

BONDS

BULK!

BURKE



"I am not paid by any company to promote their products"

"Some manufacturers fund research that I carry out"



"I will discuss materials, devices and techniques that I have used, but there may be others that are better"

"I will try to be evidence-based rather than anecdotal in everything that I say"

# First, bonding to enamel



Buonocore MG. A simple method of increasing the adhesion of acrylic filling materials to enamel surfaces. J.Dent.Res.1955:34(6):849-853.



# COMPOSITION OF DENTINE

70% Inorganic

20% Organic

10% Water

Bonding to dentine is therefore  
more difficult

# OBJECTIVE

To narrow the gap  
between bond strength  
to dentine and bond  
strength to enamel

strength to enamel  
to dentine and bond

# Why do dentists need adhesion?

- 👄 Cervical restorations
- 👄 Build up of fractured anterior and posterior teeth
- 👄 Short clinical crown for full or partial coverage restorations
- 👄 Resin retained bridges

If the tubules are  
sealed using a  
Dentine Bonding  
System.....

# **The Hydrodynamic Theory of Dentinal Pain: Sensation in Preparations, Caries, and the Dentinal Crack Syndrome**

**Martin Brännström, DDS, Dr. Odont.**

**The peculiar nature of dentin sensitivity is a source of puzzlement to the dentist. Dentin is a good insulator, but even small temperature changes that do not reach the pulp may cause pain. A series of studies are described that provide evidence that the main cause of dentinal pain is a rapid outward flow of fluid in the dentinal tubules that is initiated by strong capillary forces.**

the cavities was then subjected to negative pressure or desiccation. The teeth were subsequently extracted and prepared for light and electron microscopic examination.

In my first experiment on pairs of human premolars, reduced pressure using a vacuum pump was applied for 20 s and 2 min to cavities randomly selected for testing in one-half of the teeth. No suction was applied to cavities in contralateral control teeth. Pain was elic-

# Maximising class V effectiveness

## The survival of Class V restorations in general dental practice: part 3, five-year survival

D. Stewardson,<sup>1</sup> S. Creanor,<sup>2</sup> P. Thornley,<sup>3</sup> T. Bigg,<sup>4</sup> C. Bromage,<sup>5</sup>  
A. Browne,<sup>6</sup> D. Cottam,<sup>7</sup> D. Dalby,<sup>8</sup> J. Gilmour,<sup>9</sup> J. Horton,<sup>10</sup> E. Roberts,<sup>11</sup>  
L. Westoby<sup>12</sup> and T. Burke<sup>13</sup>

### IN BRIEF

- This study reminds dentists that they are the most important factor determining the survival of Class V restorations.
- Presents evidence that has been collected from a large number of restorations placed in dental practices and is therefore likely to be particularly relevant to general practitioners.
- Identifies a number of factors associated with poor restoration survival which can help dentists improve their patient care.

### RESEARCH

**Objective** To evaluate the survival over five years of Class V restorations placed by UK general practitioners, and to identify factors associated with increased longevity. **Design** Prospective longitudinal cohort multi-centre study. **Setting** UK general dental practices. **Materials and method** Ten general dental practitioners each placed 100 Class V restorations of varying sizes, using a range of materials and recorded selected clinical information at placement and recall visits. After five years the data were analysed using the Kaplan-Meier method, log-rank tests and Cox regressions models to identify significant associations between the time to restoration failure and different clinical factors. **Results** After five years 275/989 restorations had failed (27.8%), with 116 (11.7%) lost to follow-up. Cox regression analysis identified that, in combination, the practitioner, patient age, cavity size, moisture contamination and cavity preparation were found to influence the survival of the restorations. **Conclusions** At least 60.5% of the restorations survived for five years. The time to failure of Class V restorations placed by this group of dentists was reduced in association with the individual practitioner, smaller cavities, glass ionomer restorations, cavities which had not been prepared with a bur, moisture contamination, increasing patient age, cavities confined to dentine and non-carious cavities.

# Maximising class V effectiveness: what is associated with failure at 5 years?

Restorations involving dentine only:  
hazard of failure increased by 39%

Large restorations compared with small:  
hazard of failure increased by 85%

Major or minor moisture contamination:  
hazard of failure increased by 29%

Preparation method/rotary instrument used:  
hazard of failure decreased by 40%



# Maximising class V effectiveness: what material is best at 5 years?

Five year survival

RMGI 78.6%

Amalgam 75%

Compomer 71.2%

Flowable composite 69%

Composite 68.3%

Glass ionomer 50.6%

# Examples of Resin Modified Glass Ionomer (RMGI) filling materials



# Flowable composites are relatively resilient

However, an optimum elasticity of 1 Gpa would be required, which is far below the range available with current materials

# Class V meta analysis: conclusions

“The dentist shall roughen the dentine and enamel surfaces”

“Additional bevelling of enamel can be omitted”

“Isolation with rubber dam is recommended”



# Class V meta analysis: conclusions

“Cervical restorations with GI may have good retention rates, but poor aesthetics”

“2-step self etching systems and 3-step etch&rinse systems perform better than other adhesive systems”





F J Trevor Burke

# Dental Materials: What Goes Where? Class V Restorations

**Abstract:** A large number of Class V restorations are placed per annum to restore cervical lesions. This paper evaluates the pathogenesis of these lesions, with particular reference to the role of occlusal factors, and reviews the literature in order to provide advice on the material(s) which are most likely to produce optimal longevity of a Class V restoration.

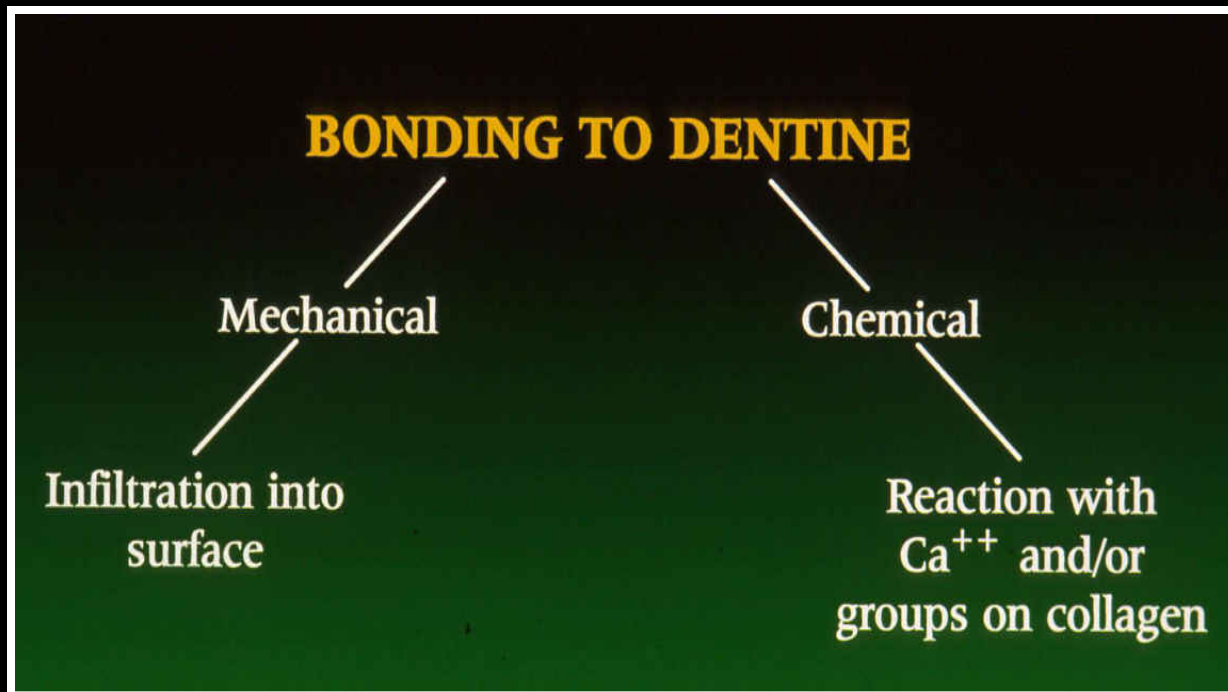
**CPD/Clinical Relevance:** Resin-modified glass ionomer materials appear to provide optimal survival for a Class V restoration, but a (flowable) composite might produce a better aesthetic result.

**Dental Update 2015; 42: 829-839**

# Bonding to dentine

Chemical = Glass ionomer

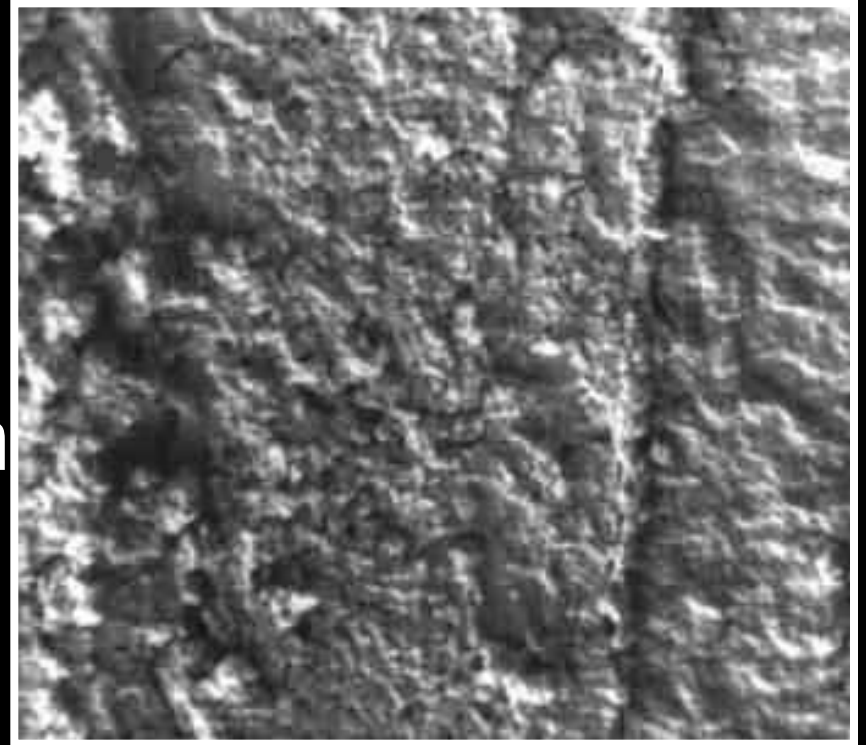
Micromechanical = Dentine bonding systems



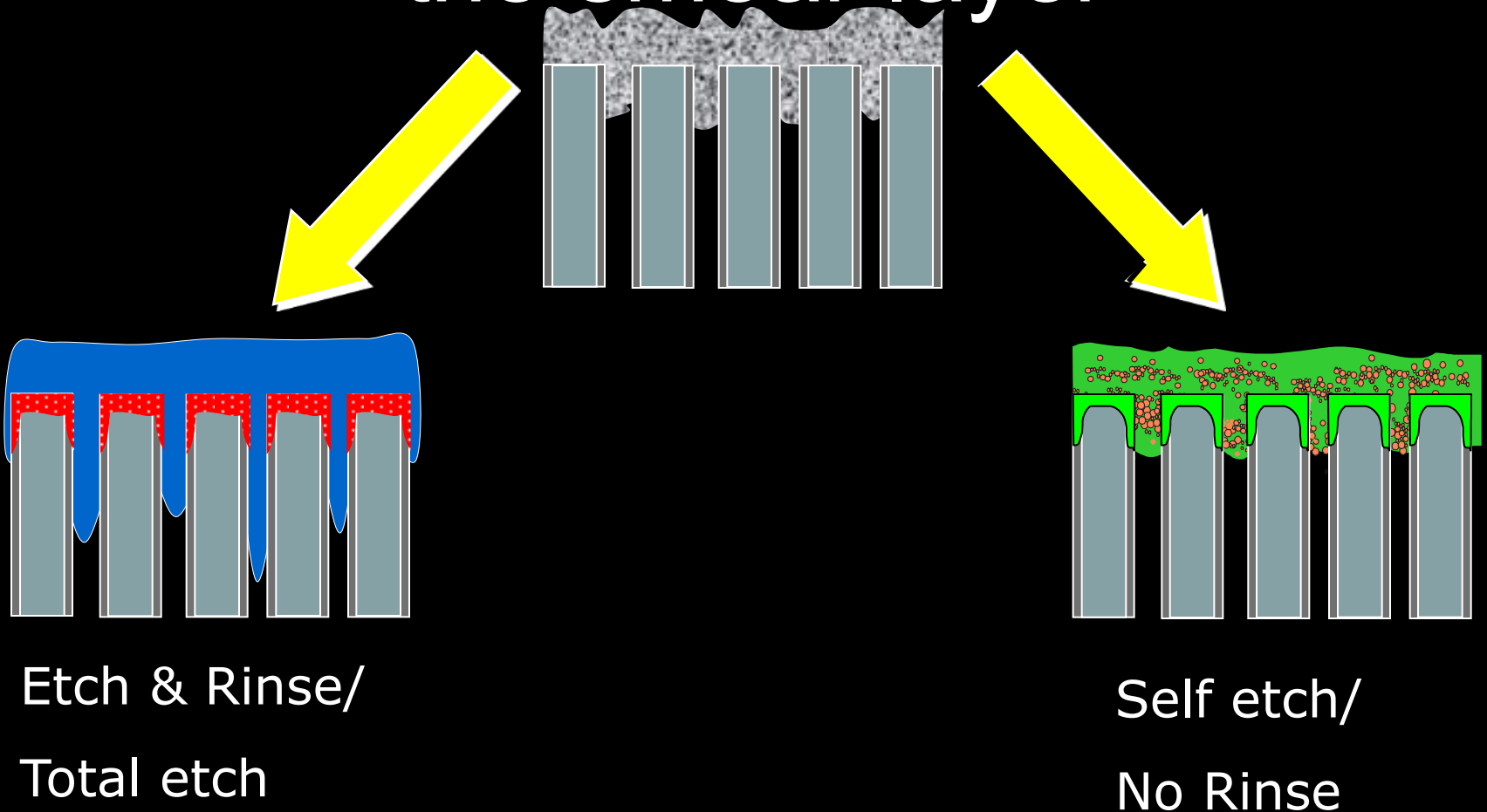


# Smear Layer

- Thickness:  
0.5 - 5.0 microns
- Will not wash off
- Weak bond to tooth  
–2 – 3 MPa
- Very soluble in  
weak acid



# *Previous* strategies to treat the smear layer



The quality of the  
hybridised  
dentine is more  
important than  
the bond  
strength

(T.Nakabayashi, 2003)

# How wet is wet?



Wet

Dry

Moist

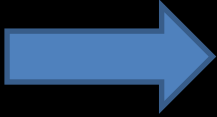

**Important!**

Noosa Beach, Queensland, Australia

# The classification, *until recently*, of dentine bonding systems

**1. Etch and rinse**

**(etch & bond, total etch)**

**2. Self etch**  **One bottle**  
 **Two bottles**

...a landmark paper

# Five-year Clinical Effectiveness of a Two-step Self-etching Adhesive

Marleen Peumans<sup>a</sup>/Jan De Munck<sup>b</sup>/Kirsten Van Landuyt<sup>c</sup>/Paul Lambrechts<sup>a</sup>/  
Bart Van Meerbeek<sup>a</sup>

**Purpose:** The purpose of this prospective randomized controlled clinical study was to evaluate the clinical performance of a "mild" two-step self-etching adhesive, Clearfil SE, in Class V restorations after 5 years of clinical functioning.

**Materials and Methods:** Twenty-nine patients received two or four restorations following two randomly assigned experimental protocols: (1) a mild self-etching adhesive (Clearfil SE, Kuraray) was applied following manufacturer's instructions on both enamel and dentin (C-SE non-etch); (2) similar application of Clearfil SE, but including prior selective acid-etching of the enamel cavity margins with 40% phosphoric acid (C-SE etch). Clearfil AP-X (Kuraray) was used as the restorative composite for all 100 restorations. The clinical effectiveness was recorded in terms of retention, marginal integrity, marginal discoloration, caries recurrence, postoperative sensitivity, and preservation of tooth vitality after 5 years of clinical service. The hypothesis tested was that selective acid etching of enamel with phosphoric acid improved retention, marginal integrity, and clinical microleakage of Class V restorations.

**Results:** Only one restoration of the C-SE non-etch group was lost at the 5-year recall. All other restorations were clinically acceptable. Marginal integrity deteriorated with time in both groups. The number of restorations with defect-free margins was significantly lower in the C-SE non-etch group ( $p = 0.0043$ ). This latter group presented significantly more small incisal marginal defects on the enamel side ( $p = 0.0169$ ). Superficial marginal discoloration increased in both groups, but was more pronounced in the C-SE non-etch group and was related to the higher frequency of small incisal marginal defects.

**Conclusion:** The clinical effectiveness of the two-step self-etching adhesive Clearfil SE remained excellent after 5 years of clinical service. Additional etching of the enamel cavity margins resulted in an improved marginal adaptation on the enamel side; however, this was not critical for the overall clinical performance of the restorations.

**Keywords:** adhesives, clinical trial, cervical lesions, composite restoration.





## CONCLUSION

From the results of this study, we may conclude that intra-orally, Clearfil SE performs reliably and stably after 5 years of clinical functioning. Selective enamel etching with phosphoric acid resulted in an improved marginal adaptation, but has no influence on the overall clinical performance of the Class V restorations.






... the new approach  
is therefore....  
selective enamel  
etching

# Treatment of the smear layer

- 👄 REMOVE (Etch & Rinse/Total etch)
- 👄 LEAVE/PENETRATE (Self etch)
- 👄 UNIVERSAL MATERIALS (Etch & Rinse, Selective enamel etch, Self etch) (use for direct and indirect)

**NEW!!**

# Scotchbond Universal Adhesive

-  Works with both Total- and Self-Etch technique, therefore high flexibility in clinical procedures
-  Provides procedural simplicity
-  Total-etch or Selective-enamel etch for highest enamel bond strength, e.g. incisal edges
-  Self-etch for low post-op sensitivity
-  Fast technique where isolation is difficult, or with non-co-operating patients

# Scotchbond Universal Adhesive: Composition

- BisGMA
- MDP
- Vitrebond Copolymer
- HEMA
- Ethanol
- Water
- Filler
- Silane
- Initiators



# SUGGESTION

For Scotchbond Universal, the  
concept of  
selective enamel etching should  
be employed



# Product Research and Evaluation by Practitioners

2013:  
A handling  
evaluation  
by the PREP  
Panel





# Scotchbond Universal Adhesive: new vial design

- flip cap for opening and closing
- new nozzle design for improved dispensing and cleanliness



# Handling evaluation of 3M ESPE Scotchbond Universal by the PREP Panel

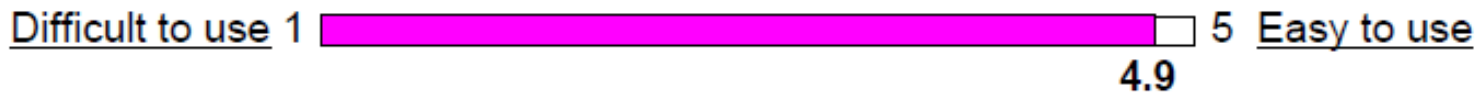
- 👉 12 evaluators
- 👉 Variety of bonding agents used pre-study
- 👉 875 restorations placed (Class 1:172, Class II:189, Class III:134, Class IV:178, Class V:182, Other:20)  
Also used for dentinal hypersensitivity, repair of fractured porcelain, bonding of posts.
- 👉 Rated material on visual analogue scales
- 👉 75% of evaluators would be prepared to pay extra for the convenience of single-unit doses
- 👉 All stated that the resin liquid easily wet the tooth surface, that the bond was easily visible. Some commented that it was “too yellow”

# Handling evaluation of 3M ESPE Scotchbond Universal by the PREP Panel

## Ease of use of previous bonding agent

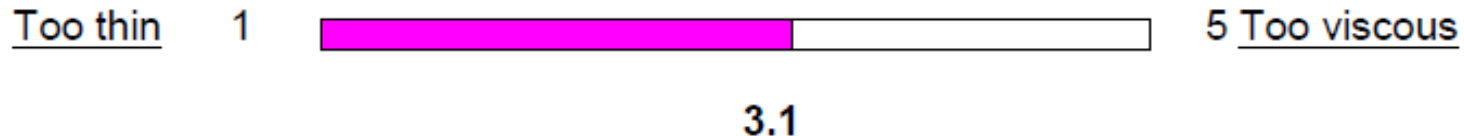


## Ease of use of Scotchbond Universal



## Viscosity of Scotchbond Universal

The viscosity of the bonding liquid was rated by the evaluators as follows:



# Handling evaluation of Scotchbond Universal by the **PREP** Panel: Comments

📖 “Disconcertingly yellow – but  
OK when thinned or light cured”

📖 “Spreads well when air applied”

📖 “Supposedly the lid can be  
opened one-handed but it is  
sometimes a problem”


📖 “First material that compares  
with G-Bond”


**SBU *is* yellow, to start with!**

Camphorquinone photoinitiator: bright yellow colour, bleaches upon irradiation

**There is an excess of CQ, just in case your curing light is less than ideal!**

# Handling evaluation of Scotchbond Universal by the **PREP** Panel: Comments

 All the evaluators stated that they would purchase if available at average price.

 “Extremely useful to have a material that bonds both to indirect restorations as well as the tooth structure. No need for multiple kits of materials. So far has worked well.”

# Reported Performance: Battle of the Bonds

1. Ciucchi B, Bouillaguet S, Holz J, Roh S: **“The Battle of the Bonds 1995”**, Schweiz Monatsschr Zahnmed 107: (1997) 32-39
2. Ciucchi B, Bouillaguet S, Meyer JM, Ciucchi Ph: **“The Battle of the Bonds 2000-2001”**, Rev Odont Stomatol 31: 163-175, 2002
3. Degrange M, Hitmi L, Bouter D, Conthier S, Basset F, Blijaoui J: **“Efficacy of new enamel-dentin bonding systems: assessment by general practitioners”** In: Wilson NHF, Roulet JF, Fuzzi M editors, Advances in operative dentistry. Quintessence Publishing: 2001, p.173-84
4. Bouillaguet S, Degrange M, Cattani M, Godin Ch, Meyer JM: **“Bonding to dentin achieved by general practioners”**, Schweiz Monatsschr Zahnmed 112: 1006-1011, 2002
5. Degrange M, Lapostolle B: **„L’expérience des batailles des adhésifs“**, L’Information Dentaire 2007, 89:112-8
6. Rumphorst A, Richter I, Bock A, Wieland M, Thalacker C: **„Bond Strengths Obtained by General Practitioners with a Portable Device“**, IADR 2011, #3049



*“A good correlation was found between the annual failure rates reported in the systematic review of Peumans et al. and the “Battle of the Bonds” shear-bond strength data from Degrange et al.”*

# 'Own-Label' Versus Branded Commercial Dental Resin Composite Materials: Mechanical And Physical Property Comparisons

## ABSTRACT

A majority of dental materials are manufactured by companies who have experience in the field. However, a number of 'own label' materials have become available, principally marketed by distributors and other companies with little or no experience in the field. These materials are attractive because of their reduced cost, but they may have no research on which clinicians might base their potential performance. It is therefore the purpose of this work to compare the performance of different batches of a number of 'own-label' dental materials with a similar number from manufacturers with experience in the field, using a variety of laboratory test regimes which include filler distribution, degree of conversion, flexural strength and flexural modulus, in order to evaluate key material properties. The results indicated that 'own-label' dental resin composites produced similar results to materials from established companies in terms of flexural strength, dynamic filler and degree of

### Keywords

Filler  
Degree of Conversion  
Own Label  
Private Label  
Resin Composite  
Flexural Modulus

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However, greater batch to batch variation in several mechanical & physical properties of the own-label materials was noted

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to improve reliability, durability and clinical longevity and their associated properties such as polymerisation shrinkage stress,<sup>28</sup> polymer conver-



# What's in Clearfil Universal?

10-MDP

Bis-GMA

2-HEMA

Hydrophilic aliphatic dimethacrylate

Colloidal silica

Silane coupling agent

Di-Camphorquinone

Ethanol

Water

# Futurabond U

Liquid 1:

BisGMA, HDDMA, UDMA, HEMA,  
fumed silica, CQ, 10 MDP

Liquid 2:

Ethanol, water, catalyst

pH.....2.3

## All-Bond Universal

- 10-MDP
- Phosphate monomer
- HEMA
- BisGMA
- Ethanol

pH 3.1

# What's in G-Premio Bond?

4-META

10-MDP

10-Methacroyldecyl  
dihydrogen thiophosphate  
Methacrylate ester

Acetone

Distilled water

Photoinitiators

Silica fine powder

# Adhese Universal (Ivoclar-Vivadent)

Monomer Name	Type	Purpose
<b>MDP</b> Methacryloyloxydecyl dihydrogen phosphate	Phosphoric acid methacrylate	Forms strong bond to hydroxyapatite surfaces. Promotes adhesion to tooth surface by formation of non-soluble $\text{Ca}^{2+}$ salts.
<b>MCAP</b>	Methacrylated carboxylic acid polymer	Carboxylic acid functional polymer reacts with and bonds to hydroxyapatite. The presence of many carboxylic acid groups along a polymeric backbone/chain allows multiple bonds to the tooth surface.
<b>HEMA</b> Hydroxyethyl methacrylate	Hydrophilic mono- functional methacrylate	Promotes wetting of polar / inorganic and moist surfaces. Assists penetration of liquid filled dentinal tubuli.
<b>Bis-GMA</b> Bisphenol A glycidyl methacrylate	Hydrophilic / hydrophobic crosslinking dimethacrylate	Facilitates compatibility of hydrophilic HEMA and hydrophobic D3MA in the presence of water, thereby preventing phase separation of adhesive. Imparts high mechanical strength and resilience to adhesive layer.
<b>D3MA</b> Decandiol dimethacrylate	Hydrophobic crosslinking dimethacrylate	Enables the reaction of the adhesive with the less polar monomers of the filling or luting composite.

# What's in Coltame 7 Universal?

10-MDP

Methacrylated polyacid

2-HEMA

Urethane dimethacrylate

Photoinitiators

Ethanol

Water

No silane: does that matter?

## Structure of Adhesive monomer MDP



*Polymerizable group*

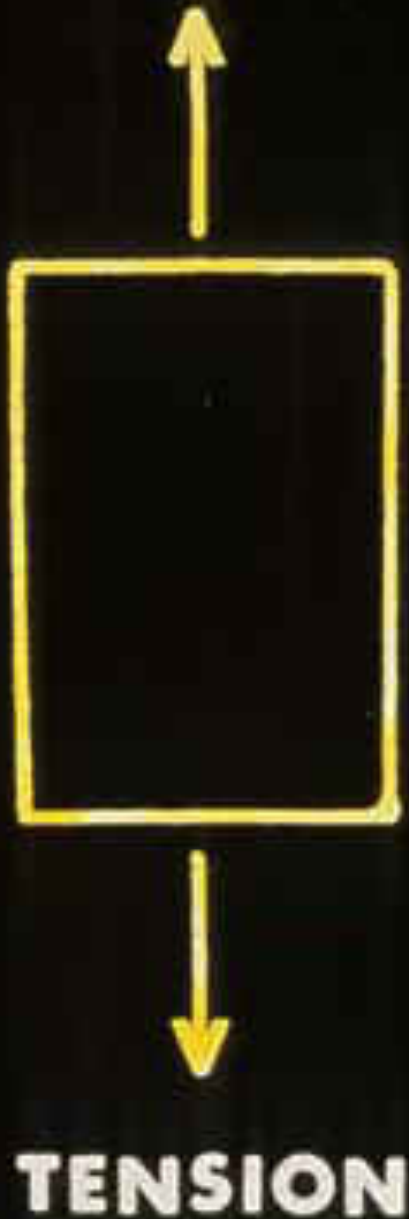
*Hydrophobic group*

*Hydrophilic group*

*Forming the chemical bond  
with calcium and hydroxy apatite*



10-MDP is  
important  
for the  
status of  
the bond  
reaction  
with HAP



Effects of moisture degree  
and rubbing action on the  
immediate resin-dentin bond strength  
Dal-Bianco K, Pellizzaro A, et al.  
Dent.Mater.2006

**Conclusion:**

High bond strength to dentine can  
be obtained under dry conditions  
when ethanol/H<sub>2</sub>O and acetone based  
systems are vigorously rubbed on  
the dentine surface. On wet surfaces,  
light rubbing may suffice.



# October 2015: The first clinical trial on Scotchbond Universal

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## Two-year clinical trial of a universal adhesive in total-etch and self-etch mode in non-carious cervical lesions<sup>☆</sup>



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☆ This article is part of the Special Issue entitled 'New Materials for Dental Adhesives'.

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Keywords: Universal adhesive; Cervical lesions; Clinical trial; Bond strength; Durability.

# October 2015: The first clinical trial on Scotchbond Universal

## CONCLUSIONS

Scotchbond Universal in total etch or self etch modes performed similar to or better than Scotchbond Multipurpose

But, more post-op sensitivity in total etch group

So, why bother to etch dentine when using Scotchbond Universal?

# SUMMARY: Universal bonding agents:

Can be used in total etch, self etch,  
selective enamel etch modes

# SUMMARY: Universal bonding agents:

Can be used in total etch, self etch, selective enamel etch modes

Are compatible with direct & indirect procedures

Can be used with self & dual cure luting materials (with separate activator)

Are suitable primers for silica & zirconia

Can bond to different substrates

# Avoiding post-op sensitivity when using dentine bonding agents

Use a so-called self etch or Universal material

Do not etch the dentine when using these materials

# MMPs

- ➡ Demineralised dentine contains these
- ➡ Require calcium to maintain their structure
- ➡ Need zinc ions for their catalytic activity

# Suggestions for inactivation of MMPs



EDTA



Glutaraldehyde



Carbodiimide



Chlorhexidine

Trevor's view:  
At present, this  
is a theoretical  
concept

# Regarding MMPs

The way to obviate problems is to protect the collagen by thorough resin infiltration



# Rules for bonding

**Do not overdry the surface**

**Etch according to manufacturers' instructions**

**Try to avoid etching the dentine.**

**Do not overblow resin layer**

**Rub in the adhesive**

# Avoiding adhesive failures

Use a material from a manufacturer with experience in the field






Follow the instructions!!

One bottle bonding (reduced risk of error)

Effective light curing (check your light regularly!)

Think seriously about selective enamel etching

# Benefits of lab testing

-  Speed by which data are gathered
-  The relative ease of test methodology
-  Possibility to measure one specific parameter, while keeping others constant
-  Ability to test many experimental groups simultaneously
-  May use unsophisticated and inexpensive protocols and/or instruments

# Long term survival of fragment bonding in the treatment of fractured crowns

Andreasen FM, Noren JG, Andreasen JO,  
Englehardsen S. et al.,  
Quintessence Int.1995;26:669-681

# **...reattachment of the coronal fragment is a realistic alternative**

**(Andreasen et al)**

- **Good fragment retention, acceptable aesthetics**
- **Use of a dentine bonding agent with acid etching provides greater strength**
- **Fragment loss was usually due to a second blow**
- **Not a successful means of managing crown-root fractures**

**Approx 25% of 334 rebonded fragments were retained at 7 years after bonding**

# The concept of pragmatic aesthetics

Burke FJT, Kelleher MGD, Wilson NA, Bishop K. Introducing the Concept of Pragmatic Esthetics, with Special Reference to the Treatment of Tooth Wear, Journal of Esthetic and Restorative Dentistry.2011;23:277–293.

# Take home messages

Dentine bonding is now reliable and effective

Self etch adhesives do not produce bond strengths as high as etch & rinse systems

Selective etching of enamel is a good idea

Universal bonding materials with MDP are now the business

# Take home message

Bonding restorations  
is more minimally invasive,  
and,  
potentially therefore less  
likely to have a bad  
medicolegal outcome



But, others are still adopting an invasive approach (and being sued!)

## Reasons to adopt minimal intervention

- 👄 Patients like it (if you advise them of your philosophy)
- 👄 Teeth like it (fewer die!)
- 👄 It's easier for dentists (fewer die: better for their blood pressure!)
- 👄 Lawyers hate it (fewer dentists get sued!)
- 👄 We now have materials to make this work

# BULK!

These need a topping because their wear resistance isn't good enough



Filtek™  
Bulk Fill  
Flowable Restorative



SDR™  
Smart Dentin Replacement

# Diplomatic Conference for the Minamata Convention on Mercury

Annex A, Part II; Measures to be taken to phase down the use of dental amalgam

- ☠ Set national objectives for caries prevention
- ☠ Set national objectives aimed at minimising the use of amalgam
- ☠ Promote use of cost-effective and clinically effective Hg-free alternatives
- ☠ Promote R&D into quality Hg-free materials

# Diplomatic Conference for the Minamata Convention on Mercury

Annex A, Part II; Measures to be taken to phase down the use of dental amalgam

- ☠ Encourage professional organisations and dental schools to train dental professionals and students in the use of Hg-free alternatives
- ☠ Discourage insurance programmes that favour dental amalgam use, and encourage insurance programmes that favour use of alternatives
- ☠ Restrict use of amalgam to capsulated form
- ☠ Promote best environmental practices in dental facilities to reduce releases of Hg

NORWAY did it!

1991, Directorate to reduce **amalgam use**

**2003, National clinical guidelines** - encouragement to reduce amalgam use. Amalgam no longer the material of choice for posterior teeth, informed consent needed from the patient if amalgam used

2007, Restrictions on mercury vapour emissions from crematoria

2008, Partial ban on amalgam use

2011, Complete ban, although dentists can apply for exemptions

Lynch CD, Wilson NHF. Br.Dent.J.2013;215:159-162

# AMALGAM

**Environmental concerns.....YES**

**Toxicity issues..... NO**

No toxicity issues for patients:  
?? for dentists??

Slide made in 1996

# Do amalgam substitutes exist?

Indirect

Cast alloys

Ceramics

Resin-based materials

All of these are more than X4  
as expensive as amalgam

# Do amalgam substitutes exist?

## Direct

Compacted gold

Gallium alloys

Resin-based composite

Galloy bit the dust 10 years ago



# Do amalgam substitutes exist?

Direct – small cavities

Resin composite

Glass ionomer

Does GI require more  
development for this indication?

# Reinforced Glass ionomer materials

- ✎ Smaller particle size leads to faster reaction
- ✎ Higher loading brings improved physical properties
- ✎ Exhibits plastic features – can be condensed and packed
- ✎ Still a need for improved wear resistance
- ✎ Typical glass ionomer features

# Clinical performance of reinforced GLC materials in loadbearing situations



FJ Trevor Burke

# Dental Materials- What Goes Where? The Current Status of Glass Ionomer as a Material for Loadbearing Restorations in Posterior Teeth

**Abstract:** Glass ionomer materials have been available for 40 years, but have not been indicated for loadbearing restorations, other than when used in the ART concept. However, there is anecdotal evidence that dentists are using the reinforced versions of this material in posterior teeth, possibly as a result of demands from patients to provide them with tooth-coloured restorations in posterior teeth at a lower cost than resin composite. This paper reviews the existing literature on reinforced glass ionomer restorations in posterior teeth, concluding that, under certain circumstances (which are not fully elucidated) these materials may provide reasonable service. However, the patient receiving such restorations should be made aware of the minimal amount of evidence for the success of these restorations and the potential need for the restorations to be re-surfaced in due course.

8 papers on GI in posterior teeth included

# Conclusions

In clinical situations where there are no adverse situations at work (such as high occlusal loading or an acidogenic plaque), certain restorations in reinforced GI materials (such as Fuji IX) may provide reasonable longevity.

However, the conditions for longevity are not readily identified.

Two of the studies (Scholtanus and Huysmans, 2007; Basso, 2013) demonstrate higher than desirable failure rates for GI restorations in posterior teeth, especially in the longer term.

# Trevor's view

Until more high quality evidence becomes available, for practitioners using reinforced GI materials in loadbearing situations in posterior teeth, it is prudent to advise patients of the relative paucity of good quality evidence for the success of the restorations that they are placing.

# Do amalgam substitutes exist?

Are reinforced glass ionomers an alternative?

Not really, because their wear resistance isn't good enough and they are soluble in dilute organic acids

# GC EQUIA doing well at 4 years

*Operative Dentistry, 2015, 40-2, 134-143*

## Four-year Randomized Clinical Trial to Evaluate the Clinical Performance of a Glass Ionomer Restorative System

S Gurgan • ZB Kutuk • E Ergin  
SS Oztas • FY Cakir

### Clinical Relevance

The clinical effectiveness of Equia and Gradia Direct Posterior was acceptable in Class 1 and Class 2 cavities subsequent to four-year evaluation.

### SUMMARY

**Objective:** The aim of this study was to evaluate the clinical performance of a glass ionomer restorative system compared with a microfilled hybrid posterior composite in a four-year randomized clinical trial.

**Methods:** A total of 140 (80 Class 1 and 60 Class 2) lesions in 59 patients were either restored with a glass ionomer restorative system

(Equia, GC, Tokyo, Japan), which was a combination of a packable glass ionomer (Equia Fil, GC) and a self-adhesive nanofilled coating (Equia Coat, GC), or with a microfilled hybrid composite (Gradia Direct Posterior, GC) in combination with a self-etch adhesive (G-Bond, GC) by two experienced operators according to the manufacturer's instructions. Two independent examiners evaluated the restorations at baseline and at one, two, three, and four years postrestoration according to



# GIs in posterior teeth – a medicolegal perspective

- 💋 Tell the patient that it *is* a glass ionomer that the evidence base is variable and limited
- 💋 Definitive restoration or long term provisional?
- 💋 The restorations may need re-surfacing with composite
- 💋 Alternatives are more expensive
- 💋 May not do harm

Possibly OK in class I cavities?

But, reinforced glass ionomers are a Godsend to special care dentists

# What does F stand for in dental materials?

## The "F" word

### Glass-ionomer Restoratives: A Systematic Review of a Secondary Caries Treatment Effect

R.C. Randall\* and N.H.F. Wilson

Restorative Dentistry, Manchester University Turner Dental School, Higher Cambridge Street, Manchester, M13 9PL  
\*corresponding author

**Abstract.** It is generally accepted that glass ionomers inhibit secondary caries *in vivo*, and data from *in vitro* studies support this effect. The aim of this review was a systematic assessment, from the literature, of clinical evidence for the ability of glass-ionomer restoratives to inhibit secondary caries at the restoration margin. Inclusion and exclusion criteria for selection of the review papers were established prior to commencement of the literature search. Papers which conformed to these criteria, and reported on secondary caries as an outcome, were selected (N = 52). Primary and secondary lists of systematic criteria for use in

#### Introduction

There is increasing interest in evidence-based dentistry (Antczak-Bouckoms *et al.* Lawrence, 1995), echoing similar trends in other professions. The intention of this approach is to provide patients with the best possible outcome for patients on a combined use of clinical expertise (S. application of treatments for which effectiveness is judged to have been

Fraud  
Fiction  
Fudge  
False  
Fools  
F all  
Fairies

## The F-word

Fluoride /S released  
by glass ionomers  
but its effect is small.

Fluoride released by  
-containing composites is  
negligible

28 papers included

No conclusive evidence for or against inhibition  
of secondary caries by glass ionomer  
restoratives

Polymerisation contraction

A longstanding  
problem with resin  
composite –  
polymerisation  
contraction *STRESS*

shrinkage **STRESS** is  
the problem

**Stress** is a function of materials  
factors such as:

Polymerisation shrinkage

Modulus of elasticity/filler load

Degree of conversion

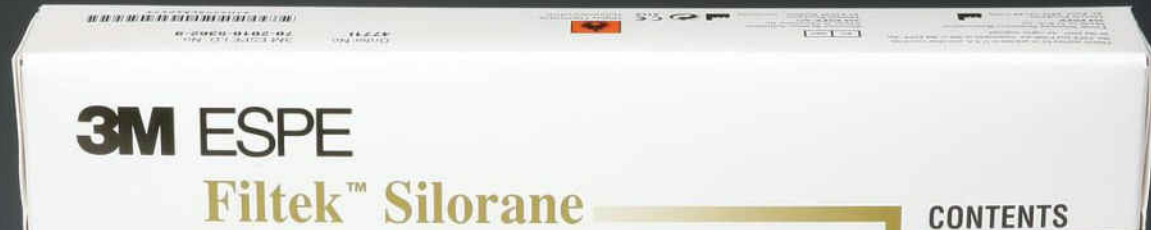
# Reducing polymerisation contraction stress

Five ways:

1. Increase the filler loading
2. Reduce resin shrinkage
3. Reduce % resin conversion
4. Bulk fill low stress material
5. Use a high molecular wt. resin

A low shrink material  
seems to be the obvious  
answer

# The Filtek™ Silorane System



The first composite to achieve 1% shrinkage







Weinmann W, Thalacker C, Guggenberger R. Siloranes in dental composites. Dent.Mater. 2005;21:68-74



# Class I & II restorations in a low shrinkage stress

Work by the Practice-based  
research group, The PREP Panel

# Methods

-  Ethical approval obtained
-  Five UK dental practitioners
-  Each practice recruited sufficient patients to provide a minimum of 20 class I or II restorations per centre.
-  Restorations assessed using modified USPHS criteria by an independent examiner along with the practitioner who placed the restorations

3M ESPE Filtek Silorane Criteria for restoration evaluation (\*=unacceptable)  
Modified from Ryge G, Cvar JF (1971) US Government Printing Office Publication.  
7902244

### Anatomic form

- A: Restoration is continuous with existing anatomic form, not under contoured.
- B: Restoration is under contoured but no dentine or base exposed.
- C\*: Sufficient restorative material is missing so that dentine or base is exposed.

### Margin integrity

- A: No visible evidence of a crevice along the margin into which a probe will catch.
- B: Probe catches in a crevice along the margin, no exposure of dentine or base.
- C\*: Visible evidence of a crevice with exposure of dentine or base along the margin

### Margin discolouration

- A: No discolouration evident at margin.
- B: Slight staining at margin
- C\*: Obvious staining, cannot be polished away.

### Colour match

- A: Restoration matches adjacent tooth structure in colour and translucency
- B: Mismatch in colour and translucency but within an acceptable range.
- C\*: Mismatch in colour and translucency outside acceptable range.

### Surface roughness

- A: Smooth surface with no irritation of adjacent tissues.
- B: Dull, matte surface, can be refinished.
- C\*: Shallow surface pitting is present. Rough, cannot be polished

# Results

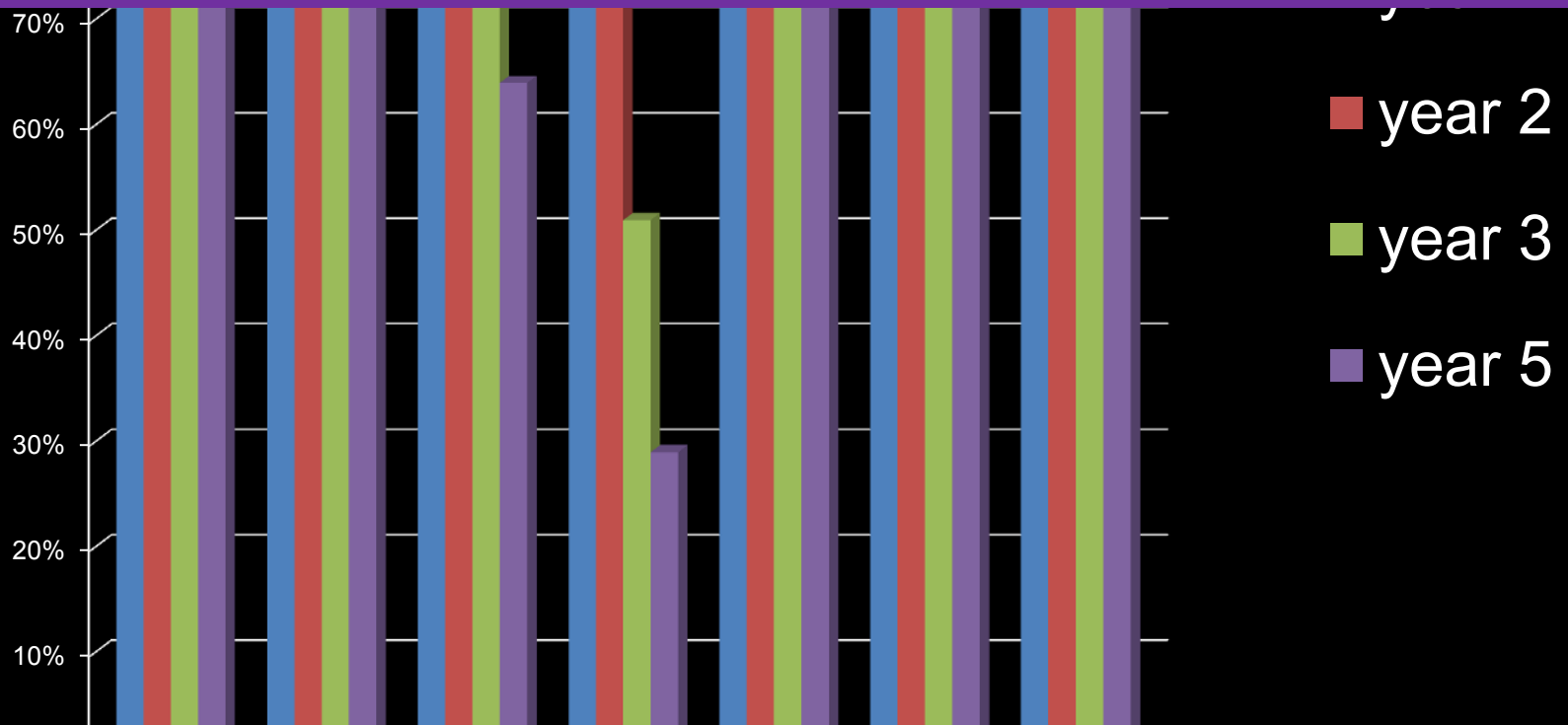
- 127 restorations originally placed in 72 patients
- 8 restorations lost to the trial
- 70 restorations (recall rate 59%) of mean age 62 months (range 54 – 68 months) in 45 patients (28 female and 17 male) of mean age 53 years examined. The 70 restorations composed of 17 Class I and 53 Class II restorations

34% (n= 24) of the restorations involved the replacement of one or more cusps

# Summary: Silorane at 5 years



Other message: almost zero post-op sensitivity



Main message = selective enamel etching

# Selective enamel etching



# Why no post-op sensitivity?

Reported post-op sensitivity in evaluations of “conventional” posterior composite:

- Burrow and colleagues<sup>2</sup> - 4% of restorations exhibited sensitivity in daily function
- Zero post-operative sensitivity reported by Opdam and co-workers<sup>3</sup>, although 19% of the teeth were sensitive to loading.
- Other studies reported 10% to 20% incidence of post-operative sensitivity at one week and one month recalls<sup>4,5</sup>
- Auschill and colleagues reported 6% overall post-operative sensitivity in a study of 600 teeth restored with resin composite with cavity depth being significantly associated with the occurrence of post-operative sensitivity<sup>6</sup>

**No post-operative sensitivity because of its low shrinkage stress**

4..Akpata ES, Sadiq W. Post-operative sensitivity in glass-ionomer versus adhesive resin-lined posterior composites. Am.J.Dent.2001;14:34-38.

5..Akpata ES, Behbehani J. Effect of bonding systems on post-operative sensitivity from posterior composites. Am.J.Dent.2006;19:151-154.

6.Auschill TM, Koch CA, Wolkewitz M, Hellwig E, Arweiler NB. Occurrence and causing stimuli of postoperative sensitivity in composite restorations. Oper. Dent.2009;34:3-10.

# Perceived difficulties with Silorane

Needed its own dedicated 2-stage adhesive

Only 2.5mm depth of cure

Large filler particles

Aesthetics suboptimal, other than A2

Difficult manufacturing process



# Novel Stress Relieving Monomer System

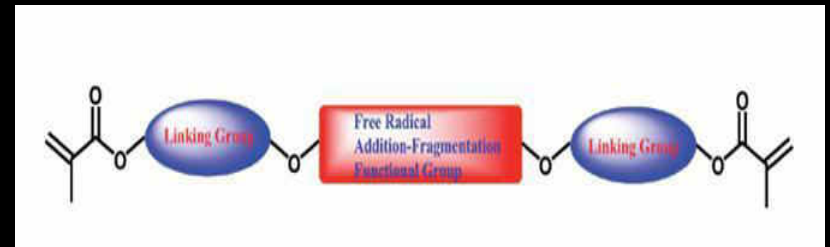
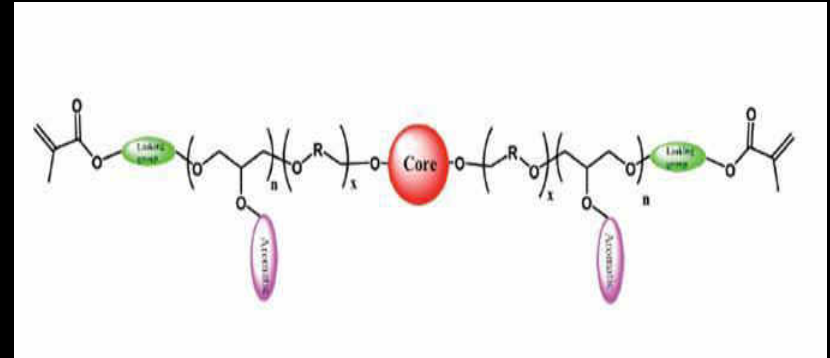
## AUDMA

High molecular weight dimethacrylate— acts to lower volumetric shrinkage

## AFM

Addition-fragmentation (AF) monomer

- Reacts into developing polymer network through terminal methacrylate bonds like other dimethacrylate monomers
- Central AF group can fragment and release stress
- Fragment may then polymerize into network in a lower stress orientation compared to its pre-fragmented state.



# Filtek Bulk Fill Posterior Restorative: Advantages over Silorane

- One-step placement
- 5 mm depth of cure
- Can use dentine bonding agent of choice
- Therefore, faster than Silorane Bond
- Easier polishing due to nanofiller
- Potentially better aesthetics

***BUT***

- Still excellent stress relief
- Still excellent handling and sculptability

# 3MESPE Filtek Bulk Fill shows low shrinkage stress

Palin W, Watts D 2014

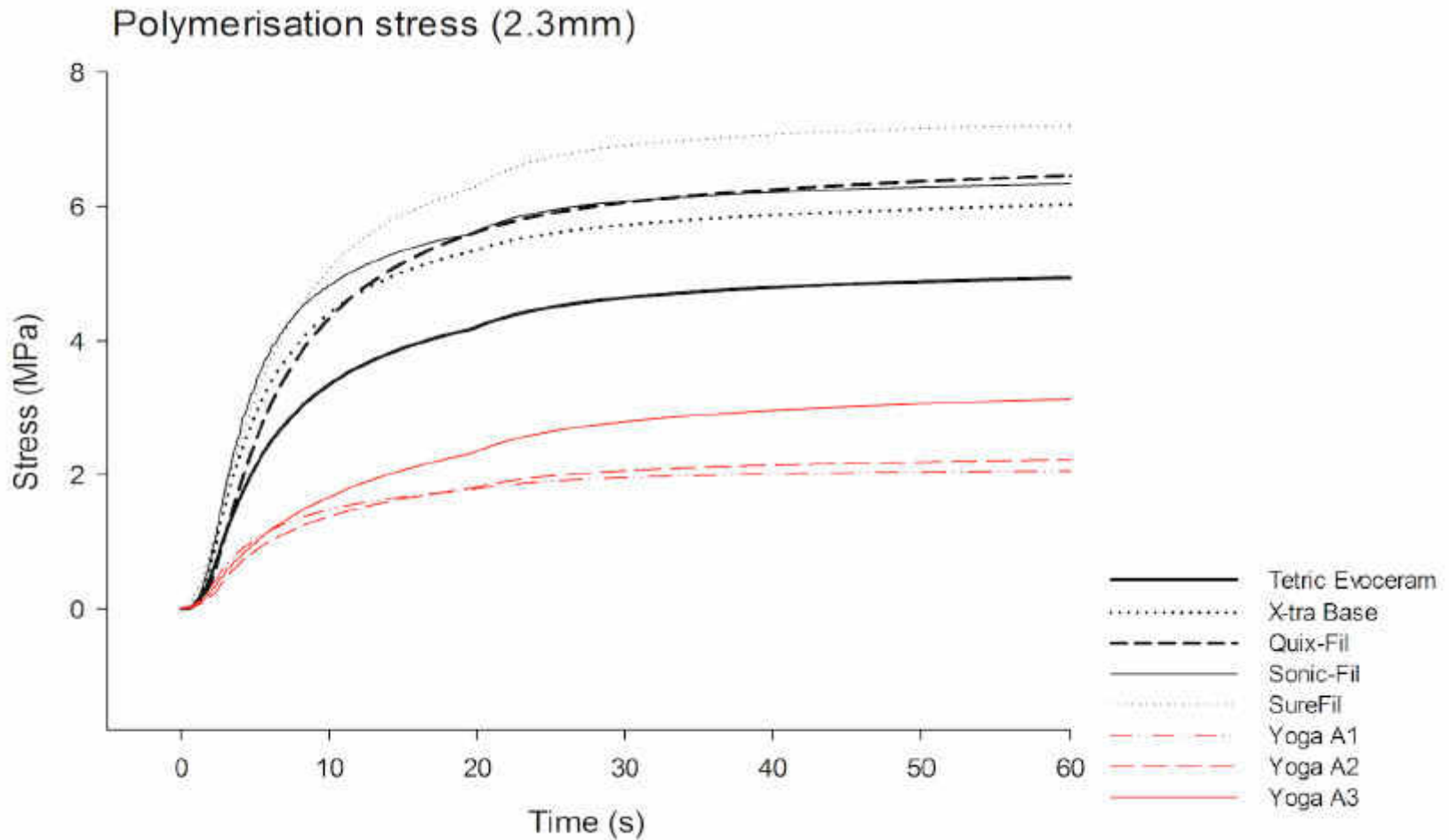


Figure 2c: Polymerisation stress at 2.3mm thickness (approx. 0.40 g)

# Filtek™ One Bulk Fill Restorative

More later!



Filtek™ One: resin the same as Filtek Bulk Fill Restorative, slight change in the filler

Posterior  
composites take  
2.5 times  
longer to place  
than amalgam

Is bulk fill the answer?

# BULK FILL IS IN!

The new classification for **BULK FILL** materials:

**BULK FILL BASE MATERIALS**

(which need a capping because their wear resistance isn't good enough)

**BULK FILL RESTORATIVE MATERIALS**

(satisfactory wear resistance)

First bulk fill materials needed a topping because their wear resistance wasn't good enough



**Filtek™**  
**Bulk Fill**  
Flowable Restorative

Flowable Restorative

BULK FILL

FILTEK™



# Cusp deflection in Dublin

JOURNAL OF DENTISTRY 40 (2012) 500–505



Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

SciVerse ScienceDirect

journal homepage: [www.intl.elsevierhealth.com/journals/jden](http://www.intl.elsevierhealth.com/journals/jden)



## Cuspal deflection and microleakage in premolar teeth restored with bulk-fill flowable resin-based composite base materials

A. Moorthy<sup>a</sup>, C.H. Hogg<sup>a</sup>, A.H. Dowling<sup>a</sup>, B.F. Grufferty<sup>b</sup>, A.R. Benetti<sup>c</sup>, G.J.P. Fleming<sup>a,\*</sup>

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<sup>c</sup> Department of Dental Materials, School of Dentistry, University of Copenhagen, Denmark

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Gingival microleakage

Resin-based composite

Bulk-fill flowable bases

### ABSTRACT

**Objectives:** To assess the cuspal deflection and cervical microleakage of standardised Class II cavities incrementally filled with a dimethacrylate RBC or bulk-fill flowable RBC bases.

**Methods:** Twenty-four sound upper premolar teeth with Class II cavities were allocated to three groups ( $n = 8$ ). Restoration of the teeth involved the placement of an RBC (GrandioSO) in eight oblique increments (Group A) or Groups B and C were restored to within 2 mm of the palatal cusp in a single increment with bulk-fill flowable RBC bases (SDR and x-tra base) before the two occlusal cavity increments were placed with GrandioSO. Buccal and palatal cusp deflections were recorded postirradiation using a twin channel deflection measuring gauge. Following restoration, the teeth were thermocycled, immersed in 0.2% basic fuchsin dye for 24 h, sectioned and examined for cervical microleakage.

**Results:** The mean total cuspal deflection for the oblique incremental restoration technique was 11.26 (2.56)  $\mu\text{m}$  (Group A) and 4.63 (1.19)  $\mu\text{m}$  (Group B) and 4.73 (0.99)  $\mu\text{m}$  (Group C) for the bulk-fill flowable RBC bases. A significant increase in the mean total cuspal deflection for the incrementally filled GrandioSO compared with the SDR ( $P = 0.007$ ) and x-tra base ( $P = 0.005$ ) restored teeth was evident. No significant difference in the cervical microleakage scores was recorded between groups AC ( $P > 0.05$ ).

**Conclusions:** The bulk-fill flowable RBC bases significantly reduced cuspal deflection compared with a conventional RBC restored in an oblique incremental filling technique with no associated change in cervical microleakage recorded.



# Cusp deflection experiments

Cusp deflection, microns

Grandoso 11.26+/-2.56

SDR 4.53+/-1.59

Xtra-Base 4.73+/-0.99

# Cusp deflection in Dublin

---

## 5. Conclusion

The current study showed that the bulk-fill flowable RBC bases investigated (SDR and x-tra base) significantly reduced cuspal deflection during light irradiation compared with a conventional RBC (GrandioSO) restored in an oblique incremental filling technique with no associated change in cervical microleakage recorded.

**SDR caused less cusp movement  
because it contains a stress modulator**

# SDR: Clinical evidence at last!



104 restorations available at 3 year recall  
Two failures in the composite only group  
observed in the first year (1.3% per annum)

No failures in the SDR group  
Conclusion: Bulk fill –highly acceptable clinical  
results

# Bulk Fill Flowables provide:

- Potentially faster restorations in back teeth
- Fewer steps than incrementally placed composites, therefore, potentially easier restorations
- Potentially fewer voids

***But,*** their wear resistance wasn't good enough, their compressive strength was poor and they were very translucent!!

**The bulk fill base materials  
are now history!**

# BULK FILL IS IN!

The **NEW** classification for **BULK FILL** materials:

**BULK FILL RESTORATIVE MATERIALS**  
(satisfactory wear resistance)

# Filtek™ Bulk Fill

Posterior Restorative

## The PREP Panel evaluation

The new Filtek™ One Bulk Fill Restorative handles similarly



12 dentists, used FBFR (shade A3)  
for 8 weeks

Respond to questionnaire

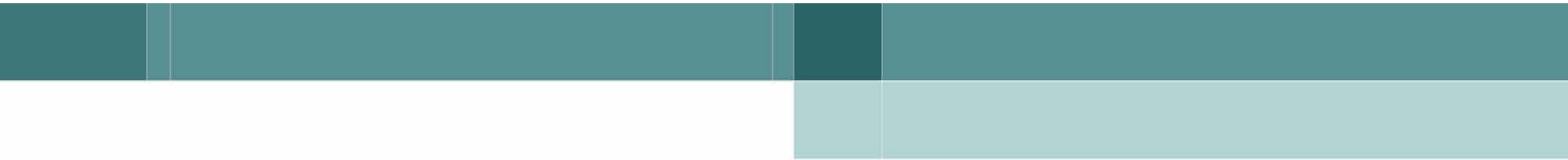
183 restorations placed:  
23 Class I, 37% Class II, 27% MOD,  
plus cusp replacements, restorations  
in primary teeth and cores



## FBFR assessment Ease of use



None of the evaluators had difficulty with FBFR sticking to instruments



## Further comments:

“Excellent handling & viscosity. Doesn’t slump, good depth of cure and no post-operative sensitivity”

“Initially I didn’t think there was a need for a Bulk Fill material but the longer I used it the better I felt about complete curing. Less shrinkage than Filtek Supreme – I have found an alternative!”

“Great material, looks great. Very convenient to place in 4mm increments – a good time saver. I would definitely buy!”

“Aesthetics good but heavily stained dentine shows through – problem to leave remove more dentine or leave and opaque out”

Filtek™ Bulk Fill  
Posterior Restorative

# The PREP Panel evaluation



## FBFR assessment

### Conclusions

75% of evaluators would purchase

92% (n=11) would recommend to colleagues

# New Filtek One

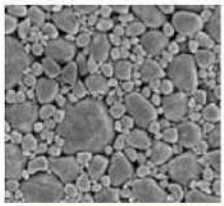


# Filtek™ One Bulk Fill Restorative Technology

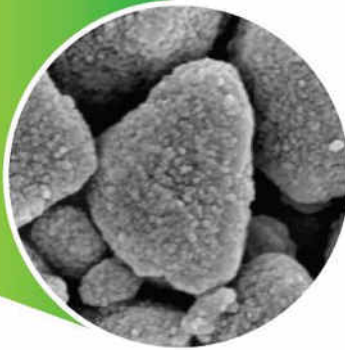
- Same patented nanofiller technology as Filtek™ Supreme Universal Restorative
- Same innovative methacrylate monomers as Filtek™ Bulk Fill Posterior Restorative

## Nanofiller Technology

5K magnification  
of nanocluster

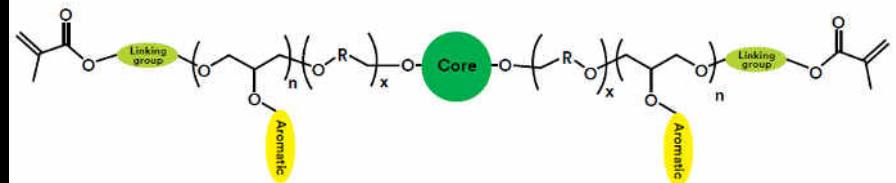


50K magnification  
of nanocluster



## Innovative Methacrylate Monomers

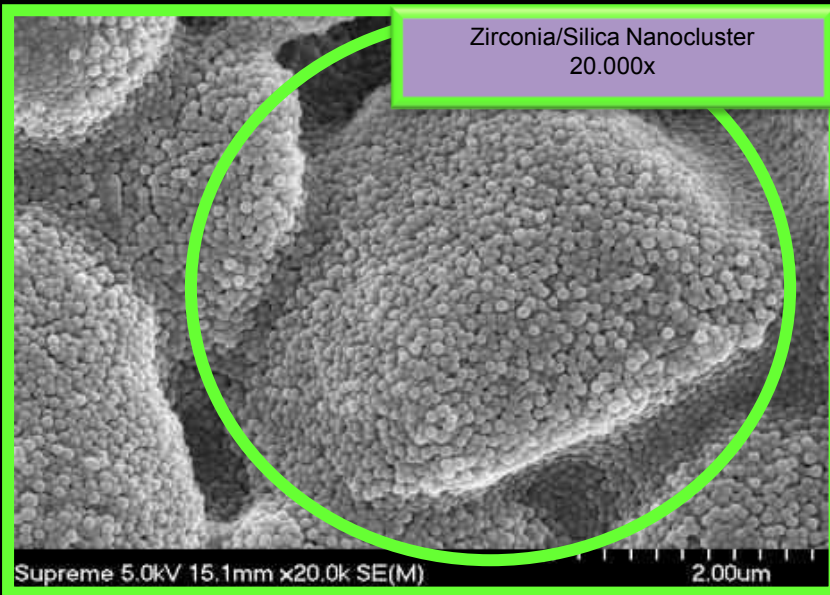
AUDMA



AFM



# 3M Nanofiller Technology (Filtek One Bulk Fill Restorative)



Nanofiller technology enables ...

- Excellent polish retention
- Management of opacity and translucency
- Excellent handling
- High strength
- Excellent wear resistance

# Filtek™ One Bulk Fill Restorative

## Resin

- Aromatic urethane dimethacrylate (AUDMA)
- Addition-fragmentation monomer (AFM)
- Urethane dimethacrylate (UDMA)
- Dodecane dimethacrylate (DDDMA)

## Filler (total inorganic filler loading = ~76.5 wt%, 58.5 vol%)

- Silica filler, 20nm, non-agglomerated **NANO!**
- Zirconia filler, 4-11nm, non-agglomerated **NANO!**
- Zirconia/silica cluster **NANO!**
- Ytterbium trifluoride, 100nm

## RESEARCH REPORTS

Biomaterials & Bioengineering

A.C. Shortall<sup>1</sup>\*, W.M. Palin<sup>1</sup>,  
and P. Burtscher<sup>2</sup>

<sup>1</sup>The University of Birmingham, School of Dentistry, St. Chad's Queensway, Birmingham B4 6NN, England; and  
<sup>2</sup>Ivoclar Vivadent, Schaan, Liechtenstein; \*corresponding author, a.c.c.shortall@bham.ac.uk

*J Dent Res* 87(1):84-88, 2008

### ABSTRACT

Limited cure depth is a drawback of light-activated composites. We hypothesize that curing light transmission and cure depth are influenced by monomer reactivity and filler/resin refractive index mismatch. Light transmission throughout cure was recorded for composites based on strontium (refractive index 1.51) or barium (refractive index 1.53) glass fillers. Fillers were mixed (70 wt%) with 4 bisphenol-A diglycidyl-ether-dimethacrylate (bis-GMA):triethylene glycol dimethacrylate (TEGDMA) formulations with refractive indices ranging from 1.4703 to 1.5370.

## Refractive Index Mismatch and Monomer Reactivity Influence Composite Curing Depth

### INTRODUCTION

Direct-placement resin-based composites are replacing amalgam and gold for extensive posterior restorations (Lutz and Krejci, 1999; Burke, 2004). This trend will continue as clinicians seek to satisfy the expectations of patients who request affordable, aesthetic, minimally invasive restorations (Liebenberg, 2000; Roeters *et al.*, 2005). There is a need for materials and techniques that accommodate the variable demands of clinical practice, while allowing for the successful utilization of posterior resin-composites in extensive cavities (Liebenberg, 2000). A limitation of light-activated composites is their finite cure depth relating to inefficiency in light transmission, coupled with polymerization termination reactions of highly cross-linked immobile networks. Apart from surface reflection, light attenuation with depth relates to absorption and scattering of light within the

interaction. Composites became more opaque or translucent on curing. Optimizing filler/resin refractive index mismatch provides increased curing depth and assists shade-matching.

Adrian  
Shortall's  
theory of  
refractive  
indices and  
translucency



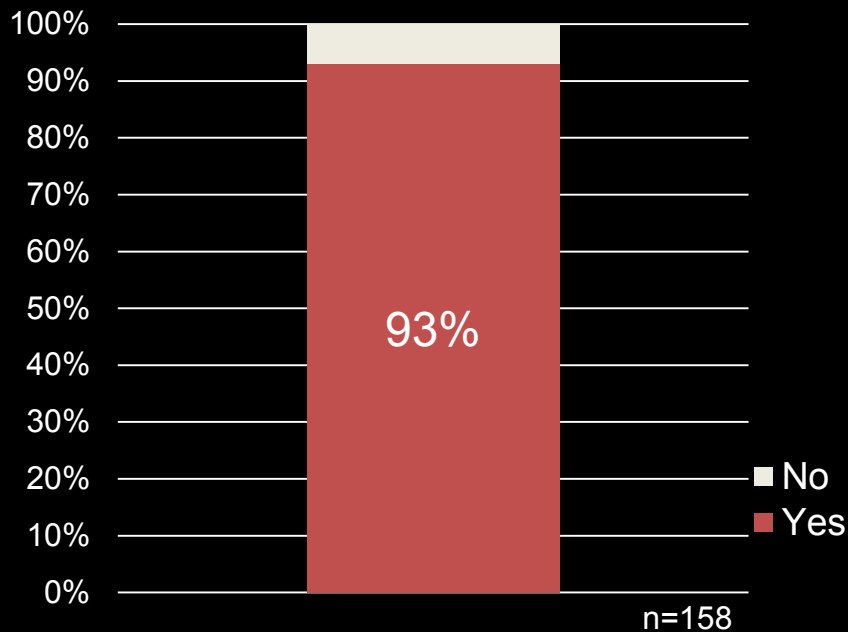
# Field Evaluation: Methodology

- In-vivo evaluation in three European countries (Germany, Italy and UK)
  - 60 dentists from each country (180 total) participating
  - Mix of bulk fill (Filtek™ Bulk Fill Posterior and competitive products) and universal composite (Filtek™ Ultimate Universal Restorative and competitive product) users
- Participants received five shades of Filtek One Bulk Fill Restorative to use clinically over a five week period
  - **5,935 restorations placed** using Filtek One Bulk Fill Restorative (~38 per participant)
  - 63% posterior; 17% anterior; and 10% core build-up
- 40 participants evaluated procedure kits
  - Filtek One Bulk Fill Restorative + Single Bond™
  - Universal + Sof-Lex™ Diamond Polishing System



# Field Evaluation Results

Would you recommend  
to a colleague?



93% of dentists who  
used Filtek™ One Bulk  
Fill Restorative clinically  
would recommend the  
material to a colleague!



# Another bulk fill with no capping



3 shades  
“Enamel-like  
translucency”



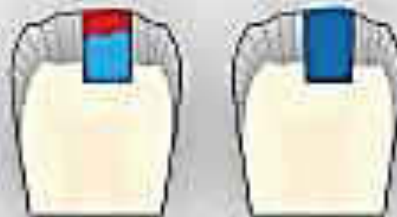
Contains a “shrinkage stress reliever”

# Shofu Bulk Fill Beautifil brochure

## BEAUTIFIL-Bulk Flowable

Shofu now offers a superior bulk fill flowable composite with ideal opaque shade stability, low shrinkage stress and full polymerization at 4mm depth of cure. The unique light properties of Giomer and high filler content (72.5wt%) helps to reduce polymerization shrinkage and shrinkage stress. Beautifil-Bulk Flowable is an advanced Giomer restorative you can trust.

- Ideal handling characteristics eliminate ooze and waste
- Low shrinkage and shrinkage stress (2.06 MPa)
- Unique light diffusion properties allow complete polymerization at 4mm depth of cure
- High flexural strength (119 Mpa) and flexural modulus (9 Gpa)
- Sustainable fluoride release and rechargability
- Self-leveling feature increases cavity adaptation
- Base/liner in class I and II posterior restorations



■ Beautifil Flow Plus/Beautifil It/Tru  
■ Beautifil Bulk Flowable  
■ Beautifil Bulk Restorative

## NEW! BEAUTIFIL-Bulk Restorative

Beautifil-Bulk Restorative is a conventional packable composite resin indicated for direct posterior restorations including the occlusal surfaces. It has excellent condensability and sculptability as well as shade stability before and after light curing. Fully polymerized at 4mm depth of cure, Beautifil-Bulk Restorative has a high fill ratio at 87.0wt%, and low shrinkage stress.

- Complete polymerization at 4mm depth of cure
- Low shrinkage (1.7%) and shrinkage stress (1.06 MPa)
- Optimum translucency creates esthetic shades unaffected by surrounding intraoral color
- Fluoride release and rechargability
- Strong and radiopaque
- Excellent condensability and sculptability optimal for posterior restorations
- Shade stability before and after light-curing
- High Vickers Hardness Value (61), flexural strength (114 Mpa) and flexural modulus (11.4 Gpa)

# VOCO Admira Fusion x-tra



Ormocer technology, low volumetric shrinkage (1.25%), claimed low shrinkage stress, 4mm depth of cure, one shade (U)

# Aura Bulk Fill (SDI)

# aura

ULTRA UNIVERSAL RESTORATIVE MATERIAL

ULTRA UNIVERSAL RESTAURATIONS MATERIAL

MATÉRIEL DE RESTAURATION ULTRA UNIVERSEL

MATERIALE DA RICOSTRUZIONE ULTRA UNIVERSALE

MATERIAL RESTAURADOR UNIVERSAL ULTRA

MATERIAL RESTAURADOR UNIVERSAL

ULTRA UNIVERZALNY MATERIAL ODTWÓRCZY

ULTRA UNIVERSAL FYLLNINGSMATERIAL

ULTRA UNIVERSAL FYLDNINGSMATERIALE

LOISTAVA UNIVERSAALI PAIKKA MATERIAALI

UNIVERSELT RESTAURERINGSMATERIALE

ΕΥΡΕΙΑΣ ΧΡΗΣΗΣ ΥΛΙΚΟ ΑΠΟΚΑΤΑΣΤΑΣΗΣ

GÜÇLENDİRİLMİŞ ULTRA DOLGU MADDESİ

ULTRA U

COMPOZ

ΥΠΤΙΠΑ Υ

ULTRA U

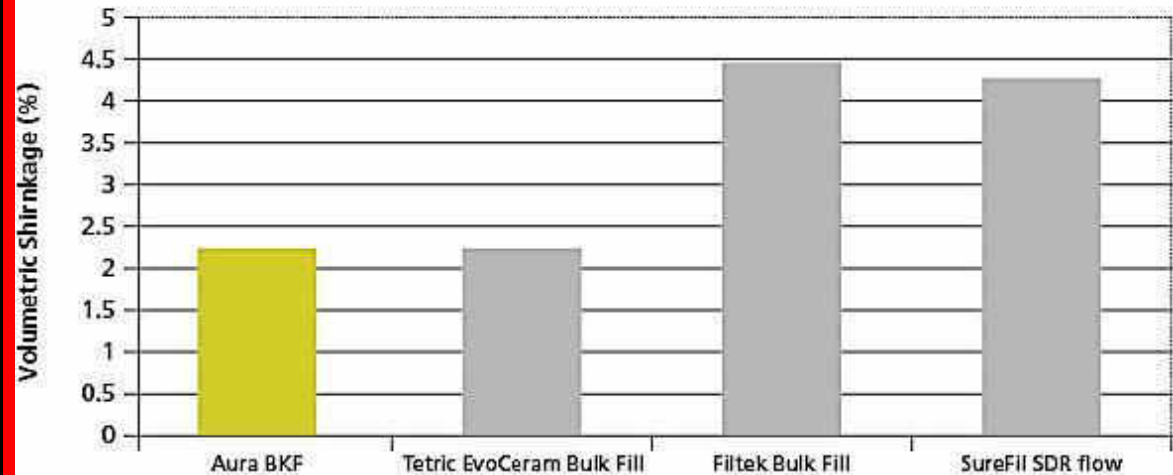
ULTRA U

超級通用

**Bulk fill:** 

For clinicians looking for a bulk filling restorative material, Aura's Bulk Fill (**BKF**) is the solution. It can be cured to a maximum of 6mm in 20 seconds with an LED curing light or 2 x 20 seconds with a halogen curing light. Available in 4g syringe and 0.25 unit dose.

## Bulk-fill Products



SDI

The Dental Advisor



# Aura Bulk Fill (SDI): How does it work?

The opacity of Aura Bulk Fill is a function of the refractive index of the filler and the resin.

The curing process alters the refractive index of the resin marginally, to match the refractive index of the filler. This lowers the opacity temporarily, allowing deeper light penetration for a high depth of cure.

Upon cooling, the indices move apart again to give an ideal opacity.

# Cusp deflection in Dublin



Bulk fills without a cap seem to stress cusps less

## ARTICLE INFO

### Article history:

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### Keywords:

Resin-based composite

Cuspal deflection measurement

Cervical microleakage score

Bulk fill flowable base materials

Bulk fill resin restorative

## ABSTRACT

**Objectives:** To assess the cuspal deflection and cervical microleakage scores of standardised large mesio-occlusal-distal (MOD) cavities filled with different restoration protocols: (1) conventional resin restoratives, (2) bulk fill flowable base materials 'capped' with a conventional dimethacrylate resin-based composite (RBC) or (3) bulk fill resin restorative materials. **Methods:** Standardised MOD cavities were prepared in sixty-four sound maxillary premolar teeth and randomly allocated to eight groups. Restorations were placed in conjunction with a universal bonding system and resin restorative materials were irradiated with a quartz-tungsten-halogen light-curing-unit. Restoration protocol (eight oblique increments of conventional resin restorative, bulk fill flowable base and two occlusal 'capping' RBC increments (three increments in total) or bulk fill resin restorative (two increments)) was the dependent variable. A twin channel deflection measuring gauge measured the buccal and palatal cuspal deflections. Teeth were thermally fatigued, immersed in a 0.2% basic fuchsin dye for 24 h, sectioned and examined for cervical microleakage score.

**Results:** Post hoc Tukey's tests highlighted significant differences in the mean total cuspal



# Sonic Fill

Viscosity change when sonic energy applied

**High Viscosity**

**High Viscosity**  
*(Press & Sculpt)*



**Low Viscosity**  
*(adapt & fill cavity)*

# Sonicfill: Potential benefits

- Single step filling of cavities of 5mm depth

- No need for packing instruments

...and you cannot shape fissures with a hand instrument

- Ergonomic tip allows good access to cavity

- Satisfactory aesthetics

...but need to purchase the handpiece

So, today there are several bulk fills which do not need a topping



.. more will appear  
in the months to come!!

# Advantages of Bulk Fill Restorative materials

- Time saving, no need for complex layering technique
- Easier handling
- Fewer increments, fewer interface imperfections
- Simpler shade selection, due to fewer shades

**BULK FILL IS IN!**

# How do manufacturers do it?

More potent/efficient initiator systems  
Increasing the translucency of the filler  
For some, improved resin systems

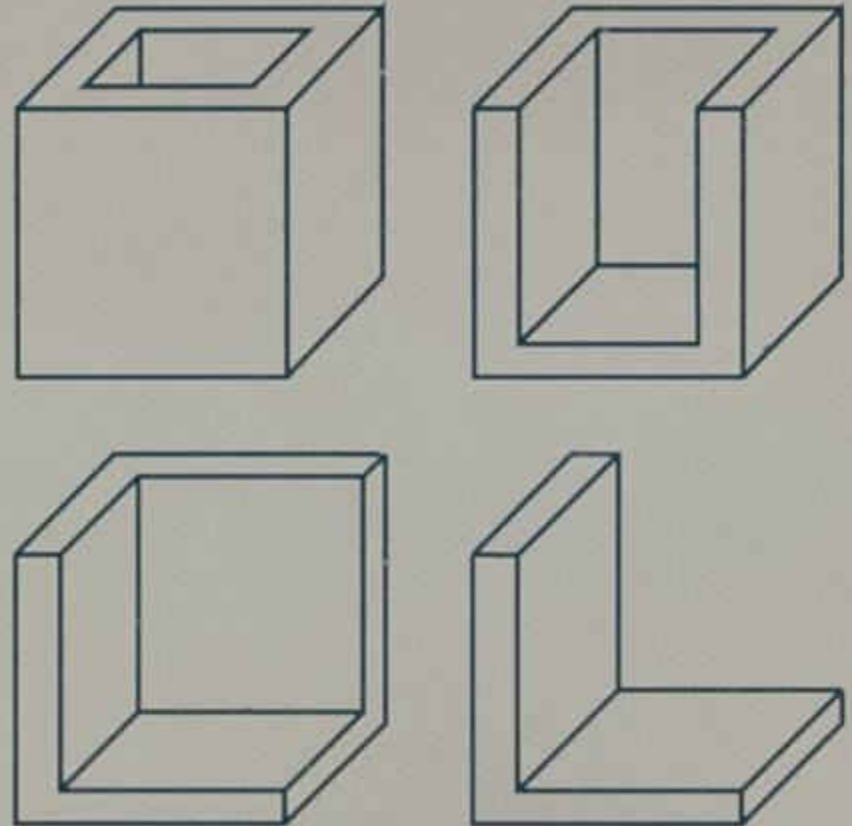
# The Configuration Factor

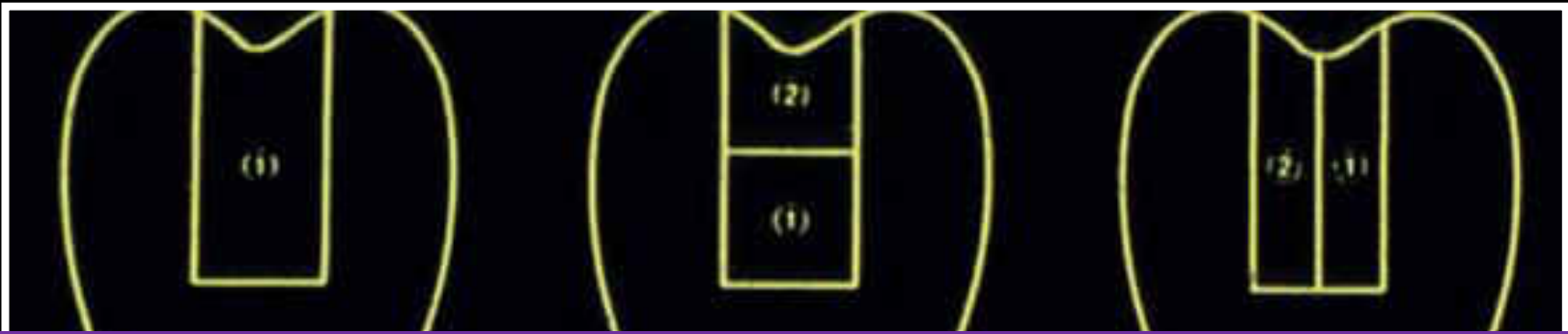
Feilzer et al

## C-Factor

$$C = \frac{\text{Total Bonded Area}}{\text{Total Unbonded Area}}$$

$C < 1$  required to survive polymerisation contraction stress (Feilzer et al., 1987)





**Bulk fill might lead to high stress!**

It is therefore important that the material that we use has demonstrable low shrinkage stress

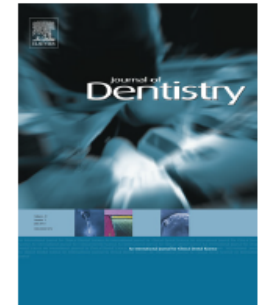
In addition, polymerisation shrinkage stress increases in a thicker composite bulk



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## Curing profile of bulk-fill resin-based composites

Q1 Xin Li, Pong Pongprueksa, Bart Van Meerbeek, Jan De Munck\*

KU Leuven-BIOMAT, Department of Oral Health Sciences, KU Leuven (University of Leuven) & Dentistry,  
University Hospitals Leuven, Kapucijnenvoer 7, Blok A – Box 7001, BE-3000 Leuven, Belgium

In general, manufacturers of bulk-fill RBCs were able to improve polymerization depth by the use of potent photo-initiator systems along with an increased translucency.<sup>1,7,25,26</sup>





The most important layer  
with regard to light curing

1

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FJ Trevor Burke

## Light curing may not be as simple as it seems!

Some readers may recall a time when resin composite materials were presented in two pots, with equal amounts of the material from each pot being mixed to produce the restorative material, which then had a working time of less than three minutes. These were the early composite materials which were chemically cured. The introduction, in the early 1980s, of so-called 'command set' materials which polymerised when exposed to a light of wavelength circa 460nm (in the blue part of the spectrum) was a welcome change, as the clinician had much longer working time. As a result, the ease of use of composite materials improved dramatically

and, indeed, the only problem was that some materials slowly polymerised in the ambient light of the surgery. Light curing materials, whose chemistry was derived as a by-product from the paint industry, are now an accepted, indeed fundamental, part of restorative dentistry. However, light curing may not be as straightforward as it seems: a number of factors are involved.

First, while light-activated resin composite materials cannot be over-cured, it is essential that they receive sufficient light energy to initiate and satisfy the curing process. Failure to do this may result in a less than optimally cured restoration whose physical properties, and resultant longevity, will suffer as a direct result. This has been brought home to me recently when I was asked to light cure a restoration in an upper first molar in a phantom head, with the irradiance being measured in a specially designed apparatus called MARC (Managing Accurate Resin Curing: BlueLight Analytics inc. Halifax Canada). My result was suboptimal because I had not held the light steady in one position and perpendicular to the restoration – a serious wake up call. I was not alone, however, as a large quantitative and qualitative variation was identified in the irradiance delivered to teeth by operators carrying out a similar experiment to that which I had done. In addition, the light energy delivered to a class V preparation was less than to the class I. Some dentists delivered as little as 20% of the energy achieved by others using the same light source and intra-oral location. However, there was no difference between dentists and fourth year dental students. This message is also worthy of transmission to our nurses, to whom many of us delegate our light curing and who may have other duties within the surgery to distract them while operating a curing light unit. The first ever study reporting on individual intra-oral variations in light curing ability also noted a wide spread difference in individual operator performance. Whilst dentists' performance was more consistent overall than second and third year undergraduates the most consistent individual was a student! If nothing else these studies should highlight the need for concentration to the task in hand. All individuals in these studies knew they were being tested! Results may have been even worse had this not been the case. Second, research studies have demonstrated considerable variability in the maintenance and quality of light curing units in dental practice<sup>1</sup>. In this respect, correct maintenance of these units is essential and their irradiance should be checked regularly, although newer types may have their own built-in radiometer<sup>2</sup>. The quality of the light curing unit, per se, is also relevant here – I recently spotted a new curing light on sale on eBay for £50 and felt that there must be questions asked about its fitness for purpose. It is interesting also to note, that while quality standards are in place for dental materials, my recent searching of the literature has indicated that no such standards exist for dental light curing units. Message: be careful what you buy!

Last, a recent paper<sup>3</sup> has drawn our attention to the potential difficulties in disinfecting light curing units. Bacterial contamination of 52 units was measured for a week, with the results indicating that, while few viable organisms were detected on the fan or handle areas, many were identified on the on/off button, including *Staphylococcus aureus*. It would therefore appear that this area is not disinfected as effectively as is necessary, presenting a theoretical infection-control risk and indicating that this area should be added to the cleaning regime.

Do we now take light curing too much for granted? It has revolutionised and enhanced restorative dentistry but also has the potential for being abused. As in life, there is a danger that familiarity may breed contempt!

## References

1. Price RB, Feller CM, Whalen JM. Factors affecting the energy delivered to simulated class I and class V preparations. *J Canad Dent Assoc* 2010; 36: 464.
2. Thornell AC, Harrington E, Patel HB, Lumley PJ. A pilot investigation of operator variability during intra-oral light curing.
3. Raghoebari M, Focher DE, Pham T. Revisiting the intensity output of curing lights in private dental offices. *Compend Contin Educ Dent* 2007; 28(7): 380-384.
4. Mitton BA, Wilson NH. The use and maintenance of visible light activating units in general practice. *Br Dent J* 2001; 191: 82-86.
5. Senowalla Z, Porter K, Shortall ACC, Burke JT, Simmons RL. Microbial contamination of light curing units: a pilot study. *J Infect Prevention* 2010; 11: 217-221.

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# The future of composite

Might bulk fills be the answer?

**Self  
Etch**

+

**Low  
shrink**

**5mm depth  
of cure**

**=  
Amalgam substitute??**

# An amalgam substitute should:

- Be self adhesive

- Have 5mm depth of cure

- Have low shrinkage stress

- Have good physical properties and good wear resistance

- Be quick & easy to place

- Be non toxic

In addition, today, adequate aesthetics for back teeth

...and, how  
close are we?

perhaps it's the older dentists  
who need some extra teaching?



## Technique Tips — A 'Get Out of Jail' Material



Figure 1. Radiograph shows deep caries (DBI), in patient with high caries activity.



Figure 2. Deep caries with exposure risk.



Figure 3. Biodentine restorations at placement.



Figure 4. Restorations at 9 month review.

The treatment of deep caries lesions may be fraught with difficulty, and total removal of deep caries in an asymptomatic tooth may result in a pulp exposure. The sealing of caries into the tooth has been suggested following the work of Mertz-Fairhurst *et al.*<sup>1</sup> but the recent introduction of a material (Biodentine, Septodont, UK), which has demonstrable dentine repair properties,<sup>2,3</sup> may be of value. This material is composed of a purified tricalcium silicate powder which is mixed with water in a capsule, with the reaction releasing calcium hydroxide.

Deep caries was noted on a bitewing radiograph (Figure 1) in a number of otherwise symptom-free teeth in a 22-year-old female patient with high caries

activity. The maxillary 1st and 2nd molar teeth tested vital. After removal of wet and infected dentine, it was decided that a pulpal exposure was likely if excavation was to be continued (Figure 2). Accordingly, excavation was stopped and Biodentine placed in the cavities and, after 15 minutes' setting time, basic carving could be carried out (Figure 3). After 9 months, the restorations were intact (Figure 4) and the tooth symptom free. A decision will be made in due course regarding the need for replacement of the restorations and whether removal of the remaining caries will be carried out, or simply that the restorations be resurfaced with resin composite.

### References

1. Mertz-Fairhurst EJ, Curtis JW, Ergle JW, Rueggeberg FA, Adair SW. Ultraconservative and caries-static sealed restorations: results at year 10. *J Am Dent Assoc* 1998; 129: 53-65.
2. Laurent P, Camps J, About I. Biodentine induces TGF- $\beta$ 1 release from human pulp cells and early dental pulp mineralisation. *Int Dent J* 2011; doi:10.1111/j.1365-2517.2011.01995.
3. Alnuh AI, Chong EZ, Richard G, Festy F, Watson TF. Dentine content: interfacial interaction: calcium silicates and polyamides. *J Dent Res Clin*; doi:10.1177/0022034312443068.

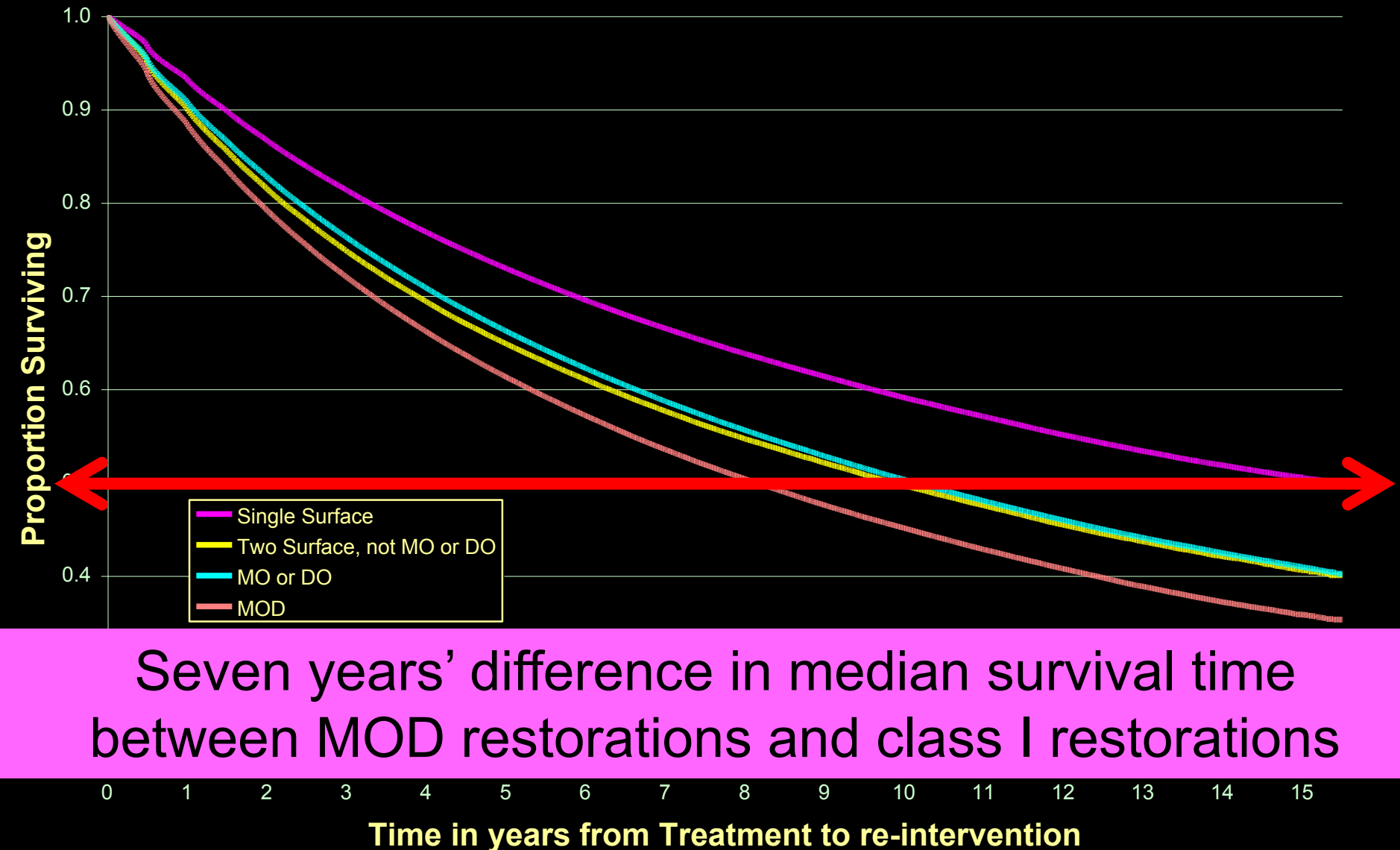
# My conclusion

# Direct placement restorations: some examples: amalgam

7,425,049 amalgam cases  
included, of which 2,537,331,  
of which had a re-intervention



# Amalgam Restoration Survival by Type of Cavity



# Take home message

Size matters – big fillings last less well than small.

Keeping crowns off teeth is important in preserving the lifespan of teeth

# Evaluation of a novel flexible lip retraction system by UK practitioners.

R J Crisp\* and F J T Burke. (University of Birmingham, UK)

Program number 608

## INTRODUCTION

➤ 1993 saw the establishment of a group of practicing dental practitioners, the PREP (Product Research and Evaluation by Practitioners) Panel<sup>1</sup>, who were prepared to complete evaluations of new materials and techniques in the practice environment. To date, over 40 evaluations, including handling evaluations and clinical trials<sup>2</sup>, have been completed. The PREP panel presently has 29 members (61% holding post-graduate qualifications) with an average time since graduation of 21 years. The Panel has a UK-wide distribution and a wide range of dental interests facilitating the assessment of a full range of products and techniques.

➤ The purpose of this study is to evaluate the handling properties of a new flexible lip retraction system (Optragate, Ivoclar Vivadent UK), which consists of 2 flexible plastic rings connected by a latex free plastic material. (Fig. 1) It was tested in 2 sizes, Regular and Small but is also now available in a Junior sizing for young patients.



Fig 1: Optragate

## METHOD

➤ Twelve dental practitioners from the PREP Panel were chosen at random and sent twenty of the retractors along with a questionnaire designed to evaluate the presentation, handling and ease of use of the system. Most responses were given on a visual analogue scale (VAS). The evaluators were also asked the reasons for use of lip retraction systems, and to compare the currently used system with the new retractor.

## BACKGROUND INFORMATION

➤ Ten (83%) of the evaluators currently used a lip retraction system. All but one evaluator used the plain plastic photographic type of retractor. Nine (75%) used the retractors for photography and 4 (33%) for an aid to isolation. The evaluators rated the ease of use of the currently used lip retraction system on a VAS (where 1 = difficult to use & 5 = easy to use) as follows:

3.9



## RESULTS

- Six (50%) of the evaluators stated that the sizes provided were adequate. The remaining 50% all stated that the regular size was too large and a smaller size than 'small' was required. (See note in Introduction).
- When asked if Optragate adequately protected the lips, 9 (75%) stated that it did. The remaining three evaluators (25%) all stated that the bottom lip slipped out.
- 58% (n=7) of the evaluators encountered difficulties initially with the use of Optragate. Comments made by these evaluators included:  
"Initially difficult but with practice – and Vaseline- I could slip it on almost undetected!" and  
"Needs to be moist to fit"
- Patient comments reported included:  
"Easier to keep my mouth open", "More comfortable then rubber dam" and "Uncomfortable behind lower lip"
- Just one evaluator reported a symptom or side effect from the use of Optragate, and that was hypersalivation in 2 cases.
- Eight (67%) of the evaluators stated that they would purchase the Optragate system and 9 (75%) that they would recommend the system to colleagues.
- The evaluators rated the ease of use of the currently used lip retraction system on a VAS (where 1 = difficult to use & 5 = easy to use) as follows:

4.2



- Final comments included:  
"I use them all the time for surgical procedures now, especially implant placements - it helps keep the patient's mouth open, and is more gentle on the tissues than a conventional retractor. It also allows both me and my nurse an extra hand as we are not having to retract!" and  
"Innovative and effective – a joy!"

## CONCLUSIONS

The Optragate lip retraction system has been subject to an extensive clinical evaluation in which it scored better for ease of use than the lip retraction system used previously. The majority of evaluators would both purchase the system and recommend it to colleagues. The sizes of Optragate provided for this evaluation did prove problematic, with 50% of the evaluators requiring a smaller size (now provided). This was a product that seemed to gain favour and find more applications the more it was used.

## ACKNOWLEDGEMENT

The support of Ivoclar Vivadent UK is acknowledged. The authors also wish to thank the participating practitioners.

## REFERENCES

1. Burke F J T, Wilson N H F. Introducing the PREP panel. Dent. Pract 1994; 32 (18): 30.
2. Burke, F J T, Crisp R J et al. Two-year evaluation of restorations of a packable composite placed in UK general dental practices. BDJ 2005; 199(5): 293-296

Patients know (and care!) more  
about dental materials than  
we think!

Burke's tips!

# Patients care more than we suspected!

## A practice-based assessment of patients' knowledge of dental materials

F. J. T. Burke<sup>\*1,2</sup> and R. J. Crisp<sup>1,2</sup>

### IN BRIEF

- Suggests that dental practice should be the prime location for clinical dental research.
- Discusses patients concerns regarding which dental materials are used.
- Demonstrates that patients care strongly that the materials are of a high quality and have been thoroughly researched.

### RESEARCH

**Aims** It is the aim of this study to determine, by means of a questionnaire completed by patients attending ten UK dental practices, patients' level of knowledge on dental materials and techniques. **Materials and methods** Members of The PREP (Product Research and Evaluation by Practitioners) Panel were asked to recruit patients to participate in a questionnaire-based assessment of their knowledge of dental materials. **Results** Two hundred and forty-nine patients took part in the questionnaire. Sixty-three percent ( $n = 157$ ) of the respondents were female and 92% ( $n = 229$ ) of the respondents stated they were regular attenders at the dental practice. The respondents were asked how important the quality of dental materials used in their mouth was, and on a Visual Analogue Scale (VAS) where 1 = not important and 10 = very important, the result was 9.6. The same score was recorded when they were asked how important it was that the materials used in their mouth were supported with relevant clinical research evidence and long term data of the success of the material. They were also questioned on the subjects of price, manufacturer, source or material and type of filling material. A significant amount of respondents demonstrated that they had concerns over the use of amalgam. **Conclusions** Respondents expressed strong views that the materials used on their teeth should have a robust evidence base and they care about the materials that are used in their mouths.

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## CONCLUSIONS:

- Patients feel that materials should have a robust evidence base, produced by manufacturers with experience in the field
- Patients care about the materials that we use
- Almost half did not wish “own label” materials to be used in their mouths
- One third expressed anxieties regarding the use of amalgam in their teeth



# Me too:

## Are own label brands a threat to the development of new materials?

### Comment

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FJ Trevor Burke

### Me too

Forty years ago, restorative dentistry had at its disposal only a handful of materials, namely amalgam, an early (macrofilled) composite, an elementary metal-ceramic, silicate cement, zinc oxyphosphate for luting and acrylic for dentures. Bonding systems had not materialized. Readers who were not around then (the vast majority I suspect) will be amazed at the very limited variety, given the wide array of materials available today. Indeed, although amalgam may not have moved on much, there are many different types of composite (microhybrid, microfilled, nanofilled, flowable) and many manufacturers of each. Presently, although metal-ceramic remains the most used material for crowns and bridges, there are many other types of ceramic and the dominant position of metal-ceramic is being threatened by the exponential rise in Tetragonal-Zirconia-Polycrystal (TZP) framed crowns and bridges. Silicate cement has long since passed its sell by date – it was never a great material anyway, and while zinc oxyphosphate is still used for luting by a dwindling number of clinicians, the majority now recognize the superior properties of resin luting materials and resin modified glass ionomer cements, the latter being a material which had not been introduced 40 years ago.

This explosion of materials and manufacturers has not come without a cost! Indeed, they come at a substantial cost. This includes the cost of research, development and testing, often over a period of many years. New materials often start as an idea, or a wish list – such as better polishability for composite, improved shades, easier handling, low shrinkage and 4mm depth of cure. A team of scientists, often specialized in chemistry, looks at the possibilities and, if and when the idea becomes a prototype material, extensive testing in the developing company's laboratory begins. If that indicates potential, further testing ensues and eventually the material undergoes toxicology testing and regulatory approval begins. There are often setbacks along the way! Readers will now begin to understand why dental materials cost as much as they do since the company developing the material will eventually be hoping for a return on its investment. However, without such investment, we would not today have glass ionomer materials, nanofilled composites, self-etch dentine bonding agents, self-adhesive luting materials and other materials that we accept as part of our clinical experience.

It therefore may be considered disappointing to see the increasing number of 'me too' (aka, own label, private label) materials coming on to the market, some sold by companies who are also agents for the products developed at great cost by innovative manufacturers, which to me seems strange. Those who sell them may suggest that they are acting to help the customer in times of economic distress. However, it is difficult to see how these imitation materials can perform as well as those which have had the investment, since they may often be derived from materials of a previous generation. We will never know about their performance anyway, because the 'me too' company may be unlikely to invest in a clinical trial of their products as ethical and innovative manufacturers do.

There is another reason why clinicians should think twice before purchasing a cheap imitation product. The principal cost of a dental restoration is the clinician's time, rather than the cost of the material in the box. If a restoration fails prematurely as a result of a deficiency in the material, the clinician ultimately will face the cost of his/her time used replacing the restoration at no cost to the patient. So, tempting though it may be in hard economic times to purchase a cheap version of a particular material, this may misfire because of inferior performance. The worst case scenario would be if everyone purchased 'me too' materials, so that research and development into new materials would be stifled and the amalgam substitute, the reliable bonding agent or the predictable mini implant, which are among the advances that many are hoping for, may never be seen. In this respect, *Dental Update* is a journal that supports research innovations and companies that provide materials with research and development potential as part of our editorial policy of clinical excellence.

The message is to think twice when tempted to purchase that imitation product.

Me too!

All articles published in *Dental Update* are subject to review by specialist referees in the appropriate dental disciplines.

# There is no evidence base for “own label” Glass Ionomer materials

DentalMaterials



Steffen Mickenautsch

## How Well are GIC Product Labels Related to Current Systematic Review Evidence?

**Abstract:** Systematic reviews have been recommended as providing the best source of evidence to guide clinical decisions in dentistry. They appraise evidence from trials focused on investigating clinical effects of dental material categories, such as conventional glass-ionomer cements (GIC) or resin-modified GIC. In contrast, the general dental practitioner is introduced to these categories of materials in the form of branded or private product labels that are marketed during dental conventions or through advertisements. Difficulties may arise in recognizing material categories that have been subjected to systematic reviews, because of the multitude of product labels on the current market. Thus, the value and relevance of published systematic review evidence concerning the material categories represented by these labels may remain obscure. Based on a systematic literature search, this article identifies glass-ionomer cement product labels used during clinical trials which, in turn, were subsequently reviewed in systematic review articles (published between 15 April 2009 and 14 April 2011). This article further clarifies how these product labels relate to the systematic review conclusions. The results show that the conventional and resin-modified glass-ionomer cements that were used in most trials were marketed by GC and 3M ESPE, respectively. The conventional GICs used in most of the reviewed trials were Fuji III and Fuji IX, while Vitremer was the most commonly used resin-modified GIC. Evidence from the reviewed trials suggests that GIC provides beneficial effects for preventive and restorative dentistry. However, more trials of higher internal validity are needed in order to confirm (or disprove) these findings. Only GIC products of branded labels and none of private labels were identified, suggesting that private label GIC products have little or no research back-up.

**Clinical Relevance:** Dental products, such as glass-ionomers cements (GIC), can only be judged as effective when they are based on sufficient research back-up. Systematic reviews of clinical trials provide such back-up at the highest level. Thus clinicians must be able to identify GIC products for which reliable evidence from systematic reviews of clinical studies is available and know about what such evidence contains.

**Dent Update 2011; 38: 634–644**



# ZERO evidence base for "own label" resin-based materials



FJ Trevor Burke

## Me Too 3

Welcome to another year of *Dental Update*, a special 40th Anniversary year which will see the publication of a 40th Anniversary issue which will reflect upon the contents of the first issue from May 1973. I hope that you will enjoy it all.

I have previously written on the subject of own label adhesives,<sup>1,2</sup> questioning the wisdom of purchasing cheaper materials which may not have been researched in the way that materials should be. A paper which I presented at a recent research meeting concludes my 'evidence' on this subject.

### References

1. Burke FJT. Me too. *Dent Update* 2010; 37: 137.
2. Burke FJT. Me too 2. *Dent Update* 2011; 38: 586-592.

## The evidence base for 'own label' resin-based dental restoratives

**Abstract:** There is anecdotal evidence that sales of 'own-label' (OL) or 'private label' dental products is increasing, as dentists become more cost conscious in times of economic downturn. However, the purchase of such (less expensive) products could be a false economy if their performance falls below accepted standards. So, while the examination of a resin-based product under research conditions alone may not guarantee success, it could be considered that a material which has been subjected to testing under research conditions will demonstrate its effectiveness under laboratory conditions or reveal its shortcomings; either of these being better than the material not being examined in any way. It was therefore considered appropriate to determine the materials on which research was carried out, with particular reference to OL brands.

**Objective:** To determine whether there is a research base behind OL resin-based restorative dental materials.

### Methods

The abstract memory stick for the IADR meeting in March 2011 in San Diego was examined. All abstracts included in the 'Dentine adhesives' and

'Composite' sections were read in full and examined in order to identify the names of products mentioned in the abstracts. These were recorded and tabulated. Any product which did not state the manufacturer was further investigated by an internet search.

Product Name	Number of Mentions in Research Abstracts
Clearfil SE Bond (Kuraray)	40
Scotchbond Multipurpose (3M ESPE)	29
Adper Easy Bond (3M ESPE)	17
Optibond Solo (Kerr)	17
Prompt L Pop (3M ESPE)	10
Optibond FL (Kerr)	10
Optibond all-in-one (Kerr)	10

Table 1. Most frequently mentioned dentine-bonding agents in the 'Bonding agent' research abstracts.

### Results

A total of 189 abstracts from the IADR classification 'dentine adhesives' were identified, although 31 of these did not mention specific bonding agents and two were on light-curing units. The results indicated that 84 different types of bonding agent (note that some of these may be discounted as some manufacturers may name the same bonding agent differently for different markets) had been subjected to research in the remaining 156 abstracts. A total of 353 bonding agents were tested in these abstracts. The most frequently researched bonding agents are presented in Table 1. Four materials did not specify their manufacturer, so these materials were investigated further in an internet search and their manufacturers identified. No OL brands were identified during the search.

The same exercise was carried out for 255 'Composite' abstracts. Of these, 44 did not state the type of composite tested, eight were on the subject of light curing, one was on the subject of FTR and one on veneering porcelain. In the remaining 201 abstracts, there were 601 occasions when the name and manufacturer of the resin composite was stated. Most frequently mentioned materials are presented in Table 2. Nine materials did not specify their manufacturer, so these materials were investigated

Product Name	Number of Mentions in Research Abstracts
Filtek Supreme/Z350 (3M ESPE)	51
Filtek Z250 (3M ESPE)	35
Filtek Z100 (3M ESPE)	18
Venus Diamond (Heraeus Kulzer)	18
EsthetX (Dentsply)	18
Kalora (GC)	17
Premise (Kerr)	12
Grandio (Voco)	10
Gradia Direct (GC)	10

Table 2. Most frequently mentioned resin composite materials in the 'Composite' research abstracts.

further in an internet search and their manufacturers identified. No OL brands were identified during the search.

### Conclusion

Within the limitations of this study, which nevertheless involved the reading of 444 IADR abstracts as a source of 'evidence', there was no evidence of any OL product being subjected to testing in a research study. Further work is now indicated to provide 'evidence' for the effectiveness of these materials, by

laboratory and, ideally, clinical evaluation of 'own label' brands of resin-based restorative dental products.

### Acknowledgment

Thanks are due to Mrs Joannette Hiscocks for tabulating the data.

### Disclosure

The author is a member of the 3M ESPE Scientific Advisory Board but has no financial interest in any of the products mentioned.

# 'Own-Label' Versus Branded Commercial Dental Resin Composite Materials: Mechanical And Physical Property Comparisons

## ABSTRACT

A majority of dental materials are manufactured by companies who have experience in the field. However, a number of 'own label' materials have become available, principally marketed by distributors and other companies with little or no experience in the field. These materials are attractive because of their reduced cost, but they may have no research on which clinicians might base their potential performance. It is therefore the purpose of this work to compare the performance of different batches of a number of 'own-label' dental materials with a similar number from manufacturers with experience in the field, using a variety of laboratory test regimes which include filler distribution, degree of conversion, flexural strength and flexural modulus, in order to evaluate key material properties. The results indicated that own-label dental resin composites produced similar results to materials from established companies in terms of flexural strength characteristics and degree of conversion. However, a greater batch-to-batch variation in several mechanical and physical

### Keywords

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However, greater batch to batch variation in several mechanical & physical properties of the own-label materials was noted

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