

***10 tips for avoiding postoperative  
sensitivity with posterior composites***



## Disclosures

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

"Some manufacturers fund my research"

"I will try to be evidence-based rather than anecdotal"

# What I plan to talk about

- 👄 Incidence of post-op sensitivity with posterior composite
- 👄 Choosing the right material
- 👄 Using it correctly!
- 👄 The role of bonding agents
- 👄 Relevant properties of materials for posterior composites
- 👄 Success rates
- 👄 Alternatives!
- 👄 Final thoughts

First, The **rise** and **rise** and **rise** of  
**posterior composites**

# Reasons to use aesthetic techniques

- ❑ Patient need
- ❑ Patient demand
- ❑ High tech practice image
- ❑ ? Working beyond the comfort zone

Aesthetics:  
No contest!



## Patient Acceptance of Posterior Composite Restorations

F.J.T. Burke

*Patients no longer simply require the restoration of their teeth but may also want their restorations to be as aesthetically pleasing as possible. Composite materials have been developed for use in posterior teeth, but how do patients assess these restorations? A questionnaire was designed to obtain patients' opinions, and the results are given here.*

COMPOSITE FILLING materials were introduced to the dental profession by Bowen<sup>1</sup> in 1963. First reports of the use of such materials for restorations in load-bearing situations in posterior teeth were favourable,<sup>2</sup> but later reports<sup>3,4</sup> indicated that excessive wear was occurring, not only occlusally, but also at contact areas, leading Leinfelder to state, in 1975, that these materials should be eliminated as a material for use in Class I and Class II restorations.<sup>5</sup>

Changes in the formulation of composite materials for anterior use have led to microfilled materials, with a filler particle size of 0.4 µm giving a highly polishable surface but having an increased risk of incisal fracture,<sup>6</sup> and 'hybrid' materials (with particles from 1 to 5 µm mixed with 0.04 µm) which offer good polishability and strengths sufficient to withstand incisal stresses. Fine-particle composites are also available with 1-8 µm particles which allow a filler content similar to or greater than the hybrids together with reasonable finishing properties. Materials suitable for use in posterior load-bearing situations have also been developed by increasing the filler/resin ratio, altering the resin formulation, improving the bonding of

filler particles to the resin matrix, and the use of light-activation.

### POSTERIOR COMPOSITES

Problems associated with early composites in Class I and Class II situations have now largely been overcome. The excessive wear of early materials has led to the development of stringent criteria for materials for use in posterior teeth. To fulfil the ADA Provisional Acceptance criteria, wear no greater than 150 µm must occur in a three year period.<sup>8</sup> Four materials have, so far, gained provisional acceptance and two materials, Occlusin (ICI Dental, Macclesfield, Cheshire, UK) and Fulfil (L.D. Caulk Company, Milford, Delaware, USA) have met the criteria for full ADA acceptance after five years.

Studies are available which show satisfactory behaviour of these materials in clinical use.<sup>9-11</sup> From further studies, it can be seen that Occlusin restorations performed their intended purpose satisfactorily for periods of at least five years.<sup>12</sup>

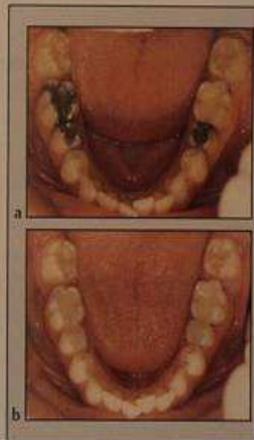
Technique problems have also largely been overcome by the development of new instruments, accessories such as burnishable matrices and transparent matrices used in conjunction with light-conducting wedges,<sup>13</sup> alongside the realization that incremental curing is necessary to prevent cuspal movement,<sup>14-16</sup> and that meticulous moisture isolation and dentine insulation is important. And so, as the clinical technique has evolved, patients have become interested in aesthetic posterior restorations.<sup>17</sup> However, as with any new procedure, it is necessary to inform them of the advantages — and possible disadvantages — of the new technique. Indeed, such is the media interest in new ideas in Medicine and Dentistry, that such new techniques may be given press coverage before clinical trials have been completed, with the result that patients may request new techniques

before they are readily available and before the dentist has undergone the necessary re-education.<sup>17</sup>

### PATIENT AWARENESS OF DENTAL AESTHETICS

Patient concern about appearance may be more important than health concerns,<sup>18</sup> and attractive persons may be considered more qualified and reliable than their unattractive peers.<sup>19,20</sup> Moreover, the appearance of a patient's teeth has been shown not only to have an effect on that patient's self-esteem,<sup>21</sup> but also to change that person's social attractiveness when judged by their peers and others.<sup>22-24</sup> In this respect, the advent of a tooth-coloured restorative for posterior teeth may offer

Figure 1. (a) Lower arch where several amalgams require replacement. (b) Amalgams in Figure 1a replaced with posterior composite.



And, don't forget that patients seem to like tooth-coloured restorations in their back teeth!

Dent.Update.1989:  
16.114-116

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# The Minamata Convention

Final agreement, 10th & 11th October  
2013, 147 countries signed up

July 2018

Amalgam banned in children 15 years  
and younger, and in pregnant/nursing women

..continuing decline in the years to 2030

# Contemporary UK dental practice 2015

Burke FJT, Brunton PR, Wilson NHF, Creanor S.

- Questionnaire to 500 UK dentists, 20015/16, useable returns 388 (77.6%)
- 60% male, 51% principals, 25% single-handed
- Mean of 4.2 dentists per practice
- 50% of patients NHS, 39% private
- 55.4% of respondents had an intra-oral camera, 80.4% used nickel-titanium files, 47.4% used zirconia-based bridgework, and 24.9% used tricalcium silicate



# Contemporary UK dental practice 2015/16: Comparison with previous results: premolars

Amalgam for Class II, 2002....86%

Amalgam for Class II, 2008....59%

Amalgam for Class II, 2015....40%

25% of respondents stated that  
amalgam should continue to be used freely,  
41% considered that it should be  
phased down or out

Is this non-retentive adhesive cavity design the cavity of choice for the COVID 19 era?

Use a Universal bonding agent

This can be cut without a turbine



So, The **rise** and **rise** and **rise** of  
**posterior composites..**

..has been driven by patient demand, the increasing rejection of a mercury-containing material and the impact of Minamata plus the potential for minimal cavity designs

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- Choosing the right material
- Using it correctly!
- The role of bonding agents
- Relevant properties of materials for posterior composites
- Success rates
- Alternatives!
- Final thoughts

Incidence of post-operative sensitivity (POS) is difficult to measure because of the heterogeneous nature of testing

## Occurrence and Causing Stimuli of Postoperative Sensitivity in Composite Restorations

TM Auschill • CA Koch • M Wolkewitz  
E Hellwig • NB Arweiler

### Clinical Relevance

This study enabled the dentist to analyze the individual risk of postoperative sensitivity after composite treatment and the type of pain patients may expect.

### SUMMARY

Despite improvements in composite treatments over the past decade, postoperative sensitivity

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still remains a problem. Therefore, this clinical study evaluated the appearance of postoperative sensitivity after composite treatments and the stimuli that may have caused it. A total of 600 teeth in 231 patients was included in this study. All treatments were performed by dental students working under close supervision following standard procedures and using the bonding system Optibond FL and the nanofilled composite Ceram X. At baseline (visit 1), the restorations were grouped according to the following criteria: use of anesthesia, use of a rubber dam, indication for the restoration treatment, cavity class and clinical dimension of the cavity. After approximately two weeks (at visit 2), all the restorations were assessed and failure was defined if one of the following criteria occurred: a negative reaction to the vitality test, postoperative pain from masticatory forces or reported postoperative sensitivity by the patient. The assessed restorations

600 restorations placed by dental students, 231 patients, Optibond FL used

Patient-reported sensitivity assessed at 2 weeks

5.4% sensitivity

# Clinical Assessment of Postoperative Sensitivity in Posterior Composite Restorations

ALF Briso • SR Mestreneur • G Delício • RH Sundfeld  
AK Bedran-Russo • RS de Alexandre • GMB Ambrosano

### Clinical Relevance

Posterior teeth restored with resin composite have been known to exhibit postoperative sensitivity. The type, size and design of the cavity, material properties and handling technique may influence the incidence of this sensitivity.

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### SUMMARY

This incidence of postoperative sensitivity was evaluated in resin-based posterior restorations. Two hundred and ninety-two direct restorations were evaluated in premolars and molars. A total of 143 Class I and 149 Class II restorations (MOD and MOD) were placed in patients ranging in age from 30 to 50 years. After the cavity preparations were completed, a rubber dam was placed, and the preparations were restored using a total-etch system (Prime & Bond NT) and a resin-based restorative material (TPH Spectrum). The patients were contacted after 24 hours and 7, 30 and 90 days postoperatively and questioned regarding the presence of sensitivity and the stimuli that triggered that sensitivity. The Chi-square and Fisher's Exact Test were used for statistical analysis. Evaluation at 24 hours after restorative treatment revealed statistically significant differences among the types of restorations.

292 Class II & II restorations in premolars & molars placed by dental students: only shallow and medium-sized cavities included

Patients contacted at 1, 7, 30 and 90 days

Sensitivity in MOD restorations (26%), Class II, (16%), class I (5%): this decreased with time

For class I, pain was on mastication (75%):  
For class II, sensitivity to cold was prevalent

## DEPTH OF THE CAVITY AND ITS RELATIONSHIP WITH THE POST-OPERATIVE SENSITIVITY IN CLASS 1 POSTERIOR RESIN COMPOSITE RESTORATIONS ON MOLARS

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### ABSTRACT

*This study was conducted to assess the post-operative sensitivity in different depths of Class I cavities in molars restored with posterior composite resin. It was an Experimental study and was conducted in Fatima Jinnah Dental Hospital, Karachi from May 2010 to October 2010. One hundred and thirty one patients had Class I cavities (depth of cavities between 3-4mm) were selected after clinical and radiographic examination. After rubber dam isolation, Class I cavity prepared on molars teeth. Incremental technique was used to restore cavity with posterior composite resin. After finishing the filling, patient was recalled at day 7 to assess post-operative sensitivity with cold and hot stimuli. Data were collected using data collection proforma, were computerized and analyzed by using SPSS (Statistical Package of Social Sciences) version 17.*

*One hundred thirty one patients, 61 male and 70 female formed the study group. The mean age was 29.6 ( $\pm 9.004$ ) years. The mean score of post-operative sensitivity was 1.05 for cold ( $\pm 0.226$ ) and 1.04 ( $\pm 0.192$ ) for hot. The chi-Square test revealed significant results with *p*-value  $< 0.000$  for cold and  $< 0.009$  for hot, when both stimuli were analyzed with different cavities depths. Deeper cavities in Class I composite resin restorations showed more post-restoration sensitivity as compared to cavities with lesser depth in dentine.*

**Key Words:** Polymerization shrinkage, Class I cavities, post-operative sensitivity, depth of the cavity, incremental technique.

### INTRODUCTION

The introduction of composite-based resin technology to esthetic dentistry was one of the most noteworthy contributions to dentistry.<sup>1</sup> This technology provides patients with more tooth-conserving and highly aesthetic restoration and also avoids the mercury controversy.<sup>2</sup> There are problems associated with using resin composite in posterior restorations, including shrinkage that occurs on setting, and cause post-operative sensitivity.<sup>3</sup> Long term prognosis of resin composite posterior restorations are influenced by tooth type, size or depth of the cavity, placement technique and composition of material.<sup>4</sup>

Contemporary composites undergo contraction of 2% to 6% by volume during setting.<sup>5</sup> In polymerization resin composite may pull away from the least retentive cavity margins, where little or no enamel present on them.<sup>6</sup> This shrinkage is responsible for the formation of gap between resin-based composite and the cut tooth surface, which allows fluid to flow out of the tubules.<sup>1,2</sup> Gap formation also allows ingress of bacteria, bacterial products, acids, enzymes and ions into the margins of the restoration and is responsible for post-operative sensitivity.<sup>7</sup> However recent researches have proved that shrinkage occurs towards the walls of the cavity to which it is bonded.<sup>8</sup> Polymerization shrinkage occurs regardless of the system used to initiate the setting reaction.<sup>9,7</sup> Opdam et al reported 14% post-operative sensitivity of resin composite in Class I cavities present on the occlusal surfaces of molar teeth.<sup>9</sup> Briso ALP et al found in his study the occurrence of post-operative sensitivity in resin-based posterior restorations was 5% in Class I cavities.<sup>8</sup>

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131 class I restorations: cavity lined with GIC, then filled with composite/Prime and Bond NT

Patients recalled after one week, tested for H & C sensitivity

5.3% of teeth exhibited sensitivity to cold, 3.8% to hot.

22.6% of restored teeth with cavity depth 4mm showed sensitivity to cold and 16.3% showed sensitivity to hot. No post-operative sensitivity was reported when depth of the cavities was 3.0mm

## Postoperative Hypersensitivity in Class I Resin-based Composite Restorations in General Practice: Interim Results

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### Abstract

Posterior permanent teeth with carious lesions radiographically extending no farther than halfway into dentin ( $n = 565$ ) were restored using a resin-based composite by 38 dentists in a practice-based research network. Preoperative and 1-, 4-, and 13-week posttreatment hypersensitivity was recorded using an 11-point visual analog scale filled out anonymously by subjects. Analyses were conducted to determine whether any correlation or association existed among several variables, including degree of carious activity, cavity extent, application of antimicrobial or desensitizing agents, application of liner, dentin bonding agent and resin-based composite employed, and composite placement method. Three results were fairly unexpected: only 36% of lesions were ranked as caries-active, 31% of teeth had appreciable preoperative hypersensitivity, and 16% of teeth with no preoperative hypersensitivity had appreciable hypersensitivity at 1 week posttreatment. Preoperative hypersensitivity was correlated with lesion visibility on radiographs but not with dentin caries activity (ranked on opening enamel), preparation depth, or preparation volume. Accrual to the study continues, and conclusions regarding other relationships awaits 13-week results.

### Introduction

Postoperative hypersensitivity (POH) can be defined as pain in a tooth associated with mastication or with contact with hot, cold, sweet, or sour stimuli that occurs 1 week or more posttreatment. Pain associated with clenching, which may indicate a restoration in hyperocclusion, is typically excluded from definitions of POH.

A 2006 survey of the authors' practice-based research network (PEARL: Practitioners Engaged in Applied Research and Learning) revealed that POH following posterior resin-based composite (RBC) restorations is a common concern among its member practitioner-investigators. The literature on POH is sparse, however, and it is difficult to draw firm conclusions from the few relevant published studies. Most studies that address POH have small sample sizes and are typically associated with evaluation of a particular bonding agent or resin-based composite formulation. Moreover, variables of interest differ from study to study, as do methods of measurement. The inconsistencies and singularly examined factors in POH studies thus limit our understanding both of the overall problem and of the influences and elements that may be key risk factors in the general practice setting.

To help improve our understanding of this phenomenon, the PEARL Network undertook an observational study among its membership to investigate the effectiveness of a range of techniques and materials in preventing or ameliorating postoperative hypersensitivity in Class I resin-based composite restorations for shallow carious lesions in dentin.

A protocol describing overall study conduct and a manual of procedures (MOP) detailing study procedures were developed by the PEARL Network Executive Management Team in conjunction with the PEARL Executive Committee (including PEARL practitioner-

565 class I restorations placed by 38 dentist members of a practice-based research network (PEARL). Cavities no deeper than halfway into dentine.

Post-op sensitivity recorded by patients on an 11-point VAS

At one week, 51% of restored teeth exhibited POS, and 16% had “appreciable hypersensitivity”, with this not being correlated with cavity volume or depth.

A summary of other  
studies on post-  
operative sensitivity  
(POS)

Lundin and Rasmusson,  
148 restorations

4% required replacement  
for POS at 2 years

Opdam and co-workers, 144 class II  
restorations

Zero POS but 19% of the teeth were sensitive  
to loading, this being correlated to bulk  
placement

Castelli and Martins, 104 class I  
restorations.

At one week post-op, no POS in 71%, 4%  
had POS: at 6 months 2% had POS

Alomari et al, 30 patients with one  
class II composite restoration, fast  
curing vs incremental

Incremental curing mode had significantly  
reduced incidence/severity of POS

Hayashi & Wilson: 1,101 Occlusin  
post comp. restorations at 5 years

Restorations more likely to have failed at 5  
years if POS had occurred within one month  
of placement.

**SUMMARY: Incidence of POS is between zero and 51%**

We learnt a lesson with Filtek Silorane, the first composite material to achieve 1% shrinkage



**A low shrink material  
seems to be the obvious  
answer**

# Silorane: lack of POS

## Keywords

Clinical Evaluation  
Restorative Dentistry  
Resin Composite  
Low Shrinkage Stress

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## Five Year Clinical Evaluation of Restorations Placed in a Low Shrinkage Stress Composite in UK General Dental Practices

### ABSTRACT

*This paper evaluates the five year clinical evaluation of restorations formed in a low shrinkage stress resin composite material (3M ESPE Filtek Silorane, Seefeld, Germany) and placed in the general dental practices of five members of the PREP Panel, a group of UK practice-based researchers. Results indicated satisfactory performance of the material under evaluation, other than for marginal staining, which affected 50% of the restorations evaluated as well as the restorations being evaluated. Parameters which were assessed were:*

### INTRODUCTION

#### PRACTICE BASED

The value of practice based research in the arena of general dentistry, in an environment in which materials and their clinical use are the majority of dental care.

A UK-based group for Research and Evaluation in Practice, established in 1993, have completed a series of evaluations of restorations. It is apparent that the

cavities.<sup>24</sup> The lack of post-operative sensitivity when using a low shrinkage stress material, in conjunction with its self-etch adhesive, is considered to be a significant benefit by the present authors, with their advice to clinicians to determine the shrinkage stress of materials that they are considering using in posterior teeth.

Why no post-op sensitivity in the Silorane study?

No post-operative sensitivity with Silorane because of its low shrinkage stress

So, what we learnt was that low shrinkage stress is important in reducing post-operative sensitivity

# What Jack said!

*Operative Dentistry*, 2008, 33-3, 247-257

Buonocore Lecture

Buonocore Memorial Lecture

## Placing Dental Composites— A Stressful Experience

JL Ferracane



### Clinical Relevance

The inevitable generation of stress in dental composites that undergo polymerization continues to mandate a precise and careful placement technique to ensure successful outcomes.



Jack L. Ferracane

### SUMMARY

The setting of dental composites is accompanied by significant polymerization contraction, resulting in the generation of stresses within the material and at the tooth-restoration interface. These stresses can have a deleterious effect on marginal integrity if they exceed the adhesive strength of the restorative, as well as on the

properties of the composite. It has been determined that several factors affect these stresses, including the polymerization rate of the compos-

ite, its formulation, including filler and monomer composition and the constraints imposed by the geometry of the cavity preparation. Many strategies have been developed to reduce the effect of these stresses. Changes in the formulation of the composite have included experimentation with a variety of stress relieving additives, modified catalyst compositions and alternative monomer systems. Modifications to the placement techniques have included the use of incremental curing, altered light activation schemes and resilient liners. This manuscript will review many of the important scientific and clinical issues relating to the generation and quantitation of the stresses produced in dental composites during curing.

### WHAT IS THE CLINICAL RELEVANCE OF POLYMERIZATION CONTRACTION STRESS?

There is no proven association between the polymerization contraction behavior of dental composite restorations and their clinical outcomes. But it is true that the primary reason for replacement of dental composites is the diagnosis of secondary caries, and this has not changed in the past 20 years.<sup>1,2</sup> It is also true that the polymerization of these polymer-based materials is accompanied by a volumetric reduction, which may

Thus, concern over the polymerization contraction of dental composite restorations has made placement of these materials a stressful situation for many practitioners and the object of inquiry for many clinical and basic science investigators. Using the keywords “dental

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# What I plan to talk about

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- Using it correctly!
- The role of bonding agents
- Relevant properties of materials for posterior composites
- Success rates
- Alternatives!
- Final thoughts

# Cost

- Materials' costs in an average practice are 5% to 7% of total expenses
- Always speak to a sales rep before purchasing a material from a major manufacturer, as they know the deals
- While there is variety in pricing, the only materials that are significantly cheaper are the "Own Label" brands

You can  
save £40 by  
buying a  
5ml bottle of  
“own label”  
bonding  
agent,  
but.....



## 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.

FJ Trevor Burka

### References

1. Burka FJT. Me too. *Dent Update* 2010; 37: 137.
2. Burka 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.

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

### 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 Supremo/Z350 (3M ESPE)	51
Filtek Z250 (3M ESPE)	35
Filtek Z100 (3M ESPE)	18
Venus Diamond (Heraeus Kulzer)	18
EsthetX (Dentsply)	18
Kalore (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.

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



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**

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

## Keywords

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

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## 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 determination, 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 properties of the own-label materials was noted.

Some own label materials performed as well in testing as those from manufacturers in the field

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



# Two own brand label (OBL) materials tested against 3M Z250

## Own brand label restorative materials—A false bargain?



Gaute Floer Johnsen<sup>a</sup>, Minh Khai Le Thieu<sup>a</sup>, Badra Hussain<sup>a</sup>, Elzbieta Pamuła<sup>b</sup>,  
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### ARTICLE INFO

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#### Keywords:

Own brand label

Composites

Flexural strength

### ABSTRACT

**Objectives:** This study aims at evaluating and comparing mechanical, chemical, and cytotoxicological parameters of a commercial brand name composite material against two 'own brand label' (OBL) composites.

**Methods:** Parameters included depth of cure, flexural strength, degree of conversion, polymerization shrinkage, filler particle morphology and elemental analyzes, Vickers hardness, surface roughness parameters after abrasion, monomer elution, and cytotoxicity.

**Results:** The conventional composite outperformed the OBLs in terms of depth of cure ( $p < 0.001$ ), degree of cure at the first and last time intervals ( $p < 0.001$ ), hardness ( $p < 0.001$ ), and post-abrasion roughness ( $p < 0.05$ ). The polymerization shrinkage was measured from 2.86% to 4.13% with the highest

should be prioritized and remain ever vigilant. At the present, the OBLs studied herein, must be considered at the very least a false bargain.

150 occlusal  
ART GIC  
restorations  
followed for 2  
years

Journal of Dentistry 101 (2020) 103446

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Is it worth using low-cost glass ionomer cements for occlusal ART restorations in primary molars? 2-year survival and cost analysis of a Randomized clinical trial

Isabel Cristina Olegário<sup>a,b</sup>, Nathalia de Miranda Ladewig<sup>b</sup>, Daniela Hesse<sup>c</sup>, Clarissa Calil Bonifácio<sup>c</sup>, Mariana Minatel Braga<sup>b</sup>, José Carlos Pettorossi Imparato<sup>b</sup>, Fausto Medeiros Mendes<sup>b</sup>, Daniela Prócida Raggio<sup>b,c</sup>

<sup>a</sup> Department of Public and Child Dental Health, Dublin Dental University Hospital, University of Dublin, Trinity College, Dublin, Ireland  
<sup>b</sup> Department of Pediatric Dentistry, School of Dentistry, University of São Paulo, São Paulo, Brazil  
<sup>c</sup> Department of Cariology, Endodontics and Prosthodontics, Academic Centre for Dentistry Amsterdam (ACTA), Amsterdam, the Netherlands

**ARTICLE INFO**

**Keywords:**  
dental caries  
artificially restorative treatment  
primary teeth  
cost effectiveness  
glass ionomer cements  
restoration survival  
dentine caries

**ABSTRACT**

**Objective:** To evaluate the 2-year survival rate and the cost-effectiveness of Artisanatic Restorative Treatment (ART) using three different glass ionomer cements (GICs) for restoring occlusal dentin caries lesions in primary molars.

**Methods:** One hundred and fifty (150) 4-6-year-old children were selected, randomly allocated and treated in school tables according to the restorative material: Fuji IX Gold Label (GC Corp), Vitro Molar (nova DFL) and Maxxion R (JGM), the latter two being low-cost brands. Materials and professionals' costs were considered to analyse baseline total cost, and from this the cumulative cost of each treatment was calculated. Restoration assessments were performed after 2, 6, 12 and 24 months by an independent calibrated examiner. Restoration survival was estimated using Kaplan-Meier survival analysis and Cox regression was used to test association with clinical factors. Bootstrap regression (1,000 replications) compared material's cost over time and Monte-Carlo simulation was used to build cost-effectiveness scatter plots.

**Results:** The overall survival rate of occlusal ART restorations after 2 years was 52% (Fuji IX = 72.7%; Vitro Molar = 46.5%; Maxxion R = 39.6%). Restorations performed with Vitro Molar and Maxxion R were more likely to fail when compared to Fuji IX. At baseline, Fuji IX was the more expensive option ( $p < 0.001$ ), however, considering the simulation of accumulated cost caused by failures until 2-year evaluation, no difference was found between the groups.

**Conclusions:** After 2 years' follow up, restorations performed with Fuji IX proved to be superior in terms of survival, with a similar overall cost, when compared to low-cost glass ionomer cements (Vitro Molar and Maxxion R).

3 materials:  
Fuji IX (GC)  
2 low cost  
GICs

J.Dent.2020:101:  
103446

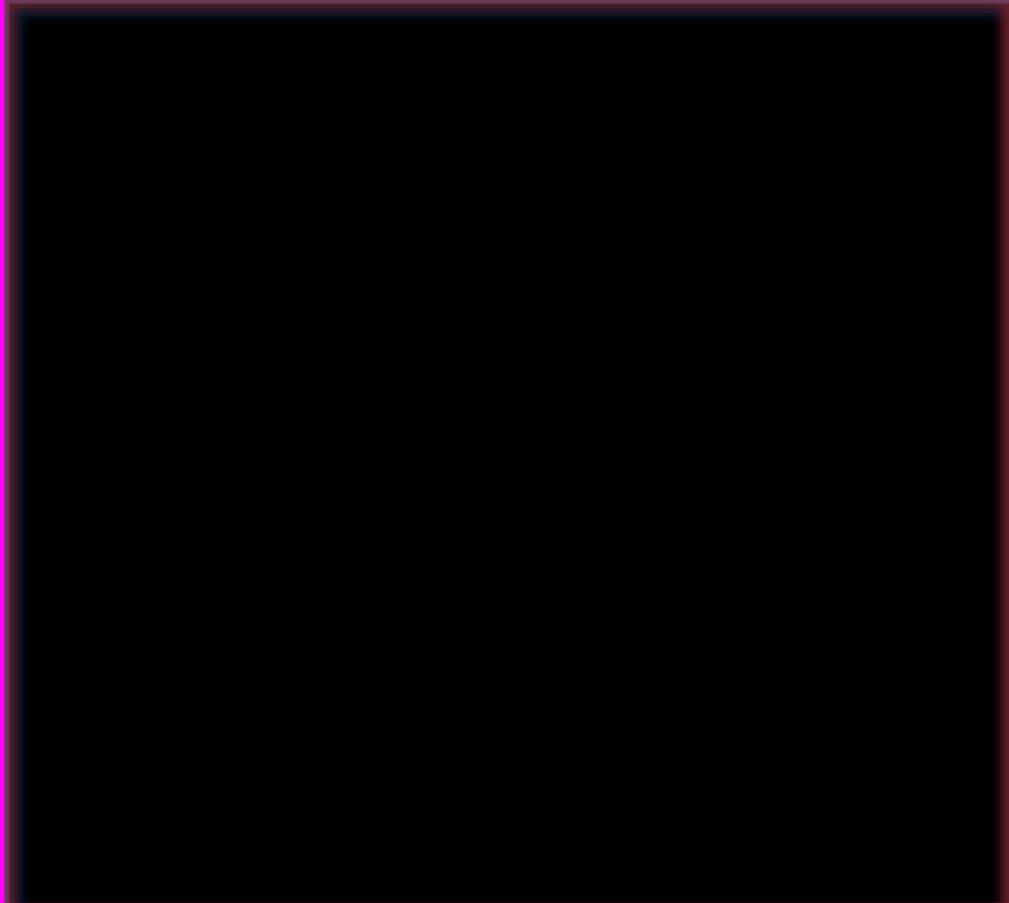
# SHORT ANSWER!

Is it worth using low-cost glass ionomer cements for occlusal ART restorations in primary molars? 2-year survival and cost analysis of a Randomized clinical trial

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Fausto Medeiros Mendes<sup>b</sup>, Daniela Prócida Raggio<sup>b,\*</sup>

*NO! They don't last as long, and, despite the fact that Fuji IX is more expensive, they are not cost-effective.*

# The “evidence” for Own Label Brands



In the current situation, it might be tempting to save £s on materials, but the saving should be considered alongside the cost of one premature failure

# Patients care more about dental materials than I 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.

Refereed Paper  
Accepted 9 November 2015  
DOI: 10.1038/sj.bdj.2015.956  
\*British Dental Journal 2015; 219: 577-582

BRITISH DENTAL JOURNAL VOLUME 219 NO. 12 DEC 18 2015

There is no (economic) sense in buying a material with no research to back it up. Patients care!

## 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

## TIP#1

Choose a reliable material with research to back it up and follow the instructions!

# What I plan to talk about

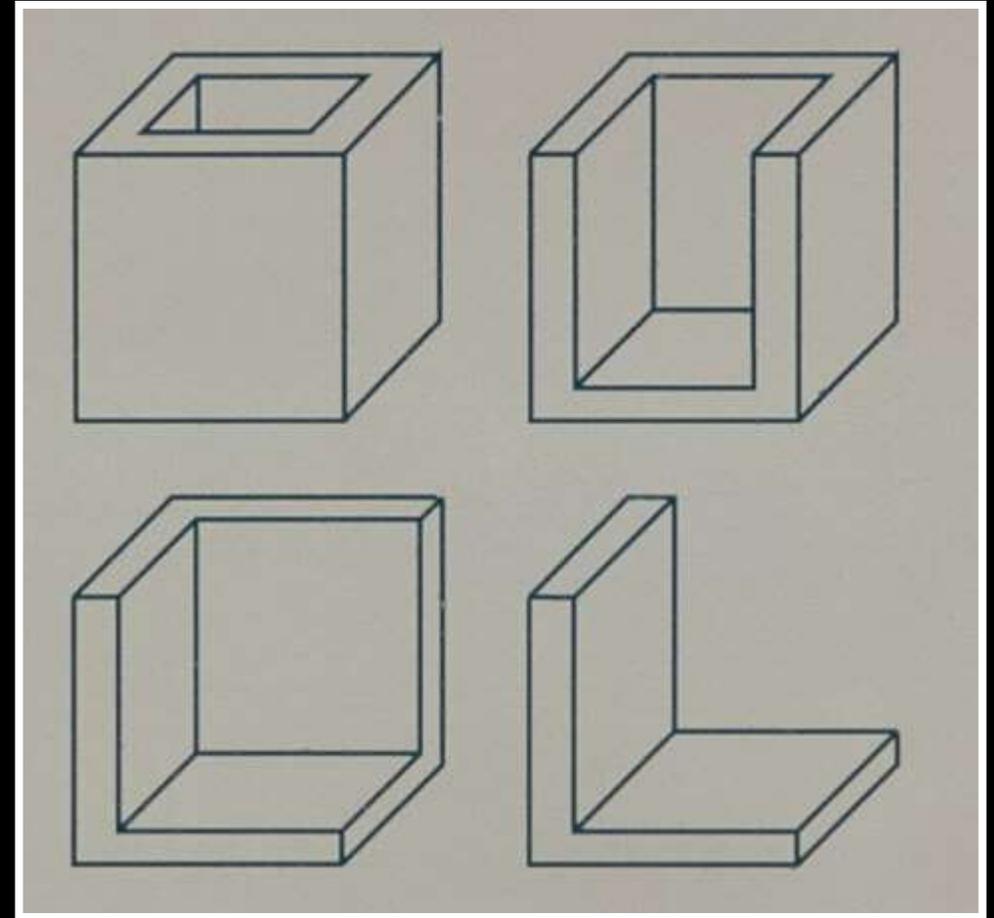
- Incidence of post-op sensitivity with posterior composite
- Choosing the right material
- Using it correctly!
- The role of bonding agents
- Relevant properties of materials for posterior composites
- Success rates
- Alternatives!
- Final thoughts

# The Configuration Factor

## C-Factor

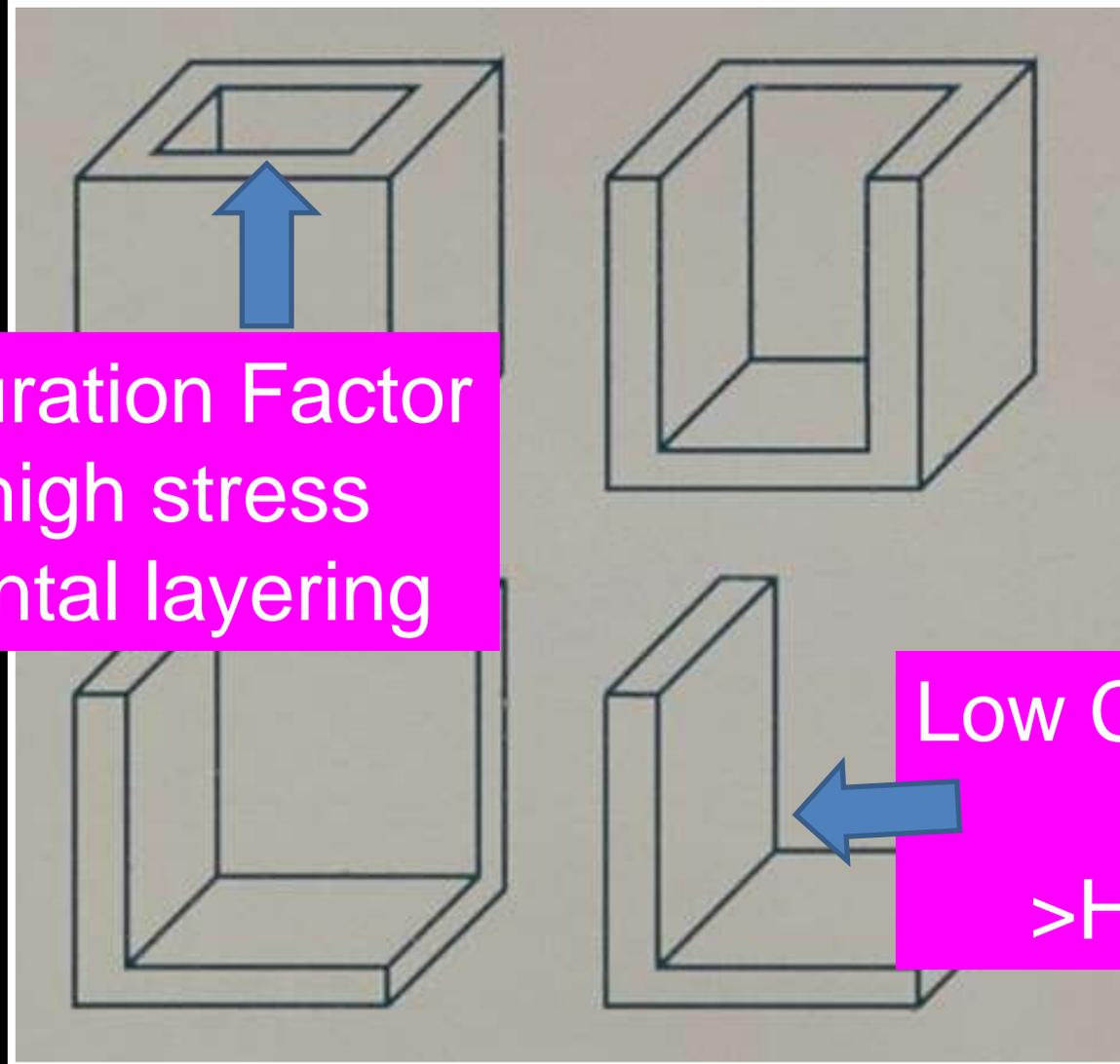
$$C = \frac{\text{Total Bonded Area}}{\text{Total Unbonded Area}}$$

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



Feilzer AJ, De Gee AJ, Davidson CL. Setting stress in composite resin in relation to the configuration of the restoration. J.Dent.Res.1987;66:1636-1639.

# The Configuration Factor



High Configuration Factor  
= high stress  
> incremental layering

Low Configuration Factor  
= low stress  
> Horizontal layering

# The Configuration Factor

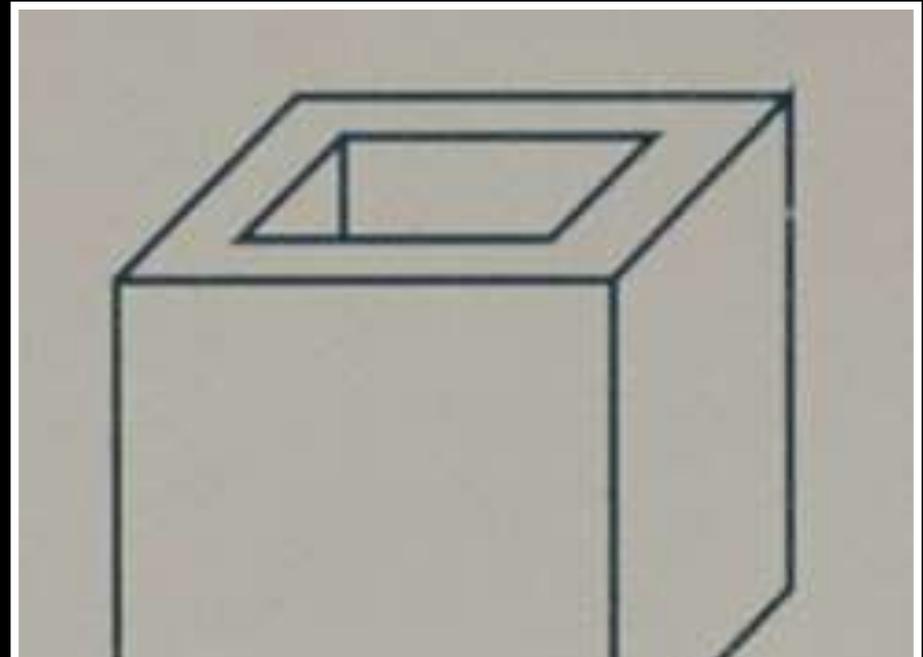
Occlusal cavities are the highest stress, especially large cavities

## C-Factor

Total Bonded Area

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

Total Unbonded Area



...therefore incremental placement is mandatory when using “normal” composites

# Cusp replacement composites show good performance at 30 months

## Clinical Evaluation of Direct Cuspal Coverage with Posterior Composite Resin Restorations

SIMONE DELIPERI, DDS\*  
DAVID N. BARDWELL, DMD, MS†

### ABSTRACT

**Background:** Composite resins have esthetic properties; they join the ability to preserve and reinforce sound tooth structure. Conservation is becoming popular for both small to medium defects and more compromised teeth.

**Purpose:** This study aimed to evaluate the clinical performance of Class II cuspal coverage direct composite restorations.

**Materials and Methods:** Twenty patients, 18 years or older, were included in this clinical trial restoring 25 vital molar teeth with one or two missing cusps. Criteria for inclusion are two or three surface restorations, replacement of composite and amalgam fillings (secondary decay, fracture of either filling material or tooth structure, aesthetic considerations), or virgin teeth with decay undermining a cusp. Teeth with residual cavity walls less than 1 mm or with complete loss of the clinical crown were excluded.

Teeth were restored using a combination of Ultra-Etch 35% phosphoric acid, PQ1 adhesive system, and Vit-I-escence microhybrid composite resin (Ultradent Products, Inc., South Jordan, UT, USA). The enamel peripheral skeleton of the restoration was built up first, followed by dentin and enamel occlusal surface stratification. Wedge-shaped increments of composite resin were placed and cured using the variable intensity polymerizer (VIP) light (Bisco Inc., Schaumburg, IL, USA) through a combination of a pulse and progressive curing technique.

**Results:** All 25 restorations were evaluated at 6-month intervals during the 30-month period using a modified US Public Health Service (USPHS) criteria by two independent evaluators pre-calibrated at 85% reliability. No failures were reported and alpha scores were recorded for all parameters. Statistical analysis was performed using a Chi-square test ( $\chi^2$ ) and the Fisher's exact test. Sixteen of the 25 samples (64%) exhibited preoperative sensitivity to air ( $\chi^2 = 10.6$ ;  $p = 0.001$ ). A significant difference in tooth sensitivity was reported after completion of the restorations. No teeth exhibited sensitivity both at the 2-week recall and the 30-month follow-up ( $\chi^2 = 23.5$ ;  $p < 0.0001$ ).

**Conclusion:** Microhybrid composite resin demonstrated excellent clinical performance in direct cuspal coverage at completion of a 30-month evaluation.

### CLINICAL SIGNIFICANCE

In selected clinical situations, cuspal coverage direct posterior composite restorations may represent a valid alternative to conventional indirect restorations.

(*J Esthet Restor Dent* 18:256–267, 2006)

\*Visiting instructor and research associate, Tufts University School of Dental Medicine, Boston, MA, USA;  
Private practice, Cagliari, Italy  
†Associate clinical professor of restorative dentistry, Tufts University School of Dental Medicine, Boston, MA, USA

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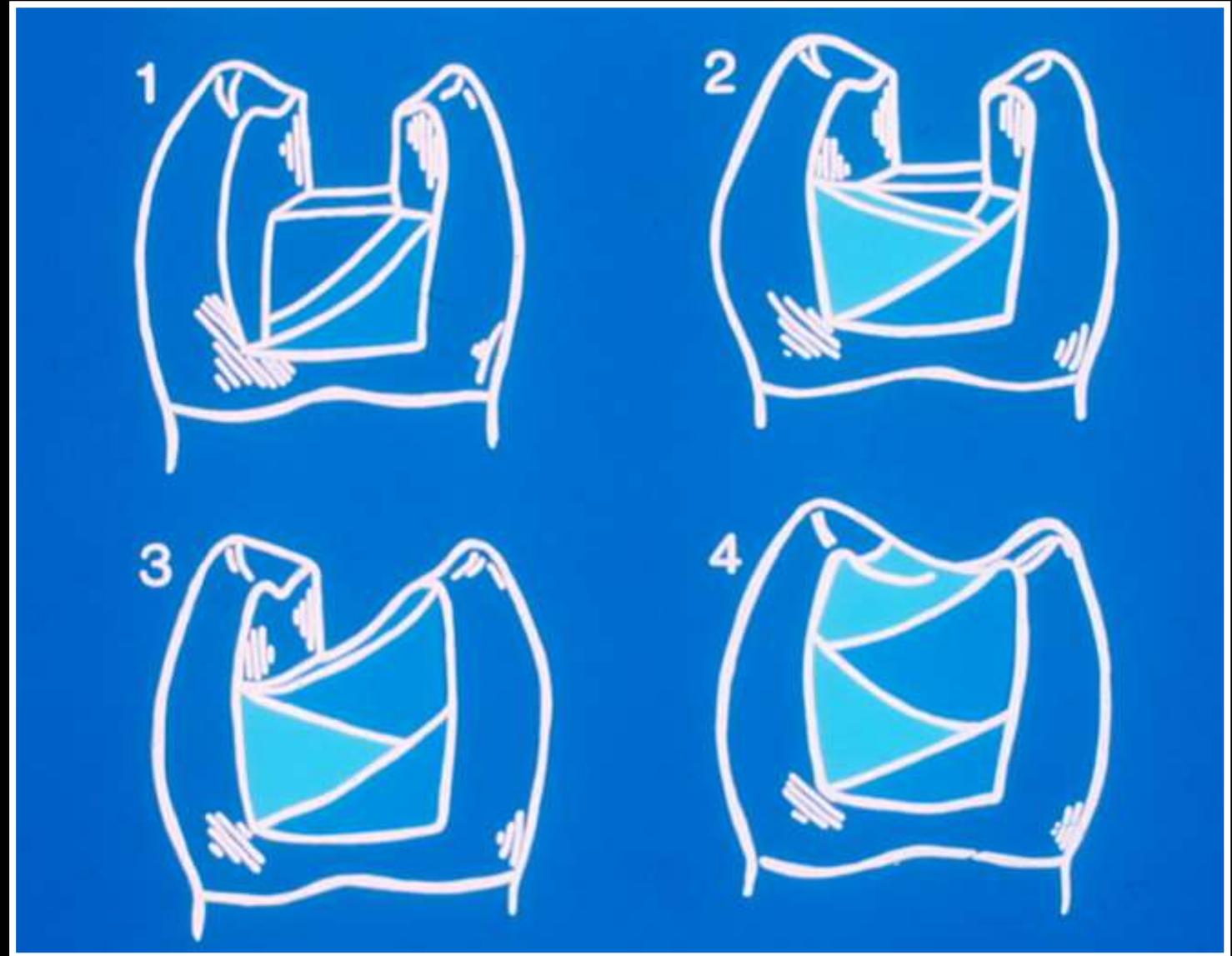
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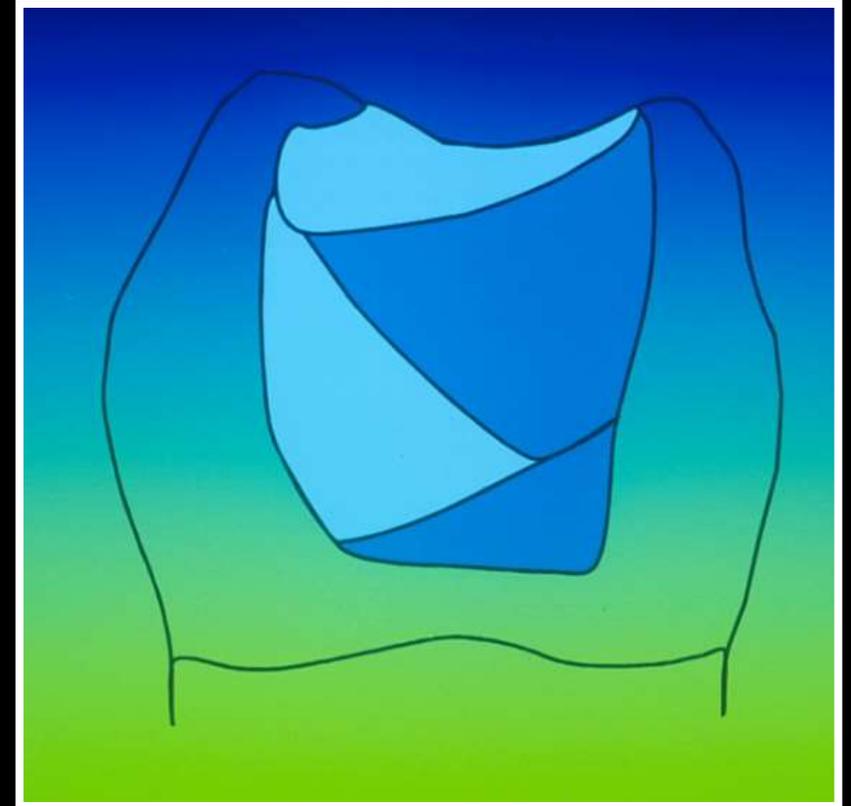
In selected clinical situations, cuspal coverage direct posterior composite restorations may represent a valid alternative to conventional indirect restorations.

Incremental buildup  
is needed if a low  
shrinkage stress  
material is not  
being used



# Clinical ways of countering polymerisation shrinkage stresses

- *Incremental curing*
- Ramped curing
- Macro fillers
- Flowable composite base layer
- Low shrink (1% shrinkage) resins
- **All of these!!**



## TIP#2

Be aware of the Configuration Factor,  
especially with medium/large occlusal cavities

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Dental Update invites submission of articles pertinent to general dental practice. Articles should be well-written, authoritative and fully illustrated. Manuscripts should be prepared following the Guidelines for Authors published in the April 2006 issue (additional copies are available from the Editor on request). Authors are advised to submit a synopsis before writing an article. The opinions expressed in this publication are those of the authors and are not necessarily those of the editorial staff or the members of the Editorial Board. The journal is listed in Index to Dental Literature, Current Opinion in Dentistry, MEDLINE & other databases.

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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 polymerized 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 polymerized 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 MAIRC (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. 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. 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>1</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, Falco CM, Whiston JM. Factors affecting the energy delivered to simulated class I and class V preparations. *J Gen Dent Assoc* 2010; 76: 204.
2. Shortall AC, Harrington E, Patel HB, Lumley PJ. A pilot investigation of operator variability during intra-oral light curing.
3. Barfina N, Fischer DE, Pham T. Revisiting the intensity output of curing lights in private dental offices. *Compend Cont Educ Dent* 2007; 28(7): 380-384.
4. Milton BA, Wilson NH. The use and maintenance of visible light activating units in general practice. *Br Dent J* 2001; 191: 82-86.
5. Janowatwa Z, Porter K, Shortall ACC, Burke FT, Sammons RL. Microbial contamination of light curing units: a pilot study. *J Infect Prevention* 2010; 11: 217-221.

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



FJ Trevor Burke

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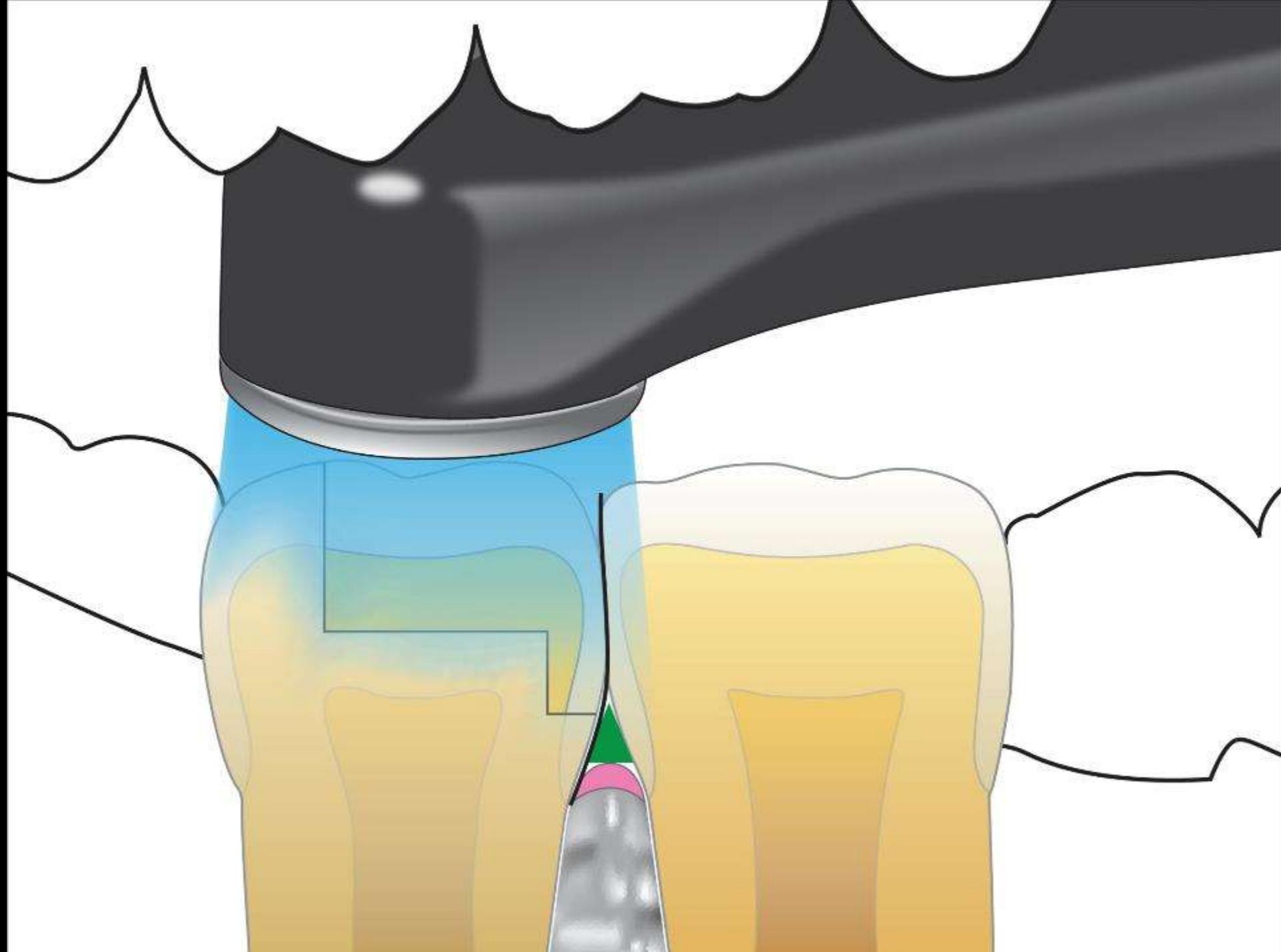


# VALO™

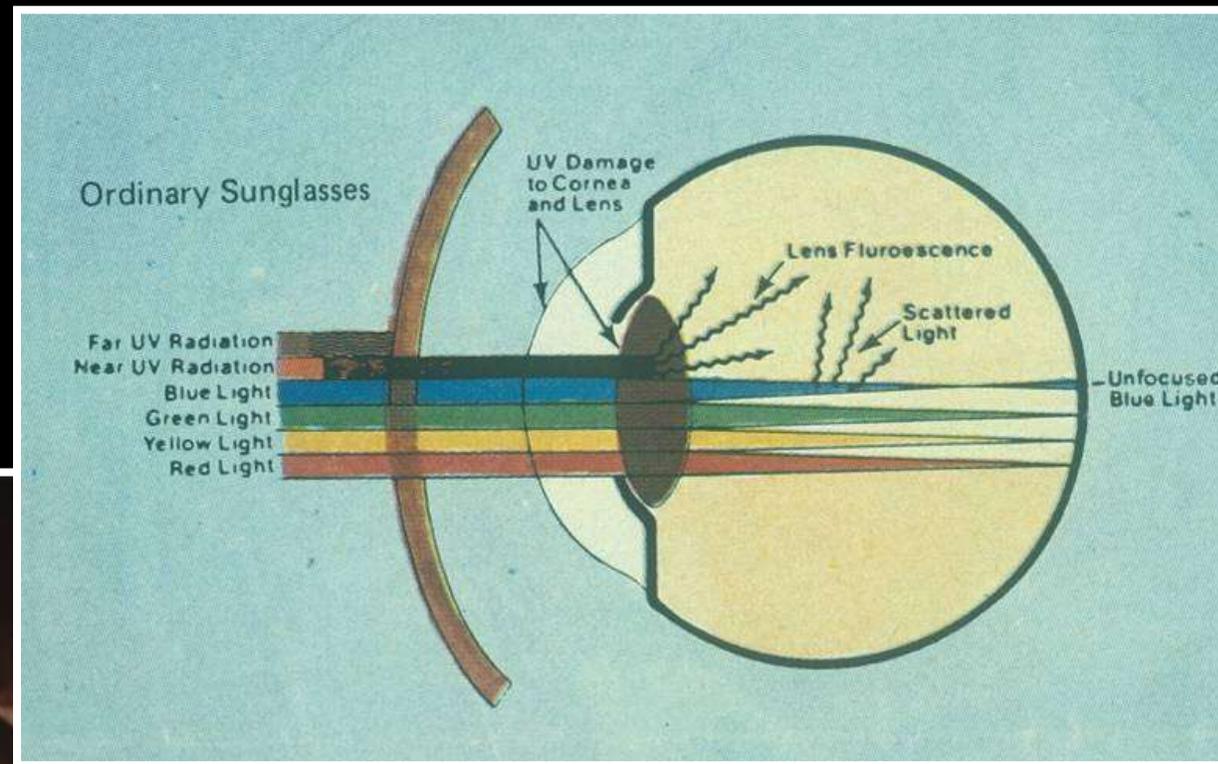
ULTRADENT'S NEW LED CURING LIGHT







# DANGER!



Avoid retina burns

## TIP#3

Use your LCU accurately  
Check its intensity regularly

# Checking your light curing unit, or not?

Every 3 months is probably enough  
(Palin W. personal communication)

53.1% of respondents stated that they checked their LCU

Bure FJT, Wilson NHF, Brunton PA. Contemporary dental practice in the UK. Part 1: demography and practising arrangements in 2015. Br.Dent.J.2019; 226: 55-61.

An additional  
tip...

If +++ occlusal adjustment is required, repeat light curing will harden the adjusted surface

Accurate deposition of etch & composite filling material saves time on adjustment

# What I plan to talk about

- Incidence of post-op sensitivity with posterior composite
- Choosing the right material
- Using it correctly!
- The role of bonding agents**
- Relevant properties of materials for posterior composites
- Success rates
- Alternatives!
- Final thoughts

# Why do dentists need adhesion?

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

ALSO.....

Seals dentinal tubules to reduce post operative sensitivity

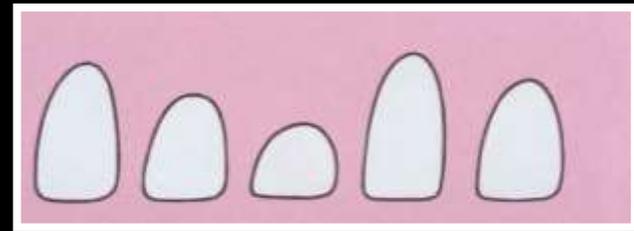
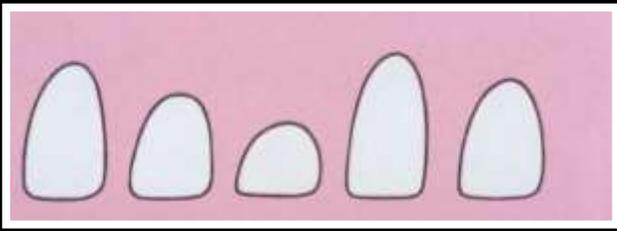
Seals restoration margins to reduce the risk of marginal staining and recurrent caries (and also, post-operative sensitivity).

0099-2399/86/1210-0453/\$02.00/0  
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**The Hydrodynamic Theory of Dentinal Pain: Sensation in Preparations, Caries, and the Dentinal Crack Syndrome**

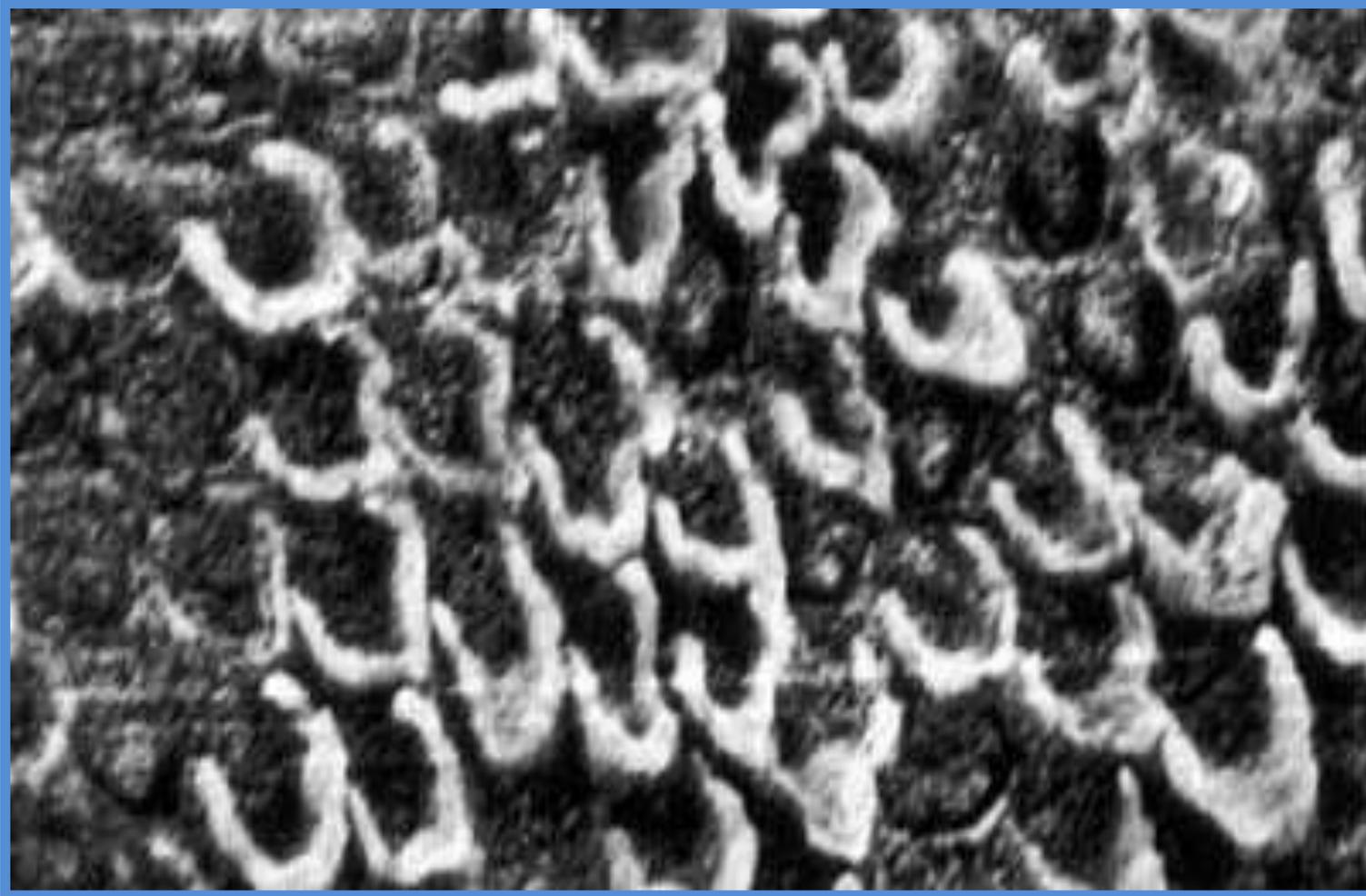
Martin Brännström, DDS, Dr. Odont.



## Bonding composite to teeth

First, enamel.....

# Michael Buonocore



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

# Problems in bonding to dentine

## COMPOSITION OF DENTINE

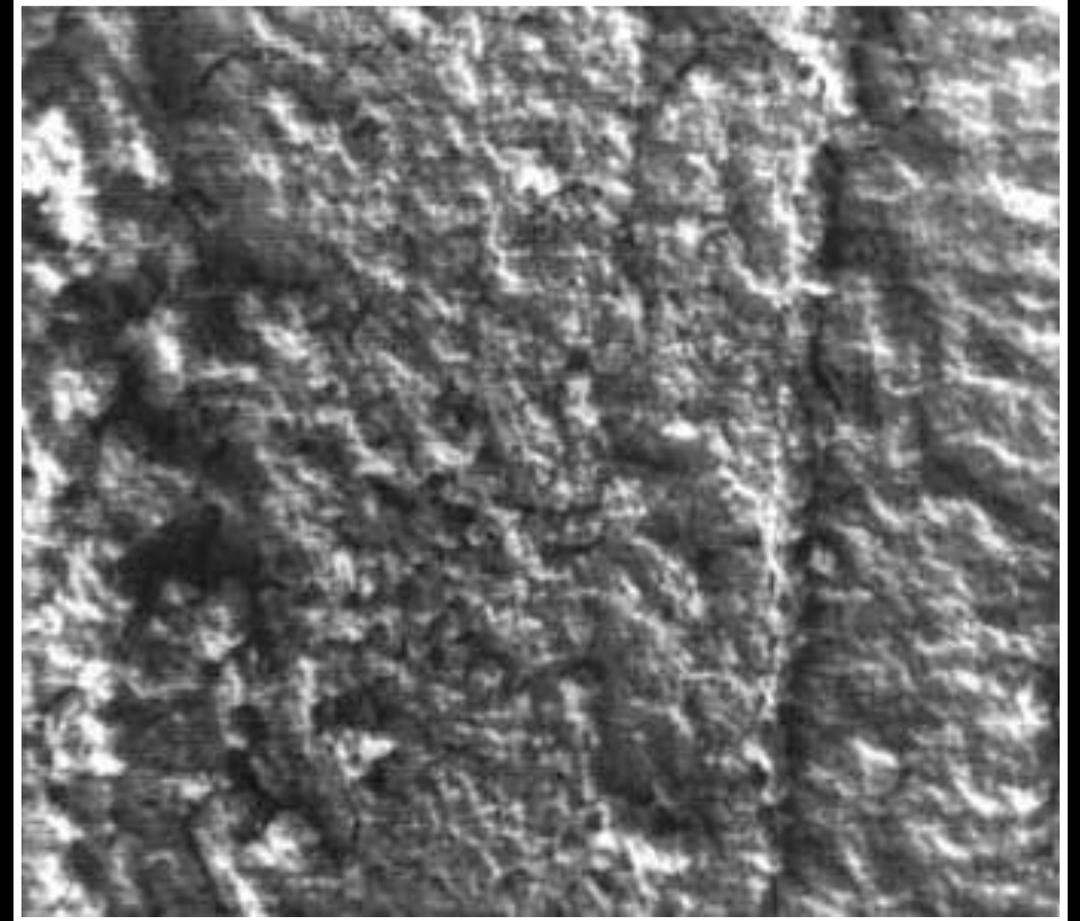
70% Inorganic

Bonding to dentine is  
therefore more difficult

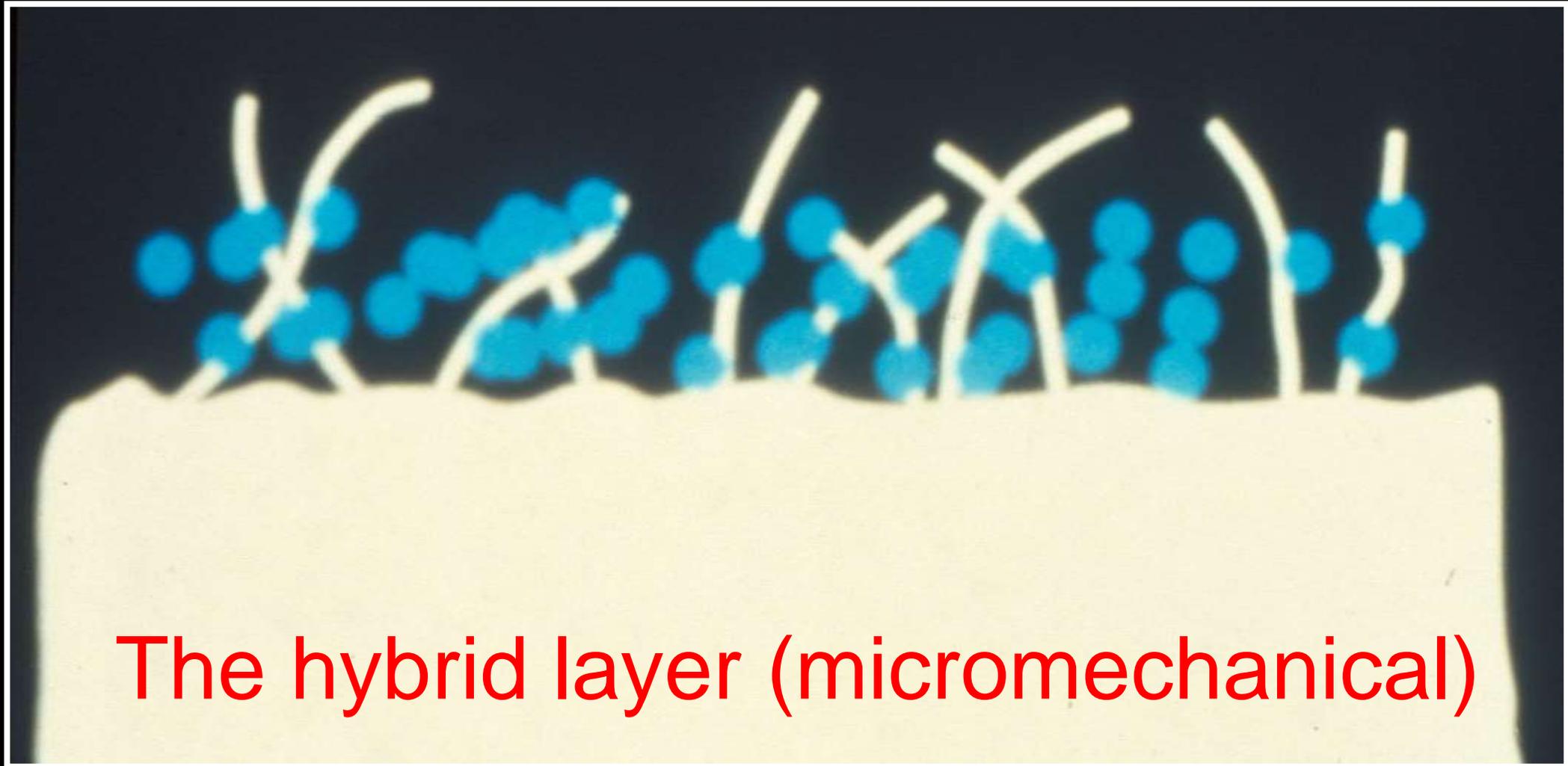
It is a vital substrate

# Another consideration: The smear Layer

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



B. Van Meerbeek in: Summitt Fund. Oper. Dent. 2001,  
Enamel and Dentin Adhesives, Col Kraig S. Vandewalle, USAF Dental  
Investigation Service,



## The hybrid layer (micromechanical)

Nakabayashi N, Kojilma K, Masuhara E. The promotion of adhesion by the infiltration of monomers into tooth substrates. *J Biomed Mater Res* 1982; 16: 265–273.

Overdrying the dentine causes the collagen to collapse

## TIP#4

Do not desiccate the dentine: the collagen collapses and the bond is challenged

# 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

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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.

Clearfil SE used as bonding agent, pH 2.3

100 class V restorations followed for 5 years



Similar results  
at 13 years

## 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.

*NOW!*

The Universal bonding agents

# 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)

Etch&Rinse and Self Etch were type specific

# How so-called self etch (and Universal bonding agents in self etch mode) work!

Without phosphoric acid etching, acidic monomers of self-etch adhesives do not remove the smear layer. Rather, the smear layer is partially demineralized and incorporated into the hybrid layer.

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### The effect of dentine surface preparation and reduced application time of adhesive on bonding strength

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**ABSTRACT**  
Objective: This study evaluated the effects of surface preparation and the application of universal adhesives on the micro-tensile bond strengths with universal adhesives.  
Methods: Forty teeth were cut to exposed root coronal dentin and divided into 12 groups (n = 11) based on three factors: (1) adhesive (Clearfil Bond [CF Bond], Tetric Bond [TB], Clearfil Universal Bond [CU], Kungfu Universal Bond [KU], Clearfil Multipurpose Plus [CMP Plus], Clearfil Universal Bond [CU], Clearfil Multipurpose Plus [CMP Plus], Clearfil Universal Bond [CU], Clearfil Multipurpose Plus [CMP Plus], Clearfil Universal Bond [CU], Clearfil Multipurpose Plus [CMP Plus], Clearfil Universal Bond [CU], Clearfil Multipurpose Plus [CMP Plus]), (2) smear layer preparation (SL, smear present, no smear or smear etched), (3) application time (standard time of manufacturer's instruction, 15-min, 30-min, 45-min, 60-min, 75-min, 90-min, 105-min, 120-min, 135-min, 150-min, 165-min, 180-min, 195-min, 210-min, 225-min, 240-min, 255-min, 270-min, 285-min, 300-min, 315-min, 330-min, 345-min, 360-min, 375-min, 390-min, 405-min, 420-min, 435-min, 450-min, 465-min, 480-min, 495-min, 510-min, 525-min, 540-min, 555-min, 570-min, 585-min, 600-min, 615-min, 630-min, 645-min, 660-min, 675-min, 690-min, 705-min, 720-min, 735-min, 750-min, 765-min, 780-min, 795-min, 810-min, 825-min, 840-min, 855-min, 870-min, 885-min, 900-min, 915-min, 930-min, 945-min, 960-min, 975-min, 990-min, 1005-min, 1020-min, 1035-min, 1050-min, 1065-min, 1080-min, 1095-min, 1110-min, 1125-min, 1140-min, 1155-min, 1170-min, 1185-min, 1200-min, 1215-min, 1230-min, 1245-min, 1260-min, 1275-min, 1290-min, 1305-min, 1320-min, 1335-min, 1350-min, 1365-min, 1380-min, 1395-min, 1410-min, 1425-min, 1440-min, 1455-min, 1470-min, 1485-min, 1500-min, 1515-min, 1530-min, 1545-min, 1560-min, 1575-min, 1590-min, 1605-min, 1620-min, 1635-min, 1650-min, 1665-min, 1680-min, 1695-min, 1710-min, 1725-min, 1740-min, 1755-min, 1770-min, 1785-min, 1800-min, 1815-min, 1830-min, 1845-min, 1860-min, 1875-min, 1890-min, 1905-min, 1920-min, 1935-min, 1950-min, 1965-min, 1980-min, 1995-min, 2010-min, 2025-min, 2040-min, 2055-min, 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16425-min, 16440-min, 16455-min, 16470-min, 16485-min, 16500-min, 16515-min, 16530-min, 16545-min, 16560-min, 16575-min, 16590-min, 16605-min, 16620-min, 16635-min, 16650-min, 16665-min, 16680-min, 16695-min, 16710-min, 16725-min, 16740-min, 16755-min, 16770-min, 16785-min, 16800-min, 16815-min, 16830-min, 16845-min, 16860-min, 16875-min, 16890-min, 16905-min, 16920-min, 16935-min, 16950-min, 16965-min, 16980-min, 16995-min, 17010-min, 17025-min, 17040-min, 17055-min, 17070-min, 17085-min, 17100-min, 17115-min, 17130-min, 17145-min, 17160-min, 17175-min, 17190-min, 17205-min, 17220-min, 17235-min, 17250-min, 17265-min, 17280-min, 17295-min, 17310-min, 17325-min, 17340-min, 17355-min, 17370-min, 17385-min, 17400-min, 17415-min, 17430-min, 17445-min, 17460-min, 17475-min, 17490-min, 17505-min, 17520-min, 17535-min, 17550-min, 17565-min, 17580-min, 17595-min, 17610-min, 17625-min, 17640-min, 17655-min, 17670-min, 17685-min, 17700-min, 17715-min, 17730-min, 17745-min, 17760-min, 17775-min, 17790-min, 17805-min, 17820-min, 17835-min, 17850-min, 17865-min, 17880-min, 17895-min, 17910-min, 17925-min, 17940-min, 17955-min, 17970-min, 17985-min, 18000-min, 18015-min, 18030-min, 18045-min, 18060-min, 18075-min, 18090-min, 18105-min, 18120-min, 18135-min, 18150-min, 18165-min, 18180-min, 18195-min, 18210-min, 18225-min, 18240-min, 18255-min, 18270-min, 18285-min, 18300-min, 18315-min, 18330-min, 18345-min, 18360-min, 18375-min, 18390-min, 18405-min, 18420-min, 18435-min, 18450-min, 18465-min, 18480-min, 18495-min, 18510-min, 18525-min, 18540-min, 18555-min, 18570-min, 18585-min, 18600-min, 18615-min, 18630-min, 18645-min, 18660-min, 18675-min, 18690-min, 18705-min, 18720-min, 18735-min, 18750-min, 18765-min, 18780-min, 18795-min, 18810-min, 18825-min, 18840-min, 18855-min, 18870-min, 18885-min, 18900-min, 18915-min, 18930-min, 18945-min, 18960-min, 18975-min, 18990-min, 19005-min, 19020-min, 19035-min, 19050-min, 19065-min, 19080-min, 19095-min, 19110-min, 19125-min, 19140-min, 19155-min, 19170-min, 19185-min, 19200-min, 19215-min, 19230-min, 19245-min, 19260-min, 19275-min, 19290-min, 19305-min, 19320-min, 19335-min, 19350-min, 19365-min, 19380-min, 19395-min, 19410-min, 19425-min, 19440-min, 19455-min, 19470-min, 19485-min, 19500-min, 19515-min, 19530-min, 19545-min, 19560-min, 19575-min, 19590-min, 19605-min, 19620-min, 19635-min, 19650-min, 19665-min, 19680-min, 19695-min, 19710-min, 19725-min, 19740-min, 19755-min, 19770-min, 19785-min, 19800-min, 19815-min, 19830-min, 19845-min, 19860-min, 19875-min, 19890-min, 19905-min, 19920-min, 19935-min, 19950-min, 19965-min, 19980-min, 19995-min, 20010-min, 20025-min, 20040-min, 20055-min, 20070-min, 20085-min, 20100-min, 20115-min, 20130-min, 20145-min, 20160-min, 20175-min, 20190-min, 20205-min, 20220-min, 20235-min, 20250-min, 20265-min, 20280-min, 20295-min, 20310-min, 20325-min, 20340-min, 20355-min, 20370-min, 20385-min, 20400-min, 20415-min, 20430-min, 20445-min, 20460-min, 20475-min, 20490-min, 20505-min, 20520-min, 20535-min, 20550-min, 20565-min, 20580-min, 20595-min, 20610-min, 20625-min, 20640-min, 20655-min, 20670-min, 20685-min, 20700-min, 20715-min, 20730-min, 20745-min, 20760-min, 20775-min, 20790-min, 20805-min, 20820-min, 20835-min, 20850-min, 20865-min, 20880-min, 20895-min, 20910-min, 20925-min, 20940-min, 20955-min, 20970-min, 20985-min, 21000-min, 21015-min, 21030-min, 21045-min, 21060-min, 21075-min, 21090-min, 21105-min, 21120-min, 21135-min, 21150-min, 21165-min, 21180-min, 21195-min, 21210-min, 21225-min, 21240-min, 21255-min, 21270-min, 21285-min, 21300-min, 21315-min, 21330-min, 21345-min, 21360-min, 21375-min, 21390-min, 21405-min, 21420-min, 21435-min, 21450-min, 21465-min, 21480-min, 21495-min, 21510-min, 21525-min, 21540-min, 21555-min, 21570-min, 21585-min, 21600-min, 21615-min, 21630-min, 21645-min, 21660-min, 21675-min, 21690-min, 21705-min, 21720-min, 21735-min, 21750-min, 21765-min, 21780-min, 21795-min, 21810-min, 21825-min, 21840-min, 21855-min, 21870-min, 21885-min, 21900-min, 21915-min, 21930-min, 21945-min, 21960-min, 21975-min, 21990-min, 22005-min, 22020-min, 22035-min, 22050-min, 22065-min, 22080-min, 22095-min, 22110-min, 22125-min, 22140-min, 22155-min, 22170-min, 22185-min, 22200-min, 22215-min, 22230-min, 22245-min, 22260-min, 22275-min, 22290-min, 22305-min, 22320-min, 22335-min, 22350-min, 22365-min, 22380-min, 22395-min, 22410-min, 22425-min, 22440-min, 22455-min, 22470-min, 22485-min, 22500-min, 22515-min, 22530-min, 22545-min, 22560-min, 22575-min, 22590-min, 22605-min, 22620-min, 22635-min, 22650-min, 22665-min, 22680-min, 22695-min, 22710-min, 22725-min, 22740-min, 22755-min, 22770-min, 22785-min, 22800-min, 22815-min, 22830-min, 22845-min, 22860-min, 22875-min, 22890-min, 22905-min, 22920-min, 22935-min, 22950-min, 22965-min, 22980-min, 22995-min, 23010-min, 23025-min, 23040-min, 23055-min, 23070-min,

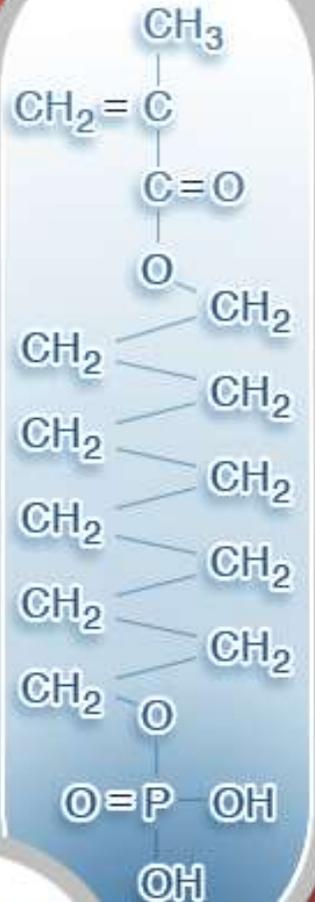
# Universal bonding agents:

## new additions are on the way!



# Most contain the resin 10-MDP

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

# SUMMARY: Universal bonding agents:

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

Some are compatible with direct & indirect procedures

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

Are suitable primers for silica & zirconia

Can bond to different substrates (e.g. metal)



FJ Trevor Burke

Anna Lawson, David JB Green and Louis Mackenzie

# What's New in Dentine Bonding?: Universal Adhesives

**Abstract:** The ability to bond restorations to dentine successfully is central to minimally invasive restorative dentistry. While dentine-bonding agents have gone through a variety of 'generations,' it is the purpose of this paper to describe the latest dentine-bonding agents, the Universal Bonding Agents. These materials may be considered 'Universal' insofar as they may be considered to be capable of being used for direct and indirect dentistry, as well as being suitable for use in whichever etching modality the clinician considers appropriate, namely self-etch, etch and rinse or selective enamel etch. Laboratory investigations and initial clinical studies hold the promise that Universal Bonding Agents are a forward step in the quest for the ultimate bond to tooth substance.

**CPD/Clinical Relevance:** New Universal Bonding Agents appear to present a promising advance in bonding to dentine.

**Dent Update 2017; 44: ??? ??**

Dentine-bonding agents play a strategic role in the sealing and retention (where necessary) of resin composite restorations, which are increasingly placed by dentists worldwide.<sup>1</sup> Bonding to dentine is also central to the practice of minimally invasive dentistry, given that bonded restorations do not require macro-mechanical retentive features such as locks and keys, which are a feature of non-adhesive (amalgam) cavity preparations.<sup>2</sup>

A dentine-bonding agent should perform the following functions:<sup>3</sup>

- Provide a strong, immediate and permanent bond to dentine;
- Seal the cavity and minimize leakage;
- Resist microbial or enzymatic degradation;
- Provide adhesion *per se* of the restoration in cases where this is necessary;
- Prevent post-operative sensitivity;
- Reduce the risk of recurrent caries;
- Prevent marginal staining;
- Be easy to use.

It is the intention of this paper to update readers on the new group of Universal Dentine Bonding Agents, this being a follow-up to a paper published in 2004 giving details of the last major innovation in bonding to dentine, the introduction of the so-called self-adhesive dentine bonding agents<sup>4</sup> and to other *Dental Update* publications on the subject which readers may wish to read as background or a further update, such as those by Green and Banerjee,<sup>5</sup> Green, Mackenzie and Banerjee<sup>6</sup> and others.<sup>7,8</sup>

## A brief history of bonding to dentine

In the past, dentine-bonding agents were classified into generations.<sup>1</sup> However, this means of identifying different groups of bonding agents fell into disarray because of the failure of authorities in the subject to agree on the type of bonding agent which fitted a given 'generation'. Until recently, the classification has therefore been simply, glass ionomer materials, and resin-based dentine-bonding agents, the latter being further classified into *etch and rinse* materials and *self-etch* materials, with some workers classifying the self-etch materials according to their pH.<sup>9</sup>

There are two principal means by which a bond to dentine may be achieved:<sup>9</sup>

- First, glass ionomer materials (GIC – glass-ionomer cements) which were developed in the 1970s, initially being derived from the Fluoro-Alumino-Silicate glass used in the silicate cement materials which were used until the 1960s, but with the phosphoric acid used in silicate cements being substituted by a

**FJ Trevor Burke, DDS, MSc, MDS, MGDS, FDS(RCS Edin), FDS(RCS(Engl), FFGDP (UK), IADM, Primary Dental Care Research Group, University of Birmingham School of Dentistry, Anna Lawson, BDS, MSc, MFDC(RCS Edin), General Dental Practitioner, Nottingham, David JB Green, BDS(Hons), BSc, MFDS(RCS(Edin), SrR Restorative Dentistry, Birmingham Dental Hospital and Louis Mackenzie, BDS, General Dental Practitioner, Birmingham and University of Birmingham School of Dentistry, 5 Mill Pool Way, Peckie Mill, Birmingham B5 7EG, UK.**

# Conclusion from this publication:

# New Universal bonding agents are an advance in bonding

Dent.Update.2017:44:328-340

RCT:  
34 patients,  
152 NCCLs

*Operative Dentistry*, 2019, 44-5, 476-487

## Bonding Performance of Simplified Adhesive Systems in Noncarious Cervical Lesions at 2-year Follow-up: A Double-blind Randomized Clinical Trial

RF Zanatta • TM Silva • MALR Esper • E Bresciani • SEP Gonçalves • TMF Caneppele

### Clinical Relevance

The composition and adhesion strategy of current simplified adhesives may be used for noncarious cervical lesions with minimal dentin sclerosis.

### SUMMARY

**Objectives:** This study aimed to evaluate the bonding performance of a universal adhesive used according to self-etching or etch-and-rinse protocols in noncarious cervical lesions (NCCLs) and to compare the two protocols with their respective gold standard techniques.

**Methods and Materials:** This randomized, double-blind clinical study enrolled 34 partici-

pants who met the inclusion criteria, 29 of whom returned after two years. They received 152 restorations bonded with one of the three adhesives (Scotchbond Universal Adhesive, Adper Single Bond 2, or Clearfil SE Bond) and one of the two bonding techniques tested. The NCCLs were restored with nanocomposite resin (Filtek Supreme). Final contours were done with a fine diamond rotary instrument and polished with rubber points. The restorations were evaluated using the FDI World

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DOI: <https://doi.org/10.2341/18-049-C>

Bonded with  
SB Universal,  
Adper Single  
Bond, Clearfil  
SE

The success of universal adhesives is attributed to the presence of 10-MDP monomer, which is responsible for the chemical bonding, creating a stable interface even without micromechanical retention.

**CONCLUSION:** This 2-year clinical evaluation showed that SB Universal performed similarly in restoring NCCLs compared with the etch&rinse (Single Bond) or self-etch (Clearfil SE) systems

18 pages!!

Shear bond strength tests

9284 publications,  
81 read in full,  
57 reviewed



## Bonding Performance of Universal Adhesives: An Updated Systematic Review and Meta-Analysis

Carlos Enrique Cuevas-Suárez<sup>a</sup> / Wellington Luiz de Oliveira da Rosa<sup>b</sup> / Rafael Guerra Lund<sup>c</sup> /  
Adriana Fernandes da Silva<sup>d</sup> / Evandro Piva<sup>e</sup>

**Purpose:** To evaluate through a systematic review and meta-analysis whether the immediate and long-term bonding performance of universal adhesives would be improved by prior acid etching.

**Materials and Methods:** Two reviewers performed a literature search up to April 2018 in eight databases: PubMed, Web of Science, Cochrane Library, SciELO, Scopus, LILACS, IBECs, and BBO. Only studies that evaluated the dentin or enamel bond strength of universal adhesives using a self-etch or etch-and-rinse strategy were included. Analyses were carried out using RevMan 5.3.5 (The Nordic Cochrane Centre, The Cochrane Collaboration, Copenhagen, Denmark). A global analysis comparing self-etch or etch-and-rinse strategies and the influence of aging on bonding performance was performed with random-effects models at a significance level of  $p < 0.05$ .

**Results:** A total of 59 in vitro studies were included in the meta-analysis. The enamel bond strength of universal adhesives was improved by the etch-and-rinse approach ( $p < 0.05$ ). In dentin, this effect was observed for ultra-mild and intermediately strong universal adhesives ( $p < 0.05$ ). Irrespective of the strategy employed, intermediately strong adhesives showed a decrease in bond strength after all types of aging. This effect was also observed for ultra-mild universal adhesives used in the etch-and-rinse approach ( $p < 0.05$ ). Mild universal adhesives showed bond strength stability in both strategies ( $p > 0.05$ ).

**Conclusions:** The in vitro evidence suggests that bonding performance of mild universal adhesives can be improved by using the selective enamel-etch strategy. Mild universal adhesives seem to be the more stable materials, in both etch-and-rinse or self-etch strategies.

**Keywords:** adhesive, dental bonding, dental materials, universal adhesives, systematic review.

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<sup>b</sup> PhD Candidate, Postgraduate Program in Dentistry, School of Dentistry, Federal University of Pelotas, Pelotas, RS, Brazil. Study idea, systematic review design, performed the literature search, wrote the manuscript.

<sup>c</sup> Associate Professor, Postgraduate Program in Dentistry, School of Dentistry, Federal University of Pelotas, Pelotas, RS, Brazil. Full-text reading, data extraction, proofread the manuscript.

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The current adhesives can be classified according to their adhesion strategy into etch-and-rinse or self-etch adhesives.<sup>1,22</sup> Etch-and-rinse adhesives are applied after complete phosphoric acid etching of the dental substrates (dentin and enamel).<sup>75</sup> On the other hand, the acid etching step is eliminated in the self-etching adhesives, as they contain monomers with acidic functional groups that simultaneously etch and prime the dental substrate.<sup>60</sup>

Currently, clinicians may choose between these two types of adhesives.<sup>120</sup> According to Van Meerbeek,<sup>122</sup> despite the high-product dependency, both types of adhesives have performed successfully in both laboratory and clinical research. The current evidence has pointed out that adequate bonding to dentin can be achieved with the self-etch approach.<sup>10,107</sup> However, this strategy has revealed some limitations in bonding to enamel.<sup>15,62</sup> The bond strength to enamel with self-etch adhesives has been reported to be lower than that of etch-and-rinse adhesives.<sup>122</sup> Thus, selec-

low up periods are still needed.

Finally, although it is difficult to establish a relationship between the bonding effectiveness measured in the laboratory with the clinical effectiveness determined by randomized clinical trials,<sup>121</sup> it must be mentioned that the generally superior laboratory data of the adhesives currently considered the “gold standard” confirms their excellent clinical performance.<sup>14,72</sup> Since the main causes of failure of composite restorations are related to the occurrence of fracture and secondary caries, achieving a stable bonding interface, especially in the long-term, renders the restorative treatment more predictable in terms of clinical performance.

Considering the results obtained in this review, the following recommendations to clinicians are made: a) when applied to dentin, prior acid etching before the use of intermediately strong and ultra-mild universal adhesives it is not recommendable, and b) selective etching of enamel followed by the application of a mild universal adhesive currently appears to be the best choice to effectively achieve a durable bond to tooth tissues.

...tips for optimising  
bonding..



Effects of moisture degree and rubbing action on the immediate resin-dentin bond strength  
Dal-Bianco K, Pellizzaro A, et al.  
Dent.Mater.2006:22:1150-1156.

**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.

**Rub it in!**

# Agitation works with 7 Universals!

ELSEVIER

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

## Does active application of universal adhesives to enamel in self-etch mode improve their performance?



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### ABSTRACT

**Objectives:** To evaluate the effect of adhesion strategy on the enamel microshear bond strengths ( $\mu$ SBS), etching pattern, and in situ degree of conversion (DC) of seven universal adhesives.

**Methods:** 84 extracted third molars were sectioned in four parts (buccal, lingual, proximal) and divided into 21 groups, according to the combination of the main factors adhesive (AdheSE Universal [ADU], All-Bond Universal [ABU], Clearfil Universal [CFU], Futurabond U [FBU], G-Bond Plus [GBP], Prime&Bond Elect (PBE), and Scotchbond Universal Adhesive [SBU]), and adhesion strategy (etch-and-rinse, active self-etch, and passive self-etch). Specimens were stored in water (37 °C/24 h) and tested at 1.0 mm/min ( $\mu$ SBS). Enamel-resin interfaces were evaluated for DC using micro-Raman spectroscopy. The enamel-etching pattern was evaluated under a field-emission scanning electron microscope (direct and replica techniques). Data were analyzed with two-way ANOVA and Tukey's test ( $\alpha = 0.05$ ).

**Results:** Active self-etch application increased  $\mu$ SBS and DC adhesives when compared to passive application ( $p < 0.05$ ). A similar etching pattern was observed for all universal adhesives in the active self-etch mode. Improvement in etching ability was observed in active self-etch application compared to passive self-etch application. Replicas of GBP and PBE displayed morphological features compatible with water-based adhesives. Results were not affected by the application/strategy mode.

**Conclusions:** In light of the improved performance of universal adhesives when applied actively in SE mode, selective enamel etching with phosphoric acid may not be crucial for their adhesion to enamel.

Rub it in!

# Air Thinning

It's easy to blast the bonding agent out of the cavity with a 50psi 3in1 syringe

## TIP#5

Rub the bonding agent in!  
And do not blast with the 3in1 syringe

# The PREP Panel evaluation of Zipbond

A good result!

100% would purchase if available at “average” price

When they were asked if there were any changes the considered essential to the acceptability of the material the following comments were made:

“None”

“Make single dose compule easier to use- may have been just my inexperience using them”

“Packaging of single dose compules a little bulky”

When the evaluators were asked to rate the ease of use of SDI Zipbond, the result was as follows:

Difficult to use 1  5 Easy to use

4.9



F J Trevor Burke

Russell J Crisp and Peter Sands

## A 'Handling' Evaluation of the Dentsply Sirona Class II Solution System by the PREP Panel

Dent Update 2018; 45: 1032-1040

### Practice-based research

The value of practice-based research has been previously discussed,<sup>1</sup> with the arena of general dental practice having been considered the ideal environment in which to carry out evaluations of the handling of dental materials and their clinical effectiveness. In this regard, a wide variety of research projects may be considered to be appropriate to general dental practice, including assessment of materials, devices and techniques, clinical trials of materials, assessment of treatment trends and patient satisfaction with treatment.<sup>1</sup> A UK-based group of practice-based researchers is the PREP (Product

Research and Evaluation by Practitioners) Panel. This group was established in 1993 with six general dental practitioners (GDPs), and has grown to contain 31 dental practitioners located across the UK, with one in mainland Europe.<sup>2</sup> The group has completed over 70 projects – 'handling' evaluations of materials and techniques, and, more recently, clinical evaluations (n = 8) of restorations placed under general dental practice conditions, with the restorations being followed for up to five years.<sup>2</sup>

### Resin composite systems

As patients increasingly move away from amalgam restorations in their posterior teeth,<sup>3</sup> with the added impetus of the Minamata Agreement by which the use of amalgam has been banned, from 1st July 2018, in children 15 years and younger and in pregnant and nursing women, dental practitioners have had to use an alternative material, the most appropriate of which is resin composite. In this regard, practice-based clinical evaluations of this material have indicated positive results.<sup>4,5</sup> However, in order to obtain such results, along with the resin composite material, a variety of materials and devices must be employed, for example, a dentine-

have been marketed as a single system, the Dentsply Sirona Class II Solution system. It is therefore the aim of this study to evaluate the opinions of a group of practice-based researchers, the PREP Panel, of the components of this system, and the system as a whole.

The Dentsply Sirona products under evaluation therefore are: the dentine bonding system Prime & Bond Active™, the Palodent V3 Sectional Matrix System, SDR® Flow+ composite, Ceram.x Universal composite and the Enhance® Finishing and Polishing System (all manufactured by Dentsply Sirona, Building 3, The Heights, Brooklands, Weybridge, Surrey, KT13 0NY at [www.dentsplysirona.com/en-gb](http://www.dentsplysirona.com/en-gb)).

### Methods

#### Selection of participants

All 31 members of the practice-based research group, the PREP Panel, were sent an email communication asking if they would be prepared to be involved in the 'handling' evaluation of a recently-introduced Class II resin composite system. Of those who agreed to participate, 12 were selected at random.

A questionnaire was designed



Figure 1. Prime &amp; Bond Active™



Figure 3. The Dentsply Sirona ceram.X Universal resin composite material.

When the evaluators were asked to rate the ease of use of the Prime & Bond Active™, the result was as follows:

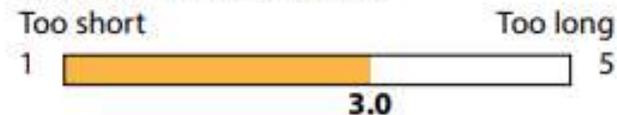


The ease of use of ceram.X was rated by the evaluators as follows:



The viscosity of ceram.X was stated to be satisfactory by all 100% of the evaluators.

The evaluators rated the working time of ceram.X as follows:



The ease of finishing and polishing of ceram.X was rated as follows:



# The PREP Panel evaluation of G-Premio Bond

12 evaluators, 719 restorations placed

When the evaluators were asked to rate the ease of use of the bonding system which they currently used, the result was as follows:



When the evaluators were asked to rate the ease of use of the G-Premio Bond, the result was as follows:



## *SUMMARY*

Universal bonding agents score highly for ease of use

# Scotchbond Universal Plus: What's different?

It bonds to caries affected dentine

Does everything that SBU did,  
but better bond (manufacturer's data)

Improved silane

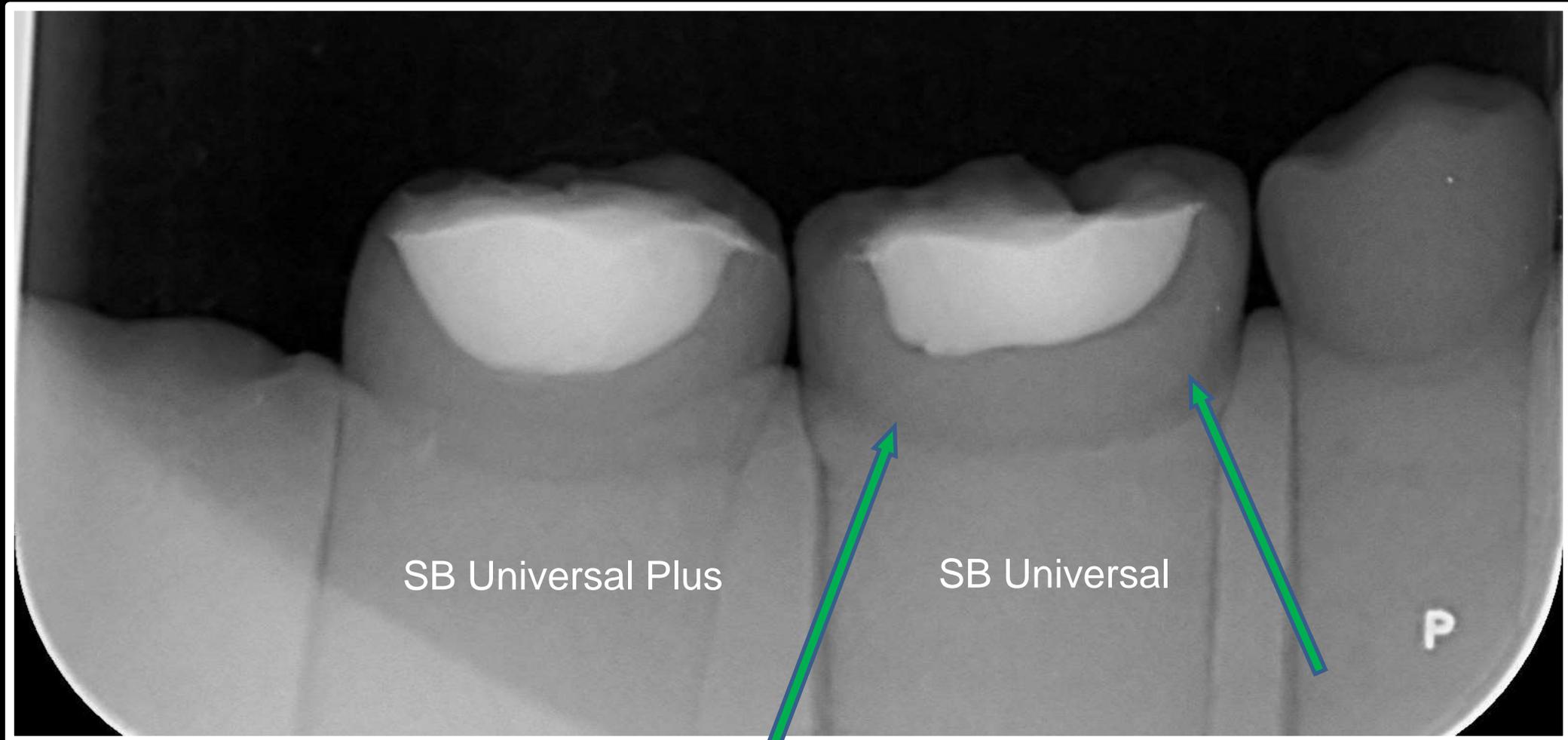
BPA free

The gamechanger



A longstanding  
question

Is it a layer of bond?  
Or is it caries?

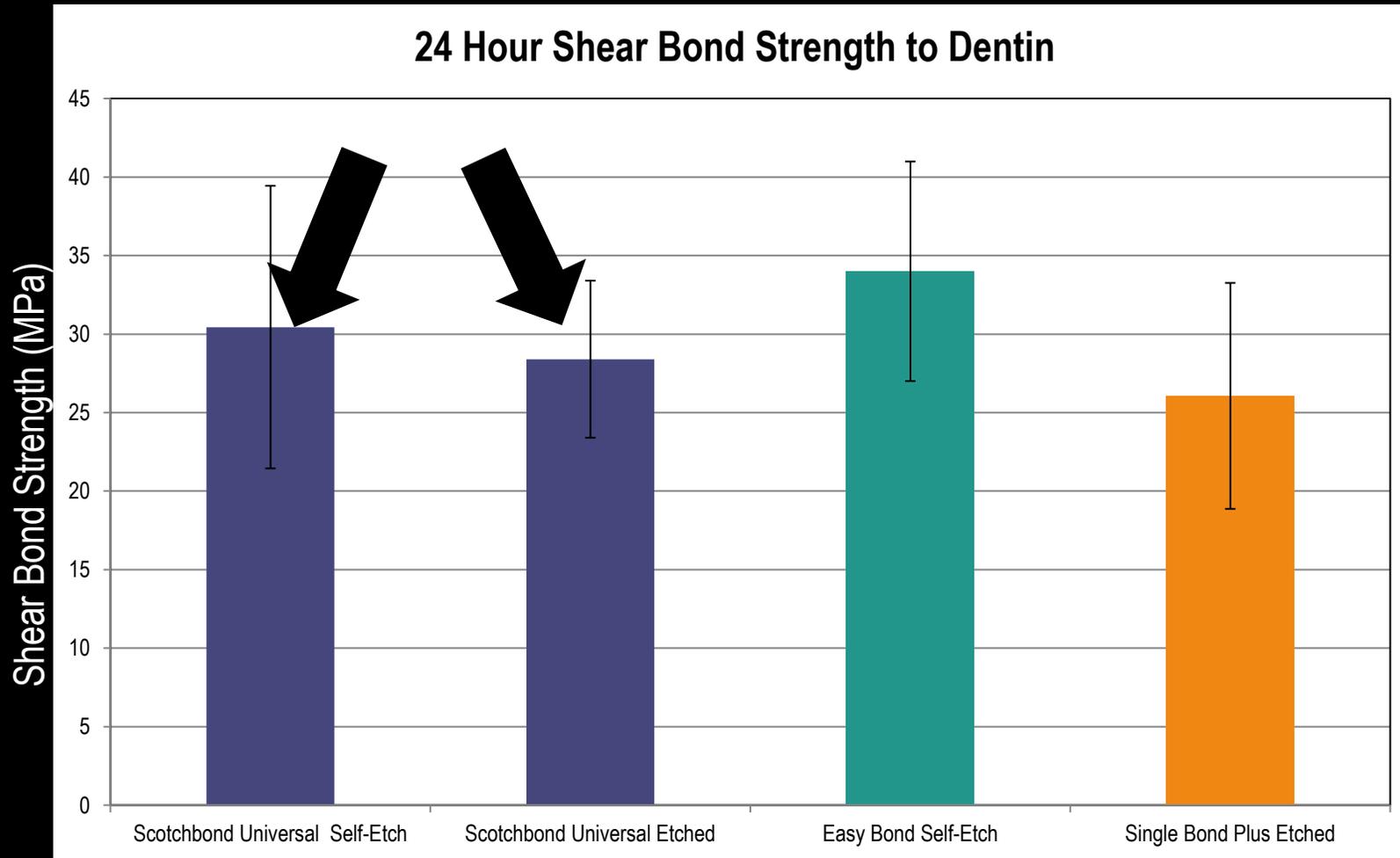


Filtek Universal Pink Opaque

**Etching**

**dentine....does this  
enhance performance  
when using a  
Universal Adhesive?**

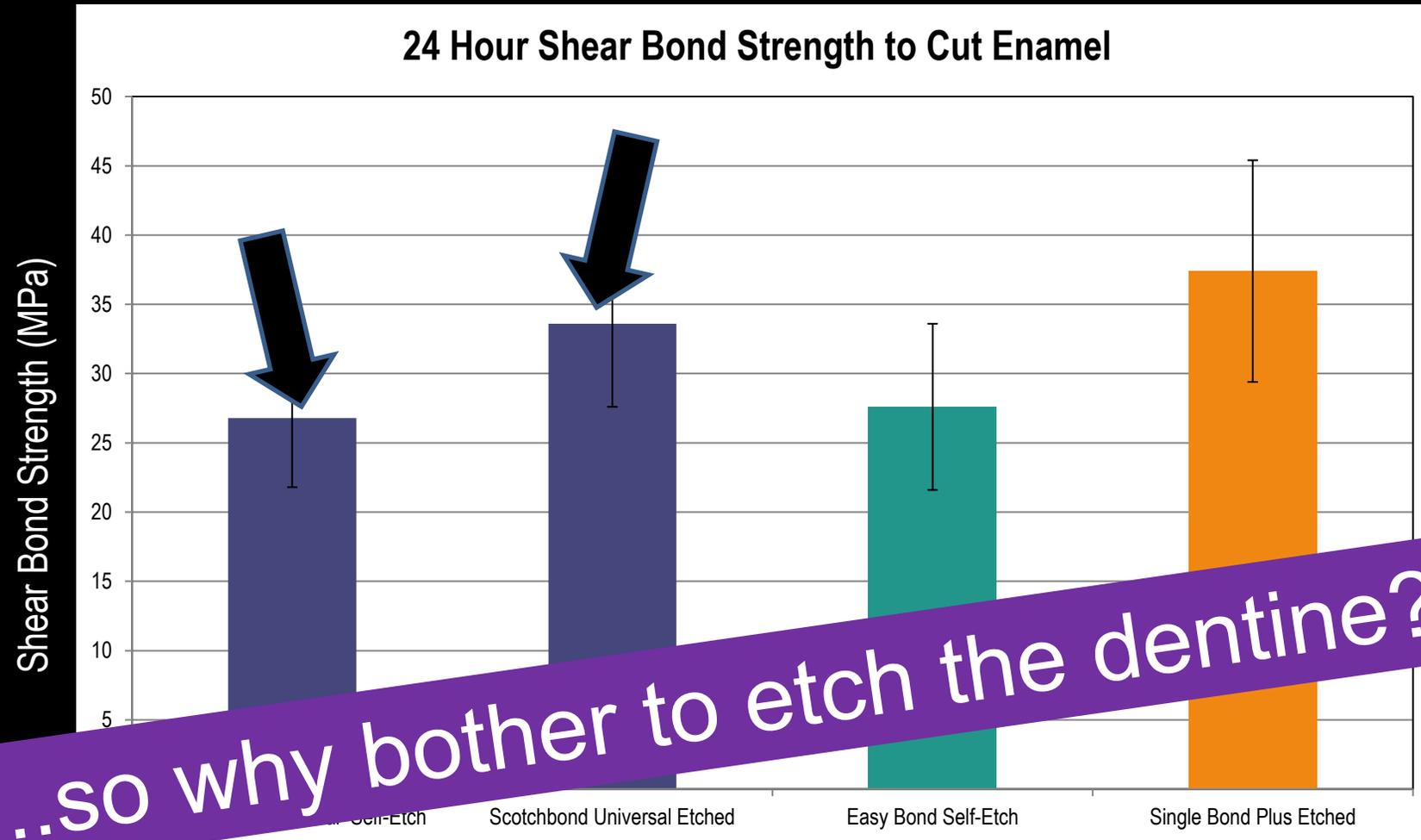
# Dentine Shear Bond Strength – Etched and Unetched



\*Study will also examine 11 month aged adhesion

Burgess J. et al, University of Alabama

# Cut Enamel Shear Bond Strength – Etched and Unetched



...so why bother to etch the dentine?

\*Study will also examine 11 month aged adhesion

Burgess J. et al, University of Alabama

# Universal adhesives



**Conclusions:** The enamel bond strength of universal adhesives is improved with prior phosphoric acid etching. However, this effect was not evident for dentin with the use of mild universal adhesives with the etch-and-rinse strategy.

**Clinical significance:** Selective enamel etching prior to the application of a mild universal adhesive is an advisable strategy for optimizing bonding.

## ARTICLE INFO

Article history:  
Received 1 December 2014  
Received in revised form  
14 March 2015  
Accepted 5 April 2015

## ABSTRACT

**Objectives:** A systematic review was conducted to evaluate the effect of self-etching mode on the bond strength of universal adhesives.

**Data:** This

So, why bother to etch dentine when using these adhesives?

... Collaboration, Copenhagen. The data were analyzed with random-effects models at a ... of dentin micro-tensile bond strength showed no statistically significant difference between the etch-and-rinse and self-etch strategies for mild universal adhesives ( $p \geq 0.05$ ). However, for the ultra-mild All-Bond Universal adhesive, the etch-and-rinse strategy was significantly different than the self-etch mode in terms of dentin micro-tensile bond strength, as well as in the global analysis of enamel micro-tensile and micro-shear bond strength ( $p < 0.05$ ).

# October 2015: The first clinical trial on Scotchbond Universal

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



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



Nathaniel C. Lawson<sup>a,\*</sup>, Augusto Robles<sup>b</sup>, Chin-Chuan Fu<sup>c</sup>, Chee Paul Lin<sup>d</sup>,  
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<sup>☆</sup> This article is part of the Special Issue entitled 'Clinical and Translational Science'.

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# October 2015: The first clinical trial on Scotchbond Universal

37 adults, 126 teeth with NCCLs,  
42 in SBU total-etch group  
42 in SBU self etch group  
42 in SB Multipurpose group

Observed after 24 months

# October 2015: The first clinical trial on Scotchbond Universal

5 failed restorations in total

SBU total etch group had most  
“perfect” ratings and no restorations  
lost to retention

But, this group had higher “sensitivity  
to cold” scores

# 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?

# Scotchbond Universal and Filtek Supreme: RCT

## No difference in margins which were etched or not etched.

## A Randomised Controlled Trial of a Universal Bonding Agent at Three Years: Self Etch vs Total Etch

### ABSTRACT

General dental practice is increasingly being recognised as the ideal situation for the conduct of clinical trials into the longevity of restorations. The aim of this study was to investigate the survival of 64 nanofilled resin composite (Filtek Supreme XTE) restorations placed principally in loadbearing cavities using a Universal dentine bonding agent (Scotchbond Universal), in five UK dental practices by members of the UK-based practice-based research group, the PREP Panel. A split mouth design was used, comprising patients who required two restorations, with one of the restorations receiving a total etch approach using phosphoric acid and the other being placed using a self-etch approach. The results indicated good performance of the restorations examined, with no difference, in terms of marginal characteristics, between the restorations which received total etching and those which did not.

### INTRODUCTION

#### PRACTICE-BASED RESEARCH

It may be considered that dental practice increasingly should become the prime location for clinical dental research, given that dental practice is the real world, and given that, if a technique or material is to be successful, it must be readily operable in the dental practice situation. Practice-based research has been considered as "the silent partner in dental practice, and the scaffolding on which we build and sustain a practice".<sup>1</sup> In addition, the volume of clinical material seen in general dental practice makes dental practice an area of importance in the assessment of new techniques and materials. Since the majority of restorations, worldwide, are placed in the real world of general dental practice, it may be considered that it is here that the performance/survival of restorations should predominantly be assessed.<sup>2</sup>

### Keywords

Randomized Controlled Trials  
Bonding Agent  
Self Etching  
Total Etching

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Therefore, use Scotchbond Universal or a 10MDP Universal in self etch mode - no etchant to wash off!

Trevor's view on his work!  
The numbers were quite small and it was only for 3 years

...slightly  
contradictory advice  
from a large  
Randomised  
Controlled Trial  
(larger numbers)

## Five-year clinical evaluation of a universal adhesive: A randomized double-blind trial

Thalita de Paris Matos<sup>a</sup>, Jorge Perdigão<sup>b,\*</sup>, Eloisa de Paula<sup>c,d</sup>,  
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### ARTICLE INFO

#### Keywords:

Universal adhesives  
Randomized clinical trial  
Etch-and-rinse  
Self-etch  
Selective enamel etching

### ABSTRACT

**Objective.** To evaluate the five-year clinical performance of Scotchbond Universal Adhesive (SU; 3M Oral Care, St. Paul, MN, USA) in non-carious cervical lesions (NCCLs) using two evaluation criteria.

**Methods.** Thirty-nine patients participated in this study. Two hundred restorations were assigned to four groups: SU-ERm: etch-and-rinse + moist dentin; SU-ERd: etch-and-rinse + dry dentin; SU-Set: selective enamel etching; and SU-SE: self-etch. A nanofilled composite resin was placed incrementally. The restorations were evaluated at baseline and after 5 years using both the World Dental Federation (FDI) and the United States Public Health Service

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

strategy was better when compared to the self-etch strategy. The use of selective enamel etching is highly recommended for the self-etch strategy. The FDI and USPHS evaluation criteria showed similar results after 5 years.

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## RESULTS at 5 years

- ✓ Recall rate 86%
- ✓ 19 restorations lost
- ✓ SE restorations 2.6 times more likely to debond
- ✓ Etched margins better, selective enamel etching advised for self etch strategy
- ✓ No difference moist or dry dentine

Dent.Mater 2010:36:1474-1485

# SUGGESTION

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

My hunch is that this applies to all Universals

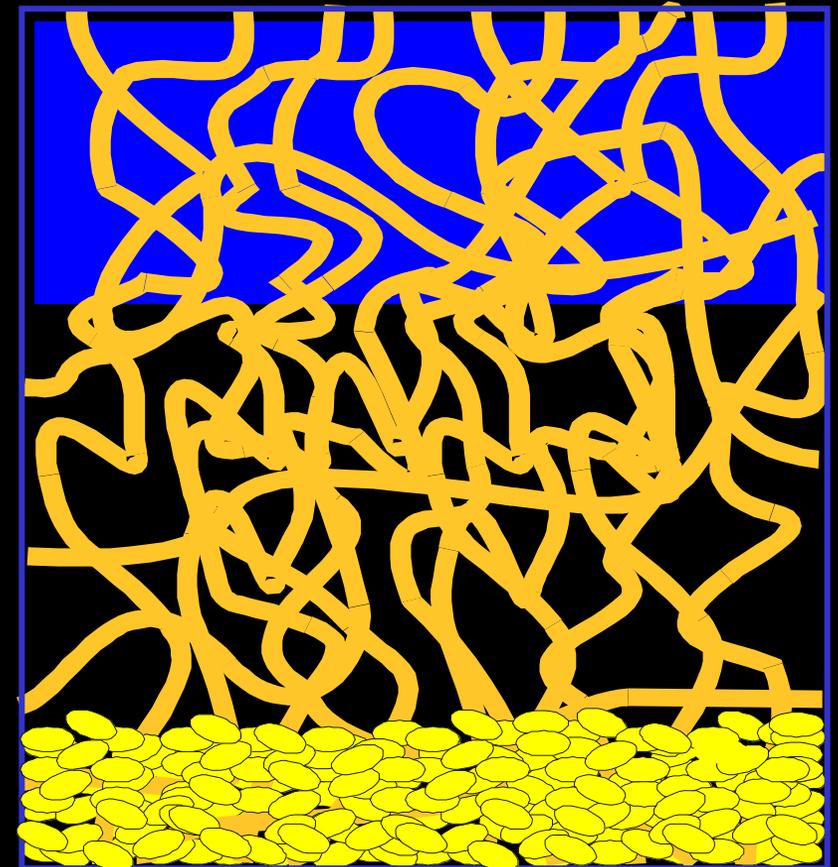
.....momentarily, back  
to the hybrid layer

**OUCH!** When the patient bites, the fluid filled layer is compressed  $\longrightarrow$  pain

Blue = resin:  
Hybrid Layer  
Formation



Overetching: no  
resin penetration,  
fluid filled space  
develops



## TIP#6

Universal Bonding agents hold great promise: Use them in selective enamel etch mode, i.e. do not etch the dentine

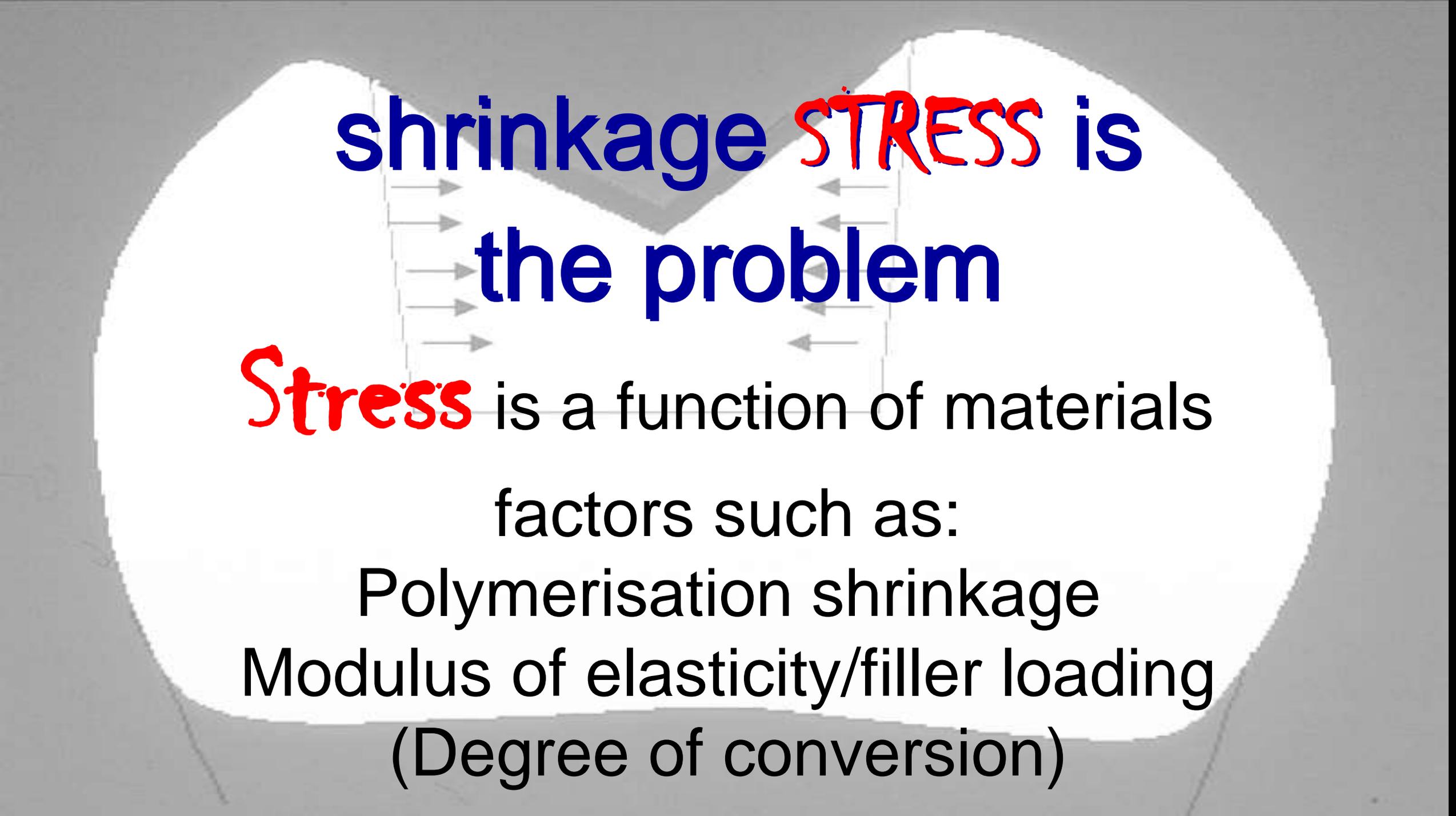
# What I plan to talk about

- Incidence of post-op sensitivity with posterior composite
- Choosing the right material
- Using it correctly!
- The role of bonding agents
- Relevant properties of materials for posterior composites
- Success rates
- Alternatives!
- Final thoughts

...a brief Dental  
Materials lesson,  
in particular, on  
polymerisation  
contraction *STRESS*

Why is this  
important?

Shrinkage *sTRESS* is a cause of  
*post-op sensitivity!*

The background of the slide features a grayscale image of a material with a vertical crack. On the left side of the crack, several horizontal arrows point to the right, indicating the direction of stress. On the right side of the crack, several horizontal arrows point to the left, also indicating the direction of stress. This visualizes the internal stress distribution around a crack in a material.

shrinkage **STRESS** is  
the problem

**Stress** is a function of materials

factors such as:

Polymerisation shrinkage

Modulus of elasticity/filler loading

(Degree of conversion)

# 3M Filtek Bulk Fill/Filtek One show low shrinkage stress

Palin W, Watts D 2014

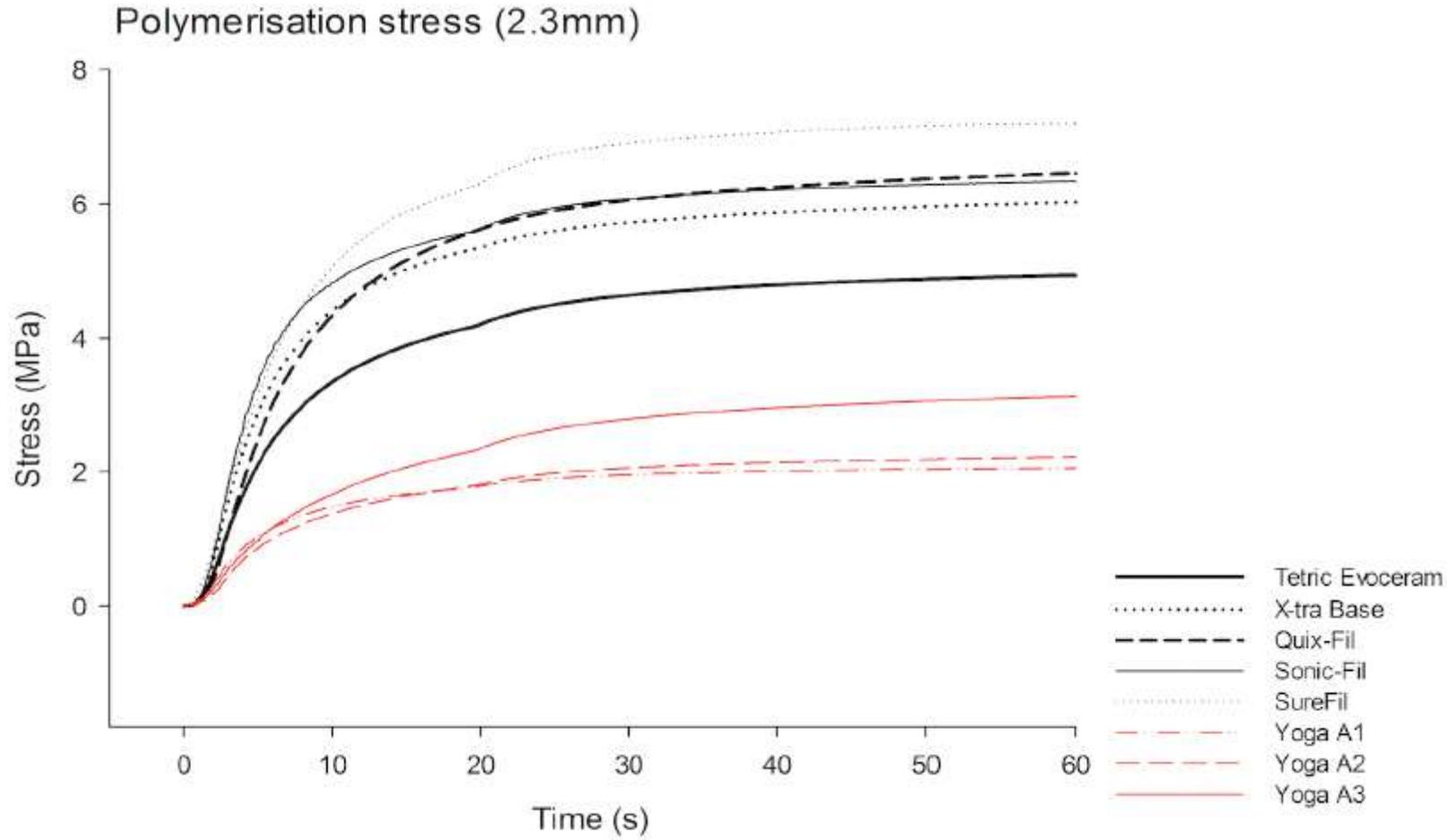


Figure 2c: Polymerisation stress at 2.3mm thickness (approx. 0.40 g)

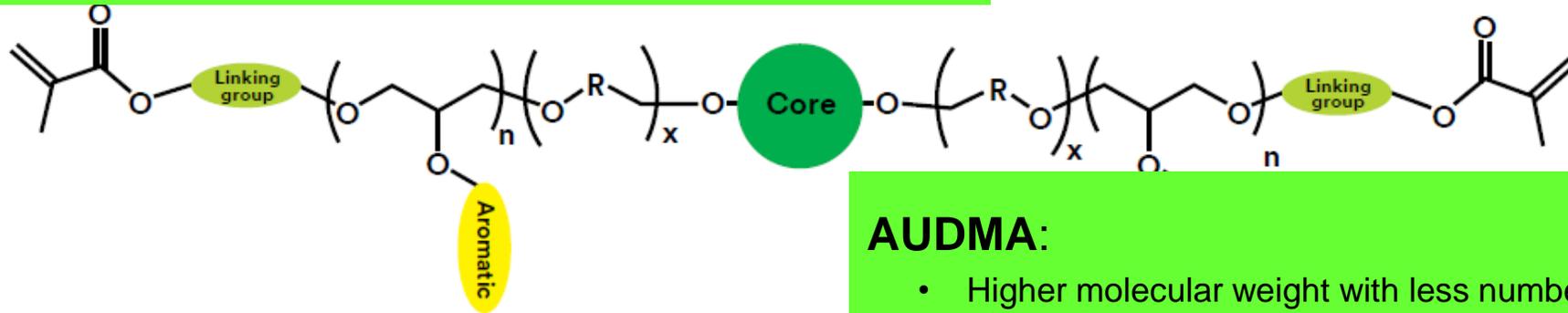


New Filtek One contains the same resin systems as Filtek Bulk Fill Posterior Restorative, but with a slightly changed filler



# New Methacrylate Monomers for Lower Shrinkage and Stress Relief

## AUDMA: Aromatic urethane dimethacrylate



## AUDMA:

- Higher molecular weight with less number of reactive groups
- Moderates volumetric shrinkage
- Contributes to stress reduction

## AFM: Addition-fragmentation (AF) monomer



# High shrinkage stress may bend cusps

=

# Postoperative pain



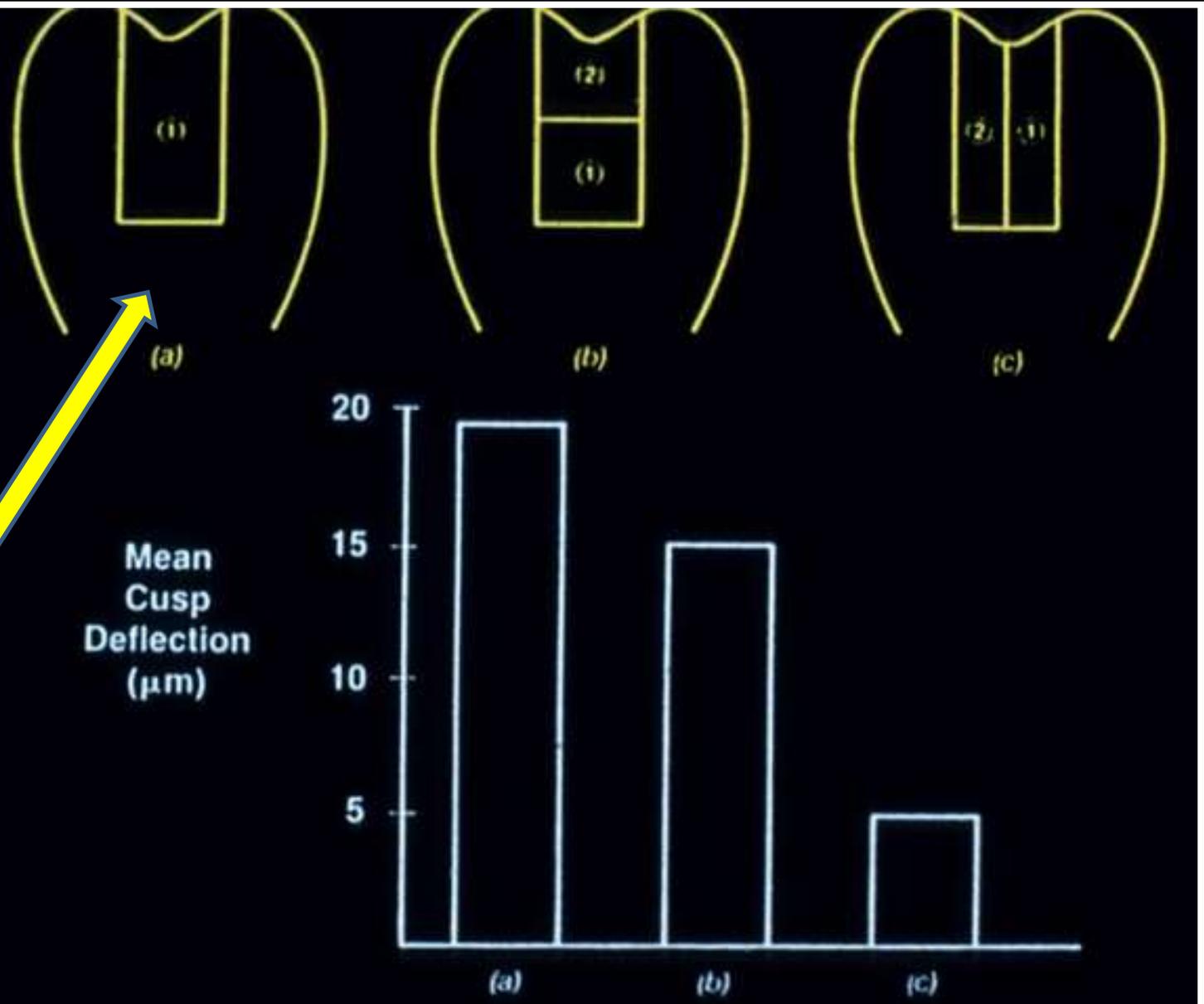
Abbas G., Fleming GJP., Harrington E., Shortall ACC., Burke FJT. Cuspal movement and microleakage in premolar teeth restored with a packable composite cured in bulk or in increments. *J.Dent.*2003;**31**:437-444.

# Cusp deflection is a proxy for stress



Class I is a high stress cavity/restoration

ONE increment  
=  
High cusp deflection  
(high stress)



Cusp deflection is a proxy for stress

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

## TIP#7

Know the **shrinkage stress** of the material  
that you are using

Because high **shrinkage stress** bends cusps

If you are using a conventional composite (i.e. not low shrinkage stress).....:  
a way of reducing marginal leakage in the class II *box*

## Effect of accelerated restorative techniques on the microleakage of Class II composites

SADULLAH UCTASLI, BDS, PhD, ADRIAN C. SHORTALL, BDS, DDS, FADM & FREDERICK J. T. BURKE, BDS, DDS, MSC, FADM

**ABSTRACT:** *Purpose:* To assess the marginal seal of Class II resin-based composite restorations cured by a high intensity halogen light or a plasma arc light. *Materials and Methods:* Class II cavities were prepared in extracted molar teeth with cervical margins located apical to the cemento-enamel junction. Cavities were restored with a posterior resin-based composite (Tetric Ceram) using either a two-increment or a bulk placement and cure restorative technique after appli

...use a flowable base layer, e.g. SDR

enamel margin of any restoration. Median gingival leakage values for the different test groups ranged from 0.02-2.51 mm. Light unit type had a highly significant effect on leakage ( $P=0.0002$ ). The highest leakage scores were recorded with the plasma arc light used in standard curing mode and the lowest with the halogen light in turbo-boost mode. (*Am J Dent* 2002;15:153-158).

**CLINICAL SIGNIFICANCE:** A combination of flowable composite lining and an incremental placement technique produced the best marginal seal at the gingival margin of Class II composite restorations. Accelerated curing, using a plasma arc light led to a high incidence of gingival margin leakage under the conditions of this study.

Not necessary when using  
low shrinkage stress composites

## TIP#8

Use a flowable base layer if you are using a “conventional” composite material (i.e not low shrinkage stress)

# BULK FILL IS IN!

My 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)

# BULK FILL IS IN!

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

**BULK FILL BASE MATERIALS**

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

# BULK FILL IS IN!

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

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



Faster *posterior* composites  
without compromise!



Tetric **EvoCeram**® Bulk Fill  
Nano-Hybrid Composite with Ivocerin™



Today there are several bulk fills  
which do not need a “topping”



.. more are appearing!

# For example...



Aura Bulk Fill (SDI)



VOCO Admira Fusion x-tra

## NEW! BEAUTIFIL-Bulk Restorative

Beautiful-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, Beautiful-Bulk Restorative has a high fill ratio at 87.0wt%, and low shrinkage stress.



Beautiful-Bulk Restorative

- 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)

# A Practice-Based Clinical Evaluation of a Bulk Fill Restorative Material

## Keywords

Evaluation  
Composite Resins  
Bulk-Fill  
Handling Properties

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## ABSTRACT

**Objective:** To evaluate the handling, by a group of practice-based researchers, of a recently introduced bulk fill resin-based composite restorative material, Filtek Bulk Fill Restorative (3M ESPE). **Methods:** The twelve selected evaluators were sent explanatory letters, a pack of the material under investigation to use for 8 weeks, and a questionnaire. **Results:** The evaluators rated the ease of use of the bulk fill restorative the same as the previously used posterior composite material. The provision of a shade only for evaluation may have compromised the score for aesthetic quality. No post-operative sensitivity was reported. **Conclusions:** The bulk fill material was well received as indicated by the high number of evaluators who would both purchase the material and recommend it to colleagues. **Clinical relevance:** A recently introduced bulk fill restorative material achieved a rating for handling which was similar to the evaluators' previously used resin composite, although there were some concerns regarding the transparency of the material.

## INTRODUCTION

### PRACTICE BASED RESEARCH

The value of practice-based research has been previously discussed,<sup>1</sup> with the arena of general dental practice having been considered the ideal environment in which to carry out evaluations of the handling of dental materials and their clinical effectiveness. In this regard, a wide variety of research projects may be considered to be appropriate to general dental practice, including<sup>1</sup> assessment of materials, devices and techniques, clinical trials of materials, assessment of treatment trends and, patient satisfaction with treatment.

A UK-based group of practice-based researchers is the PREP (Product Re-

## FBFR assessment Ease of use



None of the evaluators had difficulty with FBFR sticking to instruments

# Advantages of Bulk Fill *Restorative* materials

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

# Are new bulk fill composites quicker to place?

**Title:** 1407 - Clinical-time and Postoperative-sensitivity When Using Bulk-Fill Composites With Universal Adhesives

**Authors:**

Chane Tardem Pereira (**Presenter**)  
Fluminense Federal University

Elisa Albuquerque, Federal Fluminense University  
Sthefane Barbosa, Fluminense Federal University  
Leticia Lopes, Fluminense Federal University  
Fernanda Calazans, Fluminense Federal University  
Stella Marins, Fluminense Federal University  
Luiz Augusto Poubel, Fluminense Federal University  
Roberta Barcelos, Fluminense Federal University  
Marcos Barceleiro, Fluminense Federal University

**Abstract:**

**Objectives:** The first objective of this double-blind randomized clinical trial was to compare the different clinical-time using Scotchbond Universal adhesive (3M ESPE), in self-etch or selective enamel-etching strategy, associated with incremental or bulk-fill composite in posterior restorations. The second objective was to compare the postoperative sensitivity, 24h and 48h after the restorations.

**Methods:** A total of 196 restorations were placed in 43 patients according to the following groups: SETB- Self-etch/bulk fill; SETI- Self-etch/incremental; SEEB- Selective enamel-etching/bulk-fill and; SEEI- Selective enamel-etching/incremental. Filtek Z350XT composite (3M ESPE) was incrementally placed and Filtek Bulk Fill (3M ESPE) was placed using Bulk-fill technique. The adhesive system was used according to manufacturer's instructions. Postoperative-sensitivity was evaluated using two scales (NRS and VAS).

196 restorations  
in 43 patients

Filtek Z350 vs  
Filtek Bulk Fill, both  
placed with SB  
Universal

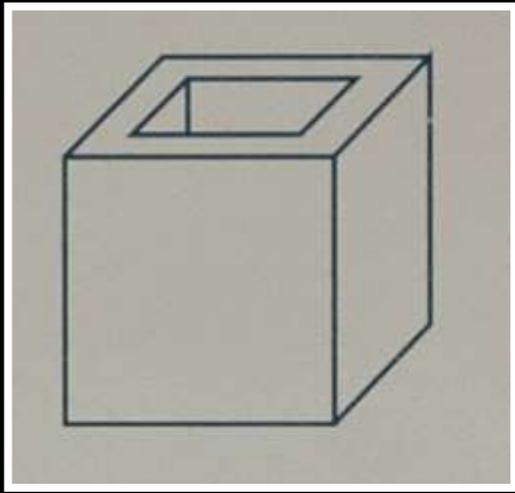
“Less time consuming”

Fluminense University, Brazil

# How do manufacturers do it?

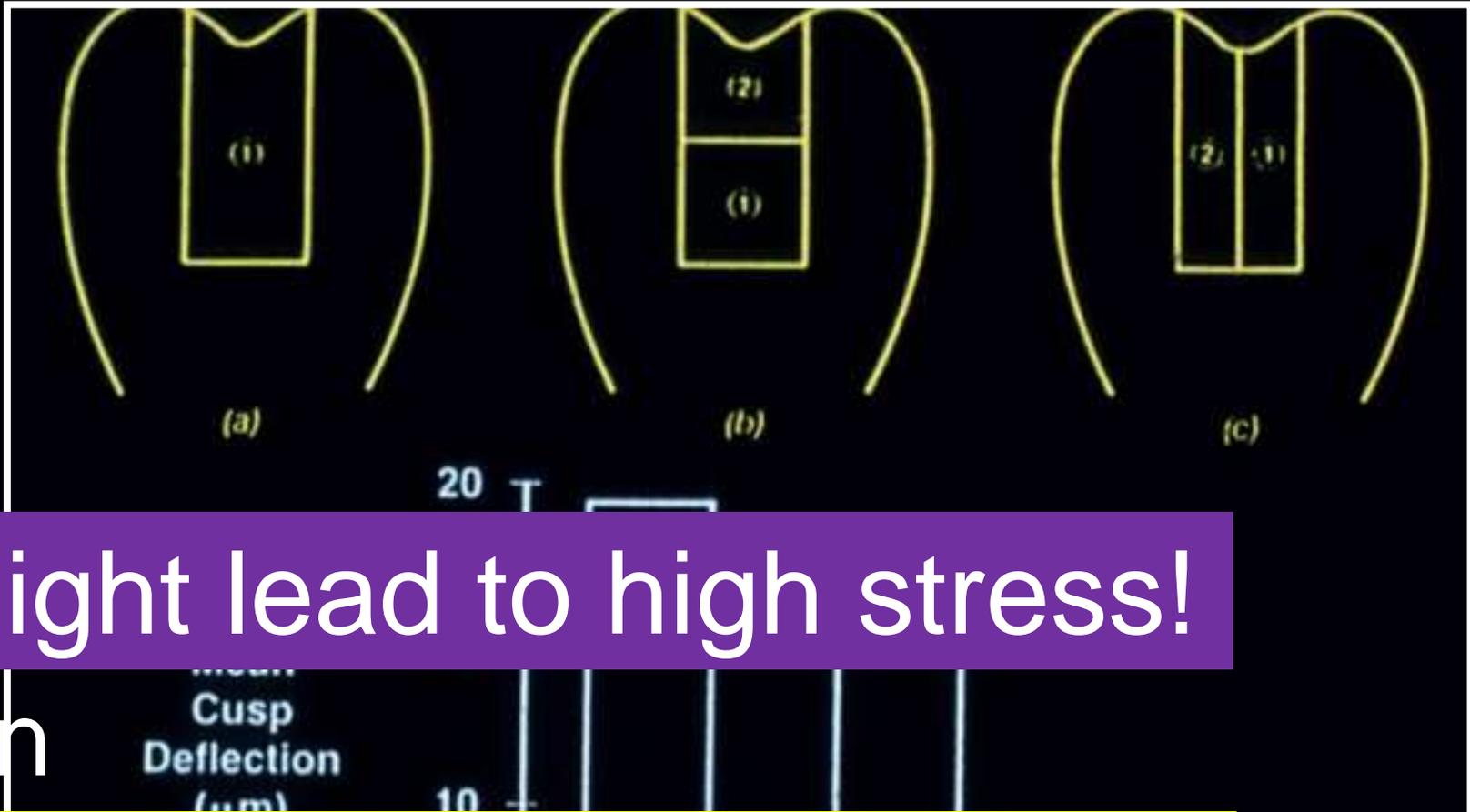
More potent/efficient initiator systems  
Increasing the translucency of the filler  
For some, improved resin systems

Some bulk fill worries!



Class I is a high cavity/restoration

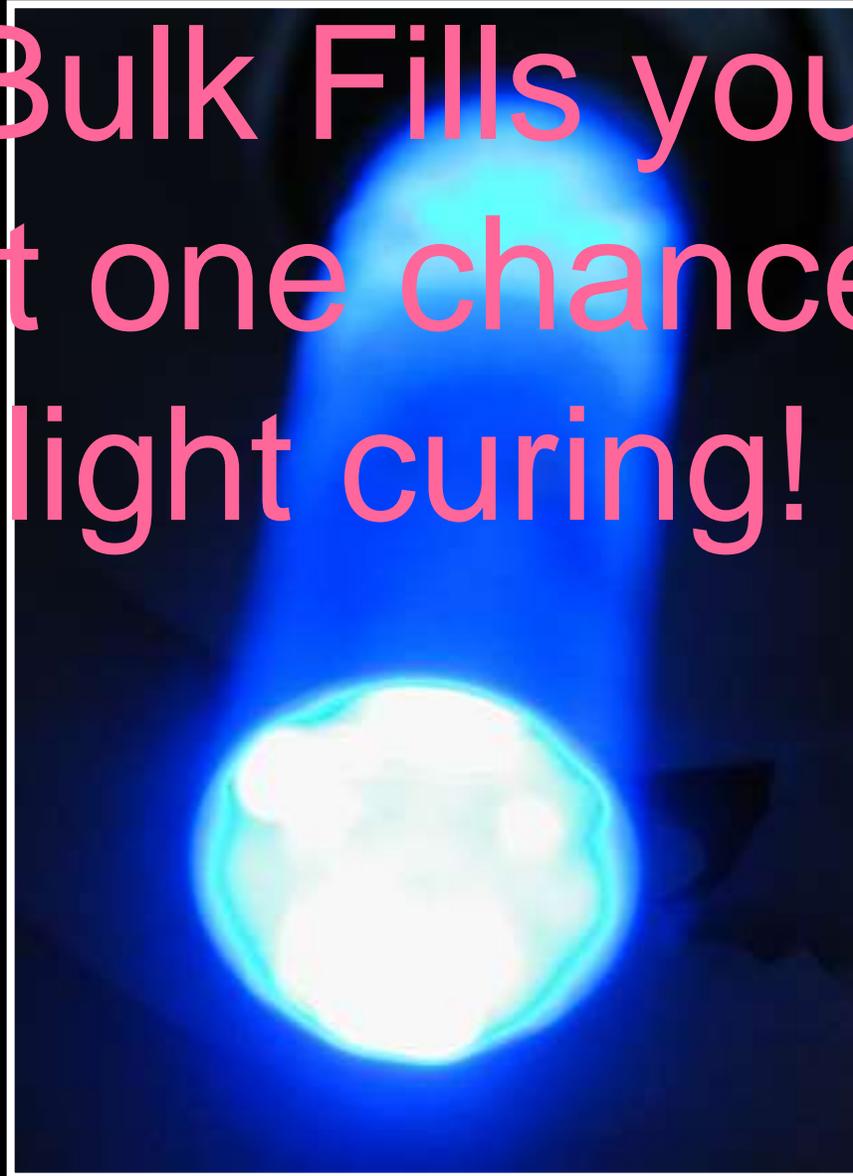
Bulk fill might lead to high stress!



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

*Another word of **warning!!***

With Bulk Fills you may  
only get one chance when  
light curing!



## TIP#9

Bulk fills may be our short-term amalgam alternative, but 100% curing is essential

# What I plan to talk about

- Incidence of post-op sensitivity with posterior composite
- Choosing the right material
- Using it correctly!
- The role of bonding agents
- Relevant properties of materials for posterior composites
- Success rates of posterior composites
- Alternatives!
- Final thoughts

Are success rates  
for posterior composite  
as good as for amalgam?

A summary of studies  
from primary dental care



**F J Trevor Burke**

**Louis Mackenzie and Adrian CC Shorthall**

# Survival Rates of Resin Composite Restorations in Loadbearing Situations in Posterior Teeth

**Abstract:** The use of resin composite for routine restoration of cavities in posterior teeth is now commonplace, and will increase further following the Minamata Agreement and patient requests for tooth-coloured restorations in their posterior teeth. It is therefore relevant to evaluate the published survival rates of such restorations. A Medline search identified 144 possible studies, this being reduced to 24 when inclusion criteria were introduced. Of these, ten directly compared amalgam and composite, eight were cohort studies, and six were systematic reviews. It was concluded that posterior composites may provide restorations of satisfactory longevity and with survival rates generally similar to those published on amalgam restorations. However, the ability of the operator in placing the restoration may have a profound effect.

**CPD/Clinical Relevance:** With the increasing use of composite for restorations in posterior teeth, it is relevant to note that these may provide good rates for survival.

**Dent Update 2019; 46: 523-535**

Resin composite has been an alternative material to dental amalgam since the first

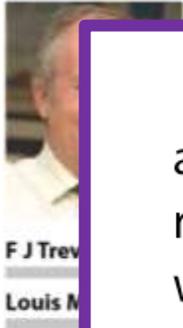
use of resin composite materials in posterior teeth (hitherto termed 'posterior composites')

need for high-quality evidence from primary dental care'. It has also been noted that RCCTs

Do you want  
to read  
more?

144 studies  
identified, 24  
included

Dent.Update.  
2019:46:  
523-535



F J Trevino  
Louis M.

# Survival of Resin Composite Restorations in Loadbearing Situations in Posterior Teeth

The conclusion gleaned from the above cohort studies is that resin composite restorations have acceptable survival rates when placed in loadbearing situations in posterior teeth, with AFRs generally within the range 2% to 3%, which the authors consider to

The conclusion gleaned from the above systematic reviews is that resin composite restorations have acceptable survival rates when placed in loadbearing situations in posterior teeth, with AFRs generally within the range 2% to 3%. Risk factors for premature failure include patients at high risk of caries and the presence of a liner or base beneath the resin composite restoration.

**Abstract:** The use of resin composite for routine restoration of cavities in posterior teeth is now commonplace, and will increase further following the Minamata Agreement and patient requests for tooth-coloured restorations in their posterior teeth. It is therefore relevant to evaluate the published survival rates of such restorations. A Medline search identified 144 possible studies, this being reduced to 24 when inclusion criteria were introduced. Of these, ten directly compared amalgam and composite, eight were cohort studies, and six were systematic reviews. It was concluded that posterior composites may provide restorations of satisfactory longevity and with survival rates generally similar to those published on amalgam restorations. However, the ability of the operator in placing the restoration may have a profound effect.

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use of resin composite materials in posterior teeth (hitherto termed 'posterior composites')

need for high-quality evidence from primary dental care'. It has also been noted that RCCTs

# Do you want to read

es  
24

## Dent.Update. 2019:46: 523-535

Are success rates for  
posterior composite  
as good as for  
amalgam?

**YES - and we aren't  
even comparing composite  
in its best situation**

Amalgam has been our “gold” standard for 100 years!

# Margins

...how to manage  
the deep  
interproximal box

Don't say, use amalgam:  
it doesn't work well covered with blood  
and/or saliva

Deep class II box  
No enamel at  
the margin



NO ENAMEL AVAILABLE  
FOR BONDING

First, the patient requires counselling  
regarding their high caries activity

I suggest a chemically-cured RMGI – it is insoluble, will bond quickly and doesn't require separate bonding step

We need a material that will bond quickly, before isolation fails (in my hands, that is)

# Resin Modified Glass Ionomers

- † Better bond strength than conventional GICs
- † Better aesthetics than conventional GICs
- † Better physical properties (reduced solubility)
- † Typical characteristics of a GIC

Do  
these  
work?

RMGI  
used

## Durability of extensive Class II open-sandwich restorations with a resin-modified glass ionomer cement after 6 years

INGRID E. ANDERSSON-WENCKERT, DDS, PHD, DR ODONT, JAN W.V. VAN DIJKEN, DDS, PHD, DR ODONT & CATHARINA KIERI, DDS

**ABSTRACT:** *Purpose:* To evaluate the durability of a modified open-sandwich restoration utilizing a resin-modified glass ionomer cement (RMGIC) in large cavities. *Methods:* 268, mostly extensive, Class II Vitremer/Z100 restorations were placed in 151 patients. 47% of the restorations were placed in patients considered as caries-risk patients. Six experimental groups, differing from each other in thickness of RMGIC layer and preconditioning, were evaluated at baseline and annually during 6-7 years according to modified USPHS criteria. *Results:* After 6 years, 220 restorations were evaluated. 42 failures (19%) were observed. The most frequent reasons for failure were material fracture (n=11), tooth fractures (n=9) and secondary caries (n=10). Non-acceptable proximal dissolution of the RMGIC was seen in six restorations. Significantly more failures, but similar dissolution of the RMGIC, were recorded in high caries risk patients. No differences were seen between the experimental groups or between restorations with thick or thin RMGIC layer. 160 restorations were also evaluated at 7 years. Another 13 failures were observed, eight with non-acceptable dissolution, three secondary caries and two fractures. It can be concluded that the modified open sandwich restoration showed an acceptable durability for the extensive restorations evaluated. An accelerating dissolution of the RMGIC was observed at the end of the study. (*Am J Dent* 2004;17:43-50).

**CLINICAL SIGNIFICANCE:** The modified open sandwich technique showed an acceptable durability in extensive restorations and is an efficient alternative in deep cavities and high caries risk patients.

Do  
these  
work?

RMGI  
used

268 “extensive” restorations in 151 patients,  
Class II Vitremer/Z100  
47% high caries risk  
Assessed after 6 years  
42 failures (19%), most frequently because  
of material #, tooth #, secondary caries

Conclusion:

Acceptable durability in extensive restorations  
More failures in high caries patients  
At 7 years, another 13 failures observed,  
8 with non-acceptable dissolution



Aftab Butt

## Cervical Margin Relocation and Indirect Restorations: Case Report and Literature Review

**Abstract:** Coronal margin relocation (CMR) is a technique that is being increasingly used to manage subgingival defects in cavities in posterior teeth. The aim of this case report and literature review is to arm the dental practitioner with up-to-date scientific literature on this topic, such that they can appropriately incorporate CMR into their practice. Inclusion criteria for the literature review were the use of composite as the material used for CMR and a subsequent indirect restoration. Medline was searched and manual search of bibliographies was carried out. This yielded nine *in vitro* studies and 12 clinical reports that were considered in this review.

**CPD/Clinical Relevance:** The CMR technique is being used more widely in dental practice and it is important for dental practitioners to be aware of the evidence base on which to guide their practice.

**Dent Update 2021; 48: 93-97**

The management of subgingivally extending carious lesions in posterior teeth poses a common clinical scenario faced in dental practice. Traditionally, surgical and orthodontic crown lengthening has been used to increase crown height in such situations, although it may be considered that additional training would be needed for such techniques.<sup>1,2</sup> The evolution of dental adhesive systems and restorative materials however, has led to the increased use of an alternative technique that first appeared in the literature in 1998: cervical margin relocation (CMR).<sup>3</sup> It has since also been referred to as 'deep margin elevation' (DME) and 'proximal box elevation' (PBE), among other names. The technique advocates the direct addition of composite resin onto the cavity floors of posterior proximal subgingival defects to produce a supragingivally displaced margin,<sup>4</sup>

which can then be used as the margin for a further indirect or, less commonly, direct restoration.<sup>4,5</sup> The rationale for this technique includes the improved ease of impression taking and isolation of the relocated margin, while being less invasive and more affordable than surgical crown lengthening options.<sup>4</sup>

The aim of this article is to present case reports using this technique and to provide a review of the existing literature. Medline was searched using the terms 'cervical margin elevation', 'proximal box elevation', 'deep margin elevation' and 'coronal margin relocation'. A further manual search of the bibliographies of all selected articles was carried out. The search concluded on 1 April 2020. Inclusion criteria were the use of composite for the elevation of margins of posterior teeth, with subsequent use of an indirect restoration.

### Case examples

In 2010, Veneziani proposed a useful classification of cervical cavities into three

with rubber dam and on the distance of the cavity margin to the supracrestal connective tissue attachment (Table 1).<sup>6</sup> The first case is an example of a grade 1 case according to Veneziani's classification because it could be isolated with rubber dam.

### Case 1. CMR procedure

A 38-year-old male patient presented complaining of a 3 month history of a broken, but otherwise asymptomatic, LR5. On examination, a large disto-occlusal cavity was present with a subgingival distal extent involving some element of gingival overgrowth (Figure 1a). Disto-buccal, disto-lingual and mid-distal probing depths of 2 mm were present and there was no bleeding on probing. The tooth provided a negative response to sensibility testing. Radiographically, the cavity was deemed to be extending past the cemento-enamel junction (CEJ) with no enamel present distally. The presence of peri-apical pathology was noted (Figure 1b).

Following local anaesthesia, a rubber

# Others suggest bonding and composite

Butt A. Dent.Update.2021:48:93-37

# The posh word for this! Proximal box elevation

JOURNAL OF DENTISTRY 40 (2012) 1068–1073

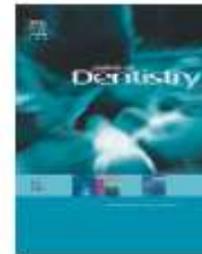


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## Effect of proximal box elevation with resin composite on marginal quality of resin composite inlays in vitro

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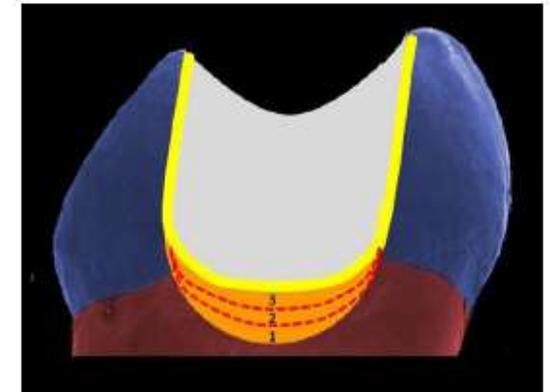


Fig. 4 – Ceramic inlay (white) luted with resin composite (yellow) in the cavity of Fig. 1 after proximal box elevation (PBE) in three consecutive increments of 1 mm each. (For ...)

## 5. Conclusions

Proximal box elevation (PBE) is a valid procedure for adhesive luting of resin composite inlays to deep proximal boxes. Three consecutive 1-mm-layers of PBE composite show the best performance regarding marginal quality to dentine among PBE groups.

**CHECK** where the your cavity margin is with regard to the occlusion!



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## Cyclic mechanical loading promotes bacterial penetration along composite restoration marginal gaps

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### ABSTRACT

**Objectives.** Secondary caries is the most common dental problem and usually forms between dentin and restoration. The purpose of this study was to investigate the combined effect of cyclic mechanical loading and bacterial penetration into gaps at the interface between a composite restoration and dentin using a novel bioreactor system and a novel staining protocol. **Methods.** Human molars were machined to create a 100- $\mu$ m wide (large) or 50- $\mu$ m wide (small) marginal gap between the dentin and restoration. *Streptococcus mutans* was inoculated into the gap prior to testing each in a bioreactor. **Results.** All samples were tested for 2 weeks and post-test bacterial viability was confirmed with a live-dead assay. Samples were fixed, mounted and cross-sectioned to reveal the gaps and observe the depth of bacterial penetration. **Results.** It was shown that for large gap samples the bacteria easily penetrated to the full depth of the gap independent of loading or non-loading conditions. The results for all cyclically loaded small gap samples show a consistently deep bacterial penetration down 100% of the gap while the average penetration depth was only 67% for the non-loaded samples with only two of six samples reaching 100%. **Significance.** A new bioreactor was developed that allows combining cyclic mechanical loading and bacterial exposure of restored teeth for bacterial biofilm and demineralization studies. Cyclic loading was shown to aid bacterial penetration into narrow marginal gaps, which could ultimately promote secondary caries formation.

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The cavity margin should not be under high occlusal loading

## TIP#10

Ensure good adaptation at the gingival margin (indeed, all margins)

# The effect of cavity depth on POS

# Failure Risk of Posterior Composites with Post-operative Sensitivity

M Hayashi • NHF Wilson

### Clinical Relevance

The findings of this study lend support to the subjective view that large posterior composites are more susceptible to post-operative sensitivity and, as a consequence, relatively early failure compared to small posterior composites.

### SUMMARY

Post-operative sensitivity (POS) may be observed in recently placed posterior composites. Evidence-based guidelines for the management of posterior composites with POS have yet to be determined. This study examined a retrospective analysis of the findings of a unique multi-center clinical trial to investigate the five-year risk of failure of posterior composites with POS and to determine the factors likely to have an important impact on the prognosis of the restorations. Longitudinal five-year data from the multi-center trial of Occlusin were analyzed. Data pertaining to a total of 1,101 restorations were included in the study. The failure rate at five years was calculated by means of three selected methods for all the restorations included in the study and for restorations with POS. Risk of failure for restorations with POS was analyzed by calculating an odds ratio along with the 95% confidence interval (CI). Logistic regression was carried out in order to identify those factors most likely to have had

an important impact on the prognosis of restorations with POS. The analysis revealed that restorations of Occlusin with POS have been more likely to have failed than the restorations of Occlusin without POS with odds ratios ranging from 1.7 (95% CI: 1.36, 2.85). Distribution of patient age and cavity size were significantly different for successful and failed restorations (chi-square test,  $p < 0.05$ ). Logistic regression indicated that cavity size was the only factor likely to have influenced the prognosis of the restorations with POS ( $p = 0.041$ , odds ratio 3.21, 95% CI 1.05, 9.70). Restorations with POS in large cavities were more likely to have failed by five years than restorations in small cavities. It was concluded that the restorations with Occlusin included in the trial program were more likely to have failed at five years if POS occurred within one month of placement. Cavity size has been shown to have been an important factor in the prognosis of Occlusin trial restorations with POS.

### INTRODUCTION

The successful long-term clinical performance of posterior composites has been reported to be attributable to the remarkable improvement in the properties of composite restorations in recent years (Marhart & Heikel, 2001; Chadwick & others, 2001). Encouraging clinical outcomes have caused many clinicians to favor using

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Literature review >restorations placed in deep cavities are associated with more POS

# Clinical Assessment of Postoperative Sensitivity in Posterior Composite Restorations

ALF Briso • SR Mestreneur • G Delício • RH Sundfeld  
AK Bedran-Russo • RS de Alexandre • GMB Ambrosano

### Clinical Relevance

Posterior teeth restored with resin composite have been known to exhibit postoperative sensitivity. The type, size and design of the cavity, material properties and handling technique may influence the incidence of this sensitivity.

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### SUMMARY

This incidence of postoperative sensitivity was evaluated in resin-based posterior restorations. Two hundred and ninety-two direct restorations were evaluated in premolars and molars. A total of 143 Class I and 149 Class II restorations (MOD and MOD) were placed in patients ranging in age from 30 to 50 years. After the cavity preparations were completed, a rubber dam was placed, and the preparations were restored using a total-etch system (Prime & Bond NT) and a resin-based restorative material (TPH Spectrum). The patients were contacted after 24 hours and 7, 30 and 90 days postoperatively and questioned regarding the presence of sensitivity and the stimuli that triggered that sensitivity. The Chi-square and Fisher's Exact Test were used for statistical analysis. Evaluation at 24 hours after restorative treatment revealed statistically significant differences among the types of restorations.

292 Class II & II restorations in premolars & molars placed by dental students: only shallow and medium-sized cavities included

Patients contacted at 1, 7, 30 and 90 days

Sensitivity greater in MOD restorations (26%) than Class I

## DEPTH OF THE CAVITY AND ITS RELATIONSHIP WITH THE POST-OPERATIVE SENSITIVITY IN CLASS 1 POSTERIOR RESIN COMPOSITE RESTORATIONS ON MOLARS

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<sup>2</sup>ASGHAR ALL, BDS, MPH, PhD Scholar

### ABSTRACT

*This study was conducted to assess the post-operative sensitivity in different depths of Class I cavities in molars restored with posterior composite resin. It was an Experimental study and was conducted in Fatima Jinnah Dental Hospital, Karachi from May 2010 to October 2010. One hundred and thirty one patients had Class I cavities (depth of cavities between 3-4mm) were selected after clinical and radiographic examination. After rubber dam isolation, Class I cavity prepared on molars teeth. Incremental technique was used to restore cavity with posterior composite resin. After finishing the filling, patient was recalled at day 7 to assess post-operative sensitivity with cold and hot stimuli. Data were collected using data collection proforma, were computerized and analyzed by using SPSS (Statistical Package of Social Sciences) version 17.*

*One hundred thirty one patients, 61 male and 70 female formed the study group. The mean age was 29.6 ( $\pm 9.004$ ) years. The mean score of post-operative sensitivity was 1.05 for cold ( $\pm 0.226$ ) and 1.04 ( $\pm 0.192$ ) for hot. The chi-Square test revealed significant results with p-value < 0.000 for cold and < 0.009 for hot, when both stimuli were analyzed with different cavities depths. Deeper cavities in Class I composite resin restorations showed more post-restoration sensitivity as compared to cavities with lesser depth in dentine.*

**Key Words:** Polymerization shrinkage, Class I cavities, post-operative sensitivity, depth of the cavity, incremental technique.

### INTRODUCTION

The introduction of composite-based resin technology to esthetic dentistry was one of the most noteworthy contributions to dentistry.<sup>1</sup> This technology provides patients with more tooth-conserving and highly aesthetic restoration and also avoids the mercury controversy.<sup>2</sup> There are problems associated with using resin composite in posterior restorations, including shrinkage that occurs on setting, and cause post-operative sensitivity.<sup>3</sup> Long term prognosis of resin composite posterior restorations are influenced by tooth type, size or depth of the cavity, placement technique and composition of material.<sup>4</sup>

Contemporary composites undergo contraction of 2% to 6% by volume during setting.<sup>5</sup> In polymerization resin composite may pull away from the least retentive cavity margins, where little or no enamel present on them.<sup>6</sup> This shrinkage is responsible for the formation of gap between resin-based composite and the cut tooth surface, which allows fluid to flow out of the tubules.<sup>1,2</sup> Gap formation also allows ingress of bacteria, bacterial products, acids, enzymes and ions into the margins of the restoration and is responsible for post-operative sensitivity.<sup>7</sup> However recent researches have proved that shrinkage occurs towards the walls of the cavity to which it is bonded.<sup>8</sup> Polymerization shrinkage occurs regardless of the system used to initiate the setting reaction.<sup>9,10</sup> Opdam et al reported 14% post-operative sensitivity of resin composite in Class I cavities present on the occlusal surfaces of molar teeth.<sup>6</sup> Briso ALP et al found in his study the occurrence of post-operative sensitivity in resin-based posterior restorations was 5% in Class I cavities.<sup>9</sup>

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131 class I restorations: cavity lined with GIC, then filled with composite/Prime and Bond NT

Patients recalled after one week, tested for H & C sensitivity

5.3% of teeth exhibited sensitivity to cold, 3.8% to hot.

Deeper cavities had more post-op sensitivity than shallow cavities

## Occurrence and Causing Stimuli of Postoperative Sensitivity in Composite Restorations

TM Auschill • CA Koch • M Wolkewitz  
E Hellwig • NB Arweiler

### Clinical Relevance

This study enabled the dentist to analyze the individual risk of postoperative sensitivity after composite treatment and the type of pain patients may expect.

### SUMMARY

Despite improvements in composite treatments over the past decade, postoperative sensitivity

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still remains a problem. Therefore, this clinical study evaluated the appearance of postoperative sensitivity after composite treatments and the stimuli that may have caused it. A total of 600 teeth in 231 patients was included in this study. All treatments were performed by dental students working under close supervision following standard procedures and using the bonding system Optibond FL and the nanofilled composite Ceram X. At baseline (visit 1), the restorations were grouped according to the following criteria: use of anesthesia, use of a rubber dam, indication for the restoration treatment, cavity class and clinical dimension of the cavity. After approximately two weeks (at visit 2), all the restorations were assessed and failure was defined if one of the following criteria occurred: a negative reaction to the vitality test, postoperative pain from masticatory forces or reported postoperative sensitivity by the patient. The associated restorations

600 restorations placed by dental students, 231 patients, Optibond FL used

Patient-reported sensitivity assessed at 2 weeks

5.4% sensitivity

Cavity depth associated with sensitivity: teeth with exposed pulps were X14 more likely to have sensitivity

Restorations placed in deep cavities are associated with more POS, therefore:

- Manage patient expectations if treatment involved deep caries
- Avoid pulp exposure in vital, asymptomatic teeth,
- Sealing caries into a cavity using bonded resin composite is an accepted technique or use Biodentine to stimulate reparative dentine.

# What I plan to talk about

- Incidence of post-op sensitivity with posterior composite
- Choosing the right material
- Using it correctly!
- The role of bonding agents
- Relevant properties of materials for posterior composites
- Success rates
- Alternatives!**
- Final thoughts

Are reinforced glass ionomers  
an alternative to amalgam?

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

But, they have low shrinkage stress,  
so low incidence of POS

...and, there is now  
some new positive  
information on GIC  
in posterior teeth



J Adhes Dent 22 (2020), No. 3 29. May 2020

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Page 235-247, doi:10.3290/j.jad.a44547, PubMed:32435764

## Clinical Performance of a Glass-Hybrid System Compared with a Resin Composite in the Posterior Region: Results of a 2-year Multicenter Study

Miletić, Ivana / Baraba, Anja / Basso, Matteo / Pulcini, Maria Giulia / Marković, Dejan / Perić, Tamara / Ozkaya, Cigdem Atalayin / Turkun, Leziza Sobnani

Positive  
short term findings!

Long-term, split-mouth, randomized, prospective, multicentre clinical study enrolled 180 patients (mean age 34.6 years) identified as in need of two Class II, two-surface restorations in the molar region of the same jaw.

The estimated survival rates at the 2-year recall were 93.6% (EQUIA Forte) and 94.5% (Tetric EvoCeram), showing no significant differences between the two materials.

# Equia Forte (GC) holds promise



# Differences from Fuji IX

New ultrafine highly reactive glass particles added

Higher molecular weight polyacrylic acid

20% improved flexural strength, 21% improvement in acid resistance, 40% wear resistance

Improved fluoride release

GC data: Needs confirmation by independent testing

**Bonus!!**

**TIP#11**

**An improved Glass Ionomer could be our  
amalgam substitute: not associated with  
post-op sensitivity**

FAQ Do I need to place a lining/base  
under composite restorations?

**NO!**

# HISTORY

- Oldies were taught that a base was always needed
- Bases are used under amalgam for thermal insulation
- In a survey of 500 GPs in 2017 (in Wales), 83% always placed a lining before placing a composite restoration
- *Supposed* antibacterial effect of Glass Ionomer as a lining
- Bases isolate the pulp from chemical irritants, i.e. pulp protection

# TODAY

- A contemporary dentine bonding agent will seal the restoration and the dentinal tubules
- A base limits the surface area for bonding
- Resin composites are insulators, therefore do not need a base for this reason
- Base only needed for therapeutic reasons
- No base = saving in time

# HISTORY

# TODAY

Von Fraunhofer and colleagues (Gen.Dent.2006) found an increase in microleakage, post-operative sensitivity and potentially secondary caries when a lining is present under a posterior composite restoration

thermal insulation

Blum et al (J.Dent.2017) found that prevalence of post-op sensitivity after placement of posterior composite restorations was 20% greater when a lining was placed

before placing a composite restoration

- *Supposed* antibacterial effect of Glass Ionomer as a lining

• A base limits the surface area for

therefore do not need a base for this reason

- Base only needed for therapeutic reasons

Schwendicke et al (Systematic review: J.Dent.2015) concluded that there was insufficient evidence to recommend cavity lining based on their antibacterial effects.

Dentists should be aware that the use of cavity liners is not recommended by clinical studies

Trust your bonding agent to seal  
the tubules!

... finally

## The ultimate guide to restoration longevity in England and Wales. Part 1: methodology

P. S. K. Lucarotti<sup>1</sup> and F. J. T. Burke<sup>\*\*1</sup>

### Key points

A large dataset, of almost 14 million restorations over 16 years, has been analysed.

The large size of the data set facilitates, not only the survival of restorations to an intervention, but also, arguably most importantly, the time to extraction of the restored tooth.

A modified form of Kaplan-Meier statistical methodology has been employed to produce survival curves of different subgroups of restorations and teeth.

## The ultimate guide to restoration longevity in England and Wales. Part 10: key findings from a ten million restoration dataset

F. J. T. Burke<sup>\*\*1</sup> and P. S. K. Lucarotti<sup>1</sup>

### Key points

Over 10 million tooth restorations were included in the analysis, with survival to an intervention at 16 years ranging for each type between 32% and 42%, with longevity near to extraction of the restored tooth, the range is from 11.8% to 24.2%.

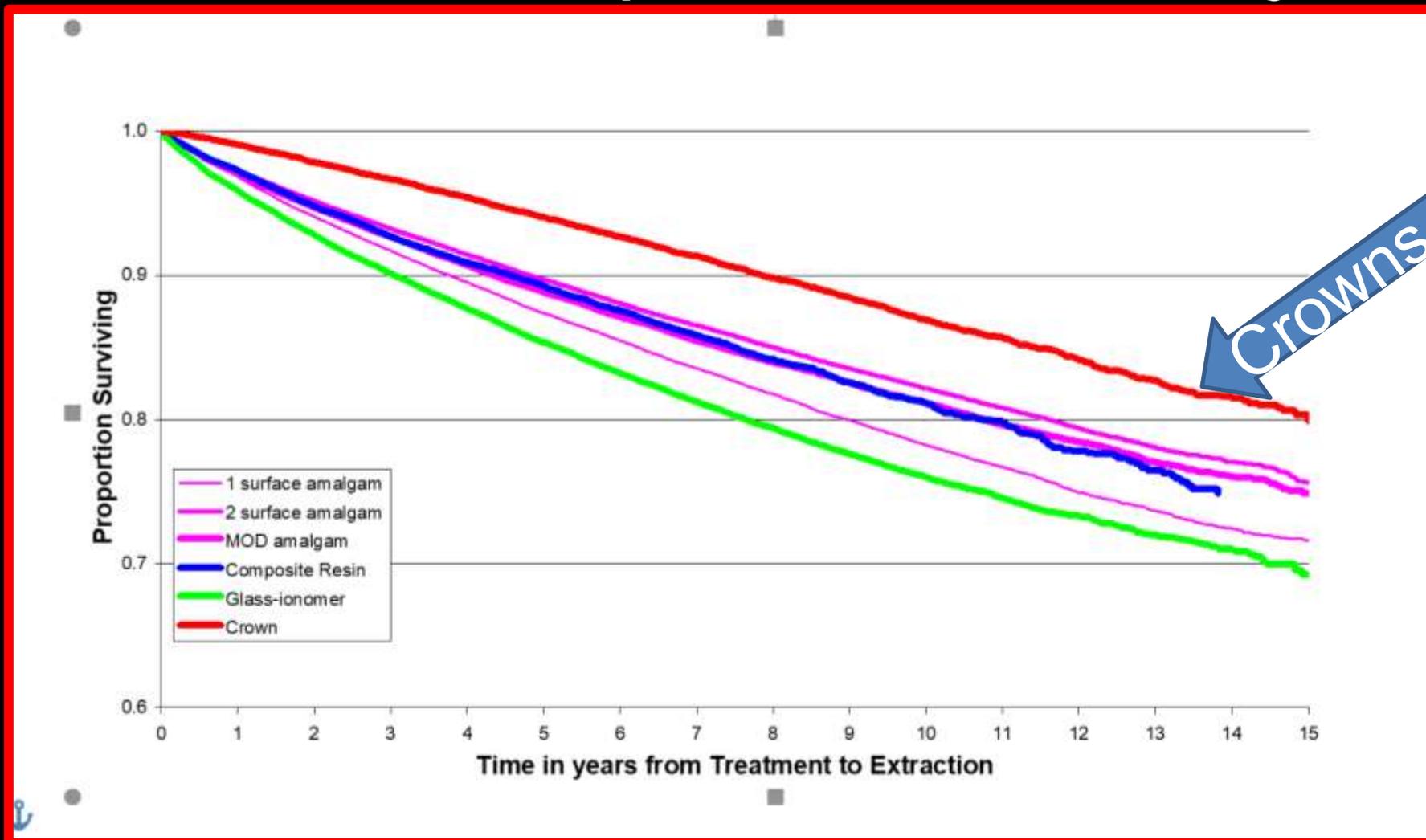
Larger restorations of all types and in all types of teeth generally performed less well than smaller restorations. Crown surfaces better to live to an intervention than direct restorations, but worse, particularly for younger patients, in time to extraction.

Patients' toothbrushing is a major factor in the survival of restored teeth, both in anterior teeth and in extraction. The greatest benefit is seen in restorations, the worse the natural dentition's age has been shown to play a part in the general investigation, with restorations being by younger dentists performing better for all types of restorative treatment.

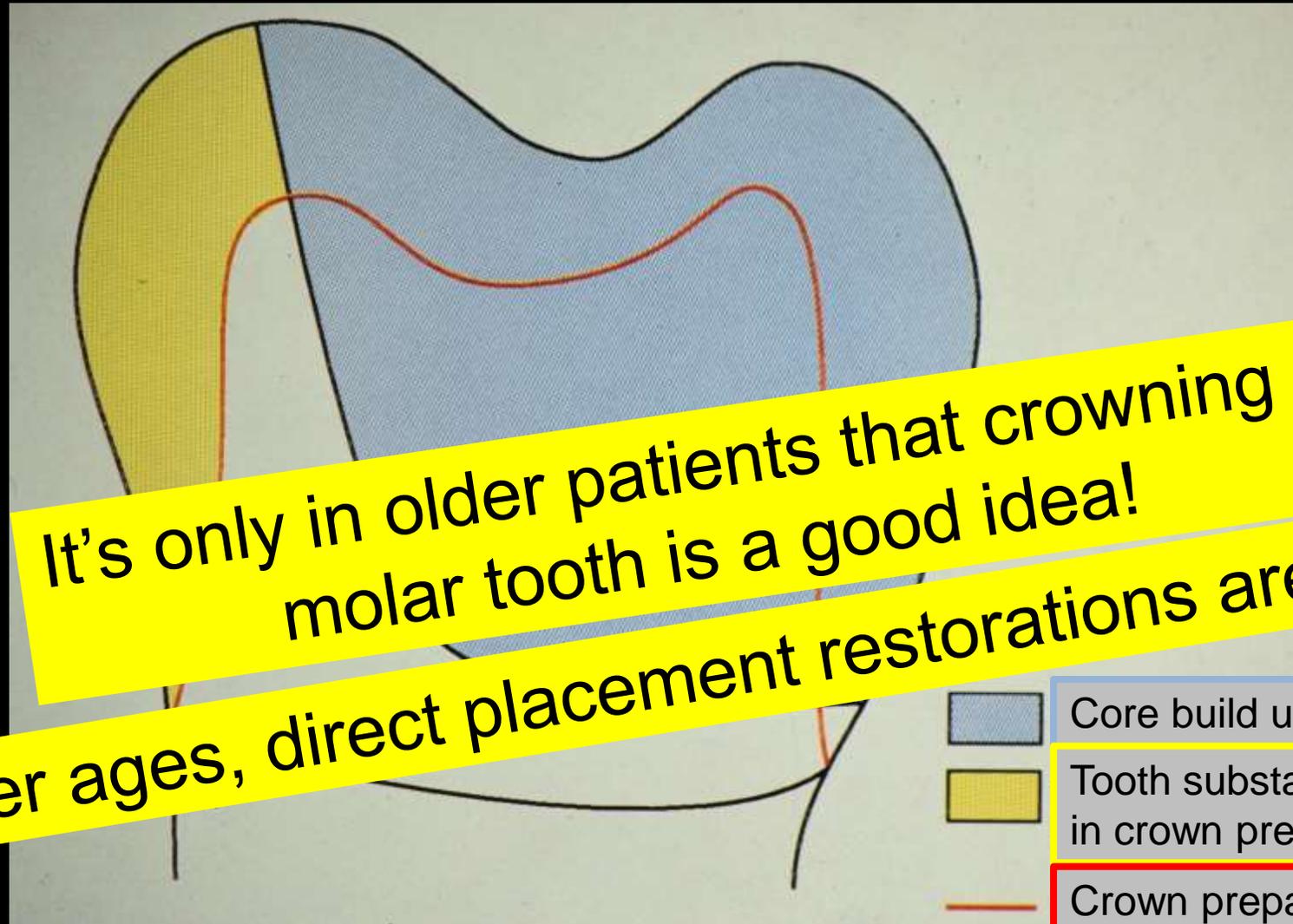
**Dataset of 10 million restorations followed for 16 years**

Why direct-placement  
restorations are king/queen!

# Molar teeth: *survival of the restored tooth to extraction*, patients over 60 years



# Why crowning a back tooth is a bad idea!



It's only in older patients that crowning a molar tooth is a good idea!

In all other ages, direct placement restorations are king/queen!

- Core build up
- Tooth substance lost in crown preparation
- Crown preparation

# Crowns are bad for the survival of teeth

The only crowns that most (thinking) dentists did before COVID were replacements of failed crowns

In the COVID era, given that failure of crowns will be at the margins, there is potential to patch and repair without having to replace the crown

*That's 10 tips for avoiding postoperative  
sensitivity with posterior composites*

Thank you for being here!