Who needs "evidence"?

AKA

A look at the evidence needs of the patient, clinician, manufacturer & third party funder(s)

What I plan to talk about

- Defining evidence
- Evidence needs of different stakeholders
- Measuring survival of dental restorations and factors influencing restoration survival
- Applying the evidence
- Narcissistic attitudes to “evidence”

Learning objectives

- Know that different stakeholders in treatment may have different criteria for the “evidence” that they might expect
- Be confident in choosing the most appropriate “evidence” when planning treatment.
- Be aware of the consequences of not following an evidence-based approach to patient care.

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Memories of dentistry’s greatest impresario!

IN LOVING MEMORY

Louis Mackenzie

BDS, FDS RCPS (Glasg), FCGDent

1968–2023

The Editorial Board of *Dental Update* was shocked and deeply saddened to learn that Louis had passed away on 23rd December 2023, after a short illness. Not only was he a longstanding member of the Editorial Board of *Dental Update*, he was also an outstanding contributor to the journal for the past two decades. His articles, often entitled 'A practical guide to…' dealt with direct and indirect resin composite, minimally invasive restorative techniques, but most recently also dental amalgam, reflecting his exceptional ability as, first and foremost, a supremely talented primary care practitioner, an educator, both at undergraduate level (especially when imparting practical skills in the clinical skills/phantom head room) and as a charismatic postgraduate lecturer. He was a prolific author and probably the most published general dental practitioner in the country, with over 40 peer-reviewed papers to his name. In addition, he contributed to book chapters, supplying high-quality clinical images from the vast library for which he was famed.

Louis was a well-respected tutor and helped to organize structured postgraduate courses at the University of Birmingham. He was also one of the original team teaching on the distance-learning primary care masters in Advanced Minimum Intervention Restorative Dentistry at King's College London. His lectures and practical courses were highly acclaimed and much sought after. He also managed, until recently, to fit in one day per week of general dental practice in Birmingham, and latterly was Head Dental Officer at Denplan. To add to all of his many achievements, through his senior leadership role at Denplan and with his connections throughout the dental industry, Louis made an invaluable national contribution by becoming the first true dental 'impresario', by organizing a series of webinars and online courses to help dentists and their teams keep up to date with their CPD when COVID-19 hit the UK in 2020. In due testament to him, these are still running successfully 4 years later.

In addition to his professional achievements, Louis had the most genuine soul imaginable, warm, kind and good-humoured with everyone he met and influenced. He was always willing to give his time and energy to support those who asked for his help. He was a master of the superlative with an ability to make those who he talked to, be it his students or colleagues, feel good about themselves, thereby inspiring confidence. He was a sharp, witty (slightly acerbic, some might say!) raconteur who entertained all, with his larger-than-life, outgoing personality. Louis lived life to the full, with those around him who really knew him marvelling at how he managed to cram so much into a working week.

Yet, he cared deeply for his wonderful family and his dog Nellie, and always looked forward to enjoying quality time with them.

Our thoughts and prayers are with those who he has left behind, especially his wife Gilly, daughter, Ella and son, Max. He will always have a special place in the hearts of all who knew him and were influenced by him. With his premature loss, our world is now a much poorer place.

FJT Burke, SJ Bonsor and A Banerjee

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WORKING TOGETHER FOR BETTER DENTISTRY

A pragmatic approach to treatment of erosive tooth wear
Trevor Burke
23 FEB

A safeguarding update
Debbie King-Thomas and Jo Banks
9 MAR

Infection, prevention and control
Part 1
Jo Russell
24 FEB

COVID-19 to COVID-21 an update for the dental team
Chet Trivedy
10 MAR

Peri implantitis!
How on earth do we treat this...?
Amit Patel
25 FEB

Common complaints and what to do with them
Sue Boynton
11 MAR

Sex, drugs, and sausage rolls
Periodontal risk factors, risk assessment & risk management
Ian Dunn
2 MAR

ABCDE! The systematic approach to medical emergencies
Katie Baker and Tracey Colmer
16 MAR

Infection, prevention and control
Part 2
Jo Russell
3 MAR

"MI" maintenance of dental restorations in the pandemic era
the "5Rs" unwrapped
Avijit Banerjee
17 MAR

The mouth is the window on the body
what can you see?
Mike Lewis
4 MAR

Grey areas: a practical guide to caries detection and diagnosis
Louis Mackenzie
18 MAR

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Louis Mackenzie

Subir Banerji, Stephen J Bonsor and Dipesh Parmar

Indirect Restorations: An Update

Abstract: Indirect restorative procedures are integral to clinical dentistry. Over the past 50 years however, minimally invasive, direct adhesive restorative techniques have gradually replaced many of the indications for traditional indirect restorations. While numerous indirect procedures are still carried out every year, multiple studies have demonstrated that these restorations have limited longevity and are subject to a wide range of clinical complications, including the reduction in lifespan of the restored teeth and an increased risk of dento-legal problems. This article provides an update on the current status of indirect restorations and presents a comprehensive step-by-step guide to optimising all clinical stages, including case selection, patient assessment, diagnosis, aesthetic considerations, treatment planning, tooth preparation design, impression techniques, temporization, cementation and maintenance.

CPD/Clinical Relevance: In contemporary dental practice there is a reduced need for indirect restorations. When indicated however, all clinical stages must be optimised to maximize longevity and minimise complications.

Dent Update 2022; 50: 321–342

In the UK, 85% of adults have restored teeth,[1] 37% have crowned teeth, with an average of three per person in this group.[1] It is estimated that there are 47.6 million crowned teeth in the UK, but unfortunately, surveys report that over one-quarter of these exhibit signs of failure, with secondary caries being the most common diagnosis.[1,2] For over 50 years, direct adhesive restorative techniques, particularly using resin composite, have progressively replaced the indications for traditional indirect restorations because they offer considerable advantages and are associated with fewer serious complications.

In clinical situations where indirect restorations are necessary, by using current concepts in adhesion and occlusion, multiple authors have described minimally invasive preparation designs that preserve significantly more natural tooth tissue than traditional full coverage crowns. The advent of implants and resin-bonded bridgework has also virtually eliminated the need for conventional fixed bridges, which commonly result in biological, functional and aesthetic problems, and may precipitate further tooth loss (Figure 1).

Fortunately, in the UK, younger patient cohorts have fewer crowns compared with older groups and are, therefore, better placed in the advancing restorative cycle process:[1,3]

- 5% of age group 16–24 years have crowned teeth;
- 57% of age group 45–74 years have crowns.

Figure 1. Fixed/fixed conventional bridgework demonstrating common endodontic, periodontal and aesthetic complications.

Disadvantages of indirect restorations

Indirect restorations are associated with a range of widely documented disadvantages, dating back to some of

Louis Mackenzie, BDS FDS RCPS FCGDent, Head Dental Officer, Dentplan; Clinical Lecturer, University of Birmingham and King's College London. **Subir Banerji**, BDS, MClinDent (Prostho), PhD, MFGDP(UK), FDS RCPS(Glasg), FCGDent, Private Practice, Ealing, London; Director MSc in Aesthetic Dentistry, Unit of Distance Learning, Faculty of Dentistry, Oral and Craniofacial Sciences, King's College London; Associate Professor, Department of Prosthodontics, University of Melbourne, Australia. **Stephen J Bonsor**, BDS(Hons) MSc FHEA FDS RCPS(Glasg) FDFTEd FCGDent GDP, The Dental Practice, 21 Rubislaw Terrace, Aberdeen; Senior Clinical Lecturer, University of Edinburgh. **Dipesh Parmar**, General Dental Practitioner, Acorn Dental, Birmingham
email: Lmackenzie@bham.ac.uk

Louis Mackenzie

Adrian CC Shortall and FJ Trevor Burke

Direct Posterior Composites: A Practical Guide

Abstract: The restoration of posterior teeth with directly placed resin-bonded composite requires meticulous operative technique in order to ensure success. Case and material selection; cavity preparation; matrix selection; isolation; bonding; management of polymerization shrinkage; placement; finishing and curing of posterior composites – all present a series of challenges that dentists must master in order to ensure high-quality, long-lasting restorations. This paper describes and discusses these aspects of the provision of composites for load-bearing situations in posterior teeth.

Clinical Relevance: Successful restoration of posterior teeth with composite is an essential component of contemporary dental clinical practice.

Dent Update 2009; 36: 71–95

Conflicting opinion and a wealth of contradictory data present difficulties for dentists in choosing which materials, instruments and techniques to employ when considering restoration of posterior teeth with direct composite.

In some areas of the world, resin composite is the first (or only) choice for direct restorations in teeth, with the setting up of 'amalgam-free' practices and a dental school which has not taught amalgam placement techniques for over a decade.[1,2] In this respect, although amalgam has served dentistry for over a century and, if well placed, may provide restorations which function beyond 30 years,[3] encouraging clinical outcomes have caused some clinicians to favour composite, even when restoring large cavities.[4] There has been a consequent decline in the worldwide use of amalgam over the last decade[3] and a concomitant increase in the use of composite.[5]

This situation has been brought about by:

- Alleged health concerns and environmental considerations regarding amalgam;
- The dental profession's desire for an adhesive material that demands less invasive cavity preparations;[6,7]
- Patient demand for tooth-coloured restorations in posterior teeth.[3,4,6,8,9]

With good case selection, proper adhesion and placement, posterior composites can provide successful and predictable restorations[1,8] that may match the appearance of natural teeth (Figure 1).[10,11]

As a result, it may be considered that the use of posterior composites is set

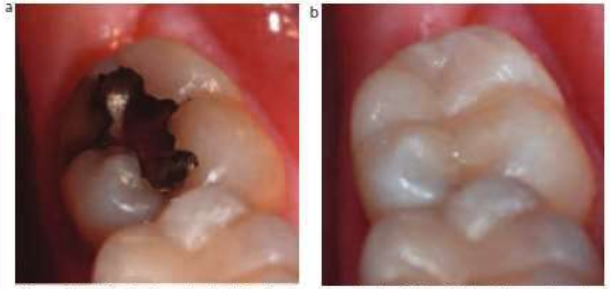

Figure 1. (a, b) Occluso-lingual restoration of a lower second molar in *Clearfil Majesty* (Kuraray, Japan).

Louis Mackenzie, BDS, General Dental Practitioner and Clinical Lecturer, **Adrian CC Shortall**, DDS, Reader in Restorative Dentistry and **FJ Trevor Burke**, DDS, MSc, MGDS FDS RCS(Edin), FDS RCS(Eng), FFGDP FADM, Professor of Primary Dental Care, Primary Dental Care Research Group, University of Birmingham School of Dentistry, St Chad's Queensway, Birmingham B4 6NN, UK.

Louis Mackenzie
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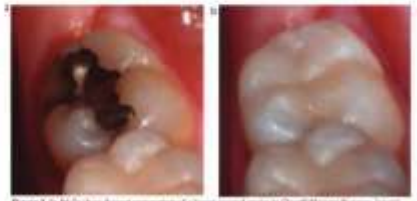
With good case selection, proper adhesion and placement, portable composites can provide successful and predictable restorations.[11] that may match the appearance of natural teeth (Figure 1).[12,13]

As a result, it may be considered that the use of posterior composites is set to replace failed or unattractive restorative to large Class I and II restorations,[7] where the preparation outline form does not place the margins under direct parafunctional loading (Figure 6).



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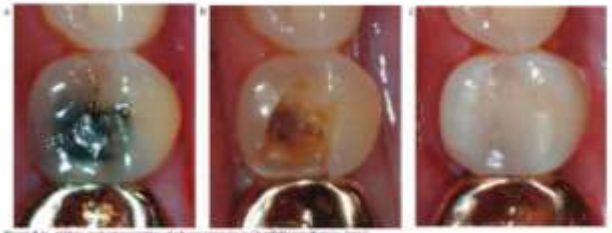


Figure 4. (a–c) Class occlusal restoration of a lower premolar in Chiarli Maesty Nursing, Japan).

Figure 5. (a, b) Conservative restoration of an upper first premolar following a buccal cusp fracture using Filtek Silorane (3M ESPE, St Paul, MN, USA).

Figure 6. (a, b) Cosmetic replacement of an occlusal amalgam using Filtek Silorane (3M ESPE, St Paul, MN, USA).

Other uses

Resin composite may be used effectively for the restoration of Class V cavities[14] and for the conservative repair of (defect) restorations. It may also be used to replace amalgam restorations implicated in lichenoid reactions, and in cases of proven allergy to metal restorations.

Worldwide, the acknowledged range of indications for which directly-placed composites can be used is growing, as clinicians' confidence and skill in placing such restorations increases. Their motivation should also be to perfect the least invasive methods for the preservation and repair of teeth throughout a lifetime.[7]

Case selection

Patients should have an acceptable level of oral hygiene, as restorations formed in resin composite have been considered to attract greater levels of pathogenic bacteria than amalgam restorations.[15] Occlusal contacts on enamel may be considered desirable and ideally all cavity margins should be in enamel. In this respect, a superior prognosis can be expected from a restoration bonded to an unaltered enamel margin.[16]

Contra-indications

Posterior composites should

Figure 18. SuperMat matrix and tightener (KerrHawe, Bioggio, Switzerland).

Figure 19. SuperMat Matrix System in place.

Louis Mackenzie
FJ Trevor Burke and Adrian CC Shortall

Posterior Composites: A Practical Guide Revisited

Abstract: Direct placement resin composite is revolutionizing the restoration of posterior teeth. Compared to amalgam, its use not only improves aesthetics but, more importantly, promotes a minimally invasive approach to cavity preparation. Despite the benefits, the use of composite to restore load-bearing surfaces of molar and premolar teeth is not yet universally applied. This may be due to individual practitioner concerns over unpredictability, time and the fact that procedures remain technique sensitive for many, particularly with regard to moisture control, placement and control of polymerization shrinkage stress. New materials, techniques and equipment are available that may help to overcome many of these concerns. This paper describes how such techniques may be employed in the management of a carious lesion on the occlusal surface of an upper molar.

Clinical Relevance: Direct posterior composite is the treatment of choice for the conservative restoration of primary carious lesions.

Dent Update 2012; 39: 211–216

Detection and diagnosis

A Class I carious lesion (ICDAS 3)[1] was detected in the mesial pit of an upper second molar (Figure 1). The lesion was diagnosed as active with respect to enamel cavitation exposing dentine. In addition the patient's dietary habits, oral hygiene measures and the presence of active lesions elsewhere indicated the need for operative intervention.

Isolation

Placement of direct restorations in the molar regions can present difficulty with regard to moisture control. Use of rubber dam with a single hole and a versatile winged molar clamp (Hygenic 124, Coltène-Whaledent, Switzerland©) provided rapid isolation, which

Louis Mackenzie, BDS, General Dental Practitioner and Clinical Lecturer, **FJ Trevor Burke**, DDS, MSc, MGDS RCS(Edin), FDS RCS(Eng), FFGDP FADM, Professor of Primary Dental Care, Primary Dental Care Research Group and **Adrian CC Shortall**, BDS, DDS, Reader in Restorative Dentistry, University of Birmingham School of Dentistry, St Chad's Queensway,Birmingham B4 6NN,

Figure 1. A cavitated Class I carious lesion in an upper second molar.

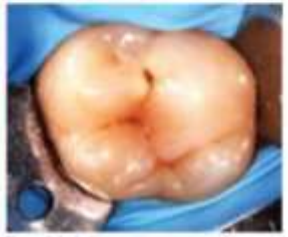


Figure 2. Isolation.

was completed (Figure 2) by flossing the dam through the mesial contact point. The speed with which this technique achieves isolation and promotes a comfortable experience for the patient and a predicable outcome for the operator cannot be overemphasized. Although the vast majority of practitioners do not routinely use rubber dam,[2] the isolation of a single tooth for an occlusal restoration is a perfect starting point for those wishing to learn and refine rubber dam techniques.

Occlusal template

left the occlusal surface virtually intact, in this case a template was used to facilitate provision of an anatomically accurate final restoration. Fabrication of a template may be achieved using a pre-operative impression gained by injecting a small amount of a clear polyvinyl siloxane material (Memosil 2, Heraeus Kulzer, Germany) onto the occlusal surface[3,4] (Figure 3). After waiting for the material to partially set, finger pressure (Figure 4) was applied to accurately capture the occlusal morphology. Once set, the template was removed (Figure 5) and the mesial surface marked with a felt pen to

Figure 3. Template material injected on to the occlusal surface.

Figure 4. Template material adapted to capture occlusal morphology.

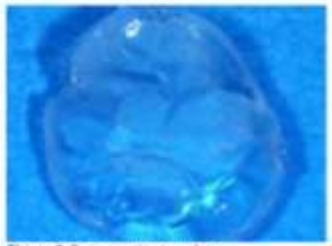


Figure 5. Pre-operative template.

Figure 6. Access to lesion.

Figure 7. Cavity preparation complete.

Figure 8. Acid etch applied.

Figure 16. Further light-curing.

Figure 19. Completed restoration.

Figure 17. Minimal excess for removal.

Figure 20. Review.

Figure 18. Occlusal check.

sharp hand instrument. (Note: Careful volume estimation of the final increment will reduce or even eliminate this stage).

Occlusal check

Articulating paper was used to confirm that the restoration conformed precisely to the patients pre-existing occlusal scheme, in both the intercuspal position and all excursions (Figure 18).

Finished restoration

The restoration was inspected (Figure 19). At this stage the surface may be refined, polished or coated with a solvent-free surface sealer, depending on operator preference.[5]

Review

At review (interval based on caries risk or, as in this case, need for further dentistry) all aspects of the completed restoration were studied (Figure 20).

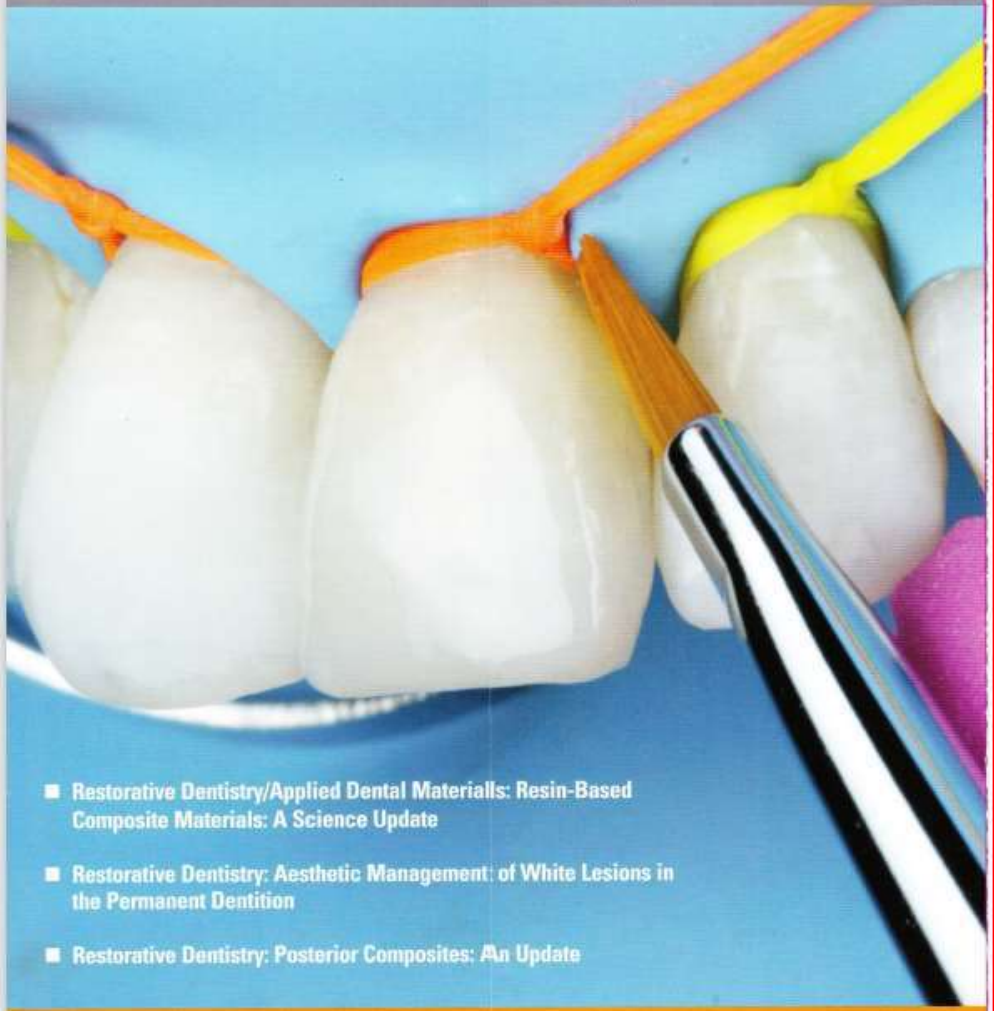
Discussion

Direct posterior composite restorations offer many benefits to both patient and dentist that go far beyond the fact that the restorations are tooth-coloured. New materials, equipment and techniques will continue to improve the quality, predictability and success of direct composite restorations. Such methods will also promote minimally invasive caries management, maximizing the amount of tooth tissue preserved. This will increase the longevity, not of just the fillings placed, but of the teeth that they restore.

Precise notation of the materials employed during each restorative procedure will provide each dentist with an invaluable evidence base for the long-term audit of their successful operative techniques.

DentalUpdate

April 2019 . Volume 46 . Number 4



- Restorative Dentistry/Applied Dental Materialls: Resin-Based Composite Materials: A Science Update
- Restorative Dentistry: Aesthetic Management of White Lesions in the Permanent Dentition
- Restorative Dentistry: Posterior Composites: An Update

Louis Mackenzie, Clinical Lecturer, University of Birmingham School of Dentistry.

The composite issue

My (nearly) 30 years in clinical practice has coincided almost exactly with a 'minimally invasive revolution' in the field of restorative dentistry. In part, this has been led by innovations in adhesive technology and by continuous advances in the use of direct composite to treat a wide range of clinical problems.

Having placed only one (very poor!) posterior composite as an undergraduate, it was a delight to be invited to write an 'update' paper entirely devoted to that subject and to guest edit the first ever 'completely composite' edition of *Dental Update*.

I would like to take this opportunity to sincerely thank all the authors who have contributed to this edition. They were hand-picked as representatives of various stages in the evolution of direct composite techniques: from legendary pioneers Adrian Shortall and Professors Trevor Burke and Nairn Wilson, to the youngest generation of 'composite natives', represented by Richard, Andrew, Dipesh and cover illustrator Minesh Patel, who have raised the standard of British direct aesthetic dentistry to an art form.

The authors were selected according to the following criteria:
1. Only UK graduates* (this issue was conceived well before Brexit!);
2. Working predominantly, or have a background, in general dental practice;
3. Have a significant career focus on the teaching of direct composite techniques.

*The only exception to this rule is South Africa-trained Jansie Van Rensberg, whose outstanding clinical skill and exemplary teaching ability made him the number one choice to write about fibre-reinforced composites.

The subject range of these papers is designed to demonstrate the array of contemporary applications for composite resins, from minimally invasive cosmetic procedures to the complete rehabilitation of worn dentitions.

Logically, the composite issue opens with a review of recent developments in resin-based composite materials by Steve Bonsor, one of the UK's most published GDPs and a vastly experienced undergraduate and postgraduate educator on the practical application of dental materials. Following this, Richard Field's beautifully illustrated paper describes the latest techniques for the minimally invasive management of white lesions using resin infiltration. Next, I team up with my mentors, Adrian Shortall and Trevor Burke, and composite prodigy Dipesh Parmar to provide a detailed update of the latest materials, equipment and evidence-based clinical techniques for the restoration of posterior teeth with resin composite. (The authors would also like to thank our friends at Radboud Dental School in Nijmegen, Holland, who continue to kindly share their revolutionary blueprint for the teaching of posterior composite techniques). Our next author, Jason Smithson, has done as much as any GDP to raise the profile of British aesthetic dentistry on the international stage. His paper provides an anatomy masterclass for the functional and aesthetic restoration of occlusal surfaces. We then switch to anterior composites with past president of the British Academy of Cosmetic dentistry (BACD), Andrew Chandrapal, who provides an outstanding step-by-step guide to polychromatic layering techniques. Nairn Wilson follows, taking an historical look at one of the most significant advances in restorative dentistry, as he describes the introduction of visible light curing and how British researchers remain at the forefront of innovation in this field. To further demonstrate how resin-based composite has transformed clinical practice, Trevor returns to describe how the latest composite luting resins form a central component of indirect restorative procedures. Our final two papers demonstrate how dedicated, experienced experts have extended the clinical applications of resin composite materials. In a companion piece to his 2015 *Dental Update* article on fibre-reinforced, composite, resin-bonded bridges, Jansie van Rensburg describes the practical stages for the successful management of mobile teeth using fibre-reinforced, composite splints. Then, pushing the boundaries even further, Dipesh Parmar, in another superbly illustrated clinical case report, demonstrates a predictable, cost-effective and time-efficient method for the conservative, full-mouth rehabilitation of patients with tooth wear. This paper reinforces a recurring theme: that rather than thinking of composite as a replacement for amalgam which in my opinion still remains an excellent option for some molar cavities), it should be more correctly thought of as a replacement for more biologically destructive, indirect techniques, whose irreversible sacrifice of tooth tissue and mode of failure often leaves no 'Plan B' when problems arise. Finally, a technique tip describes an innovative method for making a customized composite shade guide to help satisfy patient and professional demand for high-quality aesthetic restorations.

I hope you enjoy this 'composite edition' of *Dental Update*. In an era when there is an unprecedented level of negativity within the dental profession, I would argue that there has never been a better time to be a restorative dentist and that optimizing the direct composite procedures described within this issue will continue to bring great rewards for patients and clinicians alike.

A must read paper, Dent. Update Sept 2021

Perhaps the last paper ever written on amalgam?

Louis Mackenzie

Dental Amalgam: A Practical Guide

Abstract: Historically, dental amalgam is the world's most commonly used restorative material. Its use is declining due to patient and professional demand for tooth-coloured restorations that are adhesive and promote minimally invasive tooth preparation. Significant reduction has also resulted from environmental concerns relating to dental amalgam's ~50% mercury content. This paper provides a comprehensive review of the status of dental amalgam including its advantages and disadvantages, current regulations and legislation and a comparison with alternative restorative materials. As the use of dental amalgam has progressively declined, this paper also provides an illustrated step-by-step review of the techniques that will optimize the restoration of challenging, complex cavities where moisture control presents challenges.

CPD/Clinical Relevance: Amalgam remains an excellent restorative material of choice

Dent Update 2021; 48: 607–618

Advantages and disadvantages of amalgam

Although the use of dental amalgam is decreasing worldwide, it is still used in many general population, with low risk of adverse health effects.[1,4]

The main health concern regarding dental amalgam relates to the risk of release into the environment where aquatic micro-organisms can convert elemental mercury to organic compounds. These may then enter the human food chain, for example by eating fish and other marine species contaminated with organic methylmercury, which is the most toxic and bio-accumulative form of mercury.[1]

In this way, dental amalgam can indirectly contribute to a human health risk from mercury. Globally, it is estimated that approximately two-thirds of the mercury content in dental amalgam is eventually released into the atmosphere, soil, surface and groundwater.[4] Amalgam can therefore contribute to environmental pollution via the following routes:[4]

- Dental amalgam manufacture (including mercury mining, trade and supply);
- Amalgam placement and removal;
- Amalgam disposal (eg via landfill/ waste water);
- Following cremation or burial of individuals with amalgam restorations.

Since children, infants and developing fetuses have increased susceptibility to

Louis Mackenzie, BDS, FDS RCPS(Glasg), Head Dental Officer at Denplan, GDP and Clinical Lecturer, University of Birmingham School of Dentistry, email: l.mackenzie@bham.ac.uk

- restorative materials[2,3]
- Corrosion over time enhances the marginal seal
- Heavy metal ionic breakdown products are antibacterial, resulting in slower progression of secondary caries compared to composite, which has been demonstrated to attract higher levels of more cario
- Does not significantly affect subgingival h
- Suitable for use in posterior teeth
- Useful in deep cavities to be diminished
- Hi… …idence of endodontic
- …egligible risk of increasing cavity size …torations)[1,8]
- …mplifies amalgam carving/marginal finishing and indirect … teeth with amalgam cores[2]
- …mparatively inexpensive/cost-effective material[8] (reduced surgery time more than offsets the high price of silver)

Table 2. Advantages of amalgam.

…e 5 lists the …ctions introduced in 2018–2019.[4–6]

The new legislation includes the slightly confusing exception that amalgam may be used in the prohibited patient groups 'where it is deemed strictly necessary by the dental practitioner based on the specific medical needs of the patient'. Supplemental guidance statements have been published to assist clinical decision making and are summarized as follows:

- Medical needs should be interpreted to include specific dental needs of the patient, ie where there are medical or

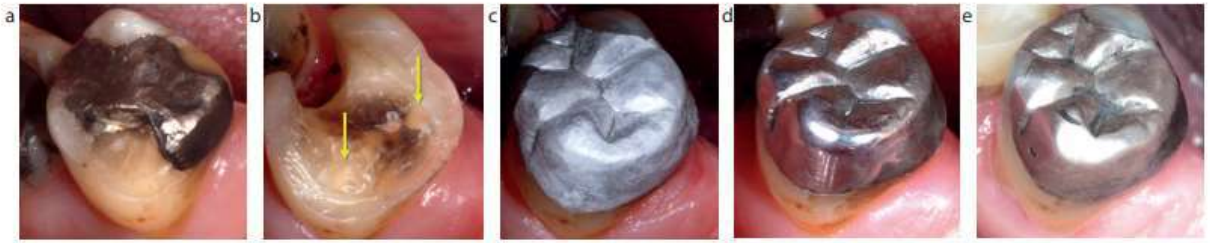


Figure 1. (a) MOD amalgam in a previously repaired mandibular first permanent molar, with a fractured mesio-buccal cusp. **(b)** Cavity preparation with resistance form augmented with pits for 'amalgapins'. **(c)** MODLB Bonded amalgam (immediate post-op). **(d)** Restoration at 6 years. **(e)** Restoration at 12 years.

A must read paper, Dent. Update Sept 2021

Perhaps the best paper ever written on amalgam?

Enhanced CPD DO C RestorativeDentistry

Louis Mackenzie

Dental Amalgam: A Practical Guide

- Amalgam exhibits less thermal expansion and contraction than tooth-coloured restorative materials[2,3]
- Corrosion over time enhances the marginal seal
- Heavy metal ionic breakdown products are antibacterial, resulting in sl… progression of secondary caries compared to composite, whi… demonstrated to attract higher levels of more cario…
- Does not significantly affect subgingival h…
- Suitable for use in posterior teet…
- Useful in deep cavitie… …to be diminishe…
- Hist… …ncidence of endodontic
- …negligible risk of increasing cavity size …storations)[1,8]
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2024 Update Webinar series

IN LOVING MEMORY

Louis Mackenzie

BDS, FDS RCPS (Glasg), FCGDent

1968–2023

The Editorial Board of *Dental Update* was shocked and deeply saddened to learn that Louis had passed away on 23rd December 2023, after a short illness. Not only was he a longstanding member of the Editorial Board of *Dental Update*, he was also an outstanding contributor to the journal for the past two decades. His articles, often entitled 'A practical guide to…' dealt with direct and indirect resin composite, minimally invasive restorative techniques, but most recently also dental amalgam, reflecting his exceptional ability as, first and foremost, a supremely talented primary care practitioner, an educator, both at undergraduate level (especially when imparting practical skills in the clinical skills/phantom head room) and as a charismatic postgraduate lecturer. He was a prolific author and probably the most published general dental practitioner in the country, with over 40 peer-reviewed papers to his name. In addition, he contributed to book chapters, supplying high-quality clinical images from the vast library for which he was famed.

Louis was a well-respected tutor and helped to organize structured postgraduate courses at the University of Birmingham. He was also one of the original team teaching on the distance-learning primary care masters in Advanced Minimum Intervention Restorative Dentistry at King's College London. His lectures and practical courses were highly acclaimed and much sought after. He also managed, until recently, to fit in one day per week of general dental practice in Birmingham, and latterly was Head Dental Officer at Denplan. To add to all of his many achievements, through his senior leadership role at Denplan and with his connections throughout the dental industry, Louis made an invaluable national contribution by becoming the first true dental 'impresario', by organizing a series of webinars and online courses to help dentists and their teams keep up to date with their CPD when COVID-19 hit the UK in 2020. In due testament to him, these are still running successfully 4 years later.

In addition to his professional achievements, Louis had the most genuine soul imaginable, warm, kind and good-humoured with everyone he met and influenced. He was always willing to give his time and energy to support those who asked for his help. He was a master of the superlative with an ability to make those who he talked to, be it his students or colleagues, feel good about themselves, thereby inspiring confidence. He was a sharp, witty (slightly acerbic, some might say!) raconteur who entertained all, with his larger-than-life, outgoing personality. Louis lived life to the full, with those around him who really knew him marvelling at how he managed to cram so much into a working week.

Yet, he cared deeply for his wonderful family and his dog Nellie, and always looked forward to enjoying quality time with them.

Our thoughts and prayers are with those who he has left behind, especially his wife Gilly, daughter, Ella and son, Max. He will always have a special place in the hearts of all who knew him and were influenced by him. With his premature loss, our world is now a much poorer place.

FJT Burke, SJ Bonsor and A Banerjee

Thanks, Louis for all that you brought us.
You are greatly missed.

What I plan to talk about

- Defining evidence
- Evidence needs of different stakeholders
- Measuring survival of dental restorations and factors influencing restoration survival
- Applying the evidence
- Narcissistic attitudes to “evidence”

Evidence:

The earliest known use of the noun *evidence* is in the Middle English period (1150—1500).
OED's earliest evidence for *evidence* is from around 1384, in *Bible (Wycliffite, early version)*.

There are **17** meanings listed in OED's entry for the noun *evidence*, six of which are labelled obsolete.

Evidence:

Oxford English Dictionary:

noun. noun. /ˈɛvədəns/ 1[uncountable, countable] the facts, signs, or objects that make you believe that something is true evidence (of something).

- **LAW**
- information drawn from personal testimony, a document, or a material object, used to establish facts in a legal investigation or admissible as testimony in a law court.
- "without evidence, they can't bring a charge"

the available body of facts or information indicating whether a belief or proposition is true or valid.
"the study finds little evidence of overt discrimination"

Similar:

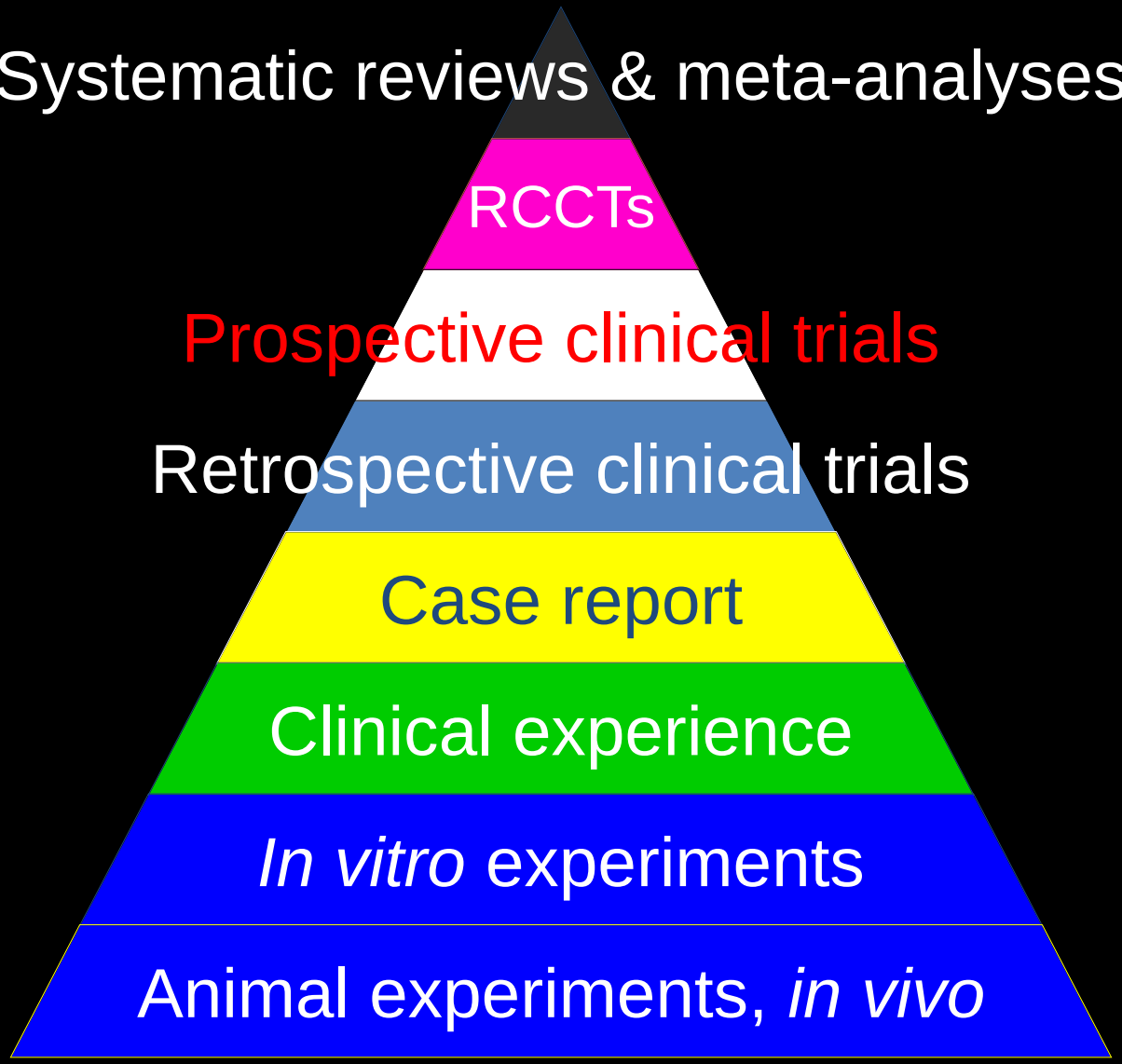
proof
confirmation
verification
substantiation
corroboration
affirmation
authentication
attestation
documentation
support for
backing for
grounds for

Evidence:

Collins Dictionary:
Evidence is **anything that you see, experience, read, or are told** that causes you to believe that something is true or has really happened.

Chartered Society of Physiotherapy
Evidence could be described as the **available body of facts, information or data** on which to base a clinical decision.

Research evidence:
Research evidence is any fact, information or data provided by a research study. The evidence may be generated from any type of research study utilising any type of research methodology.
Research evidence may come from individual research studies (primary research) or from reviews which combine and analyse the evidence from more than one study on the same topic (secondary research).



The hierarchy of evidence in dental research

The Gold Standard design

- Randomised
- Clinical
- Prospective
- Double blinded
- Controlled e.g. RCCT
- Examples – smoking cessation, BUT, not always practical or ethical e.g. passive smoking and lung cancer

RCCTs in Restorative Dentistry

- Relatively few examples
- Often of short duration and small scale
- Methodological requirement for controls and randomisation is difficult to combine with the ethical requirement for informed patient consent in a general practice environment

So, in restorative dentistry, we generally have to use other methodologies

Comment

Authors' Information
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ABC

DU ISSN 0305-5000

End of the road for the randomized controlled trial in restorative dentistry?

Trevor Burke

Satisfactory survival of restorations is central to good practice, not only because unfulfilled patient expectations may lead to adverse medicolegal circumstances, but also because third party funders, managers and governments may also be inquisitive as to the performance of clinicians in their pay. However, there seems to be an obsession among researchers with the Randomized Controlled Clinical Trial (RCCT), and, ok, it is the internationally recognized gold standard. The problem is that the RCCT was designed for medicine and the pharmaceutical industry and not specifically for dentistry, where funding is less and the prescription of a drug or treatment is not so often a matter of life or death, as it may be in medicine, surgery or pharmacy. Another problem is that RCCTs are necessarily expensive, given that these should generally continue for a minimum of five years, with sufficient numbers of patients to satisfy a power calculation.

Manufacturers of dental materials and other funders generally appear reluctant to fund RCCTs into the applied performance of dental materials and restor
mentioned above, they are expensive and th
is not likely to

Given the paucity of RCCTs in restorative dentistry, might well designed cohort studies provide good quality "evidence"?

Evidence-Based Dentistry supplements which are
British Dental Journal from time to time. However, on reading these, one cannot help being struck by the volume of studies which report that there is insufficient RCCT evidence and a need for further well-designed clinical trials. In the most recent issue,[1] of the 15 studies which were summarized, five concluded on a similar theme that:

1. 'More clinical trials should be performed (topical fluorides in children)';
2. 'Due to the small number of RCCTs on this topic and their risk of bias' (aesthetic preformed crowns);
3. 'In view of the lack of evidence' (only one study on bonded vs non-bonded amalgams);
4. 'No trials met the inclusion criteria – there is a need for well-designed and appropriately conducted clinical trials on this topic' (best therapies for post-extraction haemorrhage);
5. 'Insufficient evidence' (only one study included on BRONJ), 'insufficient evidence to support or refute use of any particular intervention for management of BMS'.

One cannot underestimate the amount of work which has gone into the original studies and their reviews, so it seems disappointing that more robust conclusions were not always possible. Perhaps the bar was set too high? Not all of the above studies related to restorative dentistry, but the same conclusion may be seen in Cochrane studies on restorative dentistry. Two, in particular, spring to mind. Firstly, the most recent Cochrane

The busy practitioner is ideally placed to observe trends in treatment need, the life-span of restorations, and whether caries activity is increasing or decreasing within the practice patient base. Some practition-

Burke F.J.T., Crisp R.J. McCord J.F. Research in dental practice:SWOT analysis. Dent.Update 2002:**29**:80-87.

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COMMENT

Practice-based Research?

The busy practitioner is ideally placed to observe trends in treatment need, the life-span of restorations, and whether caries activity is increasing or decreasing within the practice patient base. Some practitioners may store this information on disk, but others may simply store it as an anecdotal or subjective memory. For example, at recent meetings, I asked GDPs the question: "What is the greatest predisposing factor to tooth fracture?" An obvious response may be sticky toffee or a boiled sweet, but a substantial proportion of the audience replied: "An MOD restoration", which was precisely the result that a research project had demonstrated.[1] Similarly, on being asked which glove was most at risk of puncture during a surgical operation and at what point of the operation was the risk greatest, the practitioner audience responded "the left (non-working) hand, during suturing." This subjective observation has been confirmed by the results of a research project.[2]

These examples demonstrate that while practitioners have an excellent awareness of their everyday clinical situations, the majority do not analyse their observations scientifically. This has been demonstrated by the low volume of research which has been carried out in general dental practice.[3] This is not a criticism of general practice or practitioners, simply a reflection of the difficulties of practice-based research. Difficulties include cost — practices are designed for patient treatment, and time equals money, and GDPs may consider themselves ill-trained in research methodology.[4] There may be other perceived difficulties such as lack of calibration of operative diagnoses, problems of validation and other uncontrolled variables, but these are the making of real-world decisions and outcomes.[5]

Why bother confirming anecdotal observations with research? Surely our profession is founded upon scientific principles and there can be no place for anecdote and subjectivity in a science, particularly when patient treatment is involved.

Many difficulties associated with practice-based research can be overcome, and 1997 sees a massive boost for such research in the UK. The NHD R & D initiative is discussed on page 75; a project in which dental practitioners will be encouraged to put forward ideas and proposals. Clinically-related research has not been considered to be an exact science, but rather a scientifically-based approach to the investigation and quantification of the effects, behaviour and performance of therapies in patients with disorders and disease.[5] For the enlightened, it may be possible to turn observations into robust, clinically-related research projects based in the real world of general practice, which may ultimately provide the evidence to confirm that what we are doing is correct, or alternatively, to alter thinking.

A survey of papers published in three journals in 1991 showed that 21.9% were related to clinical techniques, and less than 10% of these papers involved general dental practice or practitioners.[3] It is hoped that new initiatives will change this emphasis and raise awareness of practice-based research. General dental practice is, to a large extent, where the dental health of our public stands or falls. While there are many areas from which dental research may originate, a substantial proportion of dental research projects should have a firm practice base.

F.J. Trevor Burke

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Dental Update:1997

EBD

www.nature.com/ebd

EDITORIAL

Real world evidence: will the "pyramid" of evidence need some redefining…?

Evidence-Based Dentistry (2024) 25:119–120; https://doi.org/10.1038/s41432-024-01035-1

A clinical trial conducted by Dr James Lind in the year 1747 on patients with scurvy, made the basis of modern-day RCTs. Since then, there have been many advancements in the art and science of conducting clinical trials. These advancements include: methodological know-how, framing of an organized structure for conducting and reporting of trials, laying down of ethical guidelines and regulatory frameworks etc. Owing to this robust framework, today a well-planned and meticulously executed RCT is considered indispensable in finding the evidence for any given intervention.

Further, some other studies that have human involvement vis-à-vis an expert opinion, case reports, and observational studies also contribute towards evidence building. Though these studies also use a structured framework, owing to fundamental features of RCTs, these are placed quite high in the evidence hierarchy. This hierarchical ladder is popularly known as the "evidence-based pyramid".

In this pyramid, systematic reviews are placed atop as they help to curate the "net" evidence by combining the information from all relevant clinical trials. The pooled effect from SRs and meta-analysis is frequently used by policymakers and healthcare professionals to frame evidence-based recommendations. Overall, this concept of "evidence-based pyramid" has guided the medical research since decades; and in the quest of finding the evidence for any intervention, different stakeholders including clinicians, academia, and drug-development or healthcare-technology companies have diverted their resources in planning and conducting high quality RCTs.

But despite the inherent qualities of an RCT and its ability to effectively contribute towards evidence generation, there are some concerns and limitations. These include cherry-picking a specific group of patients, enforcing the patients to adopt specific behaviors which may not be always pragmatically possible, choosing only a few objectives while neglecting the impact of the interventions beyond the target research area etc. This has two main repercussions: first, the outcome determination is based only as per data collected in the trial without any consideration to other available data; and second, it limits the generalizability of trial results thereby obscuring its true impact on healthcare stakeholders.

Hence, it is being emphasized to integrate the knowledge from clinical trials with the information gathered from real-life situations, as this might help to generate the "true" evidence. This seems possible too in the present healthcare scenario, as today we routinely collect clinical and other patient-related data which is available in EHR systems, patient registries, drug inventories, claims/billing records etc. Moreover, nowadays enormous data is also being generated at home with the use of connectable and wearable IoT devices. This includes data from smartwatches, pedometers, health Apps, IoT-based food, and exercise trackers and not to miss, App-connected toothbrushes, brushing apps etc. These modern-day sophisticated data collection methods are sensitive, and are becoming increasingly reliable. This data is stored in hospital servers or is available in cloud-based archives. Though all such data is encrypted, it can be accessed after seeking due approvals from regulatory bodies.

Overall, the data collected in such real-life situations, outside the realm of clinical trials, is referred to as real-world data (RWD)[1]. And with the use of advanced data analytics, and AI-based deep-learning and neural network applications, "this data" can be made to shake-hands with data generated from the clinical trials conducted in pseudo-perfect situations. The evidence curated from this wed-lock is called real-world evidence (RWE). RWE can be used to find various hidden relationships and has the potential to reengineer the evidence hierarchy in the healthcare system. Another utility of RWE is to determine the evidence about an intervention, meant for rare diseases, wherein the studies are mostly limited to case studies or small cohorts. In such situations, exploring RWD from EHRs, disease registries etc. might give an insight into the epidemiology, possible treatments, and outcomes[2]. It may also hint about their associations with other diseases. Thus, RWE generated from such endeavors would surely help in exploring new treatment pathways and seeking drug approvals for such unique indications.

In yester years, various drug/technology approvals by FDA and other health authorities have included RWD; depicting the

EBD

EDITORIAL

Real world evidence: wil
redefining…?

Evidence-Based Dentistry (2024) 25:119–120; https://d
s41432-024-01035-1

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Latest Reviews & Analysis >

A brave new world of evidence-based care: are you up for it?

Iain Chapple

Perspective | 25 Oct 2024

Most studies are undertaken in hospital/dental school environments = *EFFICACY*

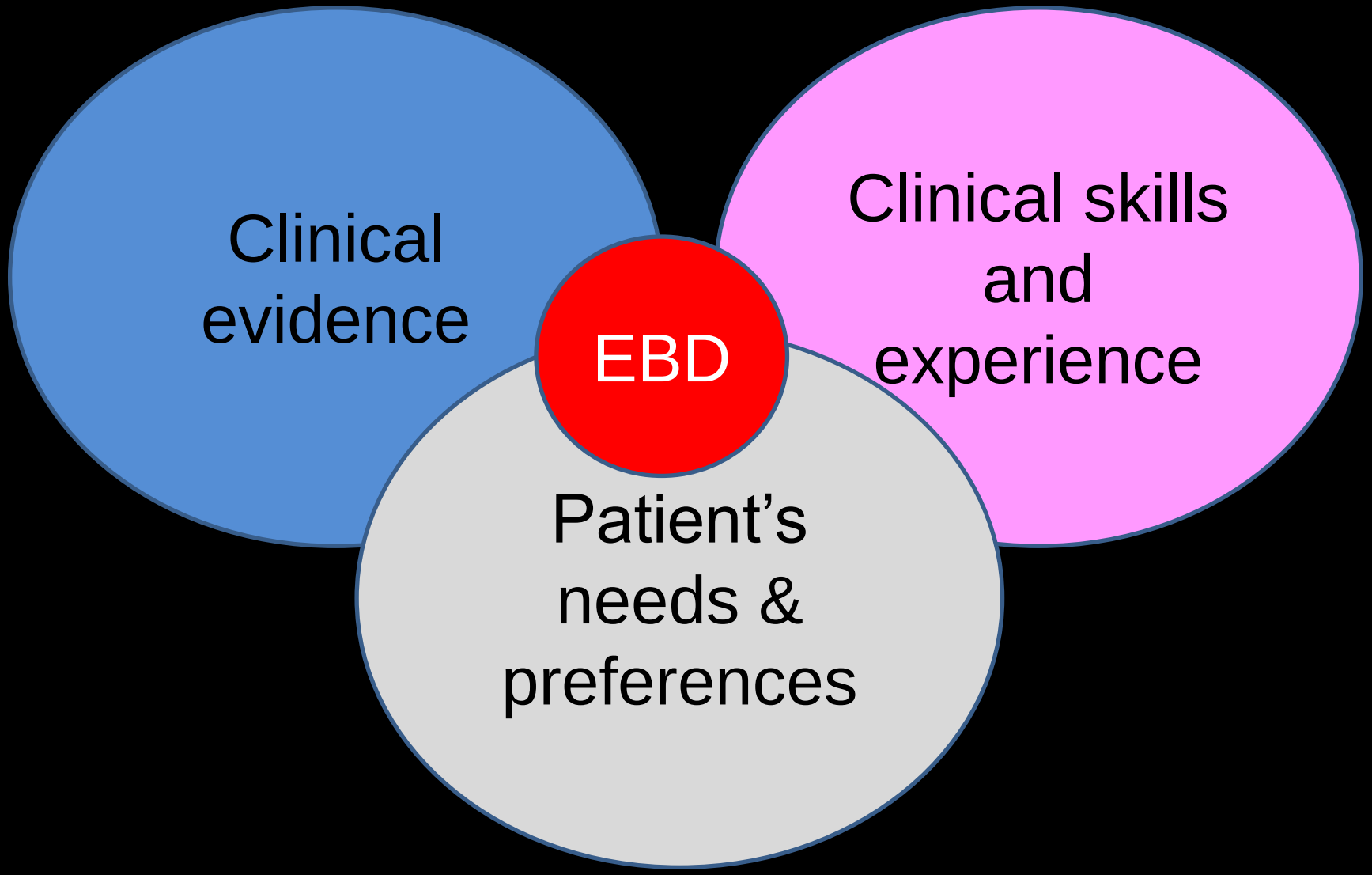
There is a need for real world studies in high street practices = *EFFECTIVENESS*

Hard evidence

BIG numbers
LONG duration

The research should be based in the real world of general dental practice

Put simply:What EBD really means



A basic principle:
Drilling isn’t great for teeth!!

Dentine/pulp reactions to full crown Procedures. Dahl BJ, J.Oral Rehabil.1977:4:247-254

Severe acute pulp reactions were observed subjacent to the dentinal tubules cut in full crown preparation

Tooth preparation and pulp degeneration Christensen GJ. JADA 1997:128:353-354

Patients should be warned that pulpal death and endodontic therapy can result from crown placement

Prevalence of periradicular periodontitis associated with crowned teeth in an adult Scottish subpopulation. Saunders WP, Saunders EM. Brit.Dent.J.1998:185:137-140.

CONCLUSION: Pulpal damage may occur during procedures to provide a crown

Iatrogenic injury to the pulp in dental procedures.
Bergenholtz G. Int.Dent.J.1991:41:99-110.

LITERATURE REVIEW: CONCLUSIONS

Iatrogenic ("dentistogenic") injury to the dental pulp is not an insignificant problem in clinical dentistry

Pulpal necrosis occurs with a frequency of 10-15% over a period of 5-10 years

Trevor’s view:

Drilling isn’t great!
……for teeth

…but

Some patients

(and their dentists) *choose* intervention!

Some patients think they know best!

Onwards at the forefront of continuing education

In the same vein, recent reports of the American rapper, singer, songwriter, record producer, and fashion designer, Ye (previously known as Kanye West) reportedly spending US$850,000 on shapeless titanium upper 'teeth' (the inverted commas are mine because they look nothing like teeth), to add to the diamond encrusted lower teeth that he received some years back. Worse still is the report that he designed the tooth structure himself. More worrying still is that, as an influencer, others will be hoodwinked into having similar treatment, but not at such great expense, since, given that Ye is estimated to be worth around US$400 million, the US$850,000 is a drop in his ocean. Questions must be asked, did a dentist actually carry out the treatment, and, if so, had he missed the seminars on dental ethics at dental school? According to media reports, Kanye's new 'denture' was fitted by one Dr Thomas Connelly in Beverly Hills,

Some patients

(and their dentists) *choose* intervention

What I plan to talk about

- Defining evidence
- Evidence needs of different stakeholders
- Measuring survival of dental restorations and factors influencing restoration survival
- Applying the evidence
- Narcissistic attitudes to “evidence”

Evidence needs of the patient

- Safe treatment
- Sustainable use
  of materials and devices
- Material does
  what is claimed
- Lasts longer than
  alternatives
- Good value
  for money

…by the way

Patients care more than we suspected!

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

F. J. T. Burke*[1,2] and R. J. Crisp[1,2]

RESEARCH

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.

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 filli
cant amount of respondents demonstrated that they had concerns over the use of amalgam. Conclu
expressed strong views that the materials used on their teeth should have a robust evidence base an
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

10 members of the PREP Panel
Ethical approval
Questionnaire to 250 patients
249 useable responses

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

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

Evidence needs of the patient

- Safe treatment
- Sustainable use of materials and devices
- Material does what is claimed
- Lasts longer than alternatives
- Good value for money

Sustainability has interested me for some time!

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COMMENT

A Green Issue?

Readers could be forgiven, on reading the above title and on noting the colour of the cover of this issue, that the Editorial Director was about to extol the beauty of the Lakes of Killarney or the Glens of Antrim, especially with St. Patrick's Day approaching. This is not the case, instead, it is the 'green' environmental issues relating to dental practice which this Comment will briefly address. When the effect of dentistry on the environment is considered, the discussions often commence with the use of amalgam; such discussions will probably continue for many years to come, and, while there is sufficient evidence to demonstrate that its use is safe for the patient[1], there is little question that the environment suffers if quantities of amalgam or mercury are discharged with the dental surgery effluent. The proper handling of scrap amalgam by recycling is also essential. The amalgam issue gets much publicity and can be emotive, but there are other matters which may be just as deserving of the profession's attention. The matter of the rubber 'mountain', for example. We use a lot of rubber in the dental surgery and the use of gloves by dental healthcare workers during patient treatment in the dental surgery has, rightly, been advised by many authorities, worldwide.[2] However, the matter of biodegradability of used latex gloves has been little discussed. Another rubber, polyvinylsiloxane, is also used in large quantities as an impression material in crown and bridge work. Its introduction was initially because of its good dimensional stability and, indeed, the stability of these materials is such that they do not easily degrade. Their use has increased further since it was considered essential to disinfect impression materials prior to handling by technicians, and again it was their stability under conditions of disinfection that made them popular. Perhaps a shift towards hydrocolloid would be more environmentally friendly, but perhaps the optimum environmental approach might be the use of CAD-CAM techniques which are becoming increasingly sophisticated and reliable. Our rubber impressions are not biodegradable; neither are the dies and casts constructed from them, but at least the large numbers of casts once examined at the Dental Practice Board (as illustrated in the cover photograph) could be used as hardcore in the building industry!

Infection control has, rightly, been the catalyst for the increasing use of disposable, single-patient-use items to replace those which are difficult or costly to autoclave. This has resulted in ever more voluminous bags of dental surgery waste which are disposed of by incineration. The plastics from which these disposable items and devices are manufactured may produce toxic fumes when incinerated, another matter which requires consideration. Dental practices may also generate substantial amounts of paper,[3] as paper towels and wrappings for instruments, let alone office activities, and consideration should be given to its recycling. There is also the matter of the disposal of chemicals used in the developing of radiographs. It is unacceptable to dispose of these through the sewerage system. Again, there is an environmentally friendly answer, digital radiography. However, while the techniques of digital radiography and CAD-CAM are potentially more 'green' than their traditional counterparts, they require capital expenditure and are therefore, in 1998, not available to all dental practices. It is hoped that, in due course, these techniques may become increasingly competitive in terms of real cost, to match their reduced cost to the environment. Green issues must be addressed in the dental surgery. Practitioners and manufacturers can help by becoming more environmentally aware, while those who fund dental treatment should realise that there may be a price to pay in monetary terms for a better environment. Happy St. Patrick's Day!

F. J. Trevor Burke

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Dental Update 1998

- Amalgam
- Poor biodegradability of latex gloves
- Ditto polyvinylsiloxane
- Disposable single-use items used in the surgery
- Bags of dental surgery waste
- Chemicals used in developing radiographs
- Paper

Now, thanks to recent work, we have a better understanding of sustainability

GENERAL

Environmental sustainability and travel within the dental practice

Brett Duane,[1]* Inge Steinbach,[2] Darshini Ramasubbu,[3] Rachel Standiffe,[2] Kim Croasdale,[1] Sara Harford[1] and Richard Lomax[1]

Key points

Highlights that more than sixty percent of dentistry's carbon emissions originates from travel. Travel affects air quality, nitrogen oxides and particulate matter, which in turn impacts on overall health.

Demonstrates how dental travel causes the loss of 325 quality-adjusted life years, at a cost to health and society of around £17.5 million.

Suggests the dental team needs to increase prevention, decrease the number of physical appointments and encourage active travel and use of public transport.

Abstract

A significant amount of dentistry's carbon emissions originate from travel (64.5%). Dental-associated travel affects air quality, releasing over 443 tonnes of nitrogen oxides (NOx) and 22 tonnes of particulate matter (PM2.5) annually. This reduction in air quality reduces over 325 quality-adjusted life years (QALY) per year. Wider health impacts associated with noise and traffic incidents doubles the impact on health in QALYs. Dental procedures that require shorter appointment times have disproportionately higher emissions due to patient travel. The dental team can reduce appointment times by combining visits for family members or combining operative procedures, or reducing appointment frequency based on patient risk. Community oral health programmes and preventive programmes reduce travel emissions. The number of physical dental appointments can be reduced using information technology such as global positioning systems (GPS), telemedicine and teleconferencing. The mode of travel is important, with the air and carbon emissions generated by active travel negligent compared to a private car. Travel plans can help encourage active travel, as can flexible working hours, cycle to work schemes, cycle racks and shower facilities. Practices should consider purchasing locally sourced or sustainably transported goods and, ideally, use local dental laboratories.

Introduction

This paper forms part of a series of papers, seven in total, which have been requested by colleagues to help them understand sustainability as it relates to dentistry. Travel and transport are the focus of this paper and consideration is given to how the dental team can both influence patient and staff travel and purchase goods with and inspiring dentistry to be more socially and environmentally sustainable, which will in turn help promote health and illness prevention.

The contribution of dentistry to the travel footprint

Travel is a significant contributor of carbon emissions and air pollution within dentistry

Dentistry and associated carbon emissions

Dentistry is different to many other areas of the NHS because a significant amount of its carbon emissions originate from travel, both staff travel (commuting to work and travelling for work purposes) and patient travel (travelling to and from the dental surgery for treatment). In the calculation, performed on behalf of Public

- Patients usually come by car
- NHS accounts for 3.5% of all UK road traffic
- Dentistry responsible for 8% of all NHS travel
- Significant amount of carbon emissions come from (staff & patient) travel
- Short procedures have a disproportionally higher carbon emissions rate

Now, thanks to recent work, we have a better understanding of sustainability

GENERAL

Environmentally sustainable dentistry: energy use within the dental practice

Brett Duane,[1]* Sara Harford,[2] Inge Steinbach,[2] Rachel Stancliffe,[2] James Swan,[1] Richard Lomax,[2] Eleni Pasdeki-Clewer[2] and Darshini Ramasubbu[2]

Key points

Highlights that one seventh of the carbon footprint in dentistry comes from the way the profession uses energy

Suggests the dental team should consider renewable energy for their electricity

Suggests there are financial and sustainable savings to be made from the use of efficient heating systems, lighting, appropriate insulation and by regulating the use of larger appliances

This paper forms part of a series of papers, seven in total, which have been requested by a number of colleagues to help them understand sustainability as it relates to dentistry. This paper focuses on energy and how the dental team can influence the amount and type of energy it uses, in order to become more sustainable. It is the authors' hope that this series of papers stimulates interest, debate and discussion and that, as well as being economically responsible, ultimately motivates and inspires dental practices to be more socially and environmentally sustainable; which will in turn help promote health and illness prevention.

Introduction

In 2014–2015, energy contributed 15.3% of the carbon emissions to the dental NHS England carbon footprint, which equates to approximately one seventh of all carbon emissions from NHS dentistry.[1] This is broadly similar to the Fife, Scotland carbon footprint study, where it was 18.3%.[2] Unexpectedly, the study in Fife showed that the older clinics generated lower carbon footprints than newer clinics; the reason for this being that the older clinics were smaller, with no air conditioning and fewer meeting rooms.[2] Based on this study, practitioners should not assume new buildings to be more energy efficient.

There are a number of ways practices can reduce both their costs and carbon emissions associated with energy. This paper will focus on the following elements: buying green energy, generating their practice's own energy, evaluating how the practice heats its building and water, and using space more effectively. Some practices lease their space while others own it. Depending on the specific arrangement, some changes suggested below will require cooperation from the building owner.

Choosing sustainable energy

Dental practices usually use two sources of energy; energy for heating water and energy for heating the building. Most practices will use natural gas to heat the building. At the time of writing, according to the Department for Environment, Food and Rural Affairs, the average supplier of electricity uses a mix of fossil fuels, such as coal and gas, plus nuclear and renewable energy, producing 440.48 g of carbon dioxide equivalents (CO_2e) for every kWh of electricity.[3] The carbon emissions of electricity are negligible when suppliers use only renewable energy sources, such as wind and solar power. Readers need to be aware, however, that although the carbon emissions

Green energy suppliers, such as Bulb, Tonik, Good Energy, and UK Sustainable Energy have very low carbon emissions and information on emission levels can be found on energy comparison sites.[4] If dental practices, along with other consumers, choose to purchase green energy, this increase in demand will increase the supply of green energy available.

It should be noted that the carbon emissions of electricity are gradually decreasing as renewable energy increases and the use of coal is reduced in its production.[3] In Table 1, the emissions from an average fuel source mix can be seen.[3] A negligible amount of pumped storage has been removed in this table to improve simplicity.

Energy for heating

Heating consumes a substantial amount of energy and there are various fuel types that dental practices can purchase and use; these are shown in Table 2.[3] From an environmental perspective, a dental practice should choose the heating source with the lowest carbon emissions and lowest potential air pollution risk. Although wood pellets have the lowest

- Choose practice energy source with lowest emissions
- Lighting can use a lot of power
- Dental suction only uses £7 per year
- Autoclaves and washer disinfectors use £180 to £240 energy per year

Now, thanks to recent work, we have a better understanding of sustainability

INTERNATIONAL DENTAL JOURNAL 72 (2022) 26–30

Commentary

Environmental Sustainability Through Good-Quality Oral Healthcare

In accordance with the FDI Vision 2030 document which calls for urgent action on oral health, the principal goal of oral health professionals is to promote universal oral health for diseases that are largely preventable and/or treatable in the early stages.[1] The provision of oral health care,[2] in the form of prevention, therapeutic interventions, or long-term maintenance, creates pollution and a significant carbon footprint. As oral health care providers, we have an ethical and moral responsibility to manage the impact of our activities on the environment and ensure that we do this in a sustainable manner.[3,4]

Oral health care contributes CO_2 emissions from 3 principal sources: (i) travel by patients and health personnel when commuting to and from care centres[5]; (ii) manufacturing, distribution, and procurement of materials and sundries along the supply chain; and (iii) waste generated and its management, including single-use plastics (SUPs) which present an environmental burden requiring urgent attention. The SUP burden is more pertinent now, with the huge volumes of SUP personal protective equipment (PPE) utilised during the ongoing COVID-19 pandemic.[6] The current increased use of SUPs highlights the difficulty of implementing sustainable health care practice as environmental impacts are often a secondary consideration to patient safety and optimal care. The challenges to sustainable health care practices are the perceived costs, individuals' attitudes, difficulties in the implementation of remediation measures, and the need to operate within the constraints of legislative frameworks. It is necessary therefore to structure a framework for oral health care provision that simultaneously advocates optimal patient care and promotes environmental sustainability at its core. This can be readily achieved for preventable oral diseases and through this paper, we aim to present a framework that reinforces the message that the delivery of good oral health care is key to disease reduction and, as an unintended consequence, through a reduced use of resources, it delivers environmentally sustainable outcomes (Table). In this way, a clear cause-and-effect relationship is established between the delivery of high-quality care and the achievement of practical and meaningful environmentally sustainable practice.

"dental practice" environment. This transition involves switching from a *behaviour* approach that is dictated by the location and circumstances in which we find ourselves to a stronger, more pervasive, and more persistent attitudinal approach.[6] This transition of our sustainability attitude from "home-based" private citizen behaviour to a "work-based" dental practice requires an understanding and appreciation amongst colleagues of our common beliefs on environmental issues. The first step is to normalise the subject of sustainability, which can be done through informal conversations and ongoing discussions amongst team members in the workplace. In this way, initial apprehension and resistance to environmentally sustainable behaviour changes in the dental practice can be addressed by increasing awareness and identifying common ground and strength of feelings amongst colleagues. The next step is to engage in real action through formal staff meetings in the dental practice. This can take place in the form of more focused discussions as part of the business agenda for the dental practice, perhaps with the appointment of a "practice sustainability champion." Simple actions that are achievable and impactful would be a perfect starting point, as suggested in this paper, to provide oral health care in an environmentally sustainable manner.

Beyond the actions of the dental team, we should be mindful of the vital role that the patient has in their contribution to sustainable oral health care as the beneficiary of the service. In this respect, the individual patient carries a significant element of responsibility for their own oral health through their attitudes and behaviours to the management of recognised risk factors, such as plaque control, diet, smoking, and alcohol intake.

Sustainability through our actions

For oral health care provision to be sustainable, there is a requirement to meet the oral health care needs of society without compromising the ability to provide this same service in the future.

For this to be realised, active and coordinated engagement

N Martin & S.Mulligan

- Practical & patient-centred prevention (reduced disease = fewer appointments, less travel, less materials' use and SUPs, less packaging)
- High quality operative care (durable treatment with fewer repairs and replacements)
- Integrated care (active participation of all stakeholders, combining managed treatment appointments, shared family appointments)

A brief look at restoration replacement, because placing and replacing restorations has an environmental cost

J Dent Res 75(12): 1942-1946, December, 1996

Prediction of Secondary Caries around Tooth-colored Restorations: A Clinical and Microbiological Study

E.A.M. Kidd[1] and D. Beighton[2]

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Abstract. Caries at the margins of restorations is difficult to diagnose, and the relevance of staining and ditching around tooth-colored fillings is unclear. This clinical study questions the relevance of marginal color change and marginal ditching to the level of infection of the dentin beneath the margins of tooth-colored restorations. Clinically visible sites (197) on the tooth/restoration margin were selected in 113 teeth. The filling margin and the enamel adjacent to each site were noted as stained or stain-free, and sites were graded as intact, having a narrow ditch, or having a wide ditch. Thirty sites with frankly carious lesions were also included. Plaque was sampled at the tooth-restoration margin and the filling removed. The enamel-dentin junction (EDJ) at each sample site was noted as hard or soft when probed, and the dentin was sampled. Samples were vortexed, diluted, and cultured for total anaerobic counts, mutans streptococci, and lactobacilli. There were more bacteria in the plaque over frankly carious cavities, and the dentin was soft and heavily infected. Only 38 out of 167 sites without frankly carious cavities had soft dentin at the EDJ. Both the plaque and dentin in these sites harbored more micro-organisms. However, none of the clinical criteria chosen would reliably predict the presence of this soft dentin. In this study, only a frankly carious lesion at the margin of the filling constituted a reliable diagnosis of secondary caries.

Key words: secondary caries, tooth-colored restorations.

Introduction

The replacement of dental restorations accounts
75% of all operative work, and caries at the m
restorations (secondary caries) is frequently a reasc
dentists for replacing restorations (Kidd *et a*
Histological studies (Hals and Kvinnsland, 1974) d
secondary caries lesion in two parts: an outer lesi
on the surface of the tooth next to the filling and a
which is assumed to develop if there is leakage be
restoration and the tooth. While an outer lesion
tooth-colored restoration may be relatively easy to
the clinical manifestations of the wall lesion are n
In particular, the relevance of a line of stain aroun
colored filling and discoloration of the dentin s
through intact enamel adjacent to the restoration a
to interpret. Do these appearances indicate leakag
stain left when the restoration was originally in
new, active secondary caries in need of operative
preventive treatment? In addition, the clinical rele
macroscopic ditch in between a tooth-colored fillir
tooth is unknown, although both marginal staining and ditching have been shown to cause dentists to replace tooth-colored restorations (Qvist *et al.*, 1990).

It seems reasonable to suggest that areas of active secondary caries in need of operative intervention will be heavily infected with micro-organisms. A logical way to investigate these diagnostic difficulties may therefore be to investigate associations between color changes and marginal ditches noted with a restoration in place and the degree of infection of the dentin once the same restoration is removed, so that the reliability of these criteria can be determined. The inclusion of a group consisting of frank carious cavities next to the filling margin can serve as a useful control, since in these cases the clinical diagnosis is rarely in dispute.

In the present study, we have therefore investigated whether a line of stain at the margin of a tooth-colored restoration, discoloration of dentin shining up through intact enamel at the margin of the filling, and/or ditching predicted the presence of infected dentin below the restoration at the

Received January 31, 1996; Accepted July 19, 1996

Research on marginal ditching & staining

J Dent Res 74(5): 1206-1211, May, 1995

Marginal Ditching and Staining as a Predictor of Secondary Caries Around Amalgam Restorations: A Clinical and Microbiological Study

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tract. Caries at the margins of restorations is difficult to
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ching and staining around amalgam restorations is
lear. This clinical study questions the relevance of
ginal ditching and color change to the level of infection
e dentin beneath the margins of amalgam restorations.
ically visible sites (330) on the tooth/restoration margin
e selected on 175 teeth. The enamel adjacent to each site
noted as stained (a grey discoloration) or stain-free.
hundred and seventy-eight sites were clinically intact,
ites had narrow ditches (< 0.4 mm), and at 49 sites, wide
hes were present (> 0.4 mm). Twenty sites with frankly
ous lesions were also included. Plaque was sampled at
tooth-restoration margin, and the dentin was sampled at
enamel-dentin junction below each site. Samples were
texed, diluted, and cultured for total anaerobic counts,
ans streptococci, lactobacilli, and yeasts. Plaque samples
wed that margins with wide ditches (> 0.4 mm)
harbored significantly more bacteria, mutans streptococci, and lactobacilli than did clinically intact margins and margins with narrow ditches. There were no significant differences in the degree of infection of the dentin beneath clinically intact restorations and those with narrow ditches, but samples associated with wide ditches and carious lesions yielded significantly more bacteria, mutans streptococci, and lactobacilli. The color of the enamel adjacent to the sample site was irrelevant to the level of infection of the dentin beneath the filling margin, provided a frankly carious lesion was not present. The results suggest that amalgam fillings where margins show wide ditches or carious lesions should be replaced. Narrow ditches and color change alone should not trigger the replacement of a filling.

Key words: ditching, staining, recurrent caries.

Received June 21, 1994; Accepted February 20, 1995

Introduction

Replacement dentistry accounts for some 75% of all operative work, and caries at the margins of restorations (secondary caries) is frequently a reason given by dentists for replacing restorations (Allender *et al.*, 1990; Kidd *et al.*, 1992). However, secondary caries is difficult to diagnose (Kidd, 1989), and thus practitioners are often inconsistent and inaccurate in this diagnosis (Merritt and Elderton, 1984), no doubt resulting in the unnecessary replacement of restorations. The relationship between marginal integrity and secondary caries is not entirely clear. Histological studies (Hals *et al.*, 1974) describe the secondary carious lesion in two parts: an outer lesion formed on the surface of the tooth next to the filling, and a wall lesion which is assumed to develop if there is leakage between the restoration and the tooth. This would indicate that demineralization can develop adjacent to the margin of a restoration that is clinically intact, but allowing leakage. Early laboratory studies suggest that defective margins on amalgam restorations predispose to secondary caries (Jorgensen and Wakumoto, 1968). Later laboratory work shows no such relationship (Kidd and O'Hara, 1990). However, clinical studies indicate that practitioners frequently replace restorations with defective margins (Dahl and Eriksen, 1978); Qvist *et al.*, 1986; Mjör, 1981; Kelsey *et al.*, 1981; Boyd and Richardson, 1985).

Discoloration around the margin of an amalgam filling may add to the diagnostic difficulty (Kidd, 1989). Discoloration may be due to the physical presence of the amalgam, corrosion products, or secondary caries. It is also possible that what appears to be active secondary caries at the margin of a restoration may in fact be residual caries that was left during cavity preparation. Studies using a caries detector dye (Fusayama and Terachima, 1972) indicate that faculty members frequently pass cavities prepared by students where use of the dye subsequently shows demineralized tissue on the enamel-dentin junction (Anderson and Charbeneau, 1985; Kidd *et al.*, 1989). It is

Research on marginal ditching

- Patients who required replacement restorations were included.
- A total of 330 sites on 175 teeth in 118 patients were measured for marginal gaps (<0.4mm or >0.4mm)
- Each restoration removed using a turbine drill and sterile bur: a sample of dentine was removed from the enamel-dentine junction beneath the site and this was processed microbiologically.
- Mutans streptococci colonies were counted on agar plates, with lactobacilli and yeasts also being identified.
- RESULTS: The narrow ditch (<0.4mm) did not have significantly more bacteria than an intact margin. However, the wider ditch (>0.4mm) presented a different story – there were significantly more micro-organisms present beneath the wider marginal gaps, with a greater proportion of these being lactobacilli
- MESSAGE: “It might be prudent to replace restorations where marginal gaps exceeded 0.4mm”. They added that colour change adjacent to an amalgam restoration should not trigger its replacement.

Kidd EAM, Joyston-Bechal S, Beighton D. Marginal ditching and staining as a predictor of secondary caries around amalgam restorations: A clinical and microbiological study. J.Dent.Res.1995:74:1206-1211.

Research on marginal staining

- 197 discrete sites in 72 patients with tooth-coloured restorations requiring replacement.
- 30 sites (12 on enamel and 18 on dentine) were carious and 167 sites were clinically non-carious. Margin sites selected for microbiological sampling.
- The colour of the margin was noted and the tip of an LA needle used for the removal of plaque from the tooth-restoration interface
- Restoration then removed using an air turbine and sterile bur. Sample of dentine was taken for microbiological testing.
- RESULTS: More bacteria in samples from carious than from non-carious sites: Not a surprise! But, more bacteria found in dentine beneath stained margins. Only margins >0.4mm yielded more micro-organisms in dentine.
- MESSAGE: “Where the margin is not frankly carious, no clinical criteria (not even margin staining) will predict the presence of soft dentine”. Therefore, in the absence of patient concern about a discoloured margin around a tooth-coloured restoration, there is no indication from a caries viewpoint to replace a tooth-coloured restoration which has a stained margin.

Kidd EAM, Beighton D. Prediction of secondary caries around tooth-coloured restorations: A clinical and microbiological study. J.Dent.Res.1996:75:1942-1946.

On the basis of this research, how many restorations have I replaced erroneously ?

Therefore, repair should be considered

This can often be done with minimal tooth preparation, other than cleaning

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KEY WORDS

LEARNING OBJECTIVES

AUTHOR

IGOR R. BLUM

Prim Dent J. 2019;8(1):38-42

RESTORATION REPAIR AS A CONTEMPORARY APPROACH TO TOOTH PRESERVATION:

CRITERIA FOR DECISION MAKING AND CLINICAL RECOMMENDATIONS

ABSTRACT

Despite the growing body of evidence-based knowledge, evidence-based restoration repair is not always applied in the clinical setting. This article is intended to give an evidence-based insight into the indications, importance, benefits and long-term success of resin composite restoration repair, together with details of relevant operative techniques aimed at conserving as much sound tooth structure as possible.

Evidence-based success of repaired restorations

Numerous longitudinal clinical studies have shown that restoration repairs in permanent teeth are able to significantly increase the lifetime of restorations,[22,27-30] and come with reduced treatment time, lower costs, and lower risks of complications than total replacements.[12,31]

The evidence base for repair is building

KEY WORDS

LEARNING OBJECTIVES

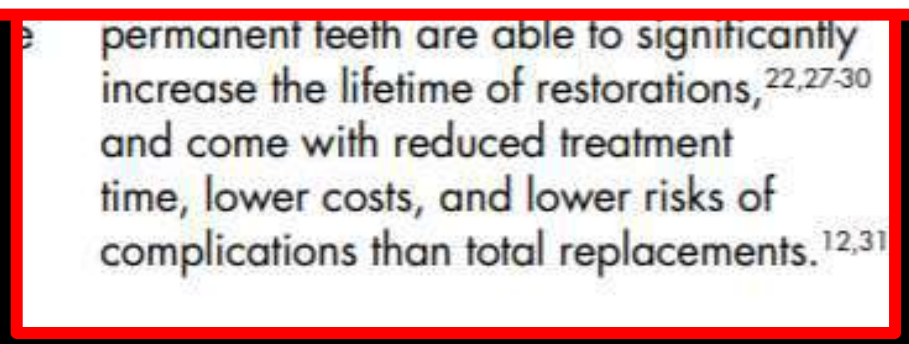
AUTHOR

IGOR R. BLUM

RESTORATION REPAIR AS A CONTEMPORARY APPROACH TO TOOTH PRESERVATION:

CRITERIA FOR DECISION MAKING AND CLINICAL RECOMMENDATIONS

Blum and Ozcan stated unequivocally that “restoration replacement should be considered as the last resort when there are no other viable alternatives”.
“The literature on survival of repaired restorations concluded that numerous longitudinal clinical studies have shown that restoration repairs in permanent teeth are able to significantly increase the lifetime of restorations and the restored tooth unit”.



permanent teeth are able to significantly increase the lifetime of restorations,[22,27-30] and come with reduced treatment time, lower costs, and lower risks of complications than total replacements.[12,31]

The evidence base for repair is building

Amalgam
V
RBC

In terms of
“sustainability”

GENERAL | VERIFIABLE CPD PAPER

The environmental impact of dental amalgam and resin-based composite materials

S. Mulligan,[1]* G. Kakonyi,[2] K. Moharamzadeh,[1] S. F. Thornton[2] and N. Martin[1]

Key points

An overview of commonly used dental materials and the impacts of their use on the environment is presented.

Environmental pollution pathways are considered for both amalgam and resin-based composite.

Microplastic pollution from dental resin-based composite applications is highlighted.

Direct-placement dental restorative materials include dental amalgam, glass ionomer, resin-modified glass ionomer, compomer and resin-based composite (RBC). The choice of restorative material is determined by its ability to restore the structure and/or the aesthetic appearance of the dentition and to impart a net therapeutic value. In this way, the most appropriate material system is chosen to manage each particular clinical situation in the most effective manner. The most commonly used direct-placement materials in everyday modern dentistry are dental amalgam and resin-based composites. To date, concerns about the environmental impact from the use of dental materials has focused on dental amalgam and mercury release. It is now evident that the continued use of dental amalgam is time-limited on the basis of environmental pollution as recommended by the Minamata Treaty. The recommendations include a planned phase-down of use of dental amalgam with an anticipated complete phase-out by 2030. The environmental impact of other restorative dental materials deserves further consideration. This article provides a detailed overview of the environmental issues associated with the use of dental amalgam, the potential environmental issues associated with the alternative resin-based composite restorative materials and to consider recommendations for further research.

Introduction

The decision-making process for the clinical use of a dental restorative material is made in accordance with the material's ability to restore the structure and/or the aesthetic appearance of the teeth and in doing so, impart a net therapeutic effect. Subjective parameters such as the clinician's personal choice, skill base and the cost of the material are also considerations made in this decision-making process. The potential impact upon the environment from the use of dental materials has been a minor consideration to date, with much of the focus centred on the use of dental amalgam.[1] Dental amalgam is a direct-placement restorative material with other materials in this category being calcium silicate, glass ionomer, resin-modified glass ionomer, compomer and resin-based composite (RBC).[1] Currently, dental amalgam remains a popular restorative material that is used throughout the world in large quantities with approximately 75 tonnes per year being used within the EU alone.[1] Worldwide, dental amalgam and RBC are the most commonly used direct-placement dental restorative materials. The decision to use amalgam instead of RBC to restore a tooth is often based on the perceived disadvantages of RBC. These disadvantages include a requirement for adjunct technologies and equipment (eg dental dam and light curing units), longer placement time, higher material costs and a less predictable functional longevity compared with dental amalgam.[2–7] Notwithstanding, in light of the advice of the Minamata Treaty and regardless of the restorative credentials of dental amalgam, its environmental impact due to mercury release means ongoing use is time-limited. An eventual cessation of use of dental amalgam is in the foreseeable future, with a predicted increase in use of the obvious alternative, RBC. This raises an important question; what are the environmental credentials of the alternative direct placement restorative materials and RBCs in particular?

The reality is that, as per any manufactured item, all dental restorative materials have a potential pollutant effect on the environment. This will be associated with the fabrication process, transportation, clinical use and disposal of waste material. In addition following the death of a person who has these restorative materials in their dentition, constituents are released into the soil or atmosphere, following interment or cremation respectively.

As stated, to date dental amalgam has received the most attention as a source of environmental pollution from dentistry on account of the mercury content of this material. Resin-based composites, by contrast, have not been considered in this context. This is possibly due to a focus on mercury release from amalgam, the knowledge that heavy metal pollution is a serious, recognised issue, and perhaps a perception that RBCs are inert plastic materials and as such not considered to be an environmental hazard. This view is possibly reinforced by virtue of the natural tooth-like appearance of RBC,

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DOI: 10.1038/sj.bdj.2018.229

Conclusion

In conclusion, environmental pollution from the release of mercury from dental amalgam is a major concern, but one that is currently being addressed at an international level, with an expected phase-out of this material in the

removal and CADCAM fabrication. The impact of RBCs is difficult to quantify due to their complex chemical nature. There is a need for a comprehensive research programme that sets out to investigate the nature, magnitude and effect of pollution caused by the release of eluates and micro-particulates in to the environment arising from common RBCs.

dental amalgam has had a turbulent history

A short history of silver amalgam

- 1819 English chemist Charles Bell invents Silver Amalgam
- 1826 Auguste Onesime Taveau “Pate d’Argent” (France)
- 1833 – 1841 Crawcour brothers “Royal Mineral Succedaneum” to the USA
- 1840 American Society of Dental surgeons (ASDS) founded
- 1843 ASDS declared the use of amalgam to be malpractice
- 1848 ASDS suspended 11 members

“I hereby certify it to be my opinion and firm conviction that any amalgam whatever is unfit for the plugging of teeth or fangs and I pledge myself never under any circumstances to make use of it in my practice as a dental surgeon, and furthermore, as a member of the American Society of Dental Surgeons, I do subscribe and write with them in this protest against the use of the same.”

The history of silver amalgam

- 2002 FDA proposes dental Hg class 2 Device
- 2002 House Bill 2221 Arizona; 1715 Georgia; 4870 Illinois; 2786 Washington; (pending).1251 New Hampshire passed
- 2002 (April) US Congress Rep. members Dan Burton (Ind) & Diane Watson (D) co-sponsor modified legislation “Mercury in Dental Filling Disclosure & Prohibition Act”

The Amalgam debate…continued

- 2 US members of congress want to abolish amalgam
- They demand full disclosure re the alleged dangers
- Anti-amalgamists (scientists, lobbyists, evangelists & litigators) are durable people
- They have enlisted the American Civil Liberties Union to defend their freedom of speech
- (Safe Drinking water & Toxic Enforcement Act of 1986)

Rep. Congresswoman Diane Watson (D.-Calif)

Extracts from statement by Congresswoman Diane Watson "Mercury in Dental Filling Disclosure & Prohibition Act" Los Angeles, California. November 5th 2001

- Mercury now removed from all but one health care use (like pre-civil war medicine!)
- USPHS agency Toxic Substances & Disease registry (1999 report (transplacental Hg → developing child's brain).
- 1997 Dentsply (USA) advise dentists not to use amalgam for children, & pregnant women, Hg hypersensitivity or kidney problems.
- Fillings are falsely called "Silver" & ADA gags dentists from talking about the risks.

Having removed

Wife blames 40 year

By **Sinead McIntyre**

FOR almost 40 years, Mary Stephenson suffered crippling depression.

She saw dozens of counsellors and tried every anti-depressant on the market, but nothing would stem her suicidal feelings.

Finally, when she was at the end of her tether, a friend suggested the cause might be mercury in her fillings.

So the 59-year-old grandmother took the painful step of having all 19 amalgam fillings replaced with plastic ones.

The result has been an extraordi-

'Now I can't wait to jump out of bed'

nary recovery. 'Having my fillings out has completely changed my life,' she said yesterday. 'I feel like a new person.'

Mrs Stephenson, who lives with her husband John, 67, in Lymington, Hampshire, found a dentist in Poole, Dorset, who would do the procedure.

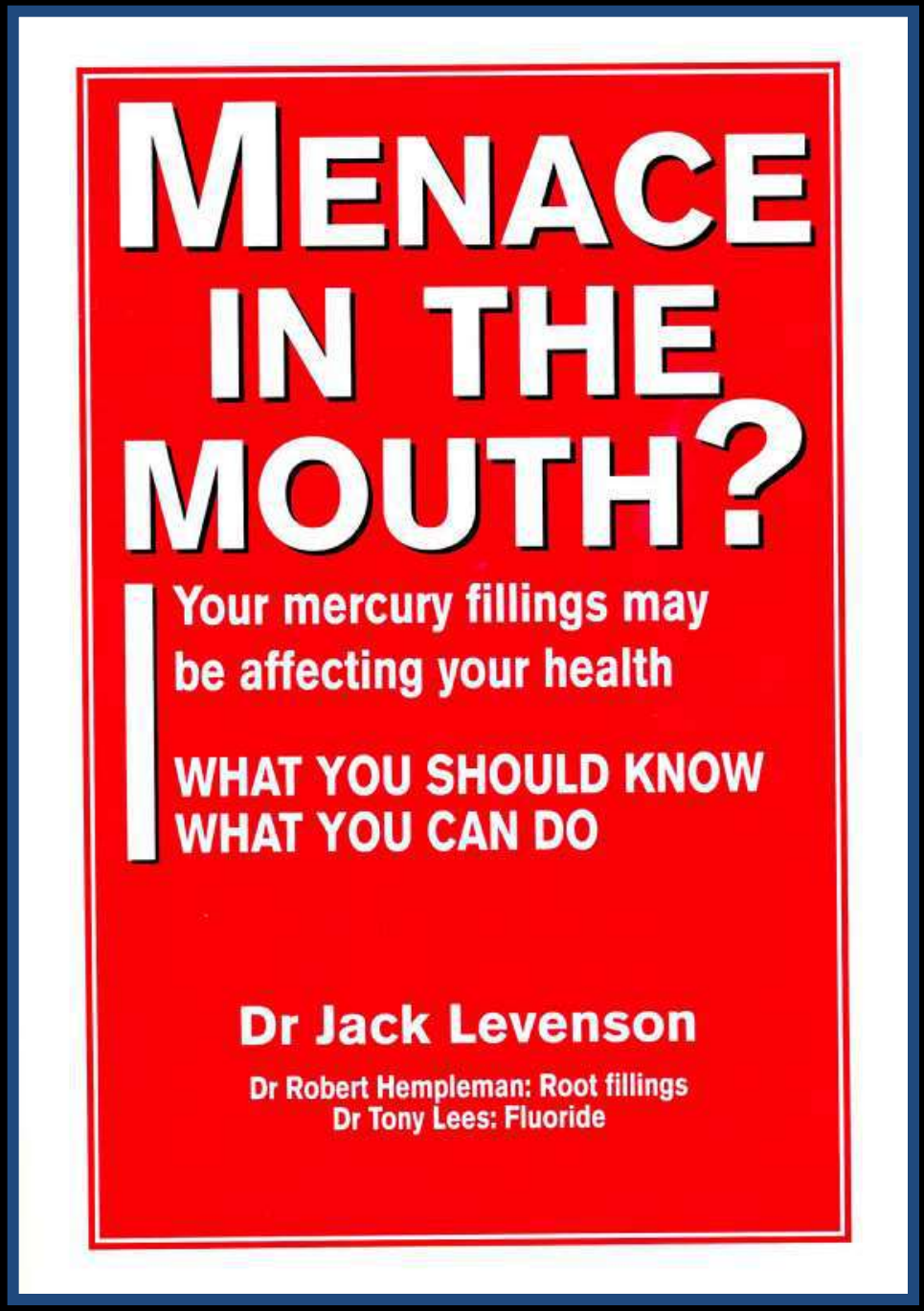
The surgery was carried out by John Aherne of Moonfleet Dental Practice. Mrs Stephenson also underwent a mercury detox programme to flush the poison from her system.

CORD WOMAN INVESTIGATION: IRA

DID DENTISTS

FILLINGS KIL

OUR BABIES?


MENACE IN THE MOUTH?
Your mercury fillings may be affecting your health
WHAT YOU SHOULD KNOW
WHAT YOU CAN DO
Dr Jack Levenson
Dr Robert Hempleman: Root fillings
Dr Tony Lees: Fluoride

A Health Information Book
To Answer Questions You May Hav
On Countering The Effects of
Dental Mercury Exposure

DENTAL MERCUR DETOX

BY

Sam Ziff

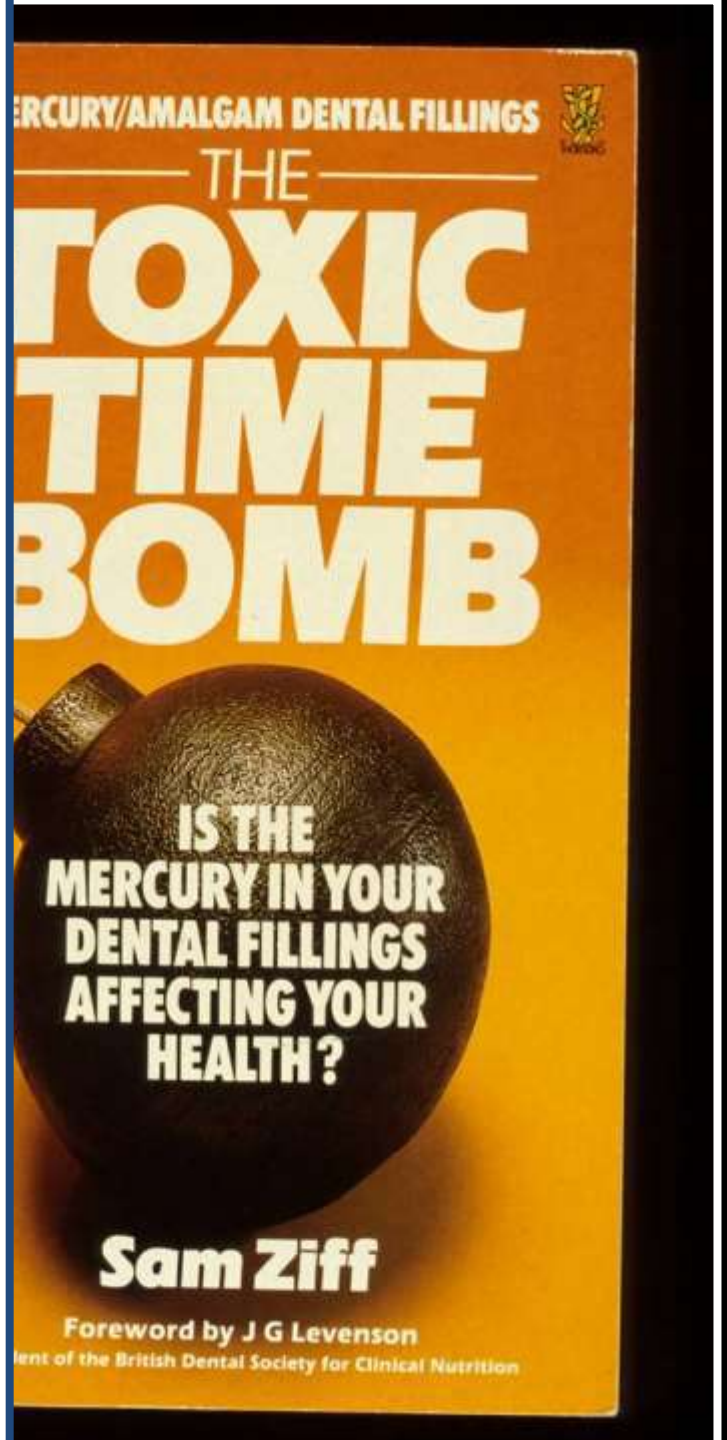
Michael F. Ziff,D.D

Mats Hanson, Ph.D

REVISED & EXPANDE
1995 EDITION

FTFD SYMPTOM ANALYSIS OF 1569 PATIENTS

% of Total	SYMPTOM	Total No.	No.Improved or Cured	% of Cure or Improvement
14%	ALLERGY	221	196	89%
5%	ANXIETY	86	80	93%
5%	BAD TEMPER	81	68	89%
6%	BLOATING	88	70	88%
6%	BLOOD PRESSURE PROBLEMS	99	53	54%
5%	CHEST PAINS	79	69	87%
22%	DEPRESSION	347	315	91%
22%	DIZZINESS	343	301	88%
45%	FATIGUE	705	603	86%
15%	GASTROINTESTINAL PROBLEMS	231	192	83%
8%	GUM PROBLEMS	129	121	94%
34%	HEADACHES	531	460	87%
3%	MIGRAINE HEADACHES	45	39	87%
12%	INSOMNIA	187	146	78%
10%	IRREGULAR HEARTBEAT	159	139	87%
8%	IRRITABILITY	132	119	90%
17%	LACK OF CONCENTRATION	270	216	80%
6%	LACK OF ENERGY	91	88	97%
17%	MEMORY LOSS	265	193	73%
17%	METALLIC TASTE	260	247	95%
7%	MULTIPLE SCLEROSIS	113	86	76%
8%	MUSCLE TREMOR	126	104	83%
10%	NERVOUSNESS	158	131	83%
8%	NUMBNESS ANYWHERE	118	97	82%
20%	SKIN DISTURBANCES	310	251	81%
9%	SORE THROAT	149	128	86%
6%	TACHYCARDIA	97	68	70%
4%	THYROID PROBLEMS	56	44	79%
12%	ULCERS & SORES (ORAL CAVITY)	189	162	86%
7%	URINARY TRACT PROBLEMS	115	87	76%
29%	VISION PROBLEMS	462	289	63%



None of these publications has been backed by scientific fact

Dental Materials

Amalgam—Resurrection and redemption. Part 2: The medical mythology of anti-amalgam

Michael J. Wahl, DDS[1]

Mercury-containing amalgam restorative material has come under attack for its alleged harmful effects on systemic health. A literature search revealed that amalgam restorations release small quantities of mercury but apparently not enough to cause systemic health problems. Mercury from dental amalgam restorations cannot be linked to kidney damage, Alzheimer's disease, multiple sclerosis, other central nervous system diseases, "amalgam disease," mental disorders, damage to the immune system, increases in antibiotic resistance, or harmful reproductive effects. Dentists occupationally exposed to mercury have not been shown to suffer harmful reproductive or other systemic health effects, provided proper mercury hygiene is used. There are legitimate health concerns about alternative restorative materials, including resin composite. According to the latest scientific information available, dental amalgam remains a safe and effective restorative material. *(Quintessence Int 2001;32;696–710)*

Key words: amalgam, biocompatibility, mercury, resin composite, safety, toxicity

Dental Materials

Amalgam—Resurrection and redemption. Part 2: The medical mythology of anti-amalgam

Michael J. Wahl, DDS[1]

The scientific evidence (170 references):
Does not support the myth that mercury from dental amalgam causes kidney damage
Does not support the myth that dental amalgam is associated with MS, Alzheimer's Disease, mental disease or "amalgam illness"
Does not support the myth that mercury from dental amalgam damages the immune system or causes harmful reproductive effects

Vimy MJ, Lorscheider FL. Intra-oral mercury released from dental amalgam. J.Dent.Res.1985:64:1069-1071

Vimy MJ, Lorscheider FL. Serial measurements of intra-oral air mercury:estimation of daily dose from dental amalgam. J.Dent.Res.1985:64:1072-1075

- Patients with amalgam restorations had an average intraoral Hg concentration of 4.9 microgram/m^3 before chewing and 12.7 microgram/m^3 after chewing gum.
- Average daily dose of 20 microgram Hg
- Those with >12 amalgam fillings had daily dose of 29 microgram Hg
- These levels are higher than the maximum daily Hg dose in many countries

Vimy MJ, Lorscheider FL. Intra-oral mercury released from dental amalgam. J.Dent.Res.1985:64:1069-1071

Vimy MJ, Lorscheider FL. Serial measurements of intra-oral air mercury:estimation of daily dose from dental amalgam. J.Dent.Res.1985:64:1072-1075

FLAWS

Vimy MJ, Lorscheider FL. Intra-oral mercury released from dental amalgam. J.Dent.Res.1985:64:1069-1071
Vimy MJ, Lorscheider FL. Serial measurements of intra-oral air mercury:estimation of daily dose from dental amalgam. J.Dent.Res.1985:64:1072-1075

- Misuse of a chrome mercury detector
- Olsson & Bergmann, and Berglund et al reported that Vimy & Lorscheider grossly overestimated the mercury vapour release
- Mackert recalculated average daily dose of Hg release as 1.7 micrograms

Olsson S, Bergmann M. Letter to the editor. J.Dent.Res.1987:66:1288-1289.
Berglund A., et al. Determination of the rate of release of intra-oral mercury vapor from amalgam. J.Dent.Res.1988:67:1235-1242.
Mackert JR. Factors affecting estimation of dental amalgam mercury exposure from measurements of mercury vapor levels in intra0-ral and expired air. J.Dent.Res.1987:66:1775-1780

Vimy MJ, Lorscheider FL. Intra-oral mercury released from dental amalgam. J.Dent.Res.1985:64:1069-1071
Vimy MJ, Lorscheider FL. Serial measurements of intra-oral air mercury:estimation of daily dose from dental amalgam. J.Dent.Res.1985:64:1072-1075

- Vimy & Lorscheider assumed that Hg vapour release depended on the flow rate during respiration
- Hg release is, in fact, time dependent
- Berglund at al recalculated daily Hg release as 1.7 micrograms and Olsson & Bergman as 1.3 micrograms

Olsson S, Bergmann M. Letter to the editor. J.Dent.Res.1987:66:1288-1289.
Berglund A., et al. Determination of the rate of release of intra-oral mercury vapor from amalgam. J.Dent.Res.1988:67:1235-1242.
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Vimy MJ, Lorscheider FL. Serial measurements of intra-oral air mercury:estimation of daily dose from dental amalgam. J.Dent.Res.1985:64:1072-1075

- Chewing food does not cause as much Hg release as chewing gum (Berglund, 2000)
- The amount of Hg released decreases as the amalgam ages (Berdouses et al, 1995)

Berglund A. Estimation by a 24 hour study of the daily dose of intra-oral mercury vapor inhaled after release from dental amalgam. J.Dent.Res.1990:69:1646-1651.

Berdouses E, Vaidynathan TK et al. Mercury release from dental amalgams: an in vitro study in controlled chewing and brushing in an artificial mouth. J.Dent.Res.1995:74:1185-1193.

Vimy MJ, Lorscheider FL. Intra-oral mercury released from dental amalgam. J.Dent.Res.1985:64:1069-1071

Vimy MJ, Lorscheider FL. Serial measurements of intra-oral air mercury:estimation of daily dose from dental amalgam. J.Dent.Res.1985:64:1072-1075

- By 1995, these studies were totally discredited, but are still quoted today by the anti-amalgam lobby

SUMMARY: Amalgam restorations release small amounts of mercury, but well below threshold levels considered dangerous for occupational exposure.

Contemporary UK dental practice 2015/16: Comparison with previous results: premolars (similar questionnaire used on 3 occasions)

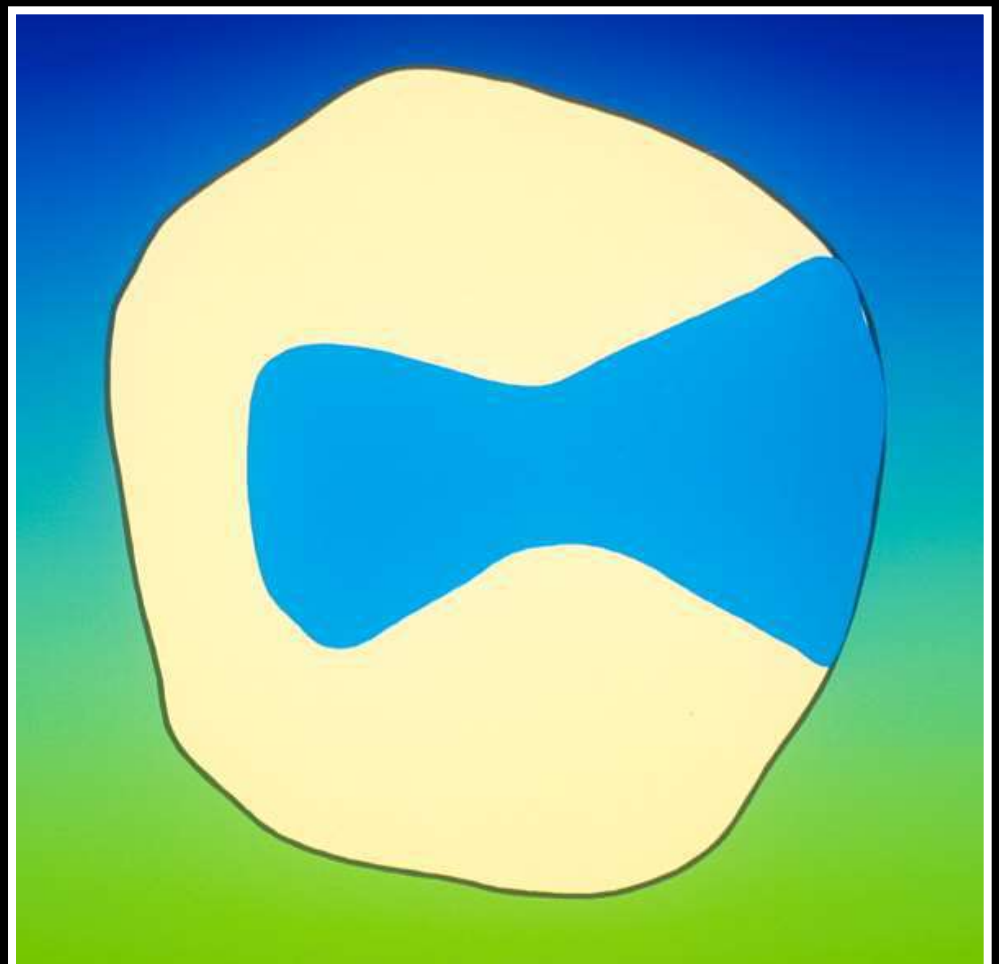
Amalgam for Class II, 2002….86%
Amalgam for Class II, 2008….59%
Amalgam for Class II, 2015….40%

RESEARCH

Contemporary dental practice in the UK. Part 1: demography and practising arrangements in 2015

What does the future hold for amalgam?

Amalgam is not adhesive,so mechanical retention is needed



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

Trevor’s View

Once a patient has received one tooth-coloured restoration in a back tooth, he/she is unlikely to return to amalgam.

A less well known fact….

ORIGINAL ARTICLE

Health and neuropsychological functioning of dentists exposed to mercury

K A Ritchie, W H Gilmour, E B Macdonald, F J T Burke, D A McGowan, I M Dale, R Hammersley, R M Hamilton, V Binnie, D Collington

ance value. Dentists were significantly more likely than control subjects to have had disorders of the kidney and memory disturbance. These symptoms were not significantly associated with urinary mercury concentration. Differences were found between the psychomotor performance of dentists and controls after adjusting for age and sex, but there was no significant association between changes in psychomotor response and mercury concentrations in urine, hair, or nails.

kidney and memory disturbance. These symptoms were not significantly associated with urinary mercury concentration. Differences were found between the psychomotor performance of dentists and controls after adjusting for age and sex, but there was no significant association between changes in psychomotor response and mercury concentrations in urine, hair, or nails.

180 dentists and 180 controls:
Urine mercury, hair & nail,
psychomotor performance analysed,
general health questionnaire given.

Ritchie KA, Gilmour WH, Macdonald EB, Burke FJT et al. Health and neuropsychological functioning of dentists exposed to mercury. Occup.Environ.Med.2002:59:287-293

The situation today….

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Ewen McColl

FJ Trevor Burke

End of the road for dental amalgam?

Readers will be aware of the Minamata Agreement, signed in 2013, in which 147 countries around the world agreed to minimize mercury use in a wide variety of fields, such as, lighting, fertilizers, and, of course, dental amalgam. This resulted in a ban, from 1st July 2018, on the use of amalgam in pregnant women and children under the age of 15 years. Some dental schools had, by then, on the surface, stopped teaching the concepts of resistance and retention form, and, as a result, a proportion of new graduates had no notion of how to retain an amalgam restoration in a tooth![1] This lack of preparedness is a particular concern in the UK as amalgam is still in widespread use among dental practitioners[2].

There is some clarity now, in the form of a European Union draft document to phase out all amalgam use by 1st January 2025. These recent EU proposals[3] suggest:

The revised Mercury Regulation targets the last intentional remaining uses of mercury in a variety of products in the EU in line with commitments set out in the EU's Zero Pollution Ambition. It sets rules that put the EU firmly on the track to becoming the first mercury-free economy by:

Introducing a total phase-out of the use of dental amalgam from 1 January 2025 in light of viable mercury-free alternatives, thereby reducing human exposure and environmental burden;

Prohibiting to manufacture and export of dental amalgam from the EU from 1 January 2025.

If this EU directive is ratified, supply chains will be disrupted and the cost of amalgam will, in all likelihood, rise significantly. This situation will occur against a backdrop of a crisis in access to NHS dentistry, with patients presenting with advanced cavitation of molar teeth where amalgam may be the restoration of choice. This is particularly the case where isolation is particularly challenging, and rubber dam isolation for restoration placement becomes increasingly difficult. The situation may be compounded in Northern Ireland under the Windsor protocol where the EU directive may disproportionately affect colleagues where fees for posterior teeth are generally based on placement of amalgam restorations.

Let's look briefly at the implications of this from an educational point of view and discuss the alternatives.

Amalgam tends to be favoured in posterior teeth where isolation can be an issue, for example where margins are subgingival or the tooth is very heavily restored. While moisture control is still very important, amalgam is more forgiving and compatible with more traditional matrix systems with which most clinicians, across the years, are familiar. Amalgam restorations are not adhesive, so rely on resistance and retention form with

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DU ISSN 0305-5000

Ewen McColl

FJ Trevor Burke

A Dental Knell or Wake-up Call?

As the January *Dental Update* Comment went to press,[1] the European Union swiftly ratified the banning of dental amalgam from use and export, with an implementation date of January 2025, except when the use of dental amalgam is deemed strictly necessary by the dental practitioner to address specific medical needs of the patient (a previously used, rather ambiguous term). This led to an outcry from across the profession in the UK, with the British Dental Association highlighting the impact on an already struggling NHS dental service. Indeed, the impact of the amalgam ban in the EU may disproportionately affect the patients who present with late caries, as is frequently seen across the UK, accepting that many patients never have the opportunity to get as far as a dentist.[2] The British Dental Association highlighted that since the Minimata Agreement in 2013, we have known this was coming, but not quite now, stating:[3]

'We have long supported a phase-down in dental amalgam. But this rapid phase-out is neither feasible nor justifiable.'

'We have stressed there are currently no alternative restorative materials that compete with amalgam on speed of placement or longevity.'

'When alternative materials can't compete, this will add new costs and new uncertainties to practices already on the brink.'

'Without decisive action this could be the straw that breaks the back of NHS dentistry.

The European Union clearly differ on whether the new ban is justifiable or not, citing environmental concerns overriding the use of dental amalgam. Of course, nobody can have failed to notice we are no longer in the European Union, but import costs of amalgam, its availability and the Windsor protocol mean that if Europe sneezes, the UK catches a cold. In this case, NHS patients in most need will suffer, because it is in that group where amalgam use is likely to be highest, and the increased cost will impact most, one way or another.

There are other reasons (perhaps the main reason), for the withdrawal of support for amalgam much earlier than the date initially planned, 2030. The European Network for Environmental Medicine published a document a year ago,[4] outlining reasons why the availability of amalgam will become increasingly limited, citing the new Medical Devices Regulation (MDR 2017/745) that came into force in May 2021, bringing much increased legal safety requirements for dental amalgam capsules, and, as a result, why six European manufacturers/distributors (including two in the UK) have left the amalgam business, with two major US players also leaving the market and others facing the end of their certification. As a result, therefore, the 'writing was on the wall' for amalgam in the EU, and, as stated above, there will be a knock-on effect in the UK. Anecdotally, on talking with dentists from around Europe, resin composite is much more widely used there for posterior teeth than in the UK, where results of the most recent survey of 500 UK dentists (response rate 78%) in 2016, indicated that 66% of respondents used resin composite for Class II restorations in premolars, with amalgam being used 7% more for Class II restorations in molars than composite (55% *vs* 48%).[5] Unfortunately, this research did not investigate whether there were differences in material use in NHS and private practice. Nevertheless, it is apparent from the above data that only half of UK dentists would have to change their materials' prescribing habits if it became

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DU ISSN 0305-5000

FJ Trevor Burke

Amalgam, Trams and Northern Ireland

Oh no, readers say, more of Burke's incomprehensible rubbish, just when they thought that they had been given an Editorial Director who could write sense!

In that regard, even the most erudite readers of the UK's best-selling subscription journal, *Dental Update*, may not appreciate the thread running between the items in the title! On the other hand, older readers may (or probably may not!) recall, in 2004, the year in which the Hong Kong tram system, which runs from one end of the city to the other and celebrated its 100th anniversary in that year, that the trams were the subject of an editorial comparing their longevity to that of dental amalgam, with the 100th anniversary tram being featured on the cover of *Dental Update* (Figure 1). The trams remain, to the present time, a useful and functional form of transport as opposed to being a relic of the past. Indeed, as trams in UK cities such as Manchester and Glasgow were retired and replaced by petrol-powered buses, the trams were added to the Hong Kong fleet.

Not many things survive for 120 years or more, other than perhaps well-maintained buildings, cathedrals and the like. However, in dentistry, dental amalgam has survived for even longer than the Hong Kong trams, but today its days are numbered, first because of environmental concerns related to its mercury content and, most recently, as uncertainties regarding its availability have surfaced, following the recent ban on its manufacture and sale in the EC. Why has one survived and not the other? While amalgam is considered simple to use, the trams also seem simple to drive, given that the driver doesn't have a steering wheel (obviously not needed because it travels along tracks), only a stop/start handle. The Hong Kong trams are a cheap form of transport, but amalgam is also a cheap dental material, given that it can be placed relatively quickly, and clinician time (=money) is low. However, other comparisons are not so flattering for amalgam. The trams, being electric, are environmentally favourable – they do not emit exhaust fumes and heat, let alone noise, like their petrol driven replacements, while, on the other hand, it is environmental concerns that are driving the demise of amalgam. The trams have, to some degree, adapted to the times: they may be slow, but this has facilitated their reincarnation as an advertising medium (Figure 2), given that the public on the streets through which the trams trundle can read the advertisements on the trams. (Daresay, this is why we don't see advertising on trains and planes!) They have also diversified – there are now four 'party trams' and a couple dedicated to city tours. They have modernized, with digital displays and sat-nav stop announcements having been installed in the past 10 years. On the other hand, the formulation of dental amalgam has not lent itself much to modernization, diversification and change. But, both the trams and dental amalgam have

Figure 1. The *Dental Update* cover from December 2004.

Nov. 2024

been proven to be reliable and effective for 120 years, and longer in the case of amalgam, which was introduced in the mid-19th century, but only became widely used after the work of GV Black.

What now for dental amalgam? The Minimata Convention agreed that amalgam would be phased out by 2030, but the EC pulled a fast one and announced its sales and manufacturing ban from 2025, as explained in the *Dental Update* editorials of January and February of this year,[1,2] with a European Union draft document to phase out all amalgam use by 1 January 2025 setting out rules:

- To introduce a total phase-out of the use of dental amalgam from 1st January 2025 in light of viable mercury-free alternatives, thereby reducing human exposure and environmental burden;
- To prohibit the manufacture and export of dental amalgam from the EU from 1st January 2025.

While these changes will have implications for dentists who use amalgam extensively, they have been felt most acutely in Northern Ireland, given that there, they have to abide by (some) post-Brexit EU regulations and amalgam is more widely used there than in other parts of the UK. It would mean that it would not simply be illegal to import dental amalgam, but to use it at all (except in exceptional circumstances), in Northern Ireland. Shortly after the initial announcement, there was further clarification when the European Union swiftly ratified the draft document, thereby banning dental amalgam from use and export, with an implementation date of January 2025, 'except when the use of dental amalgam is deemed strictly necessary by the dental practitioner to address specific medical needs of the patient'. Of course, the UK is no longer in the EU, but when the ban comes into force, it will affect UK dentists because it will disrupt supply chains, thereby making dentistry more expensive, with the BDA adding that the NHS dentistry service is 'unstable' and the conditions have not been met to see a move away from amalgam from 1st January 2025.

However, while the Council of the EU maintained the Commission's proposed date for the total phase-out in the EU, it introduced a 2-year derogation for those member states where low-income individuals would otherwise be socio-economically disproportionally affected by a phase-out in January 2025. It was considered that those member states would have to justify their use of the derogation and notify the Commission of the measures they intend to implement to achieve the phase-out by 1st January 2027.

However, help for dentists in Northern Ireland is at hand, following extensive lobbying from the Secretary of State, the British Dental Association (BDA) and others.

On 19 July 2024, The European Commission granted a derogation to Northern Ireland from the EU's new mercury regulations, which allows Northern Irish dentists to continue using dental amalgam until 31st December 2034, or until the date agreed by the Minamata Convention to which the UK is a signatory, whichever is earlier. The derogation is subject to a number of conditions, including reporting and showing progress in reducing the use of amalgam. The BDA in Northern Ireland welcomed the derogation, arguing that a ban would have had a negative impact on NHS dentistry, with 92% of dentists in Northern Ireland being concerned that a ban would have reduced NHS activity and increased costs. In that regard, the BDA stated: 'Securing a bespoke arrangement for Northern Ireland on dental amalgam involved a massive effort on the part of the profession and its representatives, working to inform and influence decision-makers, who in turn must be credited with finding a workable way forward'. Quite correctly adding: 'Now, we urge authorities to commit to following-through on prevention initiatives, reforming dental services, and giving a greater focus to new treatment materials and techniques', and, 'After years of delay and neglect, let's grasp the nettle on reforming our dental services and improving oral health outcomes'. Ciara Gallagher, chair of the BDA's Northern Ireland dental practice committee, said: 'A ban on dental amalgam in 2025 could have spelled the end for NHS dentistry in Northern Ireland. We sounded the alarm and fought tooth and nail for a workable solution. This delay is a glimmer of hope for a service that's on its knees and could not have shouldered any further financial pressure. We have some breathing space, but Stormont and Westminster cannot take their feet off the pedal to affect a seamless transition to amalgam-free dentistry'.

Figure 2. (a,b) Hong Kong trams in advertising mode.

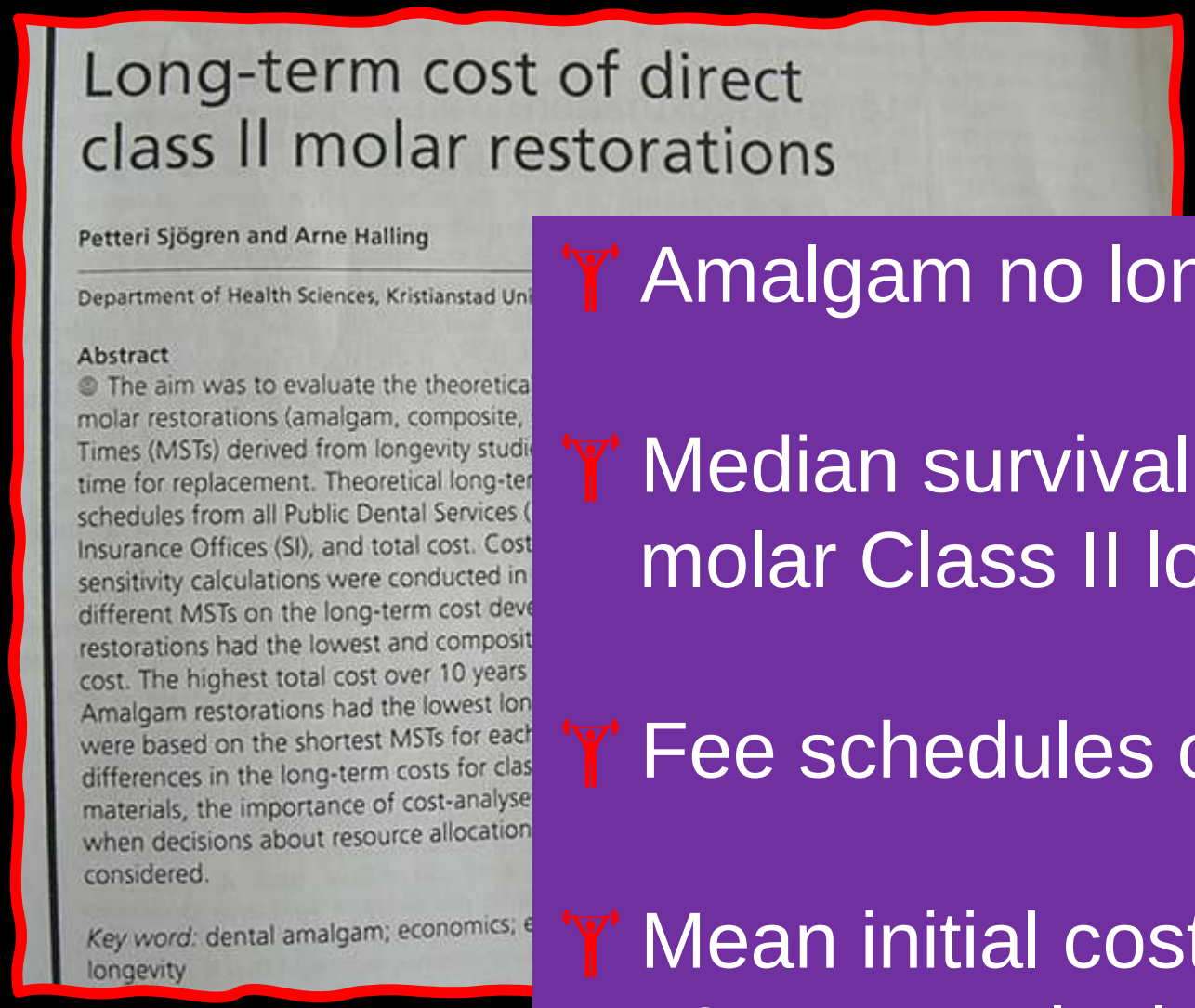
Finally, I should remind readers that this political controversy is nothing new for dental amalgam, with the so-called 'amalgam wars' in which American dentists who used amalgam were threatened with malpractice actions by dentists who did not, and that the American Society of Dental Surgeons was disbanded because of the Amalgam War, and in 1859, the American Dental Association (ADA), a group who supported the use of amalgam, becoming the nation's new dental society. Amalgam has also been debated in the US Congress, with two members of the US Congress moving a bill to abandon amalgam, and Congresswoman Diane Watson promoting the 'Mercury in Dental Filling Disclosure and Prohibition Act' as recently as 2002, stating 'we have abandoned all other forms of pre-Civil War medicine'! But, who would have thought that banning of amalgam in Europe would have led to such political outcry, while the trams in Hong Kong, which continue to amble through the crowded streets, are not being phased out any time soon.

References

1. McColl E, Burke FJT. End of the road for dental amalgam? *Dent Update* 2024; **51**: 7–9.
2. McColl E, Burke FJT. A dental knell or wake-up call? *Dent Update* 2024; **51**: 77–78.

Evidence needs of the patient

- Safe treatment
- Sustainable use of materials and devices
- Material does what is claimed
- Lasts longer than alternatives
- Good value for money



Long-term cost of direct class II molar restorations

Petteri Sjögren and Arne Halling

Department of Health Sciences, Kristianstad Uni

Abstract

The aim was to evaluate the theoretica
molar restorations (amalgam, composite,
Times (MSTs) derived from longevity studi
time for replacement. Theoretical long-ter
schedules from all Public Dental Services (
Insurance Offices (SI), and total cost. Cost
sensitivity calculations were conducted in
different MSTs on the long-term cost deve
restorations had the lowest and composit
cost. The highest total cost over 10 years
Amalgam restorations had the lowest lon
were based on the shortest MSTs for each
differences in the long-term costs for clas
materials, the importance of cost-analyse
when decisions about resource allocation
considered.

Key word: dental amalgam; economics; e
longevity

- Amalgam no longer subsidised in Sweden
- Median survival time (MST) calculated from molar Class II longevity studies
- Fee schedules obtained
- Mean initial costs and long-term cost over 10 years calculated, using MST as the time for replacement

Median Survival Time(years)

Amalgam	Composite	Glass I
9.3	4.7	3.0

Mean initial costs (Swedish Kroner)

Amalgam	Composite	Glass I
508	649	301

Mean costs over 10 yrs

Amalgam	Composite	Glass I
1016	1947	1204

Amalgam class II restorations had the lowest theoretical long term cost .

Composite was the most expensive initially and in the long term

3-year Class V evidence from Germany

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Glass hybrid versus composite for non-carious cervical lesions: Survival, restoration quality and costs in randomized controlled trial after 3 years

Falk Schwendicke [a,*], Anne Müller [a], Tilmann Seifert [b], Linda-Maria Jeggle-Engbert [c], Sebastian Paris [d], Gerd Göstemeyer [d]

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ARTICLE INFO

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ABSTRACT

Objective: This study compared survival, restoration quality and costs of glass hybrid (GH; EQUIA Forte Fil/EQUIA Forte Coat) and resin composite restorations (RC; OptiBond FL/Filtek Supreme XTE) of sclerotic non-carious cervical lesions.

Methods: This is a cluster-randomized trial (ClinicalTrials.gov: NCT02631161). 88 patients (50–70 years) with 175 sNCCLs were randomized to receive GH or RC. Restorations were placed without mechanical cavity preparation and followed for a mean 36 (min/max: 31/55) months (variable follow-up due to COVID-19 lockdown). Restoration quality was re-evaluated at 1-, 18- and 36-months using FDI-criteria. Survival was assessed using multi-level Cox-regression analysis. Costs were estimated from a payer's perspective in Germany. Initial costs were determined based on micro-costing using time recordings and hourly costs, and follow-up costs based on statutory insurance fee-item-catalogues.

Results: 88 patients (175 restorations) were treated; 43 received GH (83 restorations), 45 RC (92 restorations). 17 GH and 19 RC showed total retention loss, 5 GH were partially lost ($p = 0.396$/Cox). FDI ratings were not sufficiently different for any domain except surface luster, where RC showed higher score ($p < 0.001$). Costs were initially lower for GH (32.57; SD 16.36 €) than RC (44.25; SD 21.40 €), while re-treatment costs were similar (GH: 9.15; SD 15.70 €; RC: 7.35; SD 14.51 €), resulting in significantly lower costs for GH (GH: 41.72; SD 25.08 €) than RC (51.60; 26.17 €) ($p < 0.001$/GLM).

Conclusions: While survival was not significantly different, GH was significantly less costly both initially and long-

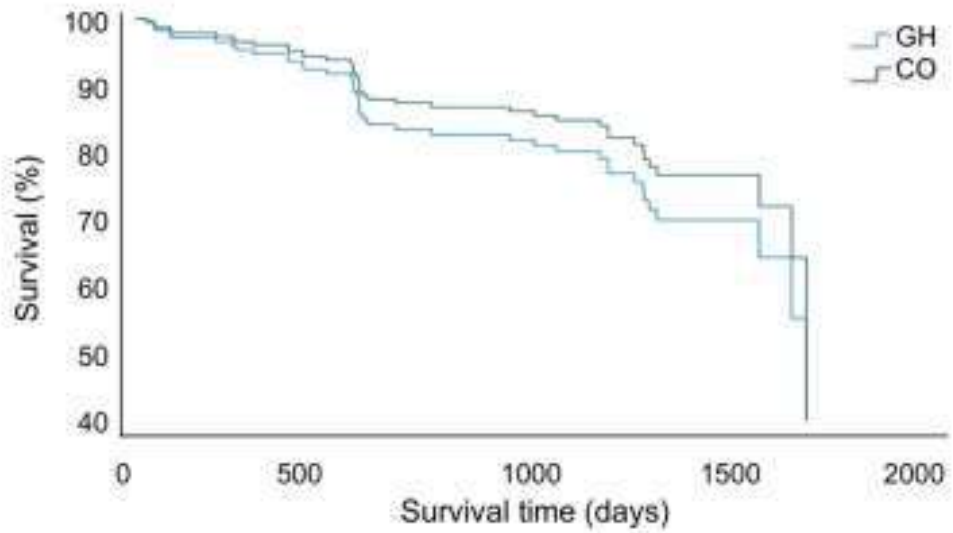

Fig. 2. Survival of Glass Hybrid (GH) and Resin Composite (RC) restorations.

Conclusions: While survival was not significantly different, GH was significantly less costly both initially and long-term than RC for restoring non-carious cervical lesions.

Clinical significance: Within this trial, survival was not significantly different between GH and RC to restore sclerotic NCCLs. As GH was significantly less costly both initially and long-term than RC, using RC was only cost-effective for payers willing to invest high additional expenses per minimal survival gains.

Evidence needs of the patient

- Safe treatment
- Sustainable use
  of materials and devices
- Material does
  what is claimed

CONCLUSION
More cost-effectiveness studies needed

- Good value
  for money

Evidence needs for the dentist

- As for patient
- Easy to use by clinician and nurse
- Value for money
- How best to use
- Know clinical limitations of material and technique

Evidence needs for the dentist

- As for patient
- Easy to use by clinician and nurse
- Value for money
- How best to use
- Know clinical limitations of material and technique

Some recent PREP Panel evaluations

The PREP Panel evaluation of G-Premio Bond

2 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:

Difficult to use 1  5 Easy to use

4.6

When the evaluators were asked to rate the ease of use of the G-Premio Bond, 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,[1] 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.[1] A UK-based group of practice-based researchers is the PREP (**P**roduct **R**esearch and **E**valuation by **P**ractitioners) 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.[2] 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.[3]

FJ Trevor Burke, DDS, MSc, MDS, MGDS, FDS (RCS Edin), FDS RCS(Eng), FFGDP(UK), FADM, Primary Dental Care Research Group, University of Birmingham School of Dentistry, The PREP Panel Ltd, Knutsford, Cheshire, **Russell J Crisp**, BDS, DGDP, The PREP Panel Ltd, Knutsford, Cheshire, **Peter Sands**, MSc, BDS, LDS RCS, MFGDP, General Dental Practitioner, Abingdon, PREP Panel member and part-time Lecturer, University of Birmingham,

Resin composite systems

As patients increasingly move away from amalgam restorations in their posterior teeth,[4] 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.[5-7] 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-bonding agent, a suitable matrix system

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**).

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 & Bond Active™

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

Difficult — Easy to use

1 — 5

4.8

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

593 restorations placed

Trevor’s view:

Universal bonding agents generally represent improved ease of use compared with previous bonding agents

…this is good because….

An easy to use material may allow us to produce better results

Special Report

Ease of use versus clinical effectiveness of restorative materials

F. J. T. Burke, DDS, MSc, MDS[1]/ M. Liebler, DDS[2]/ G. Eliades, DDS, Dr Odont[3]/
R. C. Randall, M Phil, BChD[4]

"Ease of use," as applied to dental materials and techiques, means different things to different people. Factors that may contribute to ease of use include a minimum number of application stages, easy application and shaping ability, quickness of use, lack of stick, and moisture sensitivity. Ease of use may also imply that a material or technique does not cause stress for the dentist and patient, is cost effective, is easy to learn, and should provide the operators with a sense of satisfaction with their work. Similarly, "clinical effectiveness" of the treatments prescribed for patients is not always capable of being accurately defined. Suggested factors that may contribute to clinical effectiveness include a lack of patient complaints with respect to longevity and/or cost, no secondary caries, and preservation of the remaining tooth structure during functional loading. Ease of use and clinical effectiveness are not necessarily related, but they must be combined for a technique to be successful. The achievement of this demands a partnership between clinicians, manufacturers, and patients. *(Quintessence Int 2001;32:239–242)*

Evidence needs for the dentist

- As for patient
- Easy to use by clinician and nurse
- Value for money
- How best to use
- Know clinical limitations of material and technique

…choosing a reliable material
is one thing,
but using it correctly is another!

Evidence needs for the dentist

- As for patient
- Easy to use by clinician and nurse
- Value for money
- How best to use
- Know clinical limitations of material and technique

…this is where well-designed clinical trials are needed

AND

clinicians need to have read them!

Evidence needs for the manufacturer

- Ease of use
- Clinically effective
- Cost effective
- Meets statutory requirements
- Need to convince dentists to purchase

Evidence needs for the manufacturer

- Ease of use
- Clinically effective
- Cost effective
- Meets statutory requirements
- Need to convince dentists

How many manufacturers fund independent clinical evaluations of their materials?

Evidence needs for the manufacturer

- Ease of use
- Clinically effective
- Cost effective
- Meets statutory requirements
- Need to convince dentists

QUESTION: Should we use a material which does not have data from clinical evaluations?

Evidence needs for the manufacturer

- Ease of use
- Clinically effective
- Cost effective
- Meets statutory requirements
- Need to convince dentists to purchase

Evidence needs of the third-party funder(s)

- Clinical effectiveness
- Value for money
- Probity requirements
- Need to keep dentists working in the system

Evidence needs of the third-party funder(s)

- Clinical effectiveness

Do they care? With the system since 2006, there is no way of assessing individual dentists' performance.

The Steele Report (2009) recommended the return of tooth level data collection, but nothing has changed.

Evidence needs of the third-party funder(s)

- Clinical effectiveness
- Value for money
- Probity requirements
- Need to keep dentists working in the system

The Probity department at the DPB was closed in 2005

Evidence needs of the third-party funder(s)

- Clinical effectiveness
- Value for money
- Probity requirements
- Need to keep dentists working in the system

FAILED!

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COMMENT

Dawn or disaster?

F.J. Trevor Burke

Readers in the UK cannot have failed to hear that fundamental changes are planned in April 2005 in England for the state-run and partially state-funded dental service, presently known as the General Dental Services (GDS). The GDS has been in existence since 1948 and has presided, amongst other factors, over an enormous improvement in the oral health of the population, all at a cost which is the envy of ministers of health worldwide, with the dental practitioners operating within the GDS providing treatment at a cost per item which is lower than anywhere in the developed world. The fee-per-item remuneration for this service provided treatment in the 1940s to 1990s in an efficient manner but, latterly, was criticized because it was a national fee scale not sensitive to local variations in the cost of running a dental surgery and because it was perceived by some that the system encouraged dentists to over-prescribe treatment. Perhaps a more robust criticism was that the fee-per-item approach failed to reward a preventive and minimal-intervention approach that was becoming more appropriate to the falling disease levels and more achievable with new technology, such as the bonding of resin-based materials to tooth. A 'New contract' was introduced in 1990 in which dentists were encouraged to register patients on their lists but, famously, this hit the rocks in 1992 because of a failure of government to fund the patients enticed to dentists' lists.

What is currently known is that the new system, in 2005, will be administered locally by Primary Care Trusts (PCTs) rather than centrally and that the organization which administers the GDS (the Dental Practice Board [DPB]) will be disbanded, although it will become a Special Health Authority, possibly with increased duties which include those which it holds at present. Subsequent to this, the vast collection of data at the DPB, presently being used to produce the largest database for research into longevity of restorations, will be lost. From a government viewpoint, the lack of a requirement for the dentists still operating in the new NHS to record treatment data will mean that there will be difficulty in satisfying the taxpayer, by means of bodies such as the National Audit Office, that they are receiving value for money. What also is known is that dentists operating the new state dental service will be paid a regular monthly amount and that this will be based on previous earnings.

What is not known is how ready the PCTs will be for their new challenge, given that most have little hands-on experience in dental matters. What also is not known is what will happen to the patient who has not attended a dentist for several years and who is in need of substantial amounts of dental treatment. Will the dentist under these new arrangements be keen to take on a mouthful of decay and periodontal disease, rather than maintaining a practice of well conserved and controlled mouths? Another unknown is how patient charges will be collected. As the newly salaried dentist may not recall his/her patients as frequently as when they were paid fee-per-item, attendances will be down and patient charges won't be collected. As the government has guaranteed the dentists' earnings for a time, it would seem that it will be the taxpayer who will have to bear the deficit.

Another unknown is the question of what happens a few years after the introduction of the new scheme, when it is apparent that dentists operating under the new arrangements are not producing anything like as many patient treatments or patient visits as previously. This would not be a surprise, given that salaried workers rarely produce as much as those who are incentivized by piecework rates. Will this result in a pay cut?

2004

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Trevor Burke

UDAs remain a broken currency

The Unit of Dental Activity (UDA) remains the currency by which dentists operating in the NHS system in England and Wales are paid. Introduced in 2006, it took only three years before a report roundly condemned these as an inappropriate method for paying dentists.[1]

I have to report that, sadly, the Chair of the group who produced the report, Professor Jimmy Steele, recently passed away and his untimely passing has stolen, from UK dentistry, one of its cleverest, most clear-thinking minds. Our thoughts and prayers are with his family. This sad event has removed a person who sought to devise a more equitable system for paying dentists in England and Wales and it is to be hoped that the momentum for change will not be stalled by his passing.

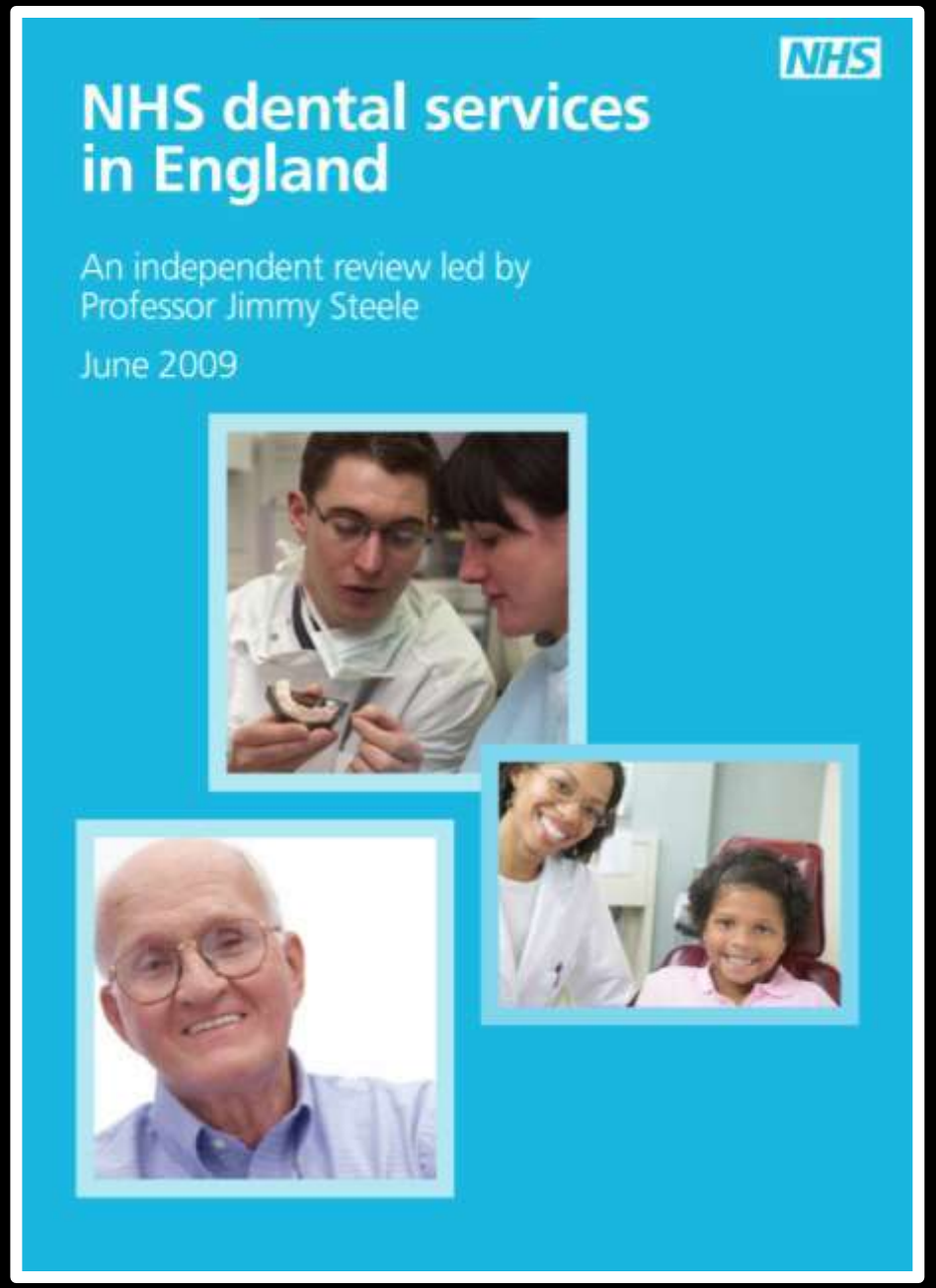
We like case studies in *Dental Update*. Here I report three related to UDAs. First, I saw a patient who had been injured when a car reversed into her as she attempted to cross a road. Her UL1 was avulsed, and UL2 fractured. There was a family wedding shortly after this unfortunate incident so, quite rightly, the dentist whom she attended made the patient (who was exempt from payment) a one tooth partial acrylic denture: 12 UDAs, minimal laboratory fee. The UL2 was, in my opinion, restorable (large composite or, at worst, a crown) but, shortly after the wedding, it was extracted and a new partial upper immediate denture was placed: another 12 UDAs, minimal lab fee. Two months later, the patient complained that the denture was loose and another was made: another 12 UDAs, minimal lab fee. When I saw the patient, her teeth were covered in plaque and there were heavy calculus deposits in many areas. On being asked, the patient advised that she had not received any scaling and polishing or oral hygiene instruction during the three courses of treatment in which the dentures were made: all that seemingly mattered was the multiple gathering of 12 UDAs.

In the second case, a patient (again exempt from payment) attended a dentist who worked for a large corporate. She was surprised that she had been unable to see either of the previous two dentists who had previously treated her and with whom she had built up a good relationship. She was advised that both had left. Despite attending for a routine 'check-up' with no symptoms, the new dentist advised that she was suffering from temporomandibular joint problems and prescribed a soft night bite guard (NBG) for the upper arch: 12 UDAs, minimal lab fee. She never wore the NBG but, on re-attending for a subsequent course of treatment, she was prescribed a further NBG guard for the lower arch: another 12 UDAs, minimal lab fee. One could ask why the patient did not question the dentist more regarding her treatment or, indeed, confront him regarding this overtreatment: all that happened was that she contacted me. I hope that cases 1 and 2 are isolated incidents, as I am sure that the majority of dentists continue to work in an ethical way, despite the system.

Case study 3 relates to an ethical dentist who had a child-only NHS contract, this being unusual at the present time, I am told. She has worked hard on prevention for her child patients, and employs an oral health educator. She has been successful in her preventive strategy, so has 'generated' a shortfall in her UDA target because the majority of her treatments achieve 1 UDA because her patients require no treatment, rather than achieving the 3 UDAs which are awarded when restorations are needed. A totally perverse incentive which needs fixing.

Sadly, there is now a whole generation of dentists who think that UDAs are the only currency by which dentists are paid for their treatment of NHS patients. By coincidence, I wrote about this in the pre-Christmas issue of *Dental Update* two years ago,[2] writing '*Perhaps the new contract will seem clearer a year on*'. This is not the case, even after two years. Pilots for a potential new system of payment have been amended and are still ongoing. The Government are not in a hurry to change how dentists are being paid: they manufactured a cash-limited system, which is what they wanted. They see no need to hurry into a new contract, when few are complaining and (some) dentists are making massive amounts of money from treatments, as described in the first two cases. The ethical dentists are doing their best but some, as described in case study 3, are suffering. I apologize for discussing a system which relates only to England and Wales, when many readers are not from there. For those of you not afflicted with the UDA system, count

2017



2009: UDAs disparaged……

In England, new contract pilots eventually set up……

…but abandoned two years ago

Also mentioned in…

Many mentions by others, for example:

Hancocks S OBE. I worry. Br.Dent.J.2022:65:

Westgarth D. How much longer does NHS dentistry have left? BDJ IN Practice 2020:35:12-15.

HEALTH

Half of dentists have cut back on their NHS work

By Paul Gallagher
HEALTH CORRESPONDENT

Half of dentists have reduced their NHS work, according to the British Dental Association (BDA), which warned more will follow as the sector plunges further into crisis.

The BDA said the exodus of dentists from the health service is going unseen in official figures. Its new survey found that more than half of dentists in England (50.3 per cent) report having reduced their NHS commitment since the start of the pandemic – by 27 per cent on average.

This movement is not tracked in official workforce data, which counts heads not commitment, and where dentists doing one NHS check-up a year carry the same weight as an NHS full-timer, the BDA said.

The proportion reporting their intention to reduce – or further reduce – the amount of NHS work they undertake stands at 74 per cent, the survey of 1,921 general dental practitioners in England showed.

Some 43 per cent indicated they were likely to go fully private and 42 per cent said they were likely to change career, or seek early retirement. More than one in 10 (12 per cent) said they were likely to move to practice abroad.

The Commons Health Committee is currently holding an inquiry into the crisis in the service, where it has become increasingly difficult for people to access a dentist.

A recent investigation found that nine in 10 NHS dental practices are not accepting new adult patients and the BDA has stressed that both the Government and the opposition now have a duty to set an urgent plan of action.

Shawn Charlwood, chair of the BDA's General Dental Practice Committee, said: "This is a warning from this profession. NHS dentistry is running out of road. Every day a broken system remains in force we lose dentists, while millions struggle to access care.

"This crisis won't be fixed with soundbites or tweaks at the margins. To turn the corner, we need a plan based on real reform and fair funding."

Up to £400m of NHS dentistry's "already inadequate" budget is set to be lost from the front line, the BDA said, as dentists are penalised for failing to hit contractual targets. This money is not ring-fenced and will probably be redistributed to balance other budgets elsewhere in the NHS.

The Department of Health and Social Care said: "We are working to improve access to NHS dental care by investing more than £3bn a year but we know there is more to do."

{i} Rishi Sunak unveiled a **five-point plan to end the access crisis** last summer, but the BDA said that no element of it has been taken forward.

Daniel Waterhouse
…vertly filmed
…ditions in the
HS CHANNEL 4

…ter, Mr
…nfortunately
…mentally
…el unable to

…HS felt
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Size matters.

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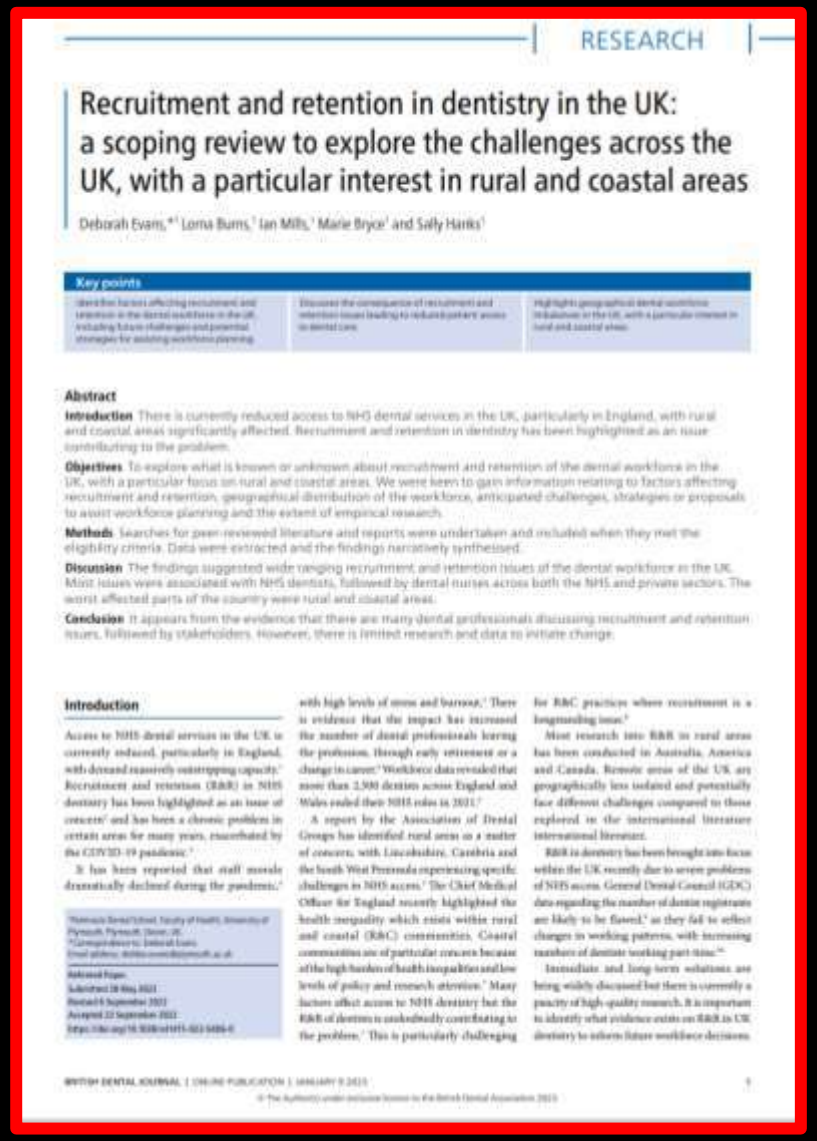


RESEARCH

Recruitment and retention in dentistry in the UK: a scoping review to explore the challenges across the UK, with a particular interest in rural and coastal areas

Deborah Evans,*[1] Lorna Burns,[1] Ian Mills,[1] Marie Bryce[1] and Sally Hanks[1]

Key points

Abstract

Introduction There is currently reduced access to NHS dental services in the UK, particularly in England, with rural and coastal areas significantly affected. Recruitment and retention in dentistry has been highlighted as an issue contributing to the problem.

Objectives To explore what is known or unknown about recruitment and retention of the dental workforce in the UK, with a particular focus on rural and coastal areas. We were keen to gain information relating to factors affecting recruitment and retention, geographical distribution of the workforce, anticipated challenges, strategies or proposals to assist workforce planning and the extent of empirical research.

Methods Searches for peer-reviewed literature and reports were undertaken and included when they met the eligibility criteria. Data were extracted and the findings narratively synthesised.

Discussion The findings suggested wide ranging recruitment and retention issues of the dental workforce in the UK. Most issues were associated with NHS dentists, followed by dental nurses across both the NHS and private sectors. The worst affected parts of the country were rural and coastal areas.

Conclusion It appears from the evidence that there are many dental professionals discussing recruitment and retention issues, followed by stakeholders. However, there is limited research and data to initiate change.

Introduction

Access to NHS dental services in the UK is currently reduced, particularly in England, with demand massively outstripping capacity.[1] Recruitment and retention (R&R) in NHS dentistry has been highlighted as an issue of concern[2] and has been a chronic problem in certain areas for many years, exacerbated by the COVID-19 pandemic.[3]

It has been reported that staff morale dramatically declined during the pandemic,[4] with high levels of stress and burnout.[5] There is evidence that the impact has increased the number of dental professionals leaving the profession, through early retirement or a change in career.[6] Workforce data revealed that more than 2,500 dentists across England and Wales ended their NHS roles in 2021.[7]

A report by the Association of Dental Groups has identified rural areas as a matter of concern, with Lincolnshire, Cumbria and the South West Peninsula experiencing specific challenges in NHS access.[8] The Chief Medical Officer for England recently highlighted the health inequality which exists within rural and coastal (R&C) communities. Coastal communities are of particular concern because of the high burden of health inequalities and low levels of policy and research attention.[9] Many factors affect access to NHS dentistry but the R&R of dentists is undoubtedly contributing to the problem.[7] This is particularly challenging for R&C practices where recruitment is a longstanding issue.[9]

Most research into R&R in rural areas has been conducted in Australia, America and Canada. Remote areas of the UK are geographically less isolated and potentially face different challenges compared to those explored in the international literature.

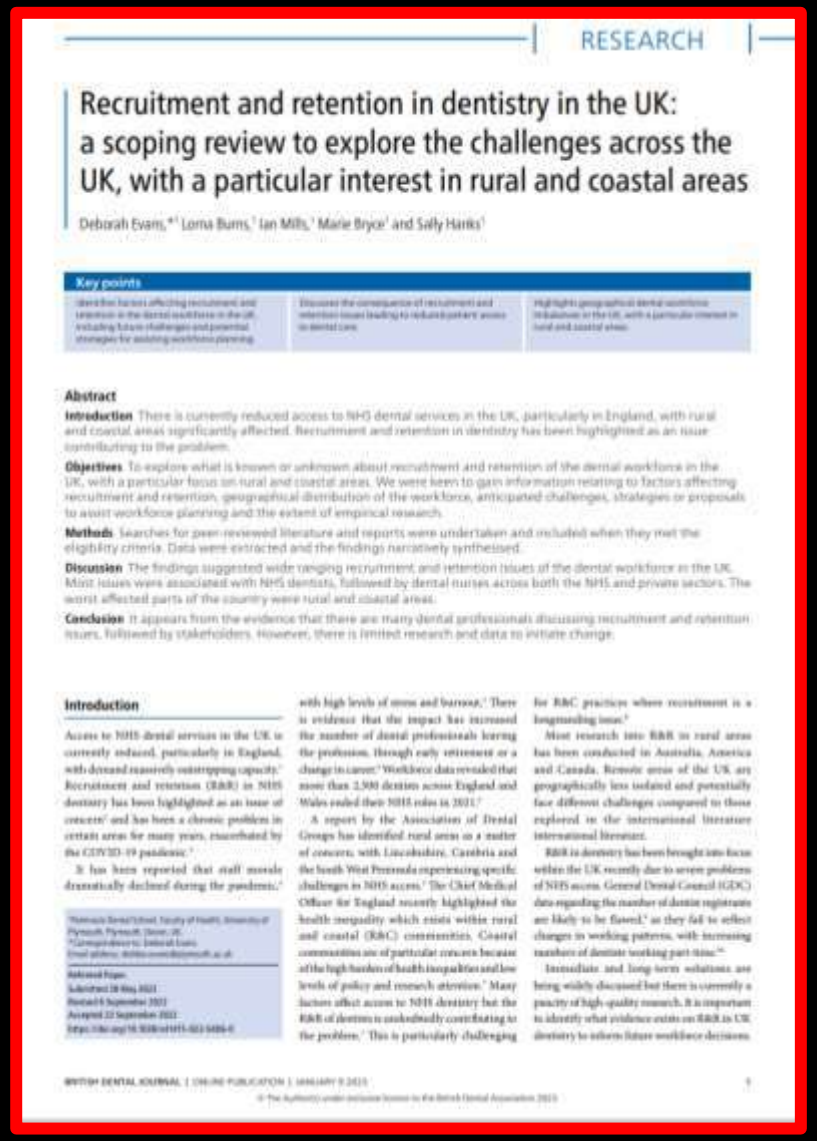
R&R in dentistry has been brought into focus within the UK recently due to severe problems of NHS access. General Dental Council (GDC) data regarding the number of dentist registrants are likely to be flawed,[7] as they fail to reflect changes in working patterns, with increasing numbers of dentists working part-time.[10]

Immediate and long-term solutions are being widely discussed but there is currently a paucity of high-quality research. It is important to identify what evidence exists on R&R in UK dentistry to inform future workforce decisions.

Evans et al, Br.Dent.J.January 9th, 2023

Scoping review: peer reviewed literature, webpages, reports & opinion pieces included from past five years: 73 in total

Have we gone below the critical mass? Size matters.



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BRITISH DENTAL JOURNAL | ONLINE PUBLICATION | JANUARY 9 2023

Evans et al, Br.Dent.J.January 9th, 2023

Factors affecting dentists' recruitment and retention identified:

NHS UDAs most common factor & its associated workload

Stress-related issues, deep discontent with the NHS primary care systems, system fundamentally flawed

Limited opportunity for career progression

Financial factors,increased cost of indemnity

Brexit, the pandemic & legislative uncertainty

In general, dentists have done a good job for their patients, under a fee per item system! They gave excellent value for money: why did the NHS have to change the system?

slide made 2006

Some things haven’t changed

16 MAY 1999 · THE SUNDAY TIMES

Star dentists strike gold in NHS exodus

by Jack Grimston

AN EMERGING breed of super-dentist is gazing down British throats. Research has shown that private dentistry is booming, turning its stars into some of the country's highest-paid professionals.

Their prosperity has been driven by the middle classes deserting the NHS in droves as charges increase and patients increasingly see dentists not just as health workers but as purveyors of

practices with 100 dentists working for him in London, Wales and the southwest. He plans to import 75 dentists from South Africa.

"I am loving the job these days," he said. "We are slowly moving towards the situation in America, where dentists are the most respected professionals."

Phil Stemmer, a cosmetic dentist who treats numerous politicians and television stars, said people were no longer bored by dentists at

1999

Dentists opt out of NHS

By Our Health Services Correspondent

THE unpopularity of new dentists' contracts means that up to one in 10 of them is not taking on new National Health Service patients, the General Dental Practitioners' Association said yesterday.

Mr Michael Watson, general secretary, said that 1,644 dentists out of 16,347 in England and Wales had not registered a new child or adult patient by the end of January.

Mr Watson said: "This contract is deeply unpopular and should be renegotiated."

Mr Stephen Noar, managing director of Denplan, a private dental health group, estimates that at least 1,000 dentists have left the NHS since the new contracts came into effect.

He said: "It is not surprising dentists are becoming dissatisfied with the NHS because it has departed so far from the philosophy of its founding fathers."

Patients travel 100 miles to sign up with new NHS clinic

1999

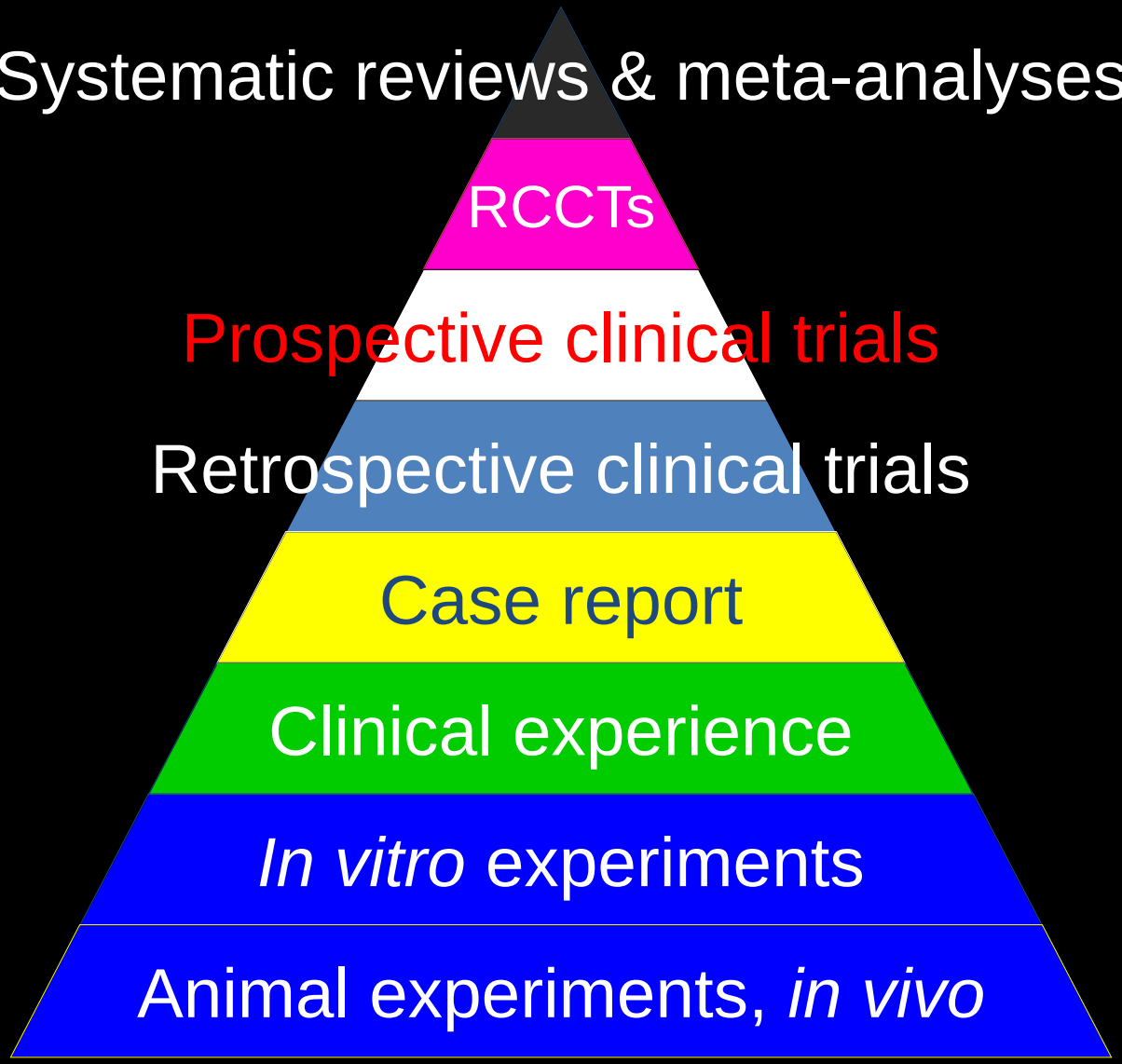
Evidence needs of the third-party funder(s)

- Clinical effectiveness
- Value for money
- Probity requirements
- Need to keep dentists working in the system

What I plan to talk about

- Defining evidence
- Evidence needs of different stakeholders
- Measuring survival of dental restorations and factors influencing restoration survival
- Applying the evidence
- Narcissistic attitudes to “evidence”

Personal evidence



The hierarchy of evidence in dental research

Why is restoration longevity important?

- Managing patient expectations (or not)
- Avoidance of adverse medicolegal situations
- Clinical Governance
- Third party funders want to know if they are getting value for money
- In the past, Government wanted to know!
- Dentists might want to audit their performance
- Keeping faith in the profession

This is how
others used to do it,
50 years ago

The durability of *conservative* restorations

Allan DN. Br.Dent.J.1969: 126:172-177. = my italics

THE DURABILITY OF CONSERVATIVE RESTORATIONS

DOUGLAS N. ALLAN*, D.D.S., M.D.S.

Introduction

...reason the course of examination of patients for dental treatment it is well known that not only do the newly carious cavities require attention. Previous restorative work may require replacement because of the development of secondary caries apart from mechanical failures of filling or tooth. The margins may not be sufficiently extended into the non-susceptible areas and failure is usually due to lack of marginal integrity. A study of amalgam from many aspects bears upon these factors.

Amalgam has been studied from the viewpoint of cavity design (Black, 1896; Markley, 1951; Pickard, 1956); the physical properties of the material as it is manufactured (A.D.A. Specification No. 1) and its correct preparation and use (Gayler, 1953-56); retention (Roosevelt, 1957), marginal fit (Rosenstiel, 1966) and photo-elastic studies of stress patterns (Robinson, 1964); the stability of the material (Skinner, 1938) and delayed expansion (Schoonover *et al.*, 1941); the adaptation of the alloy to the cavity (Jorgensen, 1965); and marginal leakage of air (Pickard, 1963), water (Harper, 1924), bacteria (Mjörstrand *et al.*, 1965), dyes (Eronemus, 1939) and radioactive isotopes (Armstrong and Stross, 1951, Bowen and Phillips, 1963) to give only a few, albeit noteworthy, examples.

Other filling materials cast and cohesive gold, fused porcelain, silicate cement, autopolymerizing acrylic resin and epoxy resins have received their share of attention. The popularity of each has waxed and waned according to the demands of function or aesthetics and the ease of manipulation of the newer materials. Amalgam was prohibited from use by the American Society of Dental Surgeons in 1845, but more recently Parfitt (1952) on finding that old amalgam fillings contained an excess of mercury suggested that properly prepared amalgam fillings were not inferior to noble metals 'but could be best of all.' Bowman (1961) and others have reiterated this belief and the object of this survey was to examine the claim.

Harris (1840) called for clinical application of the results of scientific investigation: 'We must always remember that clinical accuracy is determined by length of service.' This survey uses length of service as the basis for the inquiry.

*Sutherland Dental School, University of Newcastle upon Tyne.

Previous Surveys

Surveys on length of service are sparse in the literature. Easton (1941) examined clinical restorations which required replacement. He found most failures as being under the control of the dentist. In 74 per cent the failure was of one or both approximal surfaces. Involvement of the occlusal surface was rare. Roper (1947) investigated amalgam restorations done in the United States Army, both by clinical examination and by using figures supplied by the Surgeon General. Common causes of failure were lack of attention particularly of the gingival floor, lack of retention and poor finishing of the enamel margins.

Healey and Phillips (1961) studied 1,321 defective amalgam restorations for cause of failure. They found that 93 per cent of failures were due to improper cavity preparation and that 60 per cent were due to faulty manipulation of the amalgam, the principal factors involved being under the control of the dentist.

Merrett (1956) investigated the failure of bridges. He found that 'the average failure rate might be considered to be 10 per cent in the first year. It would not be surprising to find that 35 per cent of bridges failed to last for 5 years.'

Materials and Methods

Unselected patients who happened to be attending for conservation were used for this material survey. All filled teeth were carefully examined by routine clinical methods (including bitewing radiographs when indicated, as they were in most cases) for faults which were serious enough to cause the filling to be condemned. A good mirror and probe were used in well lit surgery conditions. The teeth were dried of saliva before examination but no magnification was used. All the examinations were carried out by the author in order to standardize clinical assessment. A critical standard of assessment was used to condemn a filling as no longer fit for service, but factors such as recurrence of caries were confirmed during subsequent treatment. The length of service of the restoration was charted in years. Authentication made it difficult to include in the survey more than one-third of the patients examined. A filling was counted as failed if, for example, it was removed because it required extension or if the tooth was extracted for orthodontic or prosthetic reasons.

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TABLE II.—MAXIMUM DURATION OF EACH TYPE OF FILLING MATERIAL

Material	*Duration*
Gold foil	45 years
Amalgam	25 "
Bridges	15 "
Silicate	13 "
Gold inlay	13 "
Porcelain veneer crowns	12 "
Acrylic veneer crowns	3 "

Silicate fillings usually failed due to dissolution of the material

THE LIFE OF A FILLING

A. D. ROBINSON[1], B.D.S.

Brit. dent. J., 1971, 130, 206.

Practice records over a period of twenty-one years are scrutinised to assess the useful life of amalgam and silicate fillings in patients attending regularly for dental examination and treatment.

MUCH has been written on methods of making better fillings, on the desirable properties of filling materials and on the design of cavities intended to achieve the long life hoped for in a dental restoration. The causes of failure of amalgam fillings have been analysed by Healey and Phillips (1949) and by Allan (1969). In both cases, groups of patients were examined and causes of failure recorded. Allan also reported on the length of life of the fillings which had been made by a number of operators. There seemed to be an opportunity, however, to obtain useful information by examining the records of a limited number of patients over a considerable period. In a practice started in 1948 in a suburban area of London it was found that over 80 patients who first attended in 1948 and 1949 were still attending in 1969. This report is based on their records over a 21-year period.

Method

Some of the patients were known to have sought treatment elsewhere at some time during the period and these were eliminated from the investigation. Any patient whose records showed an interval of over 2 years at any time between attendances was eliminated, as also were those for whom no fillings were done in 1948 or 1949. This left a list of 43 patients aged 13 to 57 at the beginning of the study with continuous records of treatment by the author from 1949 to 1969. Two of them also had fillings done in 1948 and for these the period 1948 to 1968 was also included. Only amalgam and silicate fillings in permanent teeth were studied.

For each patient a note was made of the fillings done in the first year. Detailed examination of the records in the ensuing 20 years indicated when these were lost by extraction, replaced by similar or more extensive fillings or by crowns. As there is bound to be some ambiguity about dental records, the following criteria were adopted:

(1) Where a tooth was extracted, all the fillings in that tooth were recorded as having failed.

(2) Where a new filling of the same denomination was inserted, for example, occlusal, disto-occlusal, mesio-occlusal, the original one was deemed to have failed except that for upper first and second molars and lower first premolars, where anatomical conformations lend themselves to making 2 separate occlusal fillings in the 2 pits, allowance was made. For example, if one occlusal filling was recorded in 1949, a second in 1950 and a third in 1959, it was assumed that the second one was in the other pit and was not reported as a failure. It was assumed that the third one (1959) was a renewal of the first.

Any occlusal restoration of lower molars and second premolars or of upper premolars was recorded as a failure of the original filling, similarly for the buccal and lingual surfaces of all teeth.

(3) Placing an occluso-buccal was considered to indicate failure of a buccal or an occlusal filling.

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In general, it was not thought that a filling should count as having failed simply because the surface had to be involved to provide retention for a new filling on another surface. Having regard to this, the criteria were possibly somewhat stringent and when interpreting the findings this must be borne in mind.

No attempt is made to define exactly the criteria employed when deciding to replace a filling. This involves clinical judgment and it is recognised that much variability may exist between the judgments of various operators. In general terms, however, a filling was replaced when it had ceased to function adequately, as a result of caries, fracture, attrition, corrosion, and in the case of silicates, æsthetic deterioration or solution.

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[1]Department of Conservative Dental Surgery, Guy's Hospital Dental School, London, S.E.1.

"Robinson's Rules"

Br.Dent.J.1971:130:206-208

Records of 80 patients who attended a suburban London practice in 1948, still attending in 1969

Patients who had sought treatment elsewhere were "eliminated", as were patients who had a gap in treatment of < 2 years

This left 43 patients aged 13y-57y. Only amalgam and silicate fillings were studied.

For each patient, a *note* was made of the fillings done in the first year.

Detailed examination of the records of the following 20 years

Robinson's Rules

08

TABLE II.—PATIENTS' AGES AND NUMBERS OF TEETH AT COMMENCEMENT OF STUDY, WITH FILLINGS AND EXTRACTIONS PERFORMED DURING PERIOD

Patient	Age at commence-ment	No of teeth at commence-ment	Total number of fillings in the period of 21 years	Total number of extractions in period of 21 years
1	32	22	47	1
2	19	21	28	11
3	34	24	48	6
4	44	27	43	0
5	38	24	6	0
6	29	24	98	7
7	29	23	73	2
8	47	24	32	0
9	44	22	78	6
10	40	26	27	1
11	24	26	52	1
12	42	21	10	19
13	59	27	62	0
14	35	25	33	1
15	39	14	46	3
16	30	25	45	1
17	37	26	102	2
18	23	30	63	7
19	37	26	61	3
20	38	22	46	6
21	33	30	25	1
22	29	28	18	0
23	33	27	30	1
24	27	25	40	3
25	21	28	76	5
26	31	26	26	1
27	43	24	26	2
28	38	16	38	8
29	28	28	50	1
30	38	25	64	2
31	29	22	71	5
32	30	28	30	1
33	37	27	28	3
34	42	27	11	4
35	42	6	13	2
36	28	27	53	0
37	57	19	19	7
38	61	26	42	19
39	23	30	28	0
40	33	21	23	0
41	13	26	20	3
42	26	24	28	0

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6th year) 39 amalgam fillings had failed, just over one-quarter of the total. After 10 complete years a further 33 had failed, making 72 in all, or approximately one half. After 20 years a further 40 had failed, making 112 in all, 33 still remained in place. The accumulating total of failed fillings is plotted on the graph (fig. 1). Table IV shows the number and type of amalgam fillings still standing after 20 complete years.

The silicate fillings were fewer in number. There were very few lost in the first 5 years but by the end of 10 years about half had failed and

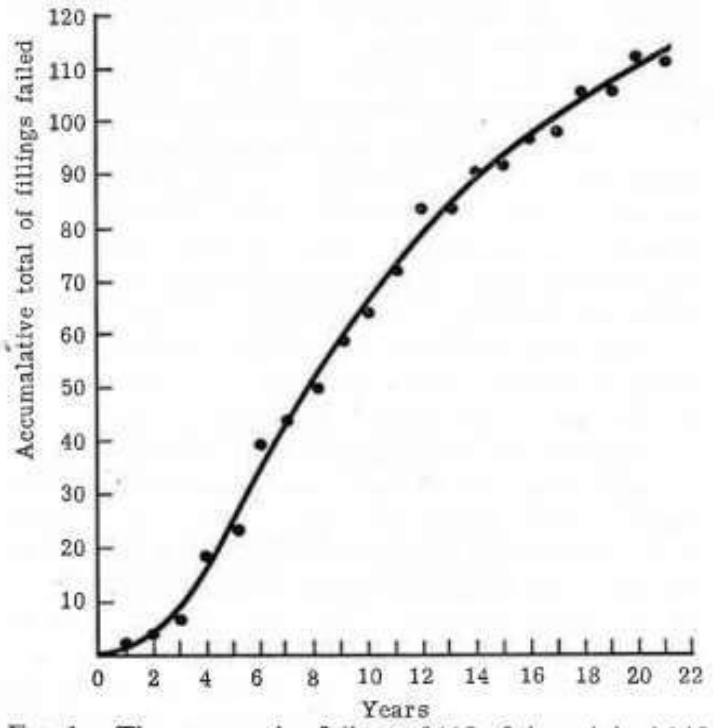
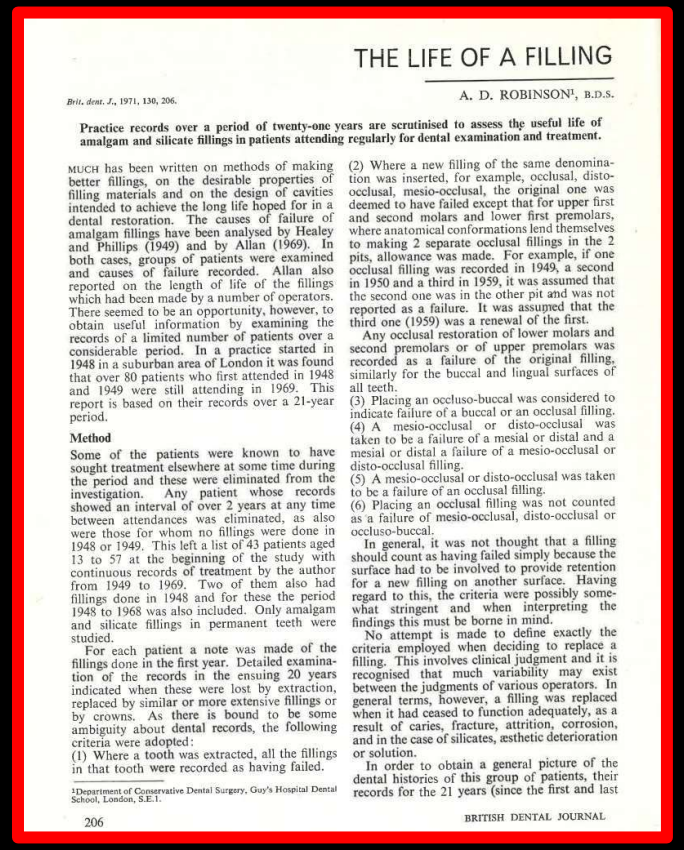


FIG. 1.—The progressive failure of 112 of the original 145 amalgam fillings, over a period of 21 years.

“Robinson’s Rules”

Br.Dent.J.1971:130:206-208



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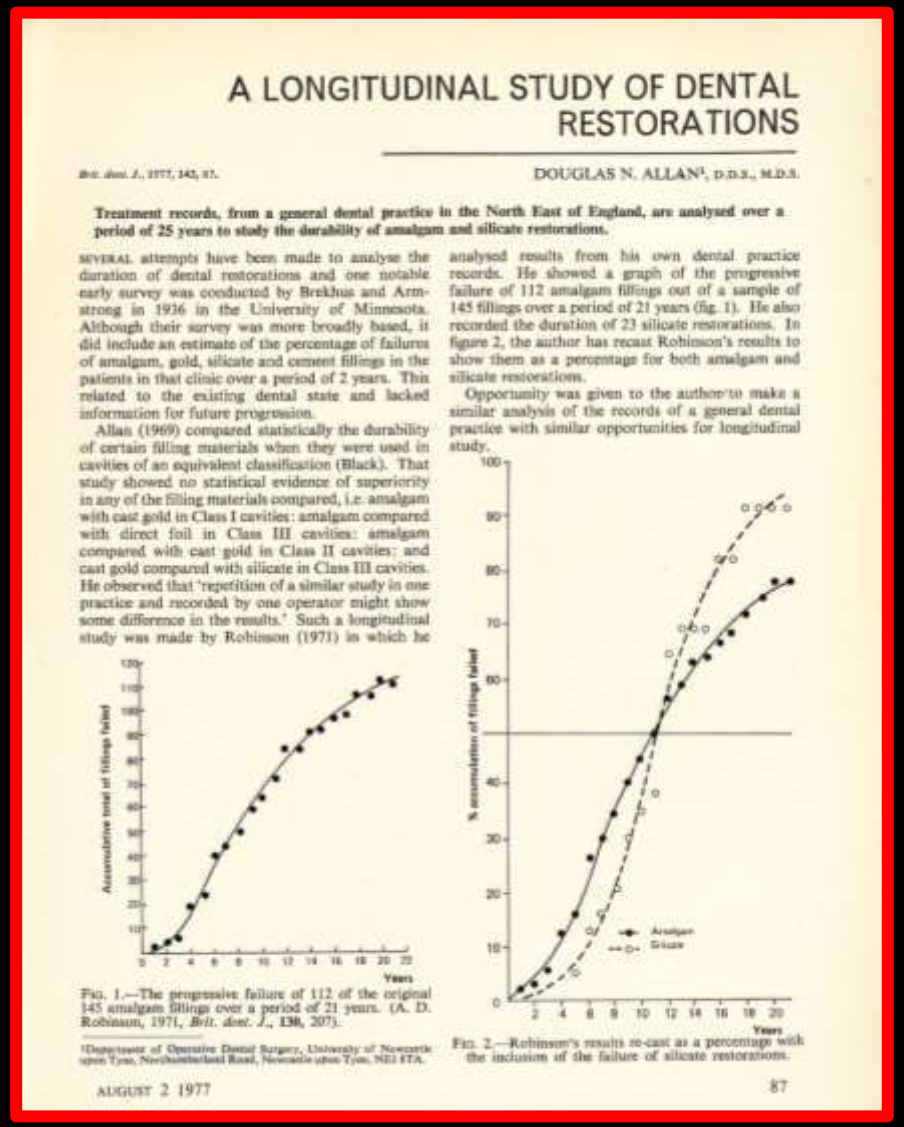
[1]Department of Conservative Dental Surgery, Guy's Hospital Dental School, London, S.E.1.

Some of the amalgam fillings lasted for only a short time but almost three-quarters of those under review lasted for 5 years or more. About half lasted for 10 years and almost a quarter lasted more than 20 years. There appeared to be a slight tendency for the rate of loss to diminish (fig. 1).

The value of fillings, as a means of saving carious teeth, is probably greater than these results appear to show. It will be remembered

A longitudinal study of dental restorations

Allan DN. Br.Dent.J.1977:143:87-89.



A LONGITUDINAL STUDY OF DENTAL RESTORATIONS

Brit. dent. J., 1977, 143, 87.

DOUGLAS N. ALLAN[1], D.D.S., M.D.S.

Treatment records, from a general dental practice in the North East of England, are analysed over a period of 25 years to study the durability of amalgam and silicate restorations.

SEVERAL attempts have been made to analyse the duration of dental restorations and one notable early survey was conducted by Brekhus and Armstrong in 1936 in the University of Minnesota. Although their survey was more broadly based, it did include an estimate of the percentage of failures of amalgam, gold, silicate and cement fillings in the patients in that clinic over a period of 2 years. This related to the existing dental state and lacked information for future progression.

Allan (1969) compared statistically the durability of certain filling materials when they were used in cavities of an equivalent classification (Black). That study showed no statistical evidence of superiority in any of the filling materials compared, i.e. amalgam with cast gold in Class I cavities: amalgam compared with direct foil in Class III cavities: amalgam compared with cast gold in Class II cavities: and cast gold compared with silicate in Class III cavities. He observed that 'repetition of a similar study in one practice and recorded by one operator might show some difference in the results.' Such a longitudinal study was made by Robinson (1971) in which he analysed results from his own dental practice records. He showed a graph of the progressive failure of 112 amalgam fillings out of a sample of 145 fillings over a period of 21 years (fig. 1). He also recorded the duration of 23 silicate restorations. In figure 2, the author has recast Robinson's results to show them as a percentage for both amalgam and silicate restorations.

Opportunity was given to the author to make a similar analysis of the records of a general dental practice with similar opportunities for longitudinal study.

FIG. 1.—The progressive failure of 112 of the original 145 amalgam fillings over a period of 21 years. (A. D. Robinson, 1971, *Brit. dent. J.*, **130**, 207).

FIG. 2.—Robinson's results re-cast as a percentage with the inclusion of the failure of silicate restorations.

[1]Department of Operative Dental Surgery, University of Newcastle upon Tyne, Northumberland Road, Newcastle upon Tyne, NE1 8TA.

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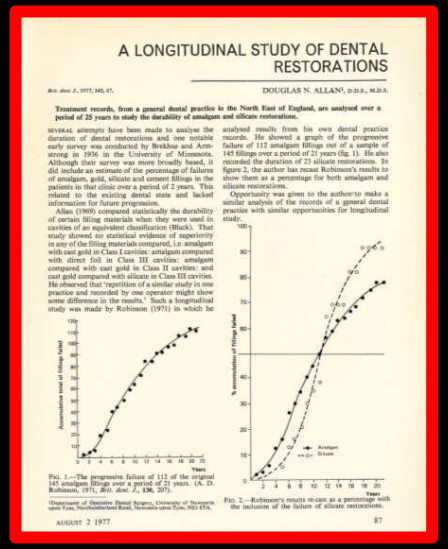
Opportunity was given to the author to make a similar analysis of the records of a general dental practice with similar opportunities for longitudinal study.

Records from a practice in NE England were made available

Records of 47 patients followed from 1951 to 1971 & 31 patients from 1954 to 1969.

A longitudinal study of dental restorations

Allan DN. Br.Dent.J.1977:143:87-89.



A LONGITUDINAL STUDY OF DENTAL RESTORATIONS

DOUGLAS N. ALLAN, D.D.S., M.D.S.

Treatment records, from a general dental practice in the North East of England, are analysed over a period of 25 years to study the durability of amalgam and silicate restorations.

SEVERAL attempts have been made to analyse the duration of dental restorations and one notable early survey was conducted by Brekhus and Armstrong in 1936 in the University of Minnesota. Although their survey was more broadly based, it did include an estimate of the percentage of failures of amalgam, gold, silicate and cement fillings in the patients in that clinic over a period of 2 years. This related to the existing dental state and lacked information for future progression.

Allan (1969) compared statistically the durability of certain filling materials when they were used in cavities of an equivalent classification (Black). That study showed no statistical evidence of superiority in any of the filling materials compared, i.e. amalgam with cast gold in Class I cavities: amalgam compared with direct foil in Class III cavities: amalgam compared with cast gold in Class II cavities: and cast gold compared with silicate in Class III cavities. He observed that 'repetition of a similar study in one practice and recorded by one operator might show some difference in the results.' Such a longitudinal study was made by Robinson (1971) in which he analysed results from his own dental practice records. He showed a graph of the progressive failure of 112 amalgam fillings out of a sample of 145 fillings over a period of 21 years (fig. 1). He also recorded the duration of 23 silicate restorations. In figure 2, the author has recast Robinson's results to show them as a percentage for both amalgam and silicate restorations.

Opportunity was given to the author to make a similar analysis of the records of a general dental practice with similar opportunities for longitudinal study.

Fig. 1.—The progressive failure of 112 of the original 145 amalgam fillings over a period of 21 years. (A. D. Robinson, 1971, *Brit. dent. J.*, **130**, 207).

Fig. 2.—Robinson's results re-cast as a percentage with the inclusion of the failure of silicate restorations.

AUGUST 2 1977

87

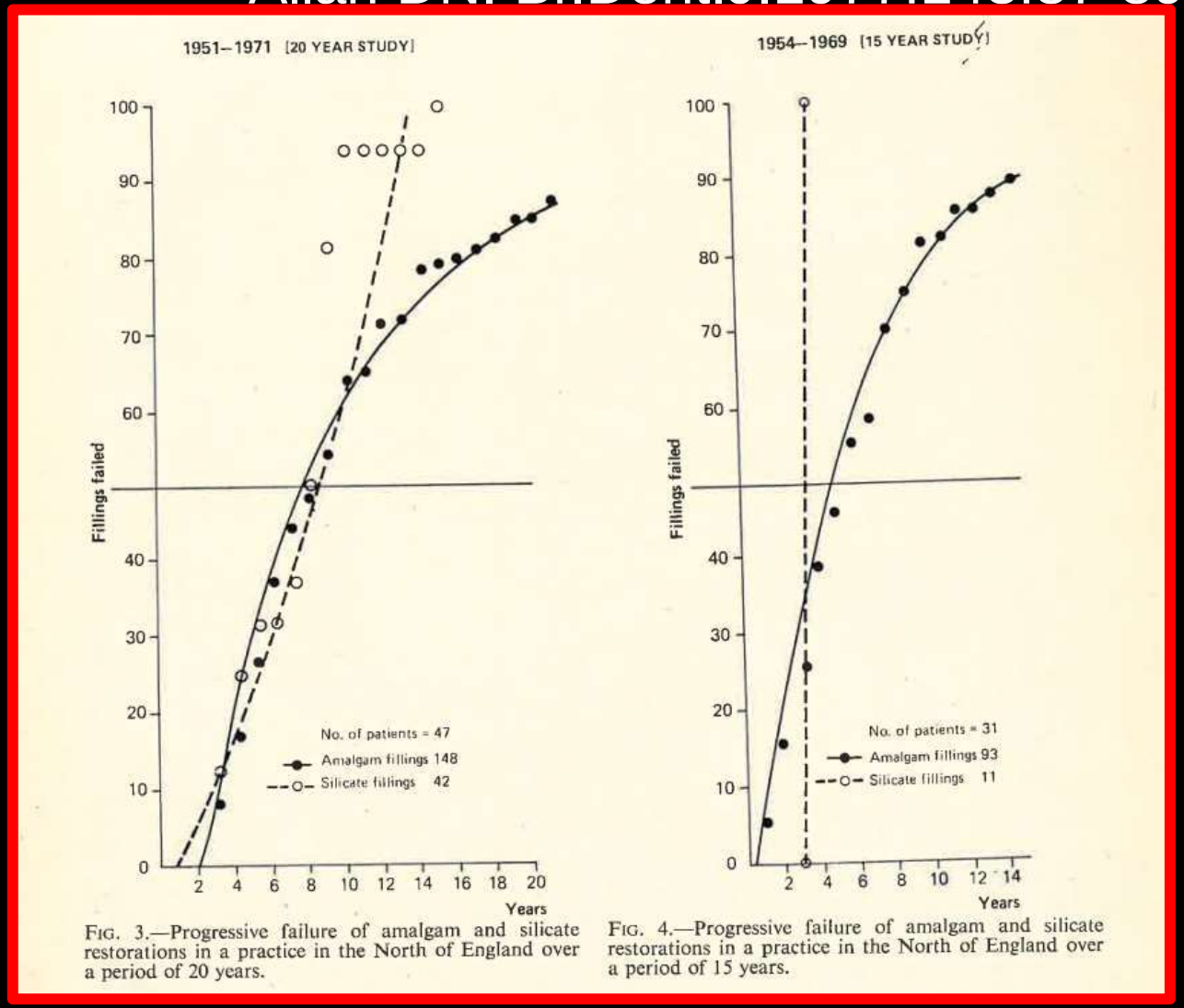


FIG. 3.—Progressive failure of amalgam and silicate restorations in a practice in the North of England over a period of 20 years.

FIG. 4.—Progressive failure of amalgam and silicate restorations in a practice in the North of England over a period of 15 years.

A longitudinal study of dental restorations

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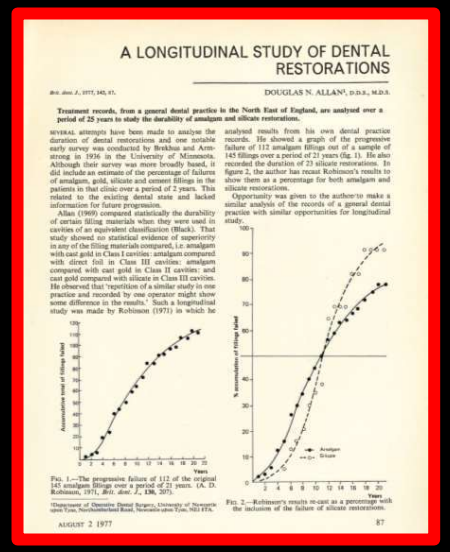

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Opportunity was given to the author to make a similar analysis of the records of a general dental practice with similar opportunities for longitudinal study.

Years

Amalgam
Silicate

AUGUST 2 1977

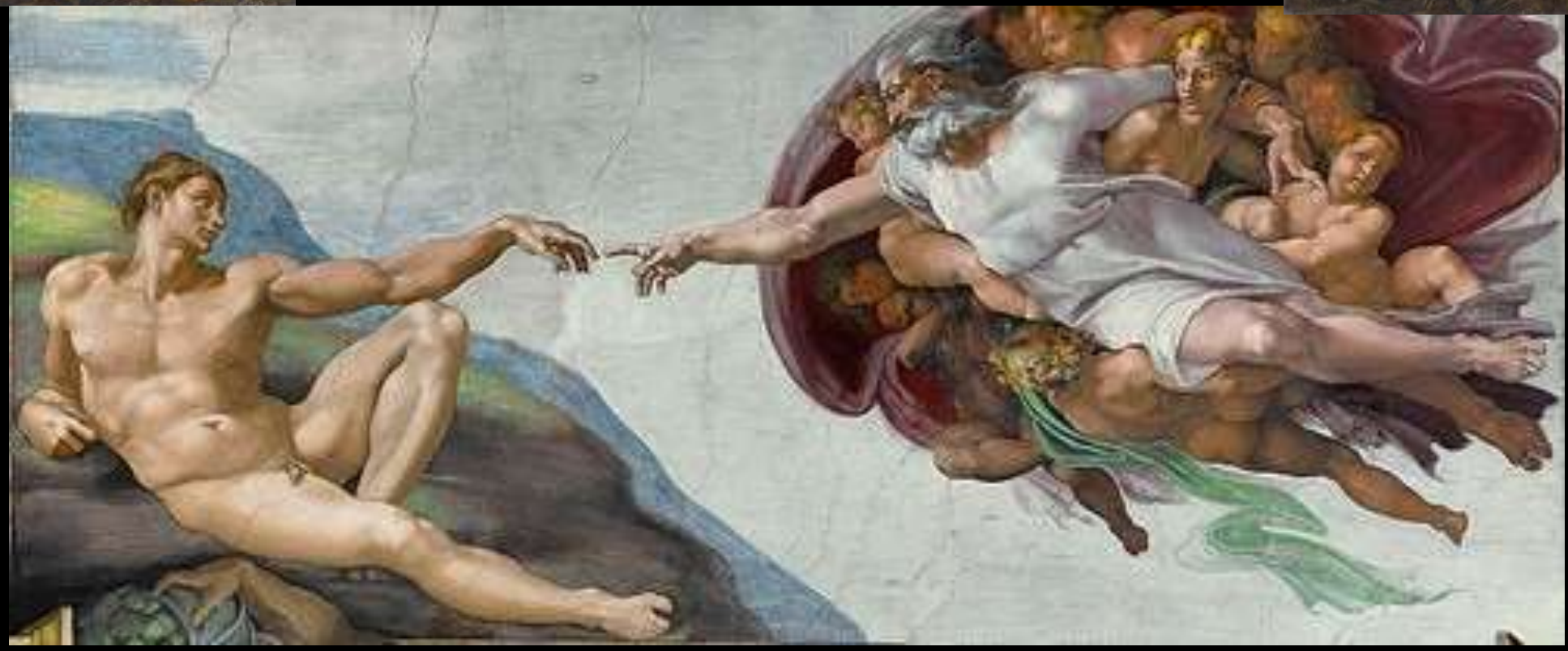
87

Results

The results for the 20-year survey commencing in 1951 are shown in figure 3 and for the 15-year survey are shown in figure 4. In figure 3, half the amalgam restorations are lost in 8 years and nearly 90 per cent are lost in 20 years. With silicate, half of the restorations are lost in 8 years but nearly all are lost in 14 years. In figure 4 half the amalgam restorations are lost in 5 years and 90 per cent are lost in 15 years. The numbers of silicate fillings are small but all fail in 4 years.

"A filling was deemed to have failed because it was replaced"

Onwards and upwards



Assessing
restorations
on a
scientific
basis

United States Public Health
Service [USPHS] criteria

ASSESSMENT OF PERFORMANCE – CLINICAL CRITERIA

- Anatomic form.
- Marginal adaptation.
- Marginal discolouration.
- Gingival condition.
- Colour match.
- Surface roughness.
- Interproximal contact.
- Temperature sensitivity.
- Secondary caries.

There is a need
for scientifically-
based evaluation of
longevity of restorations
in dental practices

Large scale administrative databases

Gilthorpe MS et al. Community Dent.Health.2002:19:3-11.

Community Dental Health (2002) **19**, 3–11
Received 31 August 2000; Accepted 24 April 2001

Multilevel survival analysis of amalgam restorations amongst RAF personnel

Mark S. Gilthorpe[1], Martin T. Mayhew[2] and John S. Bulman[3]

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Objective To introduce the concepts of multilevel survival analysis through an investigation into the longevity of amalgam restorations. ***Basic research design*** The multilevel Cox proportional hazard model is illustrated using amalgam restoration data comprising three levels: repeated restorations at level-1, teeth at level-2, and subjects at level-3. The outcome was duration of amalgam restoration survival. Single-level and multilevel Cox methods are contrasted. ***Participants*** The data were from a survey of amalgam restorations (reported elsewhere), involving 200 RAF personnel aged between 16 and 37 years at enlistment between 1947 and 1979, having served continuously for a minimum of 16 years prior to 1994. ***Results*** Differences existed between single-level and multilevel methods, the latter being the method of choice. Initial caries experience was a good predictor of longevity. Molar teeth fared worse than pre-molars and MOD & B, MOD & L, and MOD & BL restorations experienced considerably greater risk of failure than did MOD, MO, DO and MO/DO out types, which in turn fared worse than occlusal restorations. Root treated and pinned teeth also experienced an elevated risk of premature failure. There was a moderate but significant increase in restoration failure amongst subjects who were seen by more dentists throughout their service. ***Conclusions*** The application of multilevel modelling to survival analysis provides an appropriate and powerful solution to the problem of lack of independence amongst dental restorations. It is beneficial that studies undertake a multilevel analysis in preference to ignoring hierarchy or omitting swathes of information in order to perform a single-level analysis.

Key words: dental public health; hierarchical linear models; multilevel modelling; survival analysis.

Introduction

This article forms part of a series which introduces multilevel modelling (MLM) to dental research (Gilthorpe and Cunningham, 2000; Gilthorpe *et al.*, 2000; 2000a; 2000b; 2001; Lewsey *et al.*, 2000; 2001; Maddick and Gilthorpe, 2000;). This particular study was concerned with the longevity of amalgam restorations amongst subjects with several restored teeth, some of which will have undergone repeated restoration. The analysis seeks to determine which factors affect overall survival. To address this research question properly, certain methodological issues need to be considered. The problem that arises in this and similar studies is that hitherto standard statistical techniques fail to deal with the clustered nature of the study data, i.e. the grouping of successive restorations within the same tooth and multiple teeth nested within the same subject. Natural hierarchy requires special attention because the observations of interest are not strictly independent, a property required by most statistical procedures. In this instance, restored teeth and their successive restorations share a common environment within each subject; hence the assumption of independence is violated.

Wong and Day (1989) intimated that the current use of life tables is incorrect as teeth or restorations, and not the person, are taken as the experimental unit. They went on to reanalyse their results using a restoration randomly selected from each patient in the study and achieved a 13% increase in longevity compared to the non-independent study. However, they encountered a greatly increased standard error due to the decrease in sample size. Osborn (1987) questioned the independence of observations in clinical periodontal research, concluding that any strategy that examined only the sites of disease and ignored the patients should not be used, as this tactic assumed that all patients were the same, a most unlikely situation in practice. Bulman and Osborn (1989) later stated that a statistical analysis of dental disease using teeth as the units would be invalid because teeth are not independent units.

Dental research data often exhibit inherent hierarchy (Macfarlane and Worthington, 1999). Previously, the issue of data hierarchy has either been overlooked or else worked around (e.g. selecting only one restoration per subject). The first of these options is in error and the second suffers from the loss of data and a commensurate reduction in statistical power, as well as potential bias from inappropriate sub-sample selection. This article introduces the more sophisticated methodology of MLM, with which clustered survival data may be analysed. MLM can be used in any number of instances where the research data are inherently hierarchical (Goldstein, 1995), overcoming the constraint that observations are not independent. Within this study, a multilevel extension of Cox's proportional hazards model (Cox, 1972) was adopted

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Gilthorpe et al. analysed amalgam restorations in 200 RAF personnel at 16 yrs.

4,712 restorations in 200 subjects (24 restorations per subject!)

Cox Regression models used

Higher risk of failure associated with molars compared with premolars, large restorations *cf* small, presence of root fillings or pins.

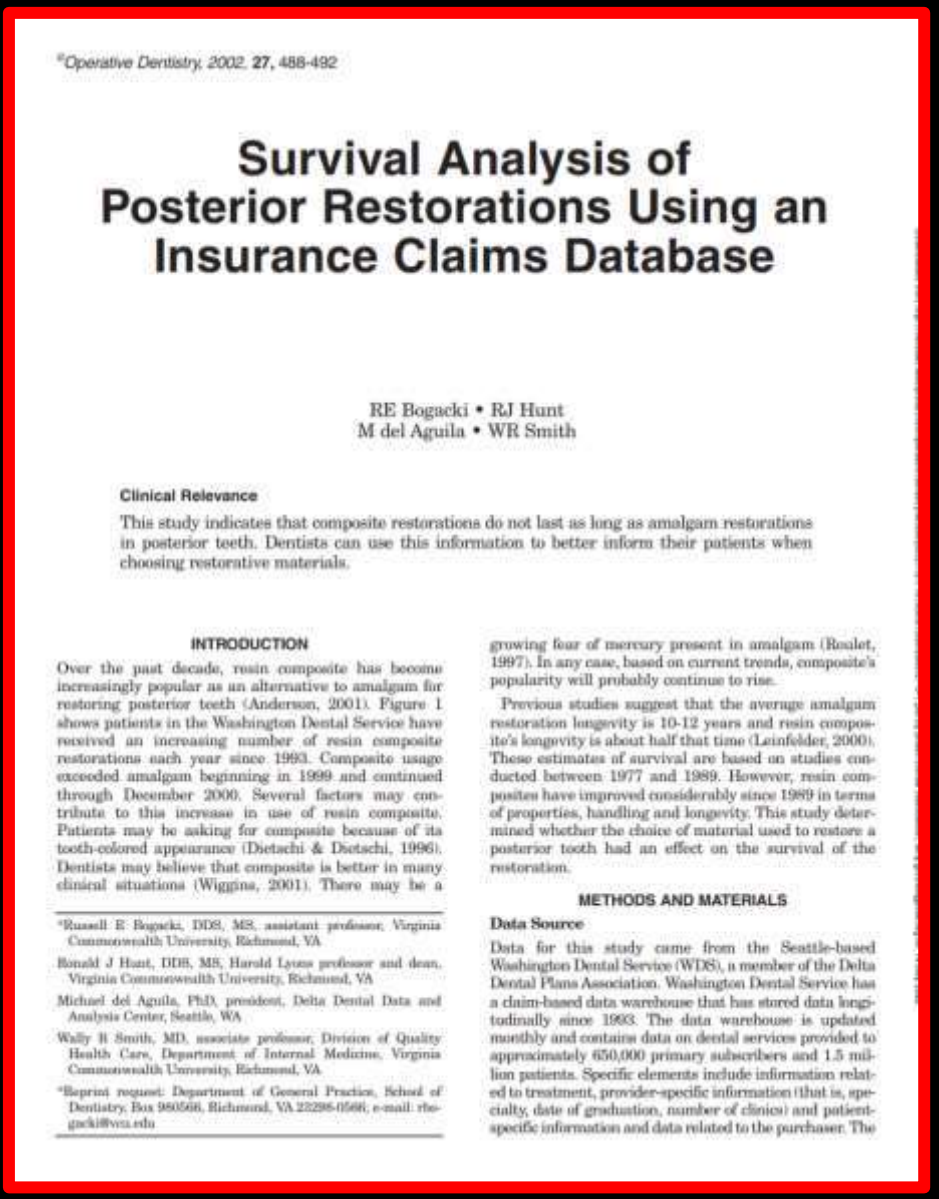
Patients who had seen different dentists had more restoration failures.

Patients with high DMFT subsequently experienced increased risk of failure.

Successive restorations fare worse than previous ones.

Large scale administrative databases

Bogacki RE et al. Oper Dent.2002:27:488-492



*Operative Dentistry, 2002, 27, 488-492

Survival Analysis of Posterior Restorations Using an Insurance Claims Database

RE Bogacki • RJ Hunt
M del Aguila • WR Smith

Clinical Relevance

This study indicates that composite restorations do not last as long as amalgam restorations in posterior teeth. Dentists can use this information to better inform their patients when choosing restorative materials.

INTRODUCTION

Over the past decade, resin composite has become increasingly popular as an alternative to amalgam for restoring posterior teeth (Anderson, 2001). Figure 1 shows patients in the Washington Dental Service have received an increasing number of resin composite restorations each year since 1993. Composite usage exceeded amalgam beginning in 1999 and continued through December 2000. Several factors may contribute to this increase in use of resin composite. Patients may be asking for composite because of its tooth-colored appearance (Dietschi & Dietschi, 1996). Dentists may believe that composite is better in many clinical situations (Wiggins, 2001). There may be a growing fear of mercury present in amalgam (Roulet, 1997). In any case, based on current trends, composite's popularity will probably continue to rise.

Previous studies suggest that the average amalgam restoration longevity is 10-12 years and resin composite's longevity is about half that time (Leinfelder, 2000). These estimates of survival are based on studies conducted between 1977 and 1989. However, resin composites have improved considerably since 1989 in terms of properties, handling and longevity. This study determined whether the choice of material used to restore a posterior tooth had an effect on the survival of the restoration.

METHODS AND MATERIALS

Data Source

Data for this study came from the Seattle-based Washington Dental Service (WDS), a member of the Delta Dental Plans Association. Washington Dental Service has a claim-based data warehouse that has stored data longitudinally since 1993. The data warehouse is updated monthly and contains data on dental services provided to approximately 650,000 primary subscribers and 1.5 million patients. Specific elements include information related to treatment, provider-specific information (that is, specialty, date of graduation, number of clinics) and patient-specific information and data related to the purchaser. The

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Michael del Aguila, PhD, president, Delta Dental Data and Analysis Center, Seattle, WA

Wally R Smith, MD, associate professor, Division of Quality Health Care, Department of Internal Medicine, Virginia Commonwealth University, Richmond, VA

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Analysis of data from the Washington State Dental Service: Records of 1.5 million patients

Cohort study of patients who received a multisurface amalgam or composite restoration between 1993 and 1999.

Failure defined as failure of the restoration.

300,753 patients, 207,558 (68%) amalgam restorations, 93,195 (31%) composite restorations. Observed for 36 – 44 months.

Survival analysis of posterior restorations using an insurance claims database.

Bogacki et al.,Oper Dent.2002:27:488-492

- Data from Washington Dental Service
- Updated monthly, 1.5m patients
- Cohort study of patients who received a multisurface amalgam or composite restoration between 1993 and 1999
- Restorations followed for at least 6 months
- Failure defined as replacement of restoration
- 300,753 patients, 207,558 (68%) amalgam restorations, 93,195 (31%) composite restorations
- Observed for 36 – 44 months

Survival analysis of posterior restorations using an insurance claims database.

Bogacki et al.,Oper Dent.2002:27:488-492

- Hazard ratio for restoration type was 1.164 (95% CI 1.118 - 1.212)
- Patients with a composite restoration had a 16.4% greater chance of restoration failure at any given time than if they had an amalgam
- Amalgam survives significantly longer
- Hazard ratio for restoration type/change of dentist was 1.058 (95% CI 1.014 – 1.103)
- Lesser chance of failure of composite restoration when the patient attends a different dentist

Survival analysis of posterior restorations using an insurance claims database.

Bogacki et al.,Oper Dent.2002:27:488-492

- Limitation of insurance claims data is the lack of control over experimental conditions
- No control of material, no control over how the material was used, no control over when the restoration was deemed a failure
- These limitations may be considered weaknesses, but are strengths because they represent real-world dentistry
- *“These data represent the true complexity of what occurs daily in dental offices”*

Large practice/research databses

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Longevity of direct restorations in Dutch dental practices. Descriptive study out of a practice based research network

Mark Laske*, Niek J.M. Opdam, Ewald M. Bronkhorst, Jozé C.C. Braspenning, Marie Charlotte D.N.J.M Huysmans

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ABSTRACT

Objectives: The aim of this retrospective practice-based study was to investigate the longevity of direct restorations placed by a group of general dental practitioners (GDPs) and to explore the effect of practice/operator, patient, and tooth/restoration related factors on restoration survival.

Methods: Electronic Patient Files of 24 general dental practices were used for collecting the data for this study. From the patient files, longevity of 359,548 composite, amalgam, glass-ionomer and compomer placed in 75,556 patients by 67 GDPs between 1996 and 2011 were analyzed. Survival was calculated from Kaplan-Meier statistics.

Results: A wide variation in annual failure rate (AFR) exists between the different dental practices varying between 2.3% and 7.9%. Restorations in elderly people (65 years and older, AFR 6.9%) showed a shorter

Laske M et al. Longevity of Class II restorations placed in Dutch general dental practices. IADR Boston, 2015, Abstract 1937

Electronic patient files from 24 dental practices

358,548 restorations in 75,556 patients, 67 gdps

AFR varied between 2.3% and 7.9%, mean 4.6% @10 years

Restorations in molars had higher AFR

AFR of composites was 4.4%, amalgam 5.1%, and GI 11.1%

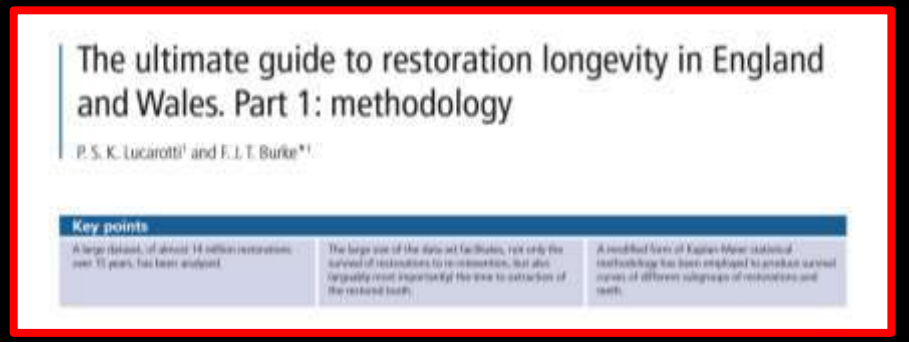
- 10 year failure rate was 3.8%, but varied between practices (2% to 5%)
- Composite showed higher survival than amalgam
- Age of patient, gender, number of surfaces, operator, tooth type and endodontically treated teeth significantly influenced survival.

Laske M et al. Longevity of Class II restorations placed in Dutch general dental practices. J.Dent.2016:46:12-17.

Surely groups of dentists in the UK (e.g. Denplan, large corporates etc.) could use this work as a model of what they could do?

Laske M et al. Longevity of Class II restorations placed in Dutch general dental practices. J.Dent.2016:46:12-17.

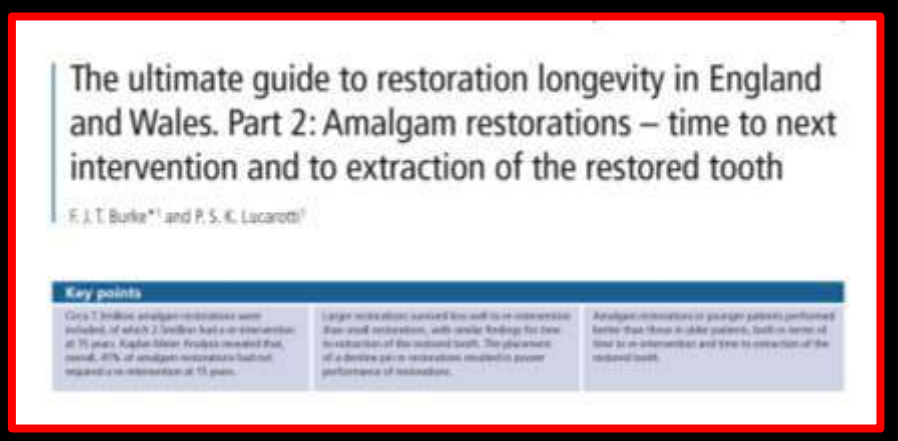
13 million restorations followed for 16 years
BDJ, series of 10 papers, 2018



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

P. S. K. Lucarotti[1] and F. J. T. Burke*[1]

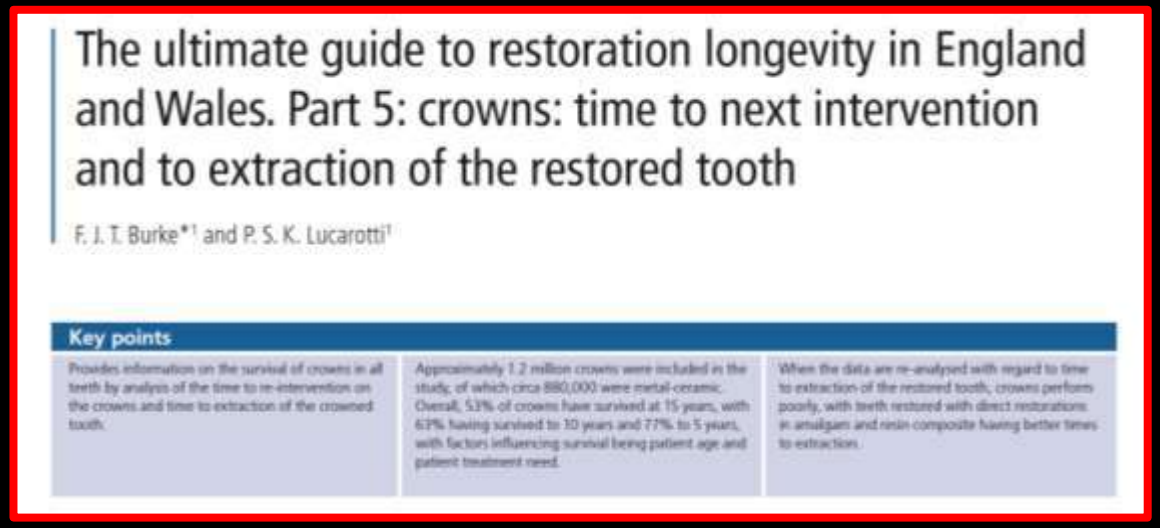
Key points



The ultimate guide to restoration longevity in England and Wales. Part 2: Amalgam restorations – time to next intervention and to extraction of the restored tooth

F. J. T. Burke*[1] and P. S. K. Lucarotti[1]

Key points



The ultimate guide to restoration longevity in England and Wales. Part 5: crowns: time to next intervention and to extraction of the restored tooth

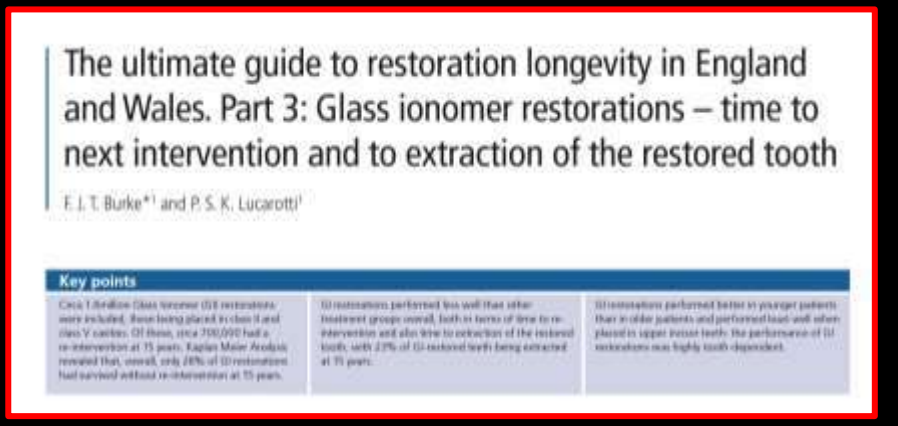
F. J. T. Burke*[1] and P. S. K. Lucarotti[1]

Key points

Provides information on the survival of crowns in all teeth by analysis of the time to re-intervention on the crowns and time to extraction of the crowned tooth.

Approximately 1.2 million crowns were included in the study, of which circa 880,000 were metal-ceramic. Overall, 53% of crowns have survived at 15 years, with 63% having survived to 10 years and 77% to 5 years, with factors influencing survival being patient age and patient treatment need.

When the data are re-analysed with regard to time to extraction of the restored tooth, crowns perform poorly, with teeth restored with direct restorations in amalgam and resin composite having better times to extraction.



The ultimate guide to restoration longevity in England and Wales. Part 3: Glass ionomer restorations – time to next intervention and to extraction of the restored tooth

F. J. T. Burke*[1] and P. S. K. Lucarotti[1]

Key points

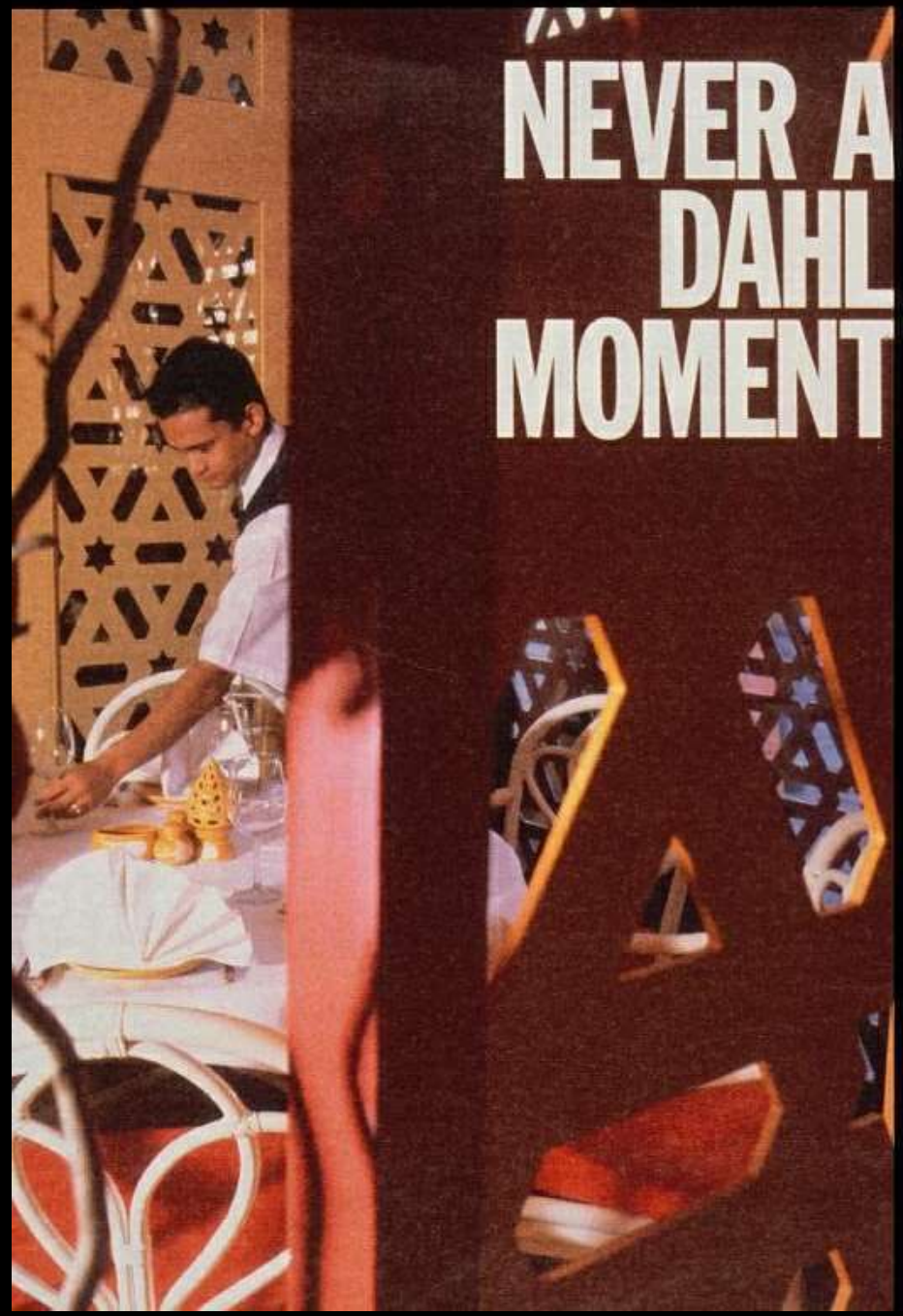
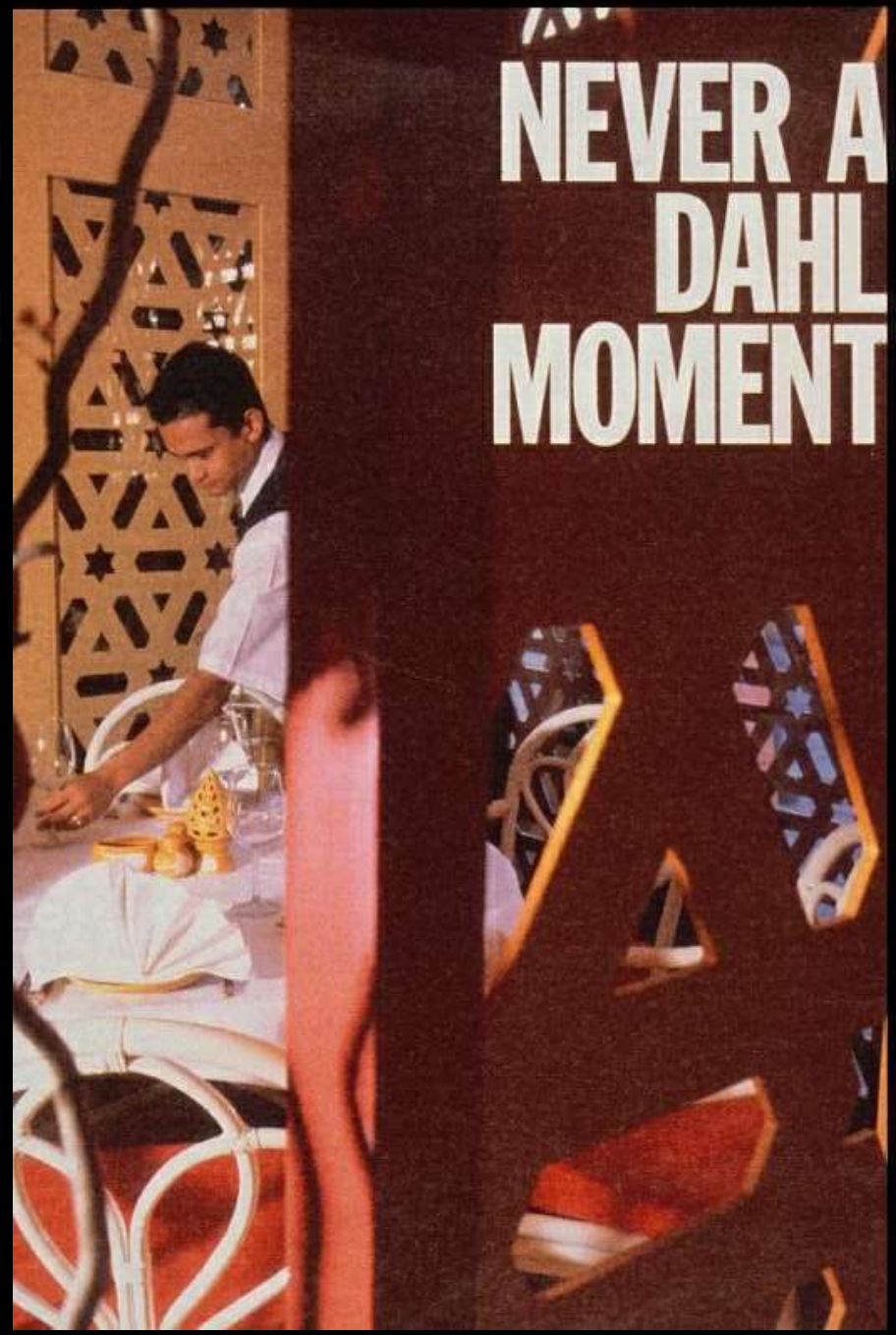
Using “evidence” for the benefit of patients

Treating tooth wear in the dental dark ages

1996

Treatment of tooth wear using extreme tooth wear by a turbine drill!

Using levels of “evidence”


NEVER A
DAHL
MOMENT

NEVER A
DAHL
MOMENT

“Dahl” appliance (cemented)

2.5mm thick, is used for obtaining space for restorative materials on palatal of anterior teeth where posterior teeth are satisfactory

- First types were removable
- Later types cemented to teeth and removed when space obtained

An alternative treatment in cases with advanced localised attrition.

Dahl BL, Krogstad O, Karlsen K. J.Oral Rehabil.1975:2:209-214.

"In an effort to avoid capping a great number of teeth, with its many jeopardising consequences, a technique has been developed by which the necessary space for the crown material has been obtained by orthodontic measures".

An alternative treatment in cases with advanced localised attrition.

Dahl BL, Krogstad O, Karlsen K. J.Oral Rehabil.1975:2:209-214.

“Male aged 18 years. Pink hue from underlying pulp apparent. Casts mounted on a Dentatus articulator.

Removable CoCr splint, approx 2mm thick fitted to cover the palatal surfaces of the upper front teeth

Patient instructed to wear the splint day and night.

Tantalum needles implanted near the midline of the basal portions of the upper & lower jaws”.

An alternative treatment in cases with advanced localised attrition.

Dahl BL, Krogstad O, Karlsen K. J.Oral Rehabil.1975:2:209-214

"Lateral head plate radiographs taken after 2, 5 and 8 months.

After 4 weeks a space could clearly be observed between the upper and lower incisors when the splint was removed

The heavily worn palatal surfaces of the upper incisors were protected by means of gold pinlays.

The patient did not complain of any discomfort".

The effect of a partial bite raising splint on the occlusal face height

An x-ray cephalometric study in human adults

BJØRN L. DAHL & OLAF KROGSTAD

Departments of Prosthetic Dentistry and Orthodontics, Dental Faculty, University of Oslo, Oslo, Norway

Dahl, B.L. & Krogstad, O. The effect of a partial bite raising splint on the occlusal face height. An x-ray cephalometric study in human adults. *Acta Odontol. Scand.* 1982, 40, 17 – 24

20 patients (18 – 50 years) with pathological attrition of upper and/or lower anterior teeth were treated, as a temporary measure, by means of a partial chrome-cobalt splint covering the palatal surfaces of the six upper front teeth. Tantalum implants to provide reference points were placed in the basal portion of upper and lower jaw bones. Lateral cephalometric radiographs were taken *with* and *without* the splint at the beginning of treatment and thereafter every two months till the difference between measurements was as small as possible. Changes in the occlusal face height were evaluated. Measurement reliability proved to be very high. Continuous use of the splint caused intrusion of the front teeth and eruption of the others in all patients. The intrusion was on an average 1.05 mm and the eruption 1.47 mm after 6 – 14 months, indicating a possible potential for tooth eruption in human adults. More eruption than intrusion appeared to take place in the youngest age groups. Sexual differences could not be established. Use of the splint did not cause the common symptoms of mandibular dysfunction. Lisping was the most serious complaint.

Key-words: Oral rehabilitation; attrition; intrusion and eruption

Bjørn L. Dahl, Department of Prosthetic Dentistry, Dental Faculty, Box 1109, Blindern, Oslo 3, Norway

The work of Thompson (19) on the rest position of the mandible served for many years as a base for the understanding of the vertical dimensions of the face. Permanent alterations in the occlusal face height have been warned against (8). It has been demonstrated, however, that the postural face height alters as a response to alterations in the occlusal face height (5, 9, 18). Thompson & Kendrick (20) have maintained that the adult occlusal face height increases with age in modern man. It has been speculated that this phenomenon is a result of continuous tooth eruption which is larger than a concomitant attrition caused by normal chewing since modern foods cause hardly any wear of the teeth (1). Nevertheless, pathological tooth wear is often observed in today's people, mainly as a result of muscular hyperactivity (13). A method of treating such cases using a partial bite raising splint has been described (7). This type of treatment could be regarded as an experiment to study the balance of forces influencing the vertical dimensions of the face.

Received for publication, December 11, 1980

eruption of human teeth. The use of such a splint both day and night caused only short and transient discomfort for the wearer. This observation indicates that an increase of the occlusal face height, if necessary, is well tolerated in most cases.

20 patients treated

Dahl, B.L. & Krogstad, O. The effect of a partial bite raising splint on the occlusal face height. An x-ray cephalometric study in human adults. *Acta Odontol. Scand.* 1982, 40, 17 – 24

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Key-words: Oral rehabilitation; attrition; intrusion and eruption

Bjørn L. Dahl, Department of Prosthetic Dentistry, Dental Faculty, Box 1109, Blindern, Oslo 3, Norway

The Dahl appliance: how it worked

Eruption	60% of cases
Intrusion	35% of cases
Intrusion/eruption	5% of cases

There is no reason to fear that moderate changes in OVD should cause muscle dysfunction problems provided that the occlusion is properly managed.

Dahl et al 1993

Clinical experience has shown that increases in OVD necessary to accomodate material thickness of 1.5 - 2.0 mm in either jaw are well tolerated.

Dahl et al 1993

Dahl appliance

- First types were removable
- Later types cemented to teeth and removed once anterior space had been gained
- Today, we use the permanent restoration to gain the space

A *Dental Update* first

Durbar UR, Hemmings KW. Treatment of localised anterior toothwear with composite restorations at an increased occlusal vertical dimension. Dent.Update.1997:**24**:72-75.

Treatment of Localized Anterior Toothwear with Composite Restorations at an Increased Occlusal Vertical Dimension

U.R. Darbar and K.W. Hemmings

RESTORATIVE DENTISTRY

First, Patient consent: they must read a Patient Information Leaflet

Information sheet for patients receiving resin composite restorations for treatment of tooth wear

Your anterior teeth will receive adhesive resin composite restorations to cover the exposed dentine and prevent it from wearing further: this is the principal reason for treatment

An improvement in appearance of your teeth will be effected if possible

You will not be able to chew on your back teeth for a period of 3 to 6 months, and you

cut your food into small pieces to avoid intestinal

Your back teeth will

The

Your

Your

you will be unsure exactly where to place your jaw to get tooth to tooth contact: however, you should become accustomed to your new “bite” after a few days

The procedure will normally be carried out without the need for local anaesthesia as there will be no, or minimal, need for tooth reduction.

If you have crowns, bridges or a denture in the posterior part of your mouth, it is likely that these will require replacement.

Regarding the longevity of the restorations:

The reliability of the restorations should be good, but that there was a small potential for restorations to de-bond, since bonding, albeit better than 15 years ago, was still not as good as dentists might wish.

The margins of the restorat

Occasionally, chipping of th

Burke FJT. Information for Patients Undergoing with Resin Composite Restorations Placed at an Increased Occlusal Vertical Dimension. Dent. Update 2014:41:28-38.

Available as a Word document on my web site

A small % of restorations debond

If treatment of tooth wear is new to you, start with a case like this

Bonding composite to worn teeth

Do the restorations last?

Ten years from the first publication, results from early published research

CONCLUSIONS from Poyser et al.

"Direct composite restorations have distinct biological advantages compared with crowns, and for the majority of patients they perform well, offer a **high degree of patient satisfaction** & require an **acceptable level of maintenance.** Patient accomodation to the technique was good. **No detrimental effect on TMJ, periodontal or pulpal health. Bulk fracture and failure were uncommon.**"

J.Oral Rehabil.2007:34:361-376.

Similar results from…

Hemmings KW, Darbar UR, Vaughan S.
Tooth wear treated with direct composite restorations at increased vertical dimension: Results at 30 months.
J.Prosthet.Dent.2000:83:28 . 7-293.

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Treatment of TW in Liverpool

Journal of Dentistry 44 (2016) 13–19

Contents lists available at ScienceDirect

Journal of Dentistry

journal homepage: www.intl.elsevierhealth.com/journals/jden

The survival of direct composite restorations in the management of severe tooth wear including attrition and erosion: A prospective 8-year study

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ARTICLE INFO

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Keywords:
Composite survival
Tooth wear
Attrition

ABSTRACT

Objectives: Survival of directly placed composite to restore worn teeth has been reported in studies with small sample sizes, short observation periods and different materials. This study aimed to estimate survival for a hybrid composite placed by one clinician up to 8-years follow-up.
Methods: All patients were referred and recruited for a prospective observational cohort study. One composite was used; Spectrum® (DentsplyDeTrey). Most restorations were placed on the maxillary anterior teeth using a Dahl approach.
Results: A total of 1010 direct composites were placed in 164 patients. Mean follow-up time was 33.8 months (s.d. 27.7). 71 of 1010 restorations failed during follow-up. The estimated failure rate in the

Journal of Dentistry

Composites placed in maxillary anterior teeth
using the “Dahl approach”
1010 restorations, 164 patients
Follow up time was 34 months

71 of the 1010 restorations failed
More failures in the lower arch, in older patients, patients with lack of posterior support and patients with class III occlusion

DISCUSSION

"Dental dam was not used, isolation with cotton rolls was adequate"

"The proportion of failures was greater in the attrition group (27.3%) was higher than in the erosion group (21.2%)"

"High load, whether in cases bruxers or cases with lack of posterior support, is likely to reduce survival"

CONCLUSIONS

“On an average follow up time of 33 months, only 71 of 1010 restorations failed.
Directly placed composite restorations are a viable treatment modality to restore the worn dentition”

Most recently!

Journal of Dentistry 112 (2021) 103743

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Journal of Dentistry

journal homepage: www.elsevier.com/locate/jdent

Clinical performance of direct composite resin restorations in a full mouth rehabilitation for patients with severe tooth wear: 5.5-year results.

Shamir B. Mehta [a,b,*,#], Verônica P. Lima [a,c,#], Ewald M. Bronkhorst [a], Luuk Crins [a], Hilde Bronkhorst [a], Niek J.M. Opdam [a], Marie-Charlotte D.N.J.M. Huysmans [a], Bas A. C. Loomans [a]

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ARTICLE INFO

Keywords:
Severe tooth wear
Restorative treatment
Tooth wear
Composite resin restorations
Survival
Clinical study
Interventions
Increase vertical dimension of occlusion

ABSTRACT

Objectives: To evaluate the 5.5-year performance of direct resin composite restorations, prescribed for patients with severe tooth wear, requiring full-mouth rehabilitation.

Methods: A convenience sample of 34 patients were recruited to a prospective trial between December 2010 and June 2013. The participants were provided 1269 full-mouth direct resin composite restorations (Clearfil AP-X) by 5 experienced operators, using the DSO-technique. Treatment resulted in an increase in the vertical dimension of occlusion (VDO). Failure was assessed at three levels. Frequencies of failure were analysed using Kaplan Meier survival curves and the effects of the relevant variables calculated with a multifactorial Cox regression ($p < 0.05$).

Results: Annual failure rates (for all levels of failure, 'Level 3-') of ≤ 2.2% and ≤ 2.9% were respectively reported for the anterior and posterior restorations with a mean observation time of 62.4 months. The completion of an anterior restoration with the need for further appointments resulted in significantly more Level 2- & 3- failures. An evaluation of the performance of the premolar and posterior maxillary restorations showed significantly lowered risks of certain types of failures, compared to the molar and posterior mandibular restorations.

Conclusions: At 5.5 years, 2.3% of the overall restorations displayed catastrophic, (Level 1) failures. Molar

34 patients, 1,269 full mouth direct *anterior* and *posterior* composite restorations, 5 operators.
5.5 year performance

Conclusions: At 5.5 years, 2.3% of the overall restorations displayed catastrophic, (Level 1) failures. Molar restorations, posterior mandibular restorations and the anterior restorations requiring two further sessions for completion, were associated with significantly higher risks for failure.

Clinical significance: Direct resin composite can offer an acceptable medium-term option for the treatment of severe, generalized tooth wear; molar restorations may require higher maintenance.

So, as the years went by, the level of evidence has improved: now we have systematic reviews

Best treatment for worn teeth?

Journal of Dentistry 48 (2016) 9–15

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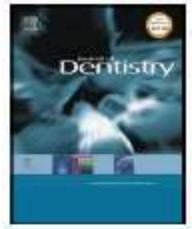
journal homepage: www.intl.elsevierhealth.com/journals/jden



Review article

Rehabilitation of severely worn teeth: A systematic review

Mauro Elias Mesko[a], Rafael Sarkis-Onofre[a], Maximiliano Sérgio Cenci[a], Niek Johannes Opdam[b], Bas Loomans[b], Tatiana Pereira-Cenci[a,*]

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ARTICLE INFO

Article history:
Received 18 September 2015
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Keywords:
Systematic review
Direct composite
Indirect composite
Severe tooth wear
Clinical studies

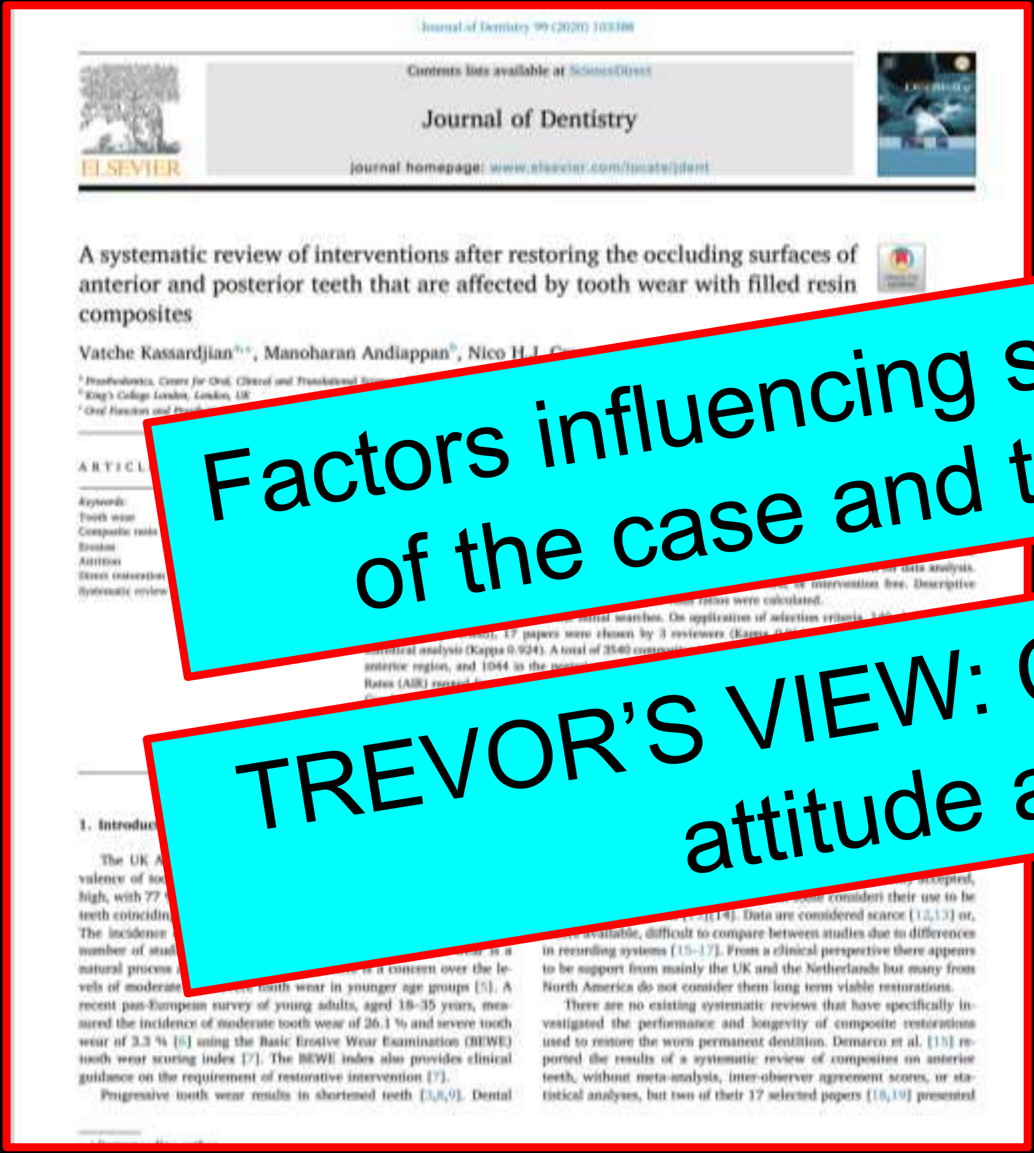
ABSTRACT

Objectives: The aim of this systematic review was to evaluate the treatment performance/longevity of dental materials/techniques indicated to restore teeth with severe wear.
Materials and methods: A systematic literature search was conducted to select retrospective studies (cohort and case series) and prospective studies that evaluated or compared techniques/materials to restore teeth with severe wear. A search was conducted in Medline (via Pubmed – June 2015) with no limits for publication year or language to identify clinical studies. Two reviewers independently selected studies, extracted data and assessed the risk of bias of randomized controlled trials included. The annual failure rate (AFR%) of restorations was calculated for each study.
Results: A total of 511 articles were found and 23 studies were eligible for full-text analysis; hand search included 7 more papers. From the 30 studies, 12 were eligible for the review. Most of these studies presented good performance of the restorations in teeth with severe wear. AFR ranged from 0.4% (microhybrid) to 26.3% (microfilled) for direct resin composite, 0% to 14.9% for indirect resin composite and 2.7% for porcelain veneers.
Conclusion: There is no strong evidence to suggest that any material is better than another. Direct or indirect materials may be feasible options to restore severely worn teeth.

Best treatment for worn teeth?

Considering this, rehabilitation with direct resin composites is undoubtedly more conservative than tooth preparations for partial or full indirect restorations and the limited data shows that this choice offers good clinical results and satisfied patients [17,18,28]. In the past, the rationale for treating patients with severe tooth wear was a full mouth rehabilitation with cast metal crowns [6] but the absence of well-designed clinical studies showing the performance of this technique for the rehabilitation of severe wear [6,40], combined with high cost and invasive technique, justifies to qualify this approach as less favorable.

The most recent systematic review


Journal of Dentistry 99 (2020) 103388

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ELSEVIER

A systematic review of interventions after restoring the occluding surfaces of anterior and posterior teeth that are affected by tooth wear with filled resin composites

Vatche Kassardjian[a,*], Manoharan Andiappan[b], Nico H.J. C

Keywords:
Tooth wear
Composite resin
Erosion
Attrition
Direct restoration
Systematic review

1. Introduction

1,683 papers, 17 selecte

Factors influencing success could be the complexity of the case and the degree of erosion/attrition

TREVOR'S VIEW: Could the operator's ability and attitude also be an influence?

remain a viable
ption to treat tooth wear but the outcome varies. Patients appreciate that some maintenance may be needed.

Take home message

Resin composite restorations may provide a minimal intervention and predictable treatment for (moderate) tooth wear, particularly in anterior teeth, ***provided that the correct materials are employed.***

European Consensus Statement

Severe Tooth Wear: European Consensus Statement on Management Guidelines

Bas Loomans[a] / Niek Opdam[b] / Thomas Attin[c] / David Bartlett[d] / Daniel Edelhoff[e] / Roland Frankenberger[f] / Goran Benic[g] / Simon Ramseyer[h] / Peter Wetselaar[i] / Bernadette Sterenborg[j] / Reinhard Hickel[k] / Ulla Pallesen[l] / Shamir Mehta[m] / Subir Banerji[n] / Adrian Lussi[o] / Naim Wilson[p]

Summary: This paper presents European expert consensus guidelines on the management of severe tooth wear. It focuses on the definition of physiological vs pathological tooth wear and recommends diagnosis, prevention, counseling, and monitoring aimed at elucidating the etiology, nature, rate and means of controlling pathological tooth wear. Management decisions are multifactorial, depending principally on the severity and effects of the wear and the wishes of the patient. Restorative intervention is typically best delayed as long as possible. When such intervention is indicated and agreed upon with the patient, a conservative, minimally invasive approach is recommended, complemented by supportive preventive measures. Examples of adhesive, minimum-intervention management protocols are presented.

Keywords: tooth wear, decision making, restorative treatment, direct, indirect.

J Adhes Dent 2017; 19: 111-119
doi: 10.3290/j.jad.a38152

Submitted for publication: 22.02.17; accepted for publication: 23.03.17

Tooth wear and its management currently pose new challenges in dentistry.[22] As predicted, tooth wear is increasingly common, especially among children and adolescents.[7,35] Epidemiological studies have reported the estimated prevalence of erosive wear of permanent teeth in children and adolescents to be 30%.[6,38] "Severe tooth wear", a condition variously defined in the literature,[47] has been found to be present in 25% of a population of 15-year-old adolescents.[12] Another report on severe tooth wear reported the prevalence to be 3% of 20-year-olds with dentin exposure and 15% of 70-year-old patients.[46] A recent survey among the Dutch adult population revealed that mild to moderate tooth wear is a common condition with prevalence and extent increasing with age.[48] Some patients exhibiting severe tooth wear may belong to a special risk group, for instance, those who exhibit reflux-related symp

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Loomans et al

Baseline

Immediately after treatment

After six months

Immediately after treatment

After six months

Fig 3 Treatment of patient with partial severe tooth wear. A Dahl plateau was placed with direct composite resin restorations. Immediately after treatment, the posterior teeth were in disclusion. After six months, extrusion of posterior teeth and intrusion of anterior occurred and all teeth were in occlusion again. Patient treated by Dr. Ulla Pallensen.

The "Dahl Plateau"

European Consensus Statement

Severe Tooth Wear: European Consensus Statement on Management Guidelines

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Guidelines for the treatment of patients with severe tooth wear

- Priority should be given to the diagnosis of the etiology of the wear and instigating appropriate preventive measures.
- Patients with moderate or severe tooth wear but without (functional or esthetical) complaints should be advised to monitor the situation first to determine whether the tooth wear is progressive or not.
- Restorative treatment should be as conservative as possible, employing minimally invasive treatment strategies according to a dynamic restorative treatment concept.
- Direct and indirect minimally invasive techniques can be employed using adhesive materials. Traditional, invasive restorations remain an option in selected cases and under certain circumstances.
- Explanation of the possible treatment options and expected complications should be included in the informed consent.

In the past, there wasn't much evidence

Now, we are surrounded by it!

… but some choose to ignore it!

When all you have is a hammer….

Fig 3g Appearance after cementation of the crowns.

Fig 3h Periapical radiographs of implants after 7 years of follow-up.

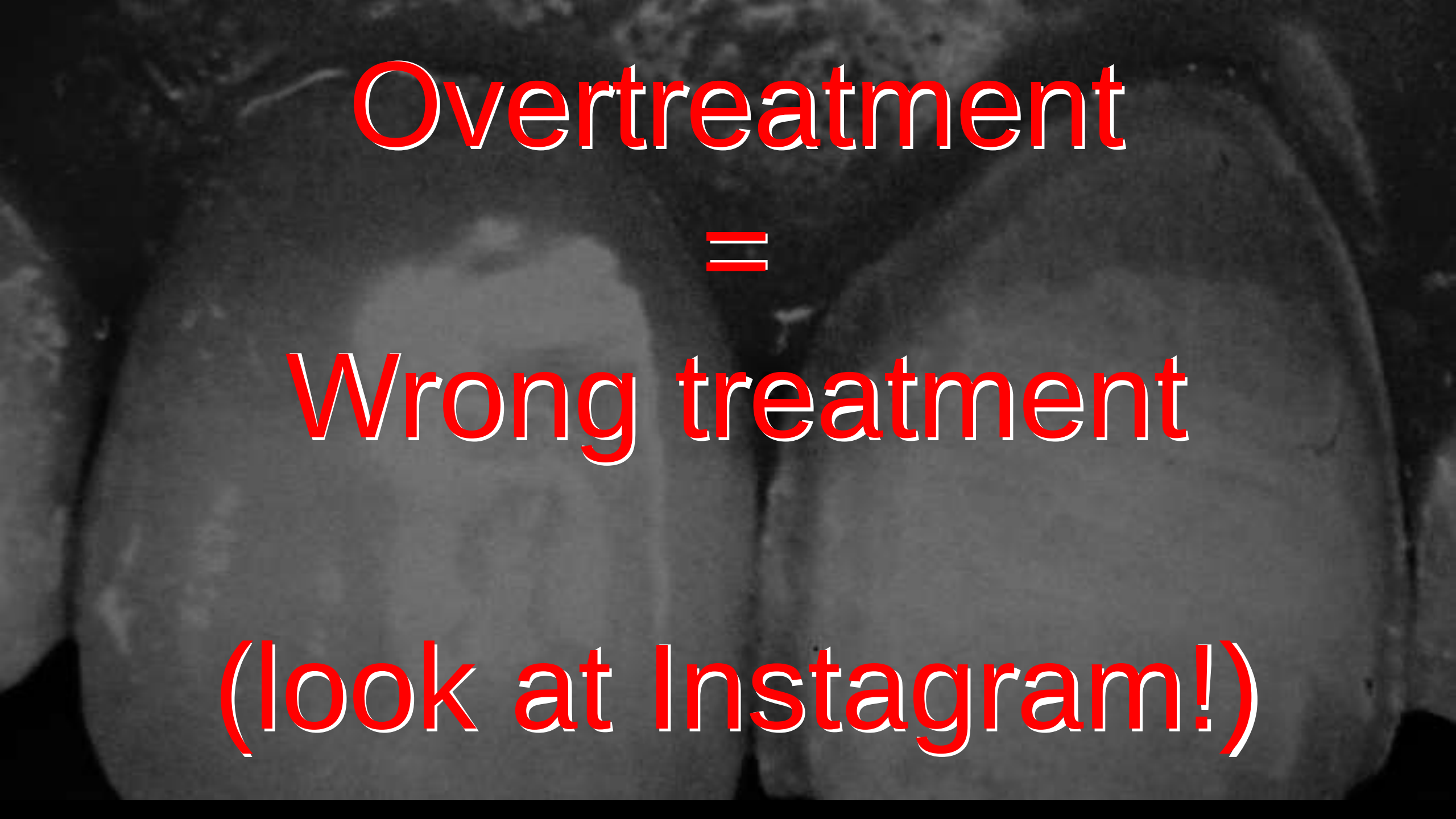
In a young patient, surely two resin retained bridges would be the first solution

What I plan to talk about

- Defining evidence
- Evidence needs of different stakeholders
- Measuring survival of dental restorations and factors influencing restoration survival
- A brief Kaplan Meier statistical analysis lesson
- Narcissistic attitudes to “evidence”
- Ignoring the evidence (at one’s peril?)

The biggest threat to dentistry in 2024 and beyond?

Dentists
who are only
in it for the money

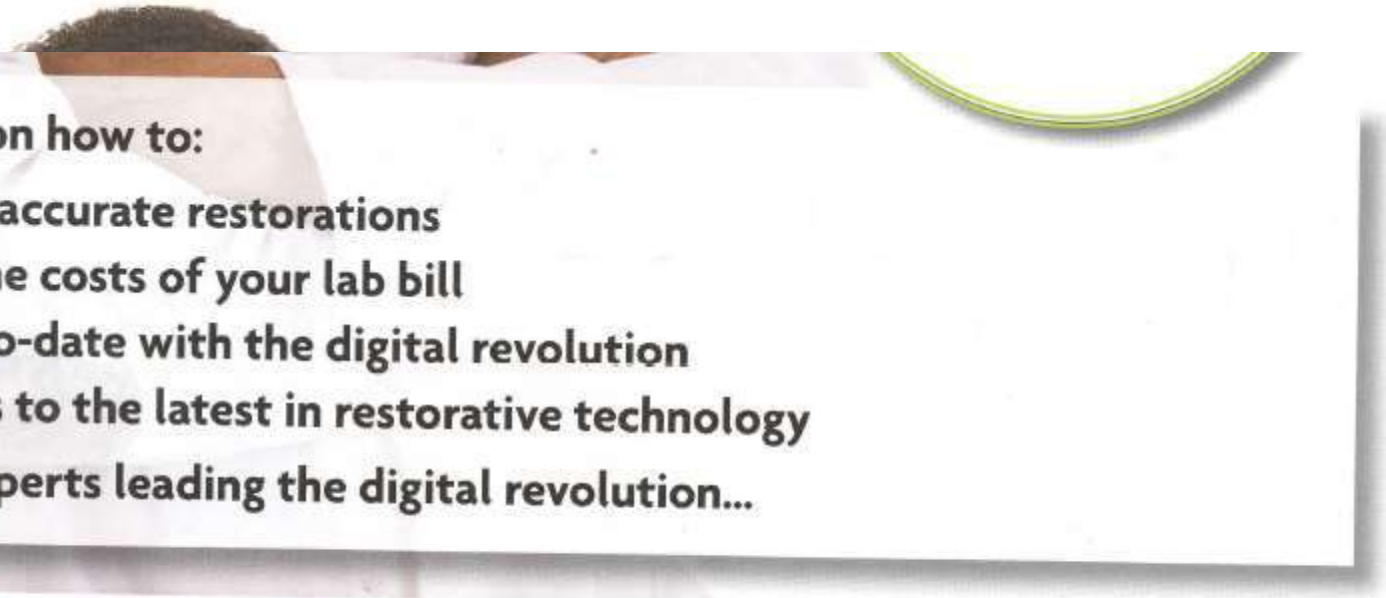

Overtreatment
=
Wrong treatment
(look at Instagram!)

Focus on CADCAM

Dentistry

Dentistry.co.uk

Spring 2012



Your guide on how to:

- **Get more accurate restorations**
- **Control the costs of your lab bill**
- **Keep up-to-date with the digital revolution**
- **Get access to the latest in restorative technology**

Meet the experts leading the digital revolution...

SUPPORTED BY AN EDUCATIONAL GRANT FROM STRAUMANN

Aesthetic Midline Re-alignment using CADCAM Technology & Straumann Zerion

Dental technicians Nigel Fordham and Martyn Lewis, and clinician Shahzhad Naseem, present a case using Straumann® CARES® CADCAM.

Initial Presentation

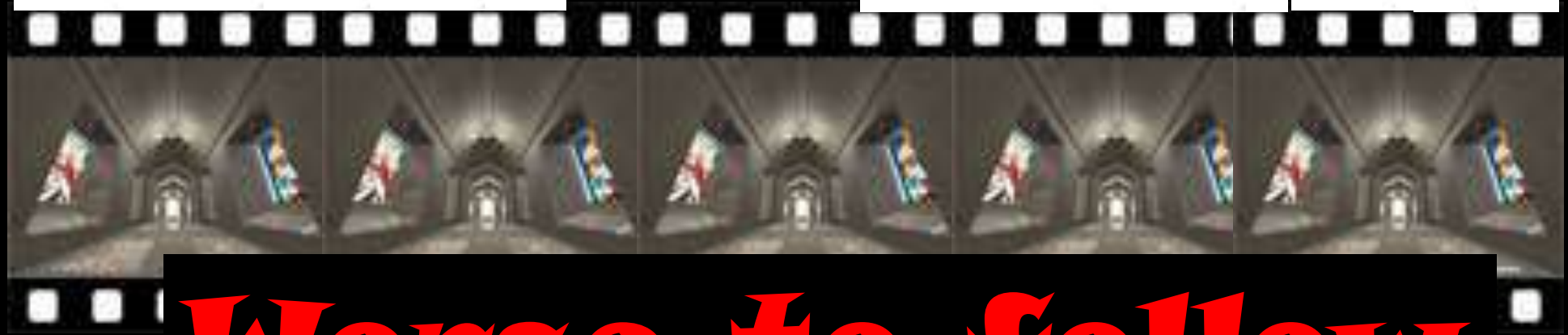
A female in her mid-twenties presented us with a reluctance to smile because of the arrangement, shape and colour of her anterior teeth. She also had a history of orthodontic treatment several years ago involving extraction of her upper right canine without replacement, which meant the teeth were drifting. Clinical examination revealed good oral hygiene, with no periodontal issues, median diastema, canted midline towards right

Figure 1

Figure 2

Destructive Dentistry

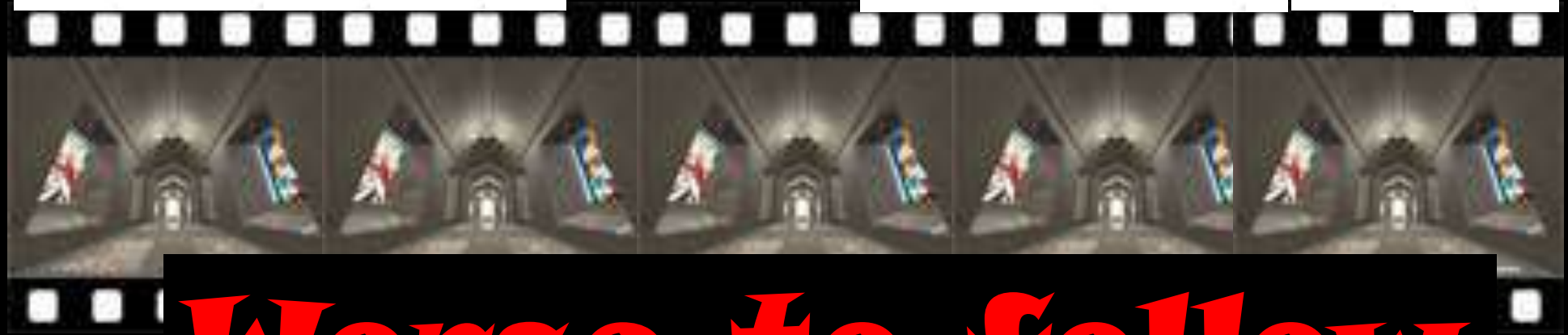
HALL OF $HAME



Worse to follow

Destructive Dentistry

HALL OF $HAME



Worse to follow

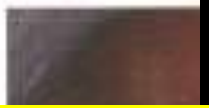
Figure 6

Figure 7

Laboratory Procedure

Impressions of the prepared anteriors were sent to the laboratory and models were cast-up using type 4 dental stone. The models were trimmed and prepared (Fig 4) ready to be scanned on our Straumann CADCAM es2 Scanner. CADCAM technology was used to fabricate both the veneers UR1 & 5, UL1, 2, 3 & 4 and the bridge UR2-UR4 all in ZERION (Zirconium) Straumann's ZERION is an extremely strong Zirconium (1300mpa) and therefore is ideal in this indication when the laboratory need

Figure 6



PROBLEM:Zirconia is not indicated for veneers because of its poor adhesive bond capability

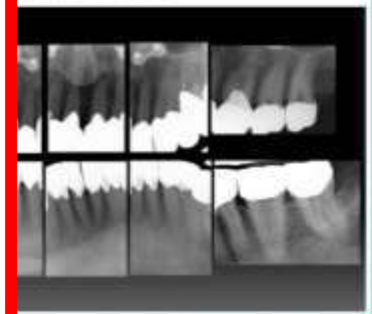
BDJ PERSPECTIVES

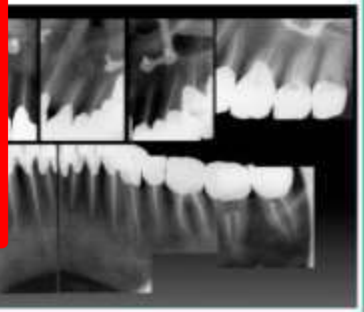
Treatment abroad

PERSPECTIVE

How do we manage the a
maximally invasive cosm
treatment? Addressing th
and ethical dilemmas fac
teams following extensiv
treatment elsewhere

BDJ PERSPECTIVES





NOT

in fact carried out in Turkey but in the heart of London (Figures 1, 2, 3 and 4). The patient's motivation appears to be social media image-driven. The clinician's motivation unfortunately appears to be mainly financial in many cases.

The main issue is one of irreversible and extensive destruction of mostly healthy teeth

Koray Feran

References

PERSPECTIVE

How do we manage the
maximally invasive cosm
treatment? Addressing t
and ethical dilemmas fa
teams following extensi
treatment elsewhere

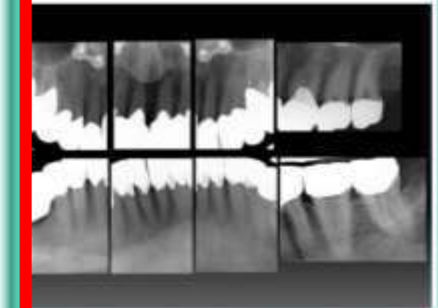
rapid loss of restorations due to decementation or decoronation of teeth, alterations in occlusion, or dissatisfaction with the aesthetics of the final work. The loss of teeth over time is also accelerated following endodontic, periodontal and structural complications of such 'restorative' work.

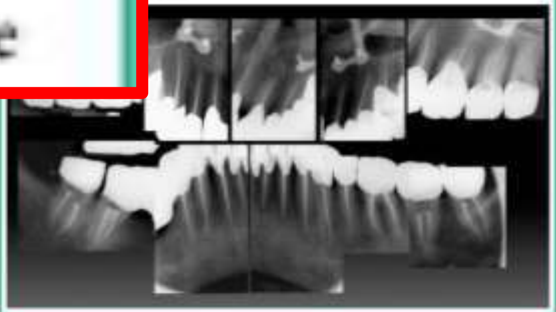
When this dentistry is carried out by a tourism arrangement, any complications often end up in the lap of UK clinician, unfamiliar with what lies underneath the extensive crowns and bridges which are often linked together in multiple units.

What is the solution?

Education is key. The dental profession must make patients more aware of the irreversible damage that can be done to their teeth and the biologic and financial repercussions of ill-considered 'treatment'.

Every patient should have a proper, sympathetic consultation to make them aware of the current situation in their mouth. We owe a duty of care





patients recourse to claim against such work or the potential cost of litigation for both sides.

There will be a steady flow of patients requiring extensive rehabilitation in the future because of these dental interventions and we need to be prepared to do what is necessary to give patients the quality of life that our profession should be providing for them.

References

KEY WORDS

Design, digital, digital dentistry, esthetic, smile

LEARNING OBJECTIVES

- To discuss the technique of smile design using common software programs
- To familiarise readers with treatment planning using PowerPoint

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VOL. 13 NO. 1 SPRING 2024

More!

AESTHETIC TREATMENT PLANNING SIMPLIFIED USING DIGITAL SMILE DESIGN: A CASE REPORT

expensive software or major investment to implement. This paper presents a technique of smile designing which is solely carried out using generic software programs such as Photoshop (Adobe, San Jose, CA, USA) and PowerPoint (Microsoft, Redmond, WA, USA), which are user friendly and cost effective.

Figure 1: Pre-operative smile: (a) facial view; (b) mesio-distal tooth inclination; (c) labiolingual tooth inclination

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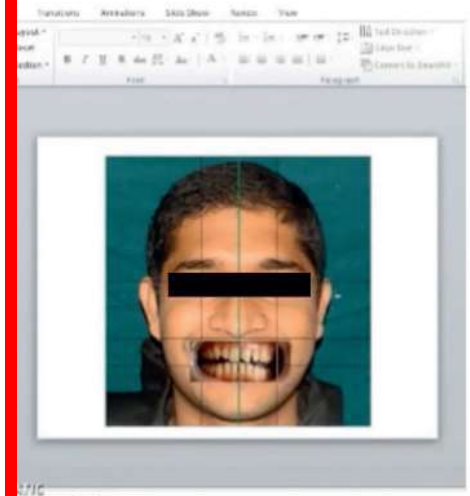

zontal and vertical reference lines marked using line tool

This photograph was
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connecting the zeniths of the maxillary canines and another vertical line passing through the dental midline. This assists in duplicating the cross, that is, the reference interpupillary and facial midline in the intraoral view. The current photo was replaced with a new photograph of the retracted smile and was oriented using these reference lines.

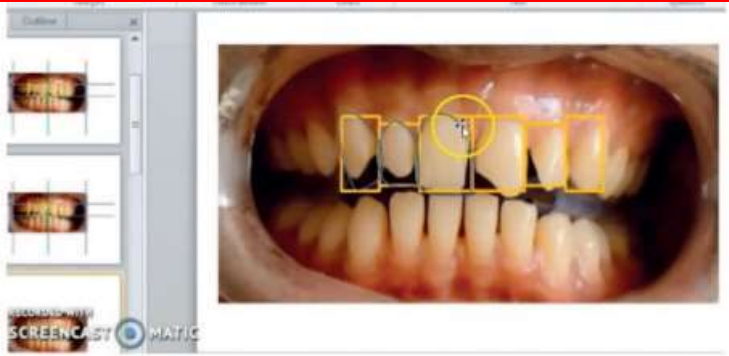


Figure 3: Rectangular shape tool to determine ideal recurring aesthetic dental (RAD) proportions

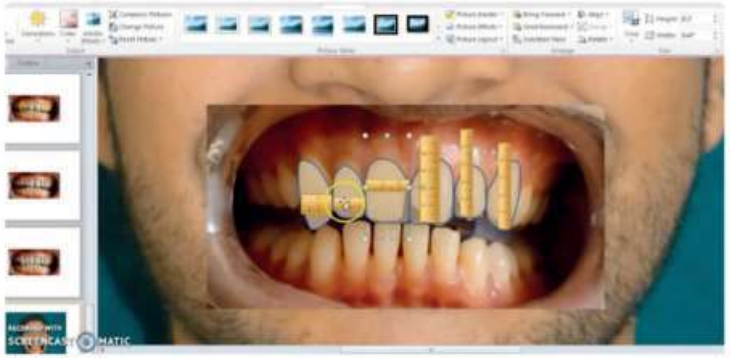


Figure 4: Digital ruler calibrated

Figure 5: Teeth prepared using the mockup as a guide

AESTHETIC TREATMENT PLANNING SIMPLIFIED USING DIGITAL SMILE DESIGN: A CASE REPORT

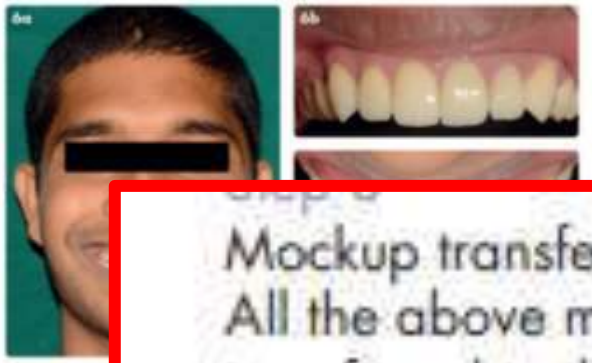
Switzerland) crowns and veneers were bonded in the conventional manner. Follow up was done at two weeks and six months (Figure 6).

Discussion

This technique illustrates a method by which clinicians can objectively overcome some of the obstacles associated with providing predictable aesthetics, in consultation with the patient. Digital imaging and designing can help a patient visualise the expected outcome before treatment begins, thus enhancing the predictability of the treatment by eliminating the communication barrier.[1,5] In their study, Cervino et al.[1] concluded that DSD aids the clinician and patient in the treatment planning, as well as the aesthetic and functional rehabilitation of the patient due to the "communicative" nature of the software. However, for digital planning to be precise, the photography protocol followed should be accurate.[3]

DSD also plays a crucial role in psychologically improving the patient's attitude towards treatment as it involves the patient in the designing process.[6] Patients can also compare and evaluate the pre- and post-treatment changes. It also leaves lesser scope for regret post-treatment where the irreversible procedures cannot be undone and can therefore have important medico-legal implications.

Various tooth proportions in relation to the length and breadth (62–80%) of teeth have been documented[4] and these can be used as a template for smile design. The selection of an ideal proportion also depends on arch shape



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Mockup transfer and treatment planning: All the above measurements were then transferred to the cast for a diagnostic wax up. The treatment plan involved intentional root canal therapy (RCT) for upper left central incisor (UL1) and upper left lateral incisors (UL2), followed by full crowns. Veneers were planned for upper right central incisor (UR1), upper right lateral incisor (UR2), upper right canine (UR3), and upper left canine (UL3). RCT was completed and mockup transfer was carried out with the help of a silicone index (Aquasil®, Dentsply Caulk,

UGH!

Digital success story: Feldspar ceramics in the aesthetic zone

Bárbara Calero shows how the tried and tested feldspar ceramic impressively enriches the material portfolio of a laboratory for the digital workflow

Bárbara Calero
Dental technician, Málaga, Spain

For some, the developments in digital dentistry and dental technology seem to have come out of nowhere. For several years now, new technologies and materials have been pervasive. But the first CAD/CAM material, Vitablocs (Vita Zahnfabrik, Bad Säckingen, Germany), already has a 35-year success story. A time when fine-structure feldspar ceramics have not only been scientifically established as the gold standard worldwide (Labban et al, 2021) but also clinically as reliable (Morimoto et al, 2016), (Otto, 2017), (Morimoto et al, 2016) and highly aesthetic (Kurbad,

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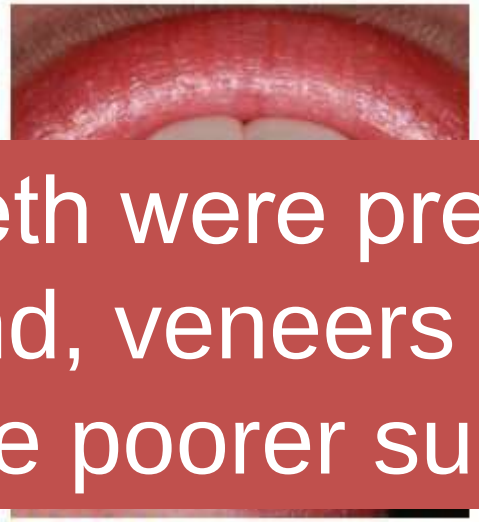
Fig. 1: The physiological rest position

Fig. 2: The incisal edges harmonise with the line of the lower lip



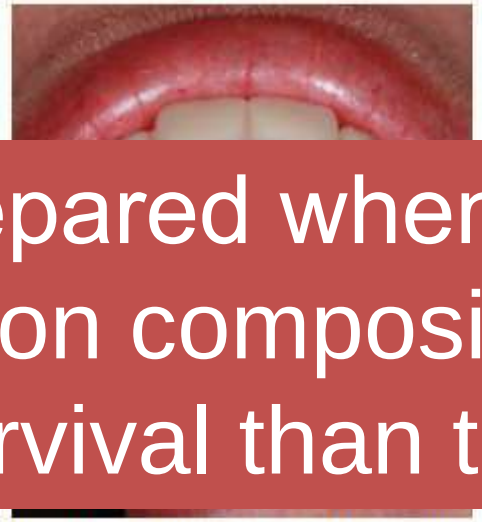


Fig. 3 to 6: Initial condition, integrated mock-up, functional control with protrusion, functional control with laterotrusion

Initial clinical situation

A patient presented in the dental practice because

SUMMARY
Digital workflow may be the way ahead but the wrong treatment is still the wrong treatment

Four teeth were prepared when they didn't need it, and, veneers on composite restorations have poorer survival than those on enamel

More digital design, …..but still the wrong treatment

The power of digital workflows in smile rehabilitation

A clinical case by Styleitaliano community member **Mark Bowes**

Modern smile rehabilitation has been made more predictable with digital workflows. The main objective is to achieve a result that is in harmony with the face and is minimally invasive. The understanding of function is key to longevity in each case. The new digital approach will provide precise planning allowing dentistry to be fully guided. A new generation of monolithic materials for direct and indirect restorations have amazing physical and optical properties, added to this the libraries of natural teeth allow dentists to achieve superior results that can focus on aesthetics, function and biology.

The issues associated with this case included failed composite restorations, the need to close spaces, and the request to improve colour (Figure 1). It is essential to remember the patient's main complaint was to improve his smile, so the case needs to be facially driven in order to achieve the ideal result. Treatment planning needs to start with the face.

When analysing the face it is important to realise that the smile is dynamic. We require a series of photos or possibly a video (Figure 2). This will allow correct decisions regarding, central incisor edge position, tooth proportion, and most importantly the required smile curve. An ideal smile curve should follow the curvature of the lower lip.

Start with 2D

Digital Smile Design (DSD) should be the starting point of all smile rehabilitations (Figure 3). The process of orofacial analysis usually involves mathematical rules and straight lines, however, it is evident that in many cases facial asymmetries exist, so the understanding of how rather develop smiles that are in harmony with the face and not symmetrical is vital. Facial flow concept suggested by Bruno Perera and Christian Coachman, utilises landmarks, glabella, the tip of the nose, the philtrum, and the centre of the chin we can see our patient has a slight deviation/flow to the right. Understanding how this affects the treatment will allow us to get aesthetic results that are more organic and balanced as the teeth, gums, and face work together. The smile frame will then determine the central incisal edge position, ideal tooth proportions, and the smile curve. With the help of libraries of natural teeth and artificial intelligence, it is possible to choose teeth that will provide ideal facial harmony.

Figure 1: Worn dentition with old composite restorations

Figure 2: Smile dynamics

Figure 3: 2D facial analysis for smile design

Figure 4: Digital smile design

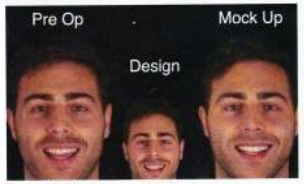


Figure 5: Time zero and mock-up

Figure 6: Dentition before veneer restoration

Figure 7: Mock-up for veneer rehabilitation

Figure 8: Mock-up guided tooth preparation

Figure 9: Mock-up guided tooth preparation

Figure 10: Silicone stent for controlled preparation

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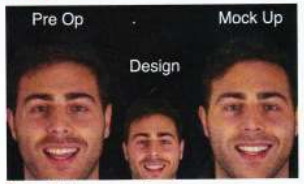

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Figure 11: Identifying substrate colour

Figure 12: Digital impression without and with chord

Figure 13: Double digital impression with and without chord

Figure 14: Digital wax up of canines

Figures 15 and 16: Injection moulding of canine veneers

Figure 17: Split dam isolation

Figure 18: Before and after veneer rehabilitation

Figure 19: Final pictures of veneer rehabilitation

Figure 20: Result after veneer rehabilitation

Nice result, but at what loss of sound tooth substance

Figure 17: Split dam isolation

Figure 18: Before and after veneer rehabilitation

Figure 19: Final pictures of veneer rehabilitation

Figure 20: Result after veneer rehabilitation

The power of digital workflows in smile rehabilitation

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Mark Bowes
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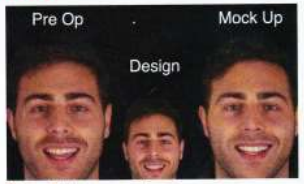

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Wrong title!

The power of digital workflows in tooth butchery

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Mark Bowes
Styleitaliano community member

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Restorative dentistry

Wilful blindness about dental damage

Sir, 'wilful blindness' involves consciously avoiding the truth as a means of avoiding self-incrimination. In the case recently published,[1] that meant overlooking the destruction undertaken for multiple monolithic full crowns, based on some quaint faith in ceramic restorations guaranteeing tooth longevity. It is a bizarre belief that ceramic, of any type, is better than remaining beautiful sound tooth structure.

It is disputable that the outcome achieved here compensated adequately for the harm caused by this unprovoked drill attack, which was not 'minimally invasive', as asserted,[1] but instead caused dental damage to intimates (Fig. 1 and Fig. 2). The real argument here focuses on elective dental destruction for full ceramic crowns versus sound tooth preservation.

'Biobrians'[2] do not claim that composite is a 'permanent' solution for managing moderate wear, but multiple studies have shown that it 'satisfices' (ie is sufficient to satisfy) for many reasonable patients, while leaving them all of their remaining invaluable tooth structure, with a much better fallback position than the one

References

1. Hassall D. The use of the monolithic ceramic and direct monolithic composite in the aesthetic rehabilitation of tooth wear. *Br Dent J* 2023; **234**: 406–412.
2. Hassall D. Early failure of traditional composites in tooth wear. *Br Dent J* 2024; **236**: 186.

https://doi.org/10.1038/s41415-024-7628-9

Valid consent?

Sir, I refer to the recent exchange between Drs Hothi[1] and Hassall[2] and specifically Dr Hassall's surprisingly aggressive defence of his elective destruction of sound tooth structure in exchange for the alleged durability of monolithic zirconia full crowns. This immediately raised several important concerns in my mind which will be more readily understood by reference to Figures 1, 2 and 3 (as above) from the original article on which Dr Hothi was commenting.[1]

I was troubled to note that Dr Hassall reveals an alarming lack of understanding of what a 'full consent process' [sic] involves. Firstly, the patient has a right to choose a treatment approach that Dr Hassall personally disapproves of (and of which he is so haughtily dismissive). Secondly, so strongly advocating a single treatment approach (to the obvious

Were he to be brave enough (or rash enough) to describe this extensive tooth destruction to the patient as being 'minimally invasive', it would be deliberately misleading and totally undermine the validity of the consent process. Furthermore, it would be likely to be regarded as being in breach of the GDC's professional conduct guidance as described in 'Standards for the dental team'.

Additionally, despite Dr Hassall's somewhat dismissive assertions, the validity of the findings of the 2002 research by Edelhoff and Sorensen is not in the least undermined by the passage of time, nor by the fact that it was a laboratory-based study. Indeed, it is particularly ironic that Dr Hassall should 'rubbish' it on that basis; the unnecessary and unjustified removal of sound, healthy tooth tissue *in vivo* would not receive ethical approval either then, or now, and so it was entirely appropriate that this landmark and much-quoted study was laboratory-based.

In his indecent haste to purvey the alleged benefits of 'contemporary' materials and techniques that he so ardently promotes, Dr Hassall overlooks the fact that the sound and healthy tooth tissue removed is gone forever.

Fig. 1 Figure 17 of the original paper. Reproduced with permission from D. Hassall, 'The use of the monolithic ceramic and direct monolithic composite in the aesthetic rehabilitation of tooth wear', *Br Dent J* 2023; **234**: 406–412

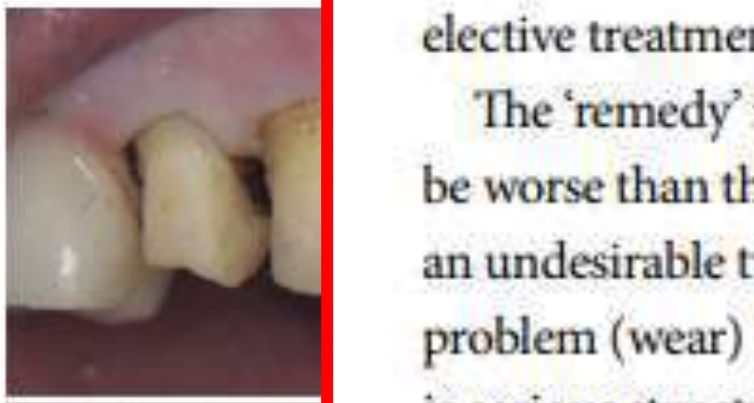

Fig. 2 Figure 23 of the
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monolithic ceramic an
in the aesthetic rehab
J 2023; **234**: 406–412

The Hippocratic Oath exhorts clinicians to 'Firstly do no harm', but Figures 1, 2 and 3 reveal the blindingly obvious harm done to those worn but healthy teeth.[1] The much less-quoted final exhortation in the Hippocratic Oath is 'Extreme remedies should be reserved for extreme diseases'. Most biologically aware dentists would not consider the wear shown in this case as an extreme disease, but that the elective treatment chosen bordered on extreme.

The 'remedy' illustrated here appears to be worse than the 'disease' and produced an undesirable two-for-one swap, with one problem (wear) being swapped for two others; ie serious structural damage and dentistogenic gingival inflammation.

G. Hothi, London, UK

I was troubled to note that Dr Hassall reveals an alarming lack of understanding of what a 'full consent process' [sic] involves. Firstly, the patient has a right to choose a treatment approach that Dr Hassall personally disapproves of (and of which he is so haughtily dismissive). Secondly, so strongly advocating a single treatment approach (to the obvious exclusion of all other options) simply because it happens to be the clinician's preferred approach, flies in the face of the UK Supreme Court's judgement in the Montgomery case. Such a consent is simply not valid in the eyes of the law, however 'full' Dr Hassall might believe it to be. Thirdly, he refers to his perception of having covered off 'all relevant consent issues', overlooking the fact that it must always be for the individual patient, not the clinician, to decide what is (and is not) relevant to them personally at the time when their consent is being sought.

Simply calling something 'minimally invasive' doesn't change the fact that the elective treatment approach illustrated here was, in reality, seriously destructive as will be clear from the images provided by Dr Hassall.

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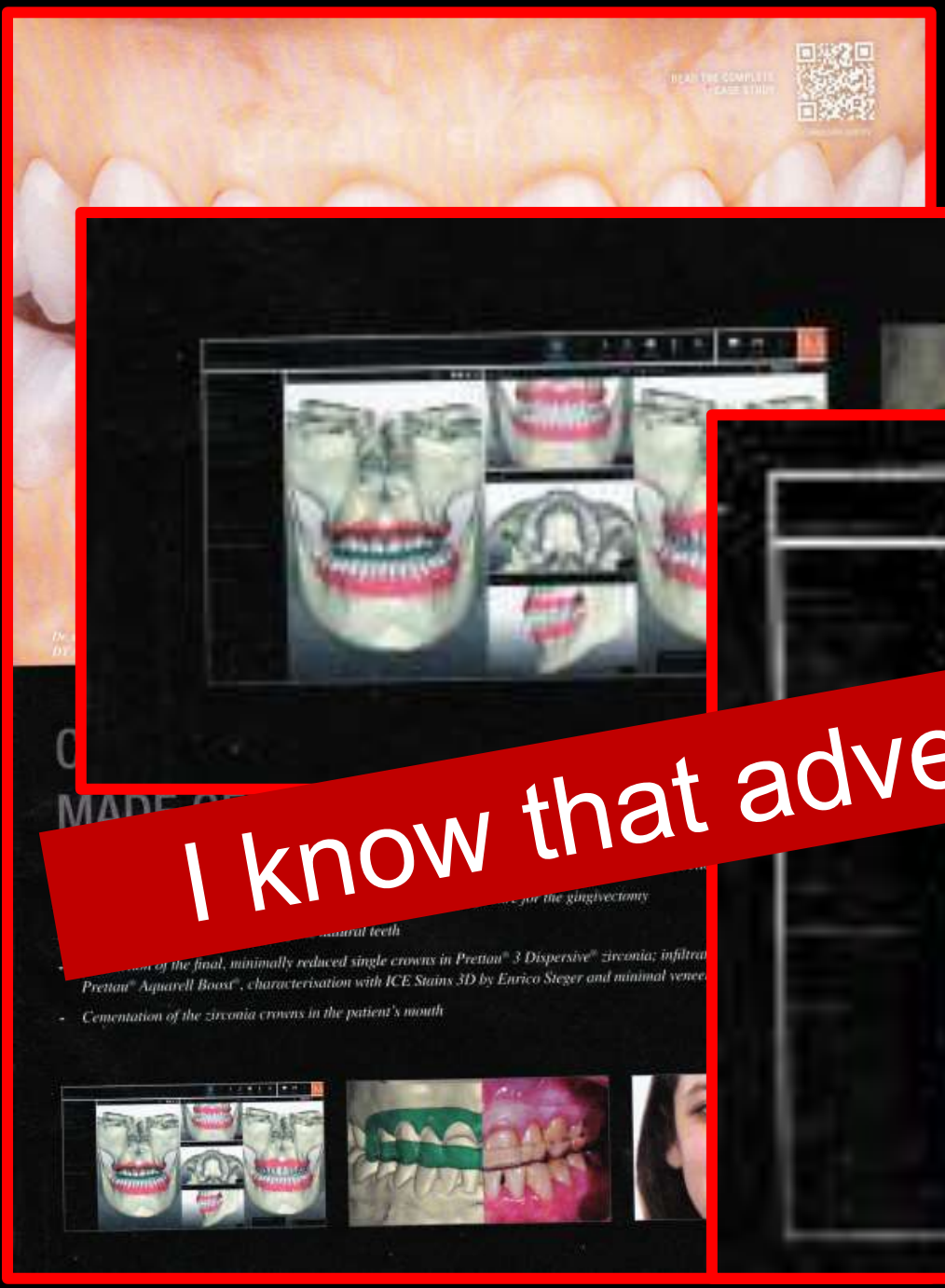
Kevin Lewis, on the same page…

In his indecent haste to purvey the alleged benefits of 'contemporary' materials and techniques that he so ardently promotes, Dr Hassall overlooks the fact that the sound and healthy tooth tissue removed is gone forever. The illustrated preparations destroyed more sound tooth tissue in minutes than the existing causative factor(s) would have achieved in a decade or more. In marked contrast, surely the

WHY?



I know that adverts are not peer reviewed!

…but, *this* journal is peer reviewed!

Orthodontic-Restorative Interface | OPEN

CLINICAL

Achieving excellence with interdisciplinary approaches in complex orthodontic adult patients

Ute E. M. Schneider*[1,2] and Lorenz Moser[1]

Key points

- Treatment planning for the adult orthodontic patient should start on day one. Comprehensive, patient-centred orthodontic treatment should be delivered by an interdisciplinary team of equally well-trained and skilled specialists.
- Treating orthodontic adult patients to the highest standard of care requires more than a specialty degree in orthodontics but also sound knowledge of the related dental and medical disciplines to jointly plan, select and execute the most appropriate treatment approach for each patient in the most efficient way.
- Without close communication and continuous exchange of information between the team members interdisciplinary treatment is reduced to mere multidisciplinary care without coordination of the single procedures.
- Digital technology is a helpful tool to facilitate true patient-centred interdisciplinary treatment by continuous exchange of updated information and monitoring of the single therapeutic steps throughout the entire course of treatment.

Abstract

Over the last decades the percentage of adult orthodontic patients has substantially increased. Undeniably, an important motif for seeking orthodontic care at an older age is smile improvement, but this is not all. Frequently, impaired dentofacial aesthetics are combined with several other issues: severe dentoskeletal malocclusions; multiple tooth loss due to caries or endodontic failure; dental agenesis or trauma; periodontal breakdown; or functional problems, such as temporomandibular disorders or obstructive sleep apnoea. Therefore, comprehensive adult treatment mostly requires close collaboration of a team of equally well-trained dental specialists to select and execute the most suitable treatment option for the individual patient from day one. With joint planning, intensive communication with the patient and the involved specialists, and continuous monitoring of the treatment process, true patient-centred care can be delivered. In order to serve the individual patient best, the treating orthodontist does not only need thorough speciality training and continuing education, but furthermore, should be well-equipped with sufficient knowledge of the other dental fields of expertise. In combination with digital technology as an important tool for enhancing communication and efficient exchange of information between all involved team members, excellent joint clinical skills will take comprehensive interdisciplinary treatment to the next level.

Digital smile design

Fig. 1 a, b, c, d, e, f, g, h) This 25-year-old female patient with constricted dental arches, maxillary and mandibular crowding, a steep lower curve of Spee, significant upper and lower anterior wear and hypo-mineralised upper central incisors requested an improvement of her smile aesthetics

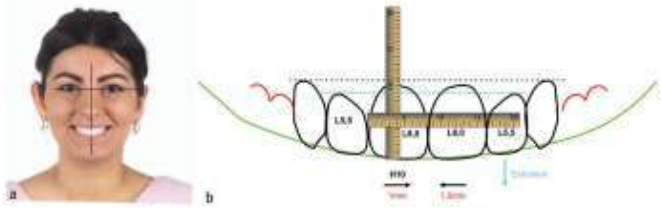


Fig. 2 a, b) A digital smile design was performed to define tooth proportions and position

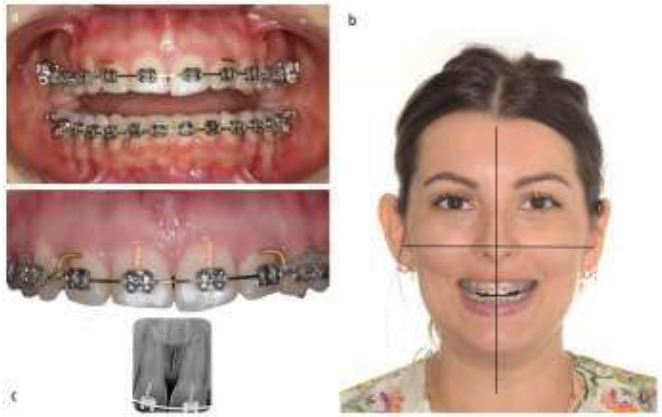


Fig. 3 a, b, c) After complete levelling and aligning of the dentition, all aspects of macro-, mini- and micro-aesthetics and the necessary finishing procedures were discussed with the restorative dentist

restorative dentist to orthodontically move the teeth in an ideal position for 'minimally invasive' prosthodontic care.[15,16,27,28] Delivering ultrathin feldspathic or disilicate ceramic laminate veneers may improve dental and smile aesthetics but also enhance the long-term success rate of these restorations.[19,20]

Case example

A 25-year-old female patient presented with a mild skeletal II pattern; maxillary and mandibular anterior crowding; accentuated curves of Spee; enamel hypoplasia of the maxillary central incisors; severe dental wear of the upper and lower anterior teeth; and insufficient passive eruption of the maxillary incisors. Her chief complaint was discontent with her smile and nocturnal bruxism (Fig. 1).

A joint interdisciplinary treatment plan, which included orthodontic levelling and alignment with fixed appliances; surgical crown lengthening of the maxillary incisors; six upper anterior feldspathic laminate veneers; and reconstruction of the worn lower incisor and canine cusps with direct composite restorations, was formulated. A digital smile design was presented to the patient for motivation and for explanation (Fig. 2).

Treatment started with bonding of a straight-wire 0.022-inch appliance (MBT prescription) for levelling and aligning of the dental arches. During the orthodontic finishing phase, close interaction with the restorative dentist and the periodontist to define the ideal final tooth

Fig. 4 a, b, c) After clinical and radiographic assessment of the position of the ce
out for creating harmonious gingival contours and a consonant smile line once t

Fig. 5 a, b, c) After orthodontics, only minimal preparation is necessary for the i

Fig. 6 a, b, c, d, e, f) Together with the delivery of six anterior veneers, it was mar
cusps with composite material to ensure maintainability of the vertical dimensio

ultrathin feldspathic ceramic veneers were placed (Fig. 5).

By combining pre-restorative orthodontic levelling and aligning with surgical crown lengthening, the biological cost was minimised while achieving excellent dental aesthetics and function. The worn lower incisors were restored with composite material to establish interincisal contact during static and dynamic occlusion (Fig. 6, Fig. 7). Given the history of parafunctional activity, a custom-made, maxillary, Kois occlusal splint for nighttime wear was

Fig. 7 a, b, c) Smile projection, s
orthodontic-periodontal-restora

Fig. 4 a, b, c) After clinical and radiographic assessment of the position of the cementoenamel junction, surgical crown lengthening was carried out for creating harmonious gingival contours and a consonant smile line once the appliances were removed

Fig. 6 a, b, c, d, e, f) Together with the delivery of six anterior veneers, it was mandatory to also restore the worn lower incisal edges and canine cusps with composite material to ensure maintainability of the vertical dimension

Question?

Fig. 4 a, b, c) After clinical and radiographic assessment of the position of the cementoenamel junction, surgical crown lengthening was carried out for creating harmonious gingival contours and a consonant smile line once the appliances were removed

Was there so much wrong with these teeth that they deserved to be cut?

Or, were the clinicians unable to fulfil their digital smile design without the help of a laboratory?

More, in the same article!

Fig. 9 This 40-year-old patient had been in clear aligner treatment for two years *alio loco* and was not satisfied with the result. Due to her high aesthetic demand and the asymmetrical skeletal Class II malocclusion, a comprehensive orthodontic-surgical-perio-prosthodontic treatment plan was established, which included a bi-sagittal split osteotomy for mandibular advancement with midline correction

Fig. 13 In the upper aesthetic zone, the extremely thin periodontal biotype required tooth preparation according to E. Loi ('gingitage') to create slightly thicker and harmonious gingival conditions before delivery of four ceramic crowns[22]

CLINICAL

OVERTREATMENT

Fig. 16 The patient is completely satisfied with her facial and dental aesthetics

Fig. 1 ... functional aspects. Due to economic limitations, a new crown for tooth 16 had to be postponed

Economic limitations – what does that mean?

Conclusions:

- It seems difficult (or impossible), for some clinicians to recreate digital designs in the mouth without the help of a laboratory.

AND

- Will these clinicians still be contactable when the treatment goes awry?

Are we healthcare professionals or beauticians?

The profession fights back!

Commerce vs care: troubling trends in the ethics of esthetic dentistry.
Simonsen RJ Dent.Clin.N.America 2007:51:281-287.

Where is the professional and public outrage at the troubling trends in the marketing and selling of "cosmetic" dentistry that beseige our profession today? The code of *primum non nocere* seems to have been cast aside in the headlong pursuit of outrageous overtreatment for financial gain by some.

Kevin Lewis: Is this the brave new world

I have an uneasy feeling that the perceived pecking order of the UK dental profession is being similarly redefined and manipulated to create a new, artificial 'elite'.

Its self-appointed members view with a mixture of indifference and disdain the efforts of those poor misguided epsilons who still strive valiantly against the odds to maintain their patients' oral health, keep them pain free and offer them a rounded service, even on the NHS and often to their own disadvantage. In short, they care.

Meanwhile the new alphas cherry-pick the sexiest and most lucrative versions of dentistry, know how best to access potential punters for those services and yet still want to claim all the benefits of their privileged status as professional people.

It seems not to occur to them that in reality they have abandoned that status in order to become part of the extended makeup department for wannabe *Love Island* contestants, influencers and Instagrammers.

Maintaining public confidence in the profession falls squarely within the remit of each country's regulator, but under pressure from the influential consumerist lobby here in the UK, the GDC's approach remains supine and hands-off in comparison to much of the developed world, from which we can learn important lessons.

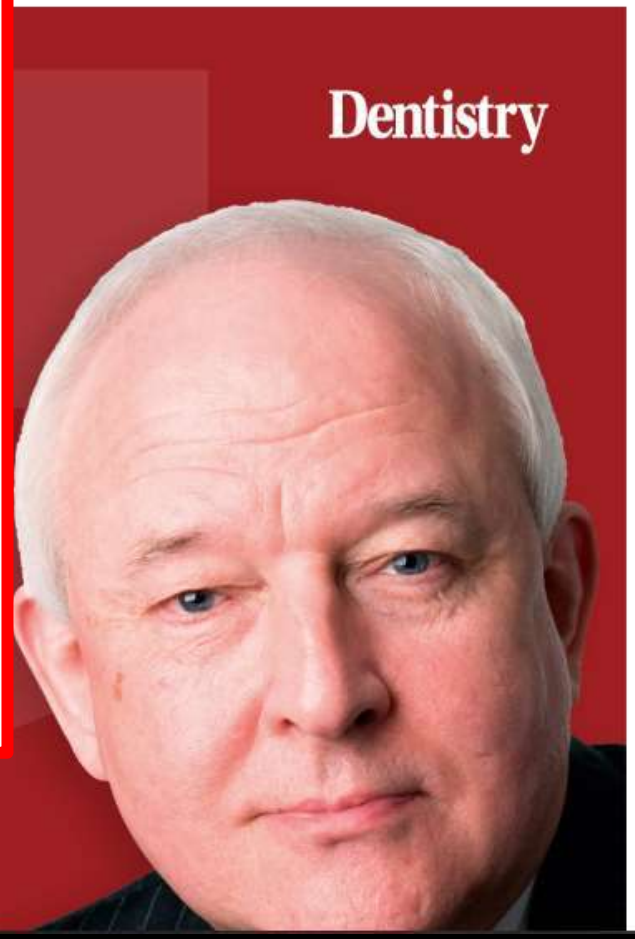
Kevin Lewis: Is this the brave new world

What the consumer wants, the consumer gets and dentistry is reduced to a mere commodity. If any profession ends up looking and behaving like a bunch of dodgy secondhand car dealers, that is supposedly a price worth paying for having an open market.

I'm not so sure about that. Members of a profession must have a collective responsibility to each other or we descend into a self-serving and grubby free-for-all, which will ultimately benefit nobody.

The challenge is that developments in society (and in technology) will always tend to move much faster than the regulatory legislation can keep pace with. Yet the regulators in countries like Canada, New Zealand and Australia as well as Hong Kong, Malaysia and Singapore are fighting an admirable rearguard action.

Similarly in Trinidad and Tobago, the council has been wrestling with these issues for several years now – with the support of the overwhelming majority of the profession (more than 90% in one survey) who supported stronger controls over professional advertising and more proactive enforcement of the standards to deter those who think the rules apply to everyone else – but not to them.



Kevin Lewis: Is this the brave new world of dentistry?

07 August 2024

I almost stopped breathing when reading two recent articles in the dental press (read on, I hear you say). One of them – written by a dentist – argued that recruiting patients off the back of past successes posted on social media paid a double dividend, not just in the pocket but also in reducing time wasted on the consent process as the patients arrive already knowing what they want.

The other article was from a marketing 'expert' who set out a pathway to ensure that patients consistently 'go ahead' with 'recommended' treatment, based on past case studies showcased online and on social media and testimonials from satisfied patients, both of which could be enhanced by the use of AI and the skills of a digital marketing agency.

Not a single word in the article mentioned the consent process or the need for treatment to be beneficial (and not harmful) to the patient.

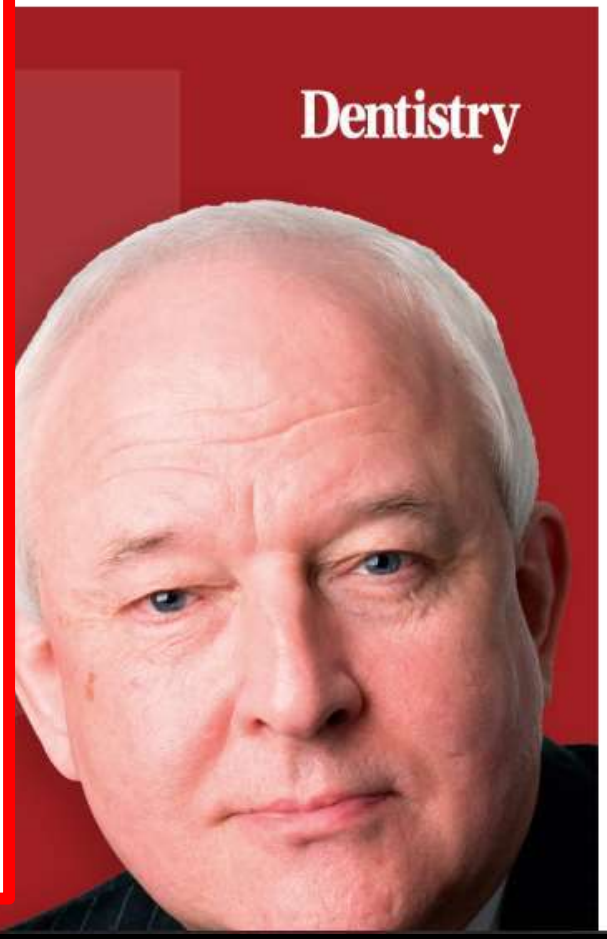
Kevin Lewis: Is this the brave new world of dentistry?

Patient testimonials and images of past cases are strictly prohibited by many dental regulators around the world, precisely because it is impossible to know if they are real, borrowed or fabricated.

In Australia, the regulator even defines the term 'purported testimonial' in case over-eager dentists couldn't work it out for themselves. In contrast, pretty much anything goes here in the UK and our reputation as professional people goes with it – down the plughole right under the nose of the GDC.

If this is really the brave new world of UK dentistry, I am starting to appreciate the benefits of the old order (which I baulked against at the time, as much as anyone else).

Back in the day when the media consisted of print and only print, in its various forms, the (then) GDC made rules about the size of lettering and prohibited the use of bold type or 'display' advertising. The rules were slightly relaxed from 1989 onwards, but the internet changed everything in the years that followed and the GDC has struggled to keep up ever since.



…I understand!

BDJ PERSPECTIVES | Dental indemnity

PERSPECTIVE

Pragmatic ethics

Raj Rattan MBE is dental director at Dental Protection, an experienced general dental practitioner, an author and an international speaker on many subjects, including law and ethics in dentistry.

Key points

- There are three classical ethical theories – deontology, utilitarianism and virtue ethics. Virtue ethics is the application of a virtue described as 'practical wisdom'.
- Many professional codes of practice focus on duty and obligation.
- Ethical and unethical behaviours are evoked by systemic features.
- Ethical pluralism offers a solution for ethical re-orientation.

Rattan R.
Br.Dent.J.2024:236:620-621

One of the challenges facing dentists is the risk that business pressures mean profit is the focus and the ethical implications are overlooked. A gap opens between theoretical constructs and real-world observations – a gap between actual and intended behaviour. Virtue ethics and rules-based approaches can be taught

The concept of satisficing is well worth adopting


Martin Kelleher Kevin Lewis

'Satisficing' in Dentis
decides? Who benef

Abstract: This series of articles challenges some popular myths about supposedl
and stimulate debate. It explains the concept of 'satisficing' (as opposed to 'maxi
and self-interests might lead supposed experts to promote arbitrary aspirational
Bolam Test standard) and what is genuinely in the best interests of an individual
planning and treatment is equally valid, with wider applicability than routinely d
spurious grounds.
CPD/Clinical Relevance: The 'satisficing' concept has wide and profound appli
explains the basic principles and how and why it is relevant to various aspects
of professionalism.
Dent Update 2024; 51: 86–94

'Satisficing' is a word made from combining 'satisfy' and 'suffice'. It means choosing something, or a solution, that is sufficient for it to be satisfactory for the purposes at that time. 'Satisficing' is often used as a contrast to 'maximizing'. 'Maximizing' involves seeking the single, supposedly best, outcome or solution to a problem.

Satisficing might sound like a new and unfamiliar word – or one invented by the authors of this article – but in fact 'satisficing' was described as long ago as 1956 by an eminent American economist and psychologist named Herbert Simon who went on to win the Nobel Prize for Economic Sciences in 1978. In his acceptance speech, Herbert Simon stated that decision-makers can 'satisfice' either by finding optimal solutions for a simplified world, or by finding satisfactory for a more realistic world.[1]

'Satisficing' in daily life

Satisficing is a 'cognitive heurist is a posh term in psychology fo most dentists would call a 'rule Heuristics are shortcuts that ou take to arrive at an acceptable quickly. We do that frequently but not necessarily when it con dentistry, or when dealing with dental problems.

An example of 'satisficing' c the following scenario:

- You want to go on a holida you would like to be picked chauffeur at mid-day, fly firs

Martin Kelleher, MSc, FDSRCS, FDSRCPS, FDSRCS, FCGDent, Specialist in Resto Dentistry and Prosthodontics, Consultant in Restorative Dentistry, King's Colleg Hospital, London. **Kevin Lewis,** BDS, FDS, RCS, FCGDent, Special Consultant, B Indemnity; Founder and former Trustee, College of General Dentistry.
email: info@martinkelleher.co.uk/kjlewis_1@hotmail.com

Figure 15. All the upper premolars, as well as the palatal aspects of both lateral incisors and maxillary canines were bonded pragmatically (without any stents) to be loaded reasonably evenly in ICP. They were adjusted/shaped to separate the tips of the upper central incisors from the opposing four mandibular incisors during all movements. In other words, simple canine guidance was provided, but with the intact maxillary lateral incisors being mainly involved during protrusive movements to reduce shearing forces on the now longer composite tips of the maxillary incisors.

Figure 16. The patient was followed up for 6 years. Apart from a minor polish every couple of years, there was nothing else required.

the marginal ridges were largely intact and therefore, were deemed to be capable of being directly bonded with additive resin composite and thereby loaded in compression (rather than in shear or tensile stresses) to take more occlusal loads preferentially. That pragmatic additive composite to the upper lateral incisors, canines and maxillary premolars created space between the upper and lower front teeth to allow the previously edge-to-edge maxillary central incisor to be made just

Figure 17. Question: given the low lip line present, what was the justification for the 'maximalist' destructive approach of two free gingival grafts prior to two post crowns (top), as opposed to a 'satisficing' pragmatic approach maintaining the residual tooth structure, but still solving the patient's perceived problems?

Some final thoughts

Charles Dickens
1812-1870

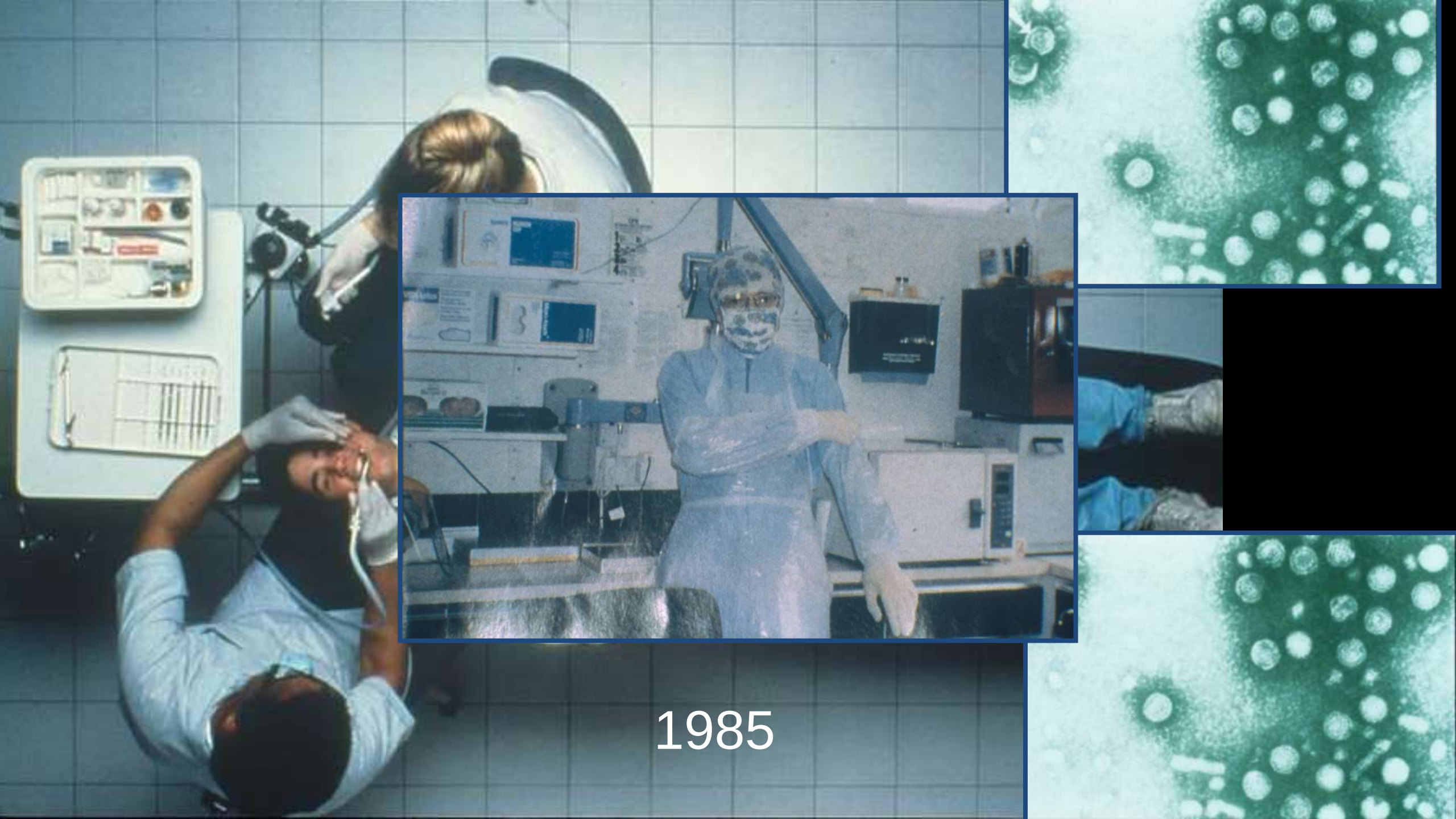
'Facts alone are wanted in life. Plant nothing else, and root out everything else. Stick to facts!'

Patients will remain loyal to a caring, competent dentist (rather than to a corporate logo)

C.A.Bain, 2000

After 2001: Changes for the dental team

- Changes in disease patterns
- Increasing use of auxiliaries
- Increasing regulation of dentists
- Increasing emphasis on evidence based dentistry
- Decreasing emphasis on NHS treatment


1985

b) 1–3 minutes
c) 3–5 minutes
d) More than 5 minutes.

Please state any further comments which you feel are relevant to glove wearing by dentists while treating patients.

DENTISTRY is potentially a most unhygienic ~~unhygienic~~ profession especially for the Dentist, glove wearing makes our work more tolerable

vii) Please estimate the time spent on surgery cleaning between patients:

a) Less than one minute
b) 1–3 minutes ✓
c) 3–5 minutes
d) More than 5 minutes.

viii) Please state any further comments which you feel are relevant to glove wearing by dentists while treating patients.

After years of wearing gloves I would be appalled by the feeling of touching patients.

c) 3–5 minutes
d) More than 5 mi

state any further comments which you feel are relevant to glove wearing by
eating patients.

IF NOT WORN THEN
DENTIST IS AN EEJIT !!

a) Less than one minute
b) 1–3 minutes
c) 3–5 minutes
d) More than 5 minutes.

viii) Please state any further comments which you feel are relevant to glove wearing by dentist while treating patients.

If I was naked I would still wear gloves and mask

That's Who needs "evidence"?

Thank you for listening

Thanks again to my sponsor Oral-B


f.j.t.burke@bham.ac.uk
Look for: Who needs evidence lecture notes