biocompatibility and sterile features. The glass ionomer based system, EQUIA is currently the restoration material that most resembles natural teeth given that it is a mineral. Amalgam and plastic resins currently used differ substantially from natural materials.

Traditionally, amalgam and resins have been the materials of choice. There is considerable debate about the potential health consequences of using these types of dental materials, which have been used for some time, and for several decades some members of the scientific community have raised doubts about the efficacy and innocuousness of these materials and the effect of the mercury in the amalgam on animals and humans. Queries have also been raised about the cytotoxicity of the composites used in various dentistry applications.



Options are changing

All these issues mean that materials with greater biocompatibility offering a solution to the current demands for minimally invasive dental restorations should be reassessed, as using toxic materials that cannot be eliminated, even in low concentrations, needs to be justified, especially as patients are already exposed to other toxic materials through other sources: i.e. environmental pollution, food, etc., and we do not have any information about individual tolerances and potential consequences. The need for a reassessment is now even more pressing due to the increased availability of such materials. In my opinion, resin is the most reasonable material of choice for the aesthetic dental zone and bonding (mainly to the enamel) reasons, and for its easy adaptability. For larger restorations on rear load-bearing areas, a different type of material should be considered.

For many years, a number of countries have adopted a cautious approach to amalgam dental fillings (they have been banned in Norway since 2008) and people have been advised of the potential risks involved. Equally, other countries have recently decided to seriously examine the warnings issued in the Official Reports of the WHO on the dangers of using mercury in amalgam dental fillings and have recommended that dentists should not use amalgam fillings, especially (but not exclusively) in pregnant women and children under the age of 14 (though I would also include elderly and high-risk patients in this group). However, it is the dental clinical team that is most at risk of contamination, given that when the product is handled some of the mercury is released into the surgery's ambient atmosphere.

Environmental awareness is changing

It has been noted that up to 56% of the population is worried about environmental pollution. The problems of amalgam dental fillings on the natural environment are also important given that the majority of dental surgeries do not dispose of mercury separately or have the appropriate technology to handle, dispose of and remove such fillings. This closes the circle given that poor management of the environment will have a negative impact on all our health. Taking care of the environment is also a way of taking care of your health. To quote the words of Daniel Goleman, author of Ecological Intelligence: "Ecological intelligence is the ability to live and have the smallest possible impact on the natural environment. It implies an understanding of the consequences our daily decisions may have on the environment and attempt, insofar as possible, to take actions that have the greatest benefit for the planet. The paradox lies in that the more consistent we are with the wellbeing of our planet, the more we will invest in our own wellbeing." And taking responsibility for the decisions we take also affects our planet and our own health. This concept will be the next revolution that will shortly change the demand for products, as companies and products promoting sustainability will be rewarded whilst those resisting the change will start to disappear.

This article and these thoughts explore a silent reality: people are now more educated and informed than ever before, and are active participants who are increasingly involved in taking decisions about their treatment and materials used - key issues behind the involvement of patients in health issues and successful treatment. Highviscosity glass ionomers, like EQUIA are therefore set to play a leading role in minimally invasive treatments, as they offer suitable aesthetic and mechanical properties, as well as low toxicity, an absence of environmental contamination, which are all arguments to encourage patients to select these ionomers over other materials.

About the author

Dr José Zalba is a Specialist in Oral and Dental Health Prevention Programmes (UCM) and a member of the GC European Minimal Intervention Advisory Board. His dental practice in Pamplona, Spain, is based on the principles of Minimum Intervention Dentistry. For more information about him please visit www.capdental.net



Solution found: the evolution of glass ionomer cement technology

Piyush Khandelwal, GC Europe N.V.

Creating the best restorative material to substitute amalgam has been one of the most important challenges for the dental materials industry since the last decade, especially when the banning of mercury-based products became more widespread. The system of EQUIA is to combines a high-viscosity GIC (EQUIA Fil) with a highly filled light curing resin coating (EQUIA Coat). This technology integrates the main advantages of the highviscosity GIC (self-adhesion, bulk application, improved mechanical properties) with a protective barrier in the early maturation phase and an improved surface hardness.

When EQUIA Fil is coated with EQUIA Coat (EQUIA System) a marked increase in fracture toughness, flexural strength and flexural fatigue resistance are observed. Creating the best restorative material to substitute amalgam has been one of the most important challenges for the dental materials industry since the last decade, especially when the banning of mercury-based products became more widespread. Cost of the material to the clinician and ultimately to the patient is the most crucial factor in developing such a material of choice.

Among the materials available today, Composites are the ones that more appropriately fulfil these requirements.

Unfortunately, these materials do not meet the economic demand of patients nor social security systems. In addition, they are not biocompatible, do not allow bulk-filling technique, and are frequently associated with quite sensitive clinical procedures.

With more than 30 years of experience in GIC technology and with more than 300 million Fuji IX restorations placed in the mouth (since 1995), GC is one of the first companies to realize this demand of restorative material. In this context, GC developed the world's first 'long term' restorative alternative based on GIC Technology which is not only as cost effective as Amalgam but can also be applied in one single increment (Bulk filled). This system is called the EQUIA and, besides being biomimetic, provides the dentist with an aesthetic material which is much easier and quicker to use.

The system of EQUIA is to combines a high-viscosity GIC (EQUIA Fil) with a highly filled light curing resin coating (EQUIA Coat). This technology integrates the main advantages of the high-viscosity GIC (self-adhesion, bulk application, improved mechanical properties) with a protective barrier in the early maturation phase and an improved surface hardness. When EQUIA Fil is coated

with EQUIA Coat (EQUIA System) a marked increase in fracture toughness, flexural strength and flexural fatigue resistance are observed. The clinical application of EQUIA utilizes all clinical merits of a high-viscosity GIC restoration.

Therefore, EQUIA offers patients who are unable to afford composite fillings a cost-effective, mercury-free and aesthetic filling. These factors combined allow modern dentists to offer their patients a wider range of safe filling solutions.

Learning from the recent scientific evidences both from in-vivo and in-vitro studies, EQUIA may safely be used as a long-term restorative system in conventional stress bearing Class I and in non-stress bearing Class II and Class V situation. Noteworthy, it is also acceptable in Class II stress bearing situations, as long as the isthmus is less than half of the intercuspal distance as stated in the manufacturer's instruction of use.

Based on our experiences, learning from the scientific evidences and the feedback from dental practitioners it can be concluded that modern day dental practices should consider two materials of choice for long term restorations, namely composites and EQUIA.

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"Creating the best restorative material to substitute amalgam has been one of the most important challenges for the dental materials industry since the last decade"



About the author

Piyush Khandelwal is a product manager at GC Europe. He started his career as a dentist after obtaining a BDS at Gulbarga University in India and working in private practice for 5 years. He obtained an MBA in Management Consulting n 2009 and has worked at GC since 2007.

Glass-Ionomer Cement Technology Advances into 21st Century Dentistry

Systematic reviews reveal the continued evolution of dental materials

Results from a recent systematic review suggest highviscosity glass-ionomer cement (GIC) as safe and economical long-term tooth restorative system in conventional stress bearing Class I and in non-stress bearing Class II and Class V situation. High-viscosity GIC may also be acceptable in Class II stress bearing situations, as long as the isthmus is less than half of the intercuspal distance as stated in the manufacturer's instruction of use.

Systematic reviews, often including meta-analysis as statistical method, provide the highest form of clinical knowledge in terms of achieving internal validity of results. One systematic review appraised the current clinical evidence regarding the use of high-viscosity GIC for longterm Class I, II and V tooth restorations placed in permanent teeth1. This systematic review included 14 clinical studies, providing a total of 27 separate study results and concluded as follows:

- Most of the 27 results show no significant statistical difference between the success rate of high viscosity GIC restoration and amalgam for treatment of the same clinical indications
- One of the 27 results show that high-viscosity GIC restorations in posterior class V cavities of permanent teeth had a 28% higher chance to be successful than amalgam after 6.3 years
- Two of the 27 results indicate that high-viscosity GIC restorations in posterior class I cavities of permanent teeth have a 6% higher chance after 2.3 years and a 9% higher chance after 4.3 years of being more successful than amalgam
- One of the 27 results show that high-viscosity GIC restorations in posterior class II cavities of permanent teeth have a 61% higher chance of being rated more successful than amalgam (this result requires further confirmation)
- None of the 27 results indicate high-viscosity GICs being inferior to amalgam in clinic

These results show that high-viscosity GIC is not inferior in comparison to traditional amalgam restorations under similar clinical conditions. In addition, two further systematic reviews revealed the following evidence:

- Tooth margins of single-surface GIC restorations in permanent teeth had significantly less carious lesions after 6 years than on amalgam restorations2
- A significantly higher fluoride release (p<0.05) of GIC than from compomers3

Further advances have revealed that a resin coating over a GIC restoration may increase its fracture toughness4 and reduce microleakage5. This resin layer may also not completely hinder the fluoride release activated by the GIC and thus its external anti-cariogenic effects within the oral cavity6.

The clinical application of EQUIA utilises all listed clinical merits of a high-viscosity GIC restoration and is based on the evidence that resin coating improves the physical properties of the resultant final restoration. In addition, EQUIA offers patients who are unable to afford composite fillings a costeffective, mercury-free and aesthetic tooth restoration.

Scientific journal articles for further reading:

1. Systematic review of clinical trials by Mickenautsch et al., Clinical Oral Investigation 2010; v14:

pp233-240.

2. Systematic review of clinical trials by Mickenautsch et al., European Journal of Paediatric Dentistry

2009; v10: pp41-46.

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- 5. Investigation of dental materials by Magni et al., Journal of Dentistry 2008; v36: pp885-891.
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Resin-modified glass ionomer cements versus resin-based materials as fissure sealants: a meta-analysis of clinical trials

As a publication, MID believes in the importance of informing dentists about the evidence available on MI topics so they can make scientifically sound choices in the treatment of their patients. In the research-clinical application jigsaw puzzle, it is essential to make all the pieces fit in order to see the whole picture.

Systematic review with meta-analysis

AIM: To appraise quantitatively current evidence regarding the caries-preventing effect of resin-modified glass ionomer cement (RM-GIC) fissure sealants in comparison to that of resin-based fissure sealants. METHODS: 8 Anglophone databases and 2 Lusophone databases were searched until 15 April 2009, using a predetermined search strategy. Clinical trials were considered for inclusion if their titles/abstracts were relevant to the topic, published in English, Portuguese or Spanish and had a two-arm longitudinal study design. The outcome measure of the caries-preventive effect was caries absence on sealed teeth. Two reviewers independently extracted data from the accepted articles in order to complete a 2x2 table for meta-analysis. The unit of interest was the tooth, and the number of caries-free teeth (n) at the end of each time interval (6, 12 and 24 months) was compared against the total number of evaluated teeth (N).

STATISTICS: Datasets were assessed for their clinical and methodological heterogeneity, following Cochrane guidelines, and only homogeneous datasets were combined for meta-analysis, using a random effects model (RevMan 4.2). Differences in the caries-preventive effect were computed on the basis of the combined Relative Risk (RR) with 95% confidence interval (CI).

RESULTS: Of the 212 articles identified, only 6 trials were included. From these, 19 separate datasets were extracted. For the pooled data, equivalent caries-preventive effects were observed at 6 months (RR= 0.98, 95% CI 0.95- 1.00; p = 0.08); 12 months (RR=1.00, 95% CI 0.96-1.04, p = 0.99) and 24 months (RR=1.01, 95% CI 0.84-1.21, p = 0.91). The 36-month data (not pooled) favoured resin-based sealants (RR 0.93, 95% CI 0.88-0.97, p = 0.002).

CONCLUSIONS: This meta-analysis found no conclusive evidence that either material was superior to the other in preventing dental caries.

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The academic perspective

Dr Steffen Mickenautsch, University of the Witwatersrand, South Africa

What were the main reasons for reviewing this particular area of dental materials?

Steffen Mickenautsch: Resin is still considered to be the material of choice, worldwide, to caries-protect pits and fissures. This begs the question: Why? Is this so because we have overwhelming scientific evidence for its preference? Or overwhelming evidence in the sense that it sweeps any other possible materials asunder? Or is it just because of tradition, because we do not know the merits of other materials, or finally simply: because we have been told so in dental school?

It is always interesting (and beneficial to the heart and mind) to find out the truth of things and that is why we embarked on an intensive systematic review programme that also included the comparison of the caries preventive effect between resin-based and resin-modified glass ionomer cement (RM-GIC) based fissure sealants.

What criteria did the articles you selected meet and why is this important?

Steffen Mickenautsch: We aimed to identify all evidence to this topic from all different sources, corners of the world and from as many languages as possible. We did that in a systematic format and from what we found we selected studies that were relevant, i.e. compared the two types of material with each other. Then these studies needed to have been randomised in some way. Randomisation assures that patients whose teeth were sealed with either resin or RM-GIC do not substantially differ, thus are comparable. Studies who do not use randomisation, cannot tell whether any observed results, e.g. that one

"This is the very first quantitative systematic review and thus offers the best source of current scientific evidence to this topic."

Dr Steffen Mickenautsch

material performed better than the other, were due to the material and not due to other factors (like one group of patients may simply had better oral hygiene or used fluoride and thus head less caries activity than the other, regardless what materials was used).

What should the general dental practitioner understand about this particular review?

Steffen Mickenautsch: The general dentist in her/his daily dental practice should have the knowledge that there is simply no scientific evidence that says that resin protects pits and fissures better against caries than RM-GIC.

How should general dentists apply the conclusion of this review to their daily practise of dentistry?

Steffen Mickenautsch: The application of this knowledge would be that if a dentist finds resin not a very favourable choice to use as fissure sealant, perhaps for reasons of moisture control, material handling, material availability, costs, personal reason, or reason stated by the patient etc., then RM-GIC can provide a good alternative.

How does this review contribute to the body of evidence on this topic in dentistry?

Steffen Mickenautsch: This is the very first quantitative systematic review and thus offers the best source of current scientific evidence to this topic. It's the best, simply because: it first and foremost employed a comprehensive systematic sweep through all possible scientific and non-scientific sources of evidence available to answer a particular question. In that way we caught whatever can be caught. From everything that we found, we select the best evidence in line with commonly accepted criteria and then we quantified this evidence, using meta-analysis, in order to provide a precise well weighted answer to whether resin is better than RM-GIC in preventing caries or not. The result showed that it's not.

Is more evidence needed on this topic? If so, what gaps are there in the research that has been done thus far on it?

From an academic point of view there is always need for more evidence – even just for the purpose to confirm the current state of evidence. It is recommended that future studies to this topic should report in much more detail on their randomisation methods, which would remove any last academic shred of doubt. Our team is committed to continuously update current systematic review evidence – to this topic perhaps in about 2-3 years' time. For now the current evidence from our systematic review is as good as it can get.

Clinician comments

Dr Geoff Knight, private dentist based in Australia

For how long have you been using glass ionomer cements in practice – and what motivated your decision to use them in the first place?

Geoff Knight: I met Dr Jurgen Eberlein at a dental seminar in Melbourne in the late 1970s. He was then with ESPE and gave me some samples of Ketac Fill to use in my practice. I was concerned about the recurrent caries I was seeing with composite resin and was impressed with the anti caries properties, low interface stress and ease of handling and I found myself using it for more and more clinical applications.

"I am unaware of any tooth that I sealed with auto-cure glass ionomer cement ever developing a carious lesion beneath the seal." Dr Geoff Knight

What is your preferred protocol for fissure sealing and what materials do you prefer to use for this?

Geoff Knight: I fissure seal with auto-cure glass ionomer cement because the material has relatively good wear resistance, releases abundant fluoride to convert carbonated apatite into fluorapatite and is a semi permeable to enable phosphate and calcium ions in towards the enamel and hydrogen ions to move outwards. Furthermore when the GIC is placed on the enamel surface it has a low pH that dissolves the outer surface of carbonated apatite enamel crystals so as to enable the formation of fluorapatite crystals after the GIC sets and the pH returns to neutral.

I am unaware of any tooth that I sealed with auto-cure glass ionomer cement ever developing a carious lesion beneath the seal. My current gem is Colgate Neutra fluor 5000 plus tooth paste. When patients brush without rinsing twice daily it prevents caries and significantly improves periodontal health

Before reading the meta-analysis, what was your opinion of resin-modified glass ionomer cements versus resin-based materials as fissure sealants?

Geoff Knight: Resin fissure sealants prevent carbonated apatite from maturing into fluorapatite and have no place in MID. Resin modified glass ionomer cements enable the transfer of carbonated apatite into fluorapatite but do not wear as well as auto-cure GICs.

As a busy clinician, how do you keep yourself updated on developments in clinical evidence in dentistry, particularly in MID?

Geoff Knight: Read the literature, use Google and look at focused resources such as Dental Outlook here in Australia.

MI toolkit

A 360° tour of the EQUIA restorative system

EQUIA FIL BULK FILLED RADIOPAQUE POSTERIOR RESTORATIVE IN CAPSULES EQUIA Coat LIGHT CURED SELF ADHESIVE WEAR RESISTANT COATING

For use only by a dental professional in the recommended indications.

RECOMMENDED INDICATIONS

- 1. Class I restorations
- 2. Non-stress bearing Class II restorations
- 3. Stress bearing Class II restorations when isthmus is less than half of intercuspal distance
- 4. Intermediate restorative
- 5. Class V and root surface restorations
- 6. Core build up

EQUIA Coat is used to seal and protect the surface of EQUIA Fil restorations.

CONTRAINDICATIONS

- 1. Pulp capping.
- 2. In rare cases the product may cause sensitivity in some people. If any such reactions are experienced, discontinue the use of the product and refer to a physician.

NOT TO BE USED

EQUIA Coat should not be used in combination with desensitizers and eugenol containing materials as these may hinder EQUIA Coat from setting or bonding properly.





GC has developed long-term restorative option, as an alternative to composites and amalgam, based on glass ionomer technology, called the EQUIA system. EQUIA is not only as cost effective as amalgam, but can also be applied in one single increment (bulk filled).Besides being biomimetic, it provides the dentist ease of use, has acceptable aesthetics and offers extra protection in case of high risk patients due to fluoride release.

> The EQUIA Restorative system combines a highviscosity glass ionomer cement (EQUIA Fil) with a highly filled light curing resin coating (EQUIA Coat). This technology integrates the main

advantages of the high-viscosity GIC (self-adhesion, bulk application, improved mechanical properties) with a protective barrier in the early maturation phase and an improved surface hardness. When EQUIA Fil is coated with EQUIA Coat (EQUIA System) a marked increase in fracture toughness, flexural strength and flexural fatigue resistance are observed.

A recently published scientific evaluation validates GC's instruction of use that stats the EQUIA system can be recommended as a longterm restorative option not only for any sized class I cavity but also for smaller class II cavities. This study evaluated 26 class I and 125 class II fillings according to the internationally approved modified USPHS (United States Public Health Service) criteria. The fillings had been in place for a mean period of 24 months in a total of 43 patients in six dental practices. According to the results, restoration with EQUIA can function not only as short or long-term temporary fillings, but even as permanent

restorative. This retrospective cohort study by Professor Karl-Heinz Friedl, of Regensburg, Germany, was published in the internationally renowned journal, Dental Materials. This research, along with many other studies, shows that the indication for EQUIA surpasses conventional glass ionomer cements, which are otherwise normally only approved for temporary care.

These results have an enormous significance for a regular dental practice, because now a dentist can use EQUIA in cases where a patient cannot afford a composite filling and does not want to have a non-aesthetic filling. Conclusively any modern dental practice would only need EQUIA and a composite resin to cover all the indications and requirements of their patients.

Click here to read more about EQUIA

DIRECTIONS FOR USE

Powder / Liquid Ratio (g/g).....0.40 / 0.12 Mixing Time (sec.)*.....10" Time of initial extrusion after mixing .10 seconds maximum Working Time (min., sec.)*.....1'15" Net Setting Time (min., sec.)*......2'00" Final Finishing Commencing Time (37°C, after starting mix) (min., sec.) . . . 2'30" VLC curing time of EQUIA Coat20" Test conditions : Temperature $(23 + /-1^{\circ}C)$, Relative humidity $(50 + /-5^{\circ})$ *ISO 9917-1: 2007 (E) (Glass polyalkenoate cement)

1. CAVITY PREPARATION

- a) Prepare tooth using standard techniques. Extensive mechanical retention is unnecessary. For pulp capping use calcium hydroxide.
- b) Apply GC CAVITY CONDITIONER (10 seconds) or GC DENTIN CONDITIONER (20 seconds) to the bonding surfaces using a cotton pellet or sponge (Fig. 1).
- c) Rinse thoroughly with water. Blot away excess water with a cotton pellet or dry by gently blowing with an air syringe. DO NOT DESICCATE. Prepared surfaces should appear moist (glistening).

2. CAPSULE ACTIVATION AND MIXING

- a) Before activation, shake the capsule or tap its side on a hard surface to loosen the powder (Fig. 2).
- b) To activate the capsule, push the plunger until it is flush with the main body (Fig. 3).
- c) Immediately place the capsule into a metal GC Capsule Applier and click the lever once (Fig. 4). The capsule is now activated.
- Note: The capsule should be activated just before mixing and used immediately.
- d) Immediately remove the capsule and set it into a mixer (or an amalgamator) and mix for 10 seconds (+/-4,000RPM) (Fig. 5).

3. RESTORATIVE TECHNIOUE

- a) Immediately remove the mixed capsule from the mixer and load it into the GC Capsule Applier.
- b) Make two clicks to prime the capsule then syringe (Fig. 6). The working time is 1 minute 15 seconds from start of mixing at 23°C (73.4°F). Higher temperatures will shorten working time.
- c) Within 10 seconds maximum after mixing, start to extrude the mixture directly into the preparation (Fig. 7).

4

EQUIA TECHNIQUE GUIDE

Prior to use, carefully read the instructions for use.





Rinse and gently

dry.



Click once to



Mix for 10 sec.

Apply GC Cavity Conditioner (10 sec.) or Dentin Conditioner (20 sec.)



Click twice to prime capsule.



Dispense within 10 sec. Pack and contour. from start of mix. Avoid moisture contamination and dry-out.



plunger.

Final finish after 2 min, 30 sec.



activate.





Apply EQUIA Coat. DO NOT



Light cure for 20 sec.



- d) Form the preliminary contour, and cover with a matrix if required.
- e) During the first 2 minutes 30 seconds from start of mix extra care should be taken to avoid moisture contamination or drying-out. In case this cannot be guaranteed, immediately apply EQUIA Coat and light cure (Fig. 8).
- **Note:** 1) To adjust the direction of the nozzle, hold the applier with the capsule towards you and turn the capsule body.
- 2) To remove the used capsule, push the applier release button. Twist the capsule and pull upwards.

4. FINISHING

Finish under water spray using superfine diamond burs after 2 minutes 30 seconds from start of mixing (Fig. 9). Note: When applying EQUIA Coat on the existing EQUIA restorations, roughen the surface to be coated with superfine diamond burs.

5. COATING

- a) Spray preparation dust away with water. Dry by gently blowing with oil free air. Surfaces to be coated should be dry. Do not desiccate.
- b) Dispense a few drops of EQUIA Coat into a disposable dispensing dish. Replace bottle cap immediately after use.
- c) IMMEDIATELY apply (within 1 minute after dispensing) to the surfaces to be coated using a micro-tip applicator. Make sure that a disposable micro-tip applicator is firmly fixed on the applicator holder. Use floss to apply to approximal surfaces. DO NOT AIR BLOW.

Note:

- 1) Non bur cut enamel should be treated with a 35-40% phosphoric acid according to the manufacturer's instructions. Rinse and dry with oil free air.
- 2) Should the coated surface be contaminated with water, blood or saliva prior to light curing, wash and dry the surface and repeat the coating procedure.

6. LIGHT CURING

IMMEDIATELY light cure all coated surfaces with a visible light curing unit (> 500mW/cm2 : Halogen, GC G-Light, LED) for 20 seconds.

Note:

- 1) Place light source as close as possible to the coated surface.
- 2) If surface is tacky or yellowish, repeat light curing.
- 3) Use a protective light shield or similar protective eye wear during light curing.

STORAGE

Store the EQUIA Fil capsules in the original aluminium foil in a cool and dark place (4-25°C) (39.2-77.0°F).

If not in use for a prolonged period of time, store EQUIA Coat in refrigerator, otherwise store at room temperature $(4-25^{\circ}C)(39.2-77.0^{\circ}F)$.

Shelf life of both EQUIA Fil and EQUIA Coat: 2 years from date of manufacture.

SHADES

A1, A2, A3, A3.5, B1, B2, B3, C4

Shade numbers according to Vita® shade guide. Vita® is a registered trademark of Vita Zahnfabrik, Bad Säckingen, Germany.

PACKAGES

- 1. Single shade package : 50 capsules.
- 2. Assortment package : 50 capsules (10 each of A2, A3, A3.5, B1, B3).

Average contents per capsule : 0.40g powder and 0.12g (0.10mL) liquid.

Minimum net volume of mixed cement per capsule : 0.14mL.

3. EQUIA Coat 4mL (1), Disposable Dispensing Dish (20), Micro Tip Applicator (50), Applicator Holder Option : GC CAPSULE APPLIER (1 piece).

CAUTION

- 1. In case of contact with oral tissue or skin, immediately remove with a sponge or cotton pellet. After the restorative treatment is finished, rinse thoroughly with water.
- 2. In case of contact with eyes, flush immediately with water and seek medical attention.
- 3. EQUIA Coat is flammable. Do not use near naked flame. Keep away from sources of ignition. Do not store large quantities in one area. Keep away from direct sunlight.
- 4. EQUIA Coat is volatile. Use in a well ventilated place. Replace cap immediately.
- If the tissue contacted by EQUIA Coat turns white or forms a blister, advise the patient to leave the affected area undisturbed, until the mark disappears, usually in 1-2 weeks. To avoid contact, it is recommended to apply cocoa butter to the area where rubber dam cannot cover.
- 6. Do not use EQUIA Coat in combination with desensitizers and eugenol containing materials as these may hinder EQUIA Coat from setting or bonding properly.
- 7. Avoid inhalation or ingestion of material.
- 8. Avoid getting material on clothing
- 9. Do not mix with other products.
- 10. Instruct the patient not to apply pressure for 1 hour.