A pragmatic approach to the treatment of tooth wear

What I plan to talk about (briefly):

- Effect of cutting tooth substance
- Incidence of tooth wear
- Bonding composite to worn teeth
- Which composite?
- Principles of dental aesthetics
- Success rates of treatment
- Patient Information/Patient satisfaction
- Why veneers are not appropriate

1996

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

…with caries (and tooth wear progressing slowly), the pulp has a chance to recover

Current Concepts and Techniques for Caries Excavation and Adhesion to Residual Dentin

Aline de Almeida Neves[a]/Eduardo Coutinho[b]/Marcio Vivan Cardoso[c]/Paul Lambrechts[d]/Bart Van Meerbeek[e]

Abstract: The advent of "Adhesive Dentistry" has simplified the guidelines for cavity preparation enormously. The design and extent of the current preparations are basically defined by the extent and shape of the caries lesion, potentially slightly extended by beveling the cavity margins in order to meet the modern concept of minimally invasive dentistry. New caries excavation techniques have been introduced, such as the use of plastic and ceramic burs, improved caries-disclosing dyes, enzymatic caries-dissolving agents, caries-selective sono/air abrasion and laser ablation. They all aim to remove or help remove caries-infected tissue as selectively as possible, while being minimally invasive through maximum preservation of caries-affected tissue. Each technique entails a specific caries-removal endpoint and produces residual dentin substrates of different natures and thus different receptiveness for adhesive procedures. This paper reviews the newest developments in caries excavation techniques and their effect on the remaining dentin tissue with regard to its bonding receptiveness.

Keywords: minimally invasive dentistry, dentin caries, caries excavation, bond strength of composite/dentin interfaces.

J Adhes Dent 2011; 13: 7-23.
doi: 10.3290/j.jad.a19443

Submitted for publication: 06.07.09; accepted for publication: 24.10.09.

NOT so, with a turbine drill!

Teeth are clever! They can heal!

briefly…Does drilling affect teeth?

Some work on crowns

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

CONCLUSION

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

- 802 crowns assessed radiographically
- 458 vital at preparation
- 87 (19%) had radiographic signs of peri-radicular disease
- 344 crowned teeth had previous root filling,
- 51% of these had peri-radicular radiolucency

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:

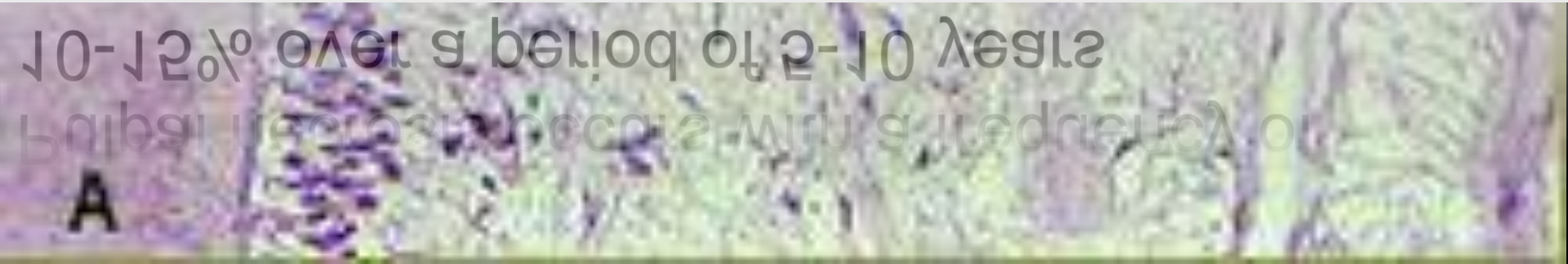
Pulpal damage may occur during procedures to provide a crown

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



Take home message

In general, keeping a tooth going with a direct placement filling is a a better option than reducing a tooth for a crown.

The same applies to tooth wear.

…therefore

A basic principle:
Minimally invasive methods of treatment should be employed where possible

Incidence of tooth wear

Adult Dental Health Survey 2009

White DA, Pitts N, Steele J, Cooke P et al, 2011, NHS Information Centre

- 77% of dentate adults showed some tooth wear in their anterior teeth
- 15% showed moderate wear, 2% severe wear
- Men have higher incidence of tooth wear
- 0.5% of adults of 18y to 24y showed severe tooth wear compared with 6% of 75 to 84 year olds

Original Paper

Caries Research

Caries Res 619
DOI: 10.1159/000XXXXXX

Received: May 8, 2008
Accepted after revision: January 27, 2009
Published online: ■■■

A New Index of Tooth Wear

Reproducibility and Application to a Sample of 18- to 30-Year-Old University Students

J. Fares[a] S. Shirodaria[b] K. Chiu[a] N. Ahmad[a] M. Sherriff[a] D. Bartlett[a]

- 1010 students aged 18 to 30 years in London
- Examined for tooth wear
- Enamel wear common to all subjects
- 6.1% had more than one third of the tooth surface affected
- Dentine exposed on 5.3% of all surfaces
- 76.9% had one or more surfaces with dentine exposed
- Males significantly more wear than females

Tooth wear in Europe

JOURNAL OF DENTISTRY 41 (2013) 1007–1013

Available online at www.sciencedirect.com

ScienceDirect

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

Prevalence of tooth wear on buccal and lingual surfaces and possible risk factors in young European adults

D.W. Bartlett[a,*], A. Lussi[b], N.X. West[c], P. Bouchard[d], M. Sanz[e], D. Bourgeois[f,g]

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[f] Department of Public Health, EA 4129, University Lyon 1, France
[g] International and European Affairs, University Lyon, France

- 3187 young adults, 7 countries in Europe
- Estonia, Finland, France, Italy, Latvia, Spain, UK
- Tooth wear measured using BEWE index

- Highest levels of TW found in UK
- UK had higher levels of TW on back teeth, while in other countries TW affected anterior teeth more than back teeth
- Strong association of TW in patients taking sleeping medication and antidepressants
- TW associated with acidic drinks, especially fresh fruit & energy drinks
- TW also associated with repeated vomiting and residence in rural areas

Also, higher incidence of TW in persons who classified themselves as managers!!

CONCLUSIONS

- Facial and oral tooth wear in adults aged 18 to 34 years was common and affected more than 25% of this population.
- Regular consumption of fruit and repeated vomiting were associated with high levels of tooth wear.

Prevalence of tooth wear in adults

Spijker AV, Rodriguez JM, Kreulen CM, Bronkhorst EM, Bartlett DW, Creugers NHJ. Int.J.Prosthodont.2009:22:35-42

- 186 references examined, 12 (from10 different countries) survived the inclusion procedure and 4 used for regression analysis
- Males had more TW than females
- % of adults with severe TW increases from 3% at 20 years to 17% at 70 years
- The Smith/Knight Index was found to be a relatively crude index

Take home message

Is tooth wear a problem?

Yes, in many parts of the world, it appears to involve a significant % of the population, both old and young, males more than females.

Maximising class V effectiveness

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

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

IN BRIEF

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

RESEARCH

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

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

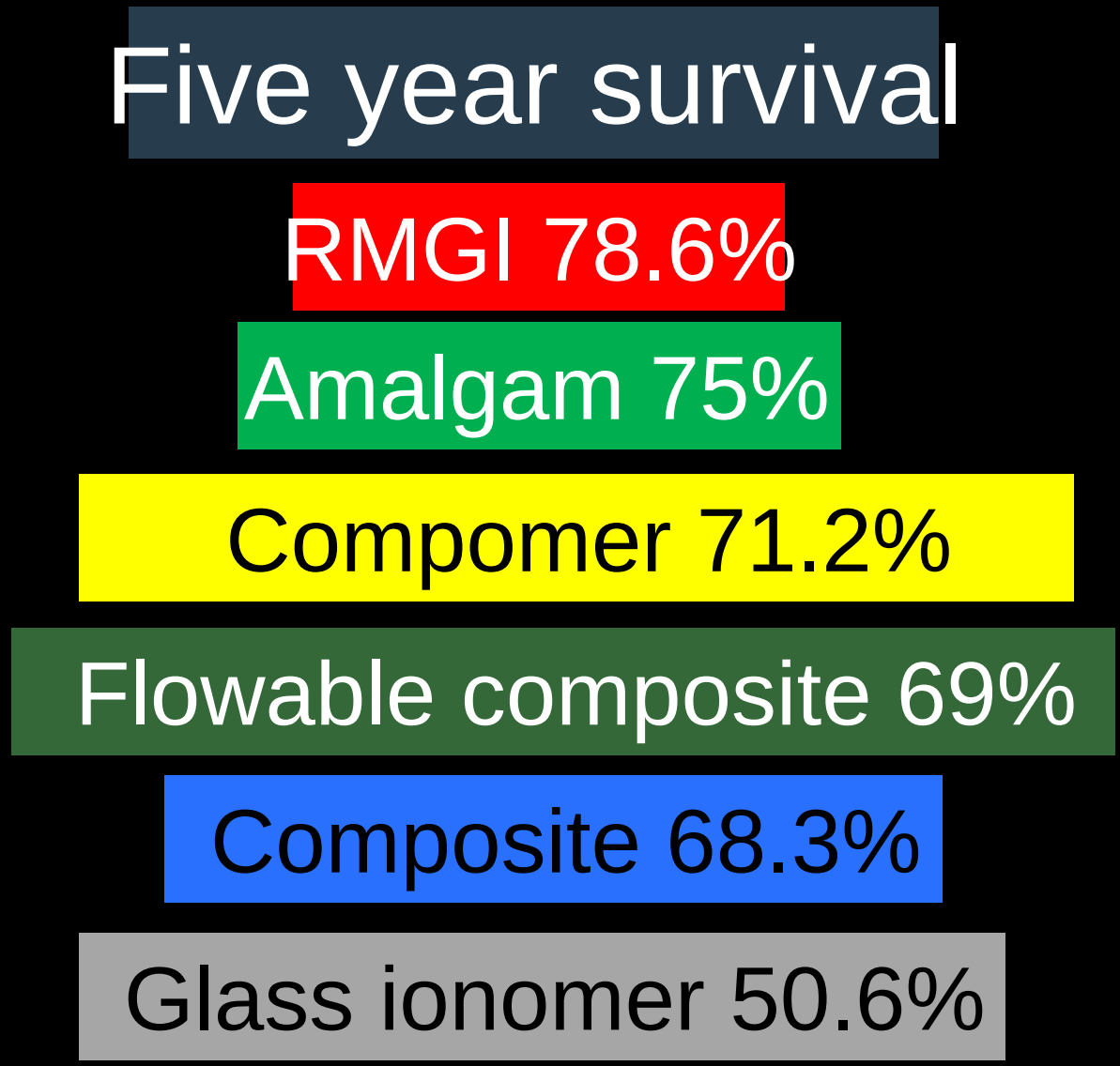
Restorations involving dentine only: hazard of failure increased by 39%

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

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

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

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



Class V meta analysis: conclusions

"The dentist shall roughen the dentine and enamel surfaces"

"Additional bevelling of enamel can be omitted"

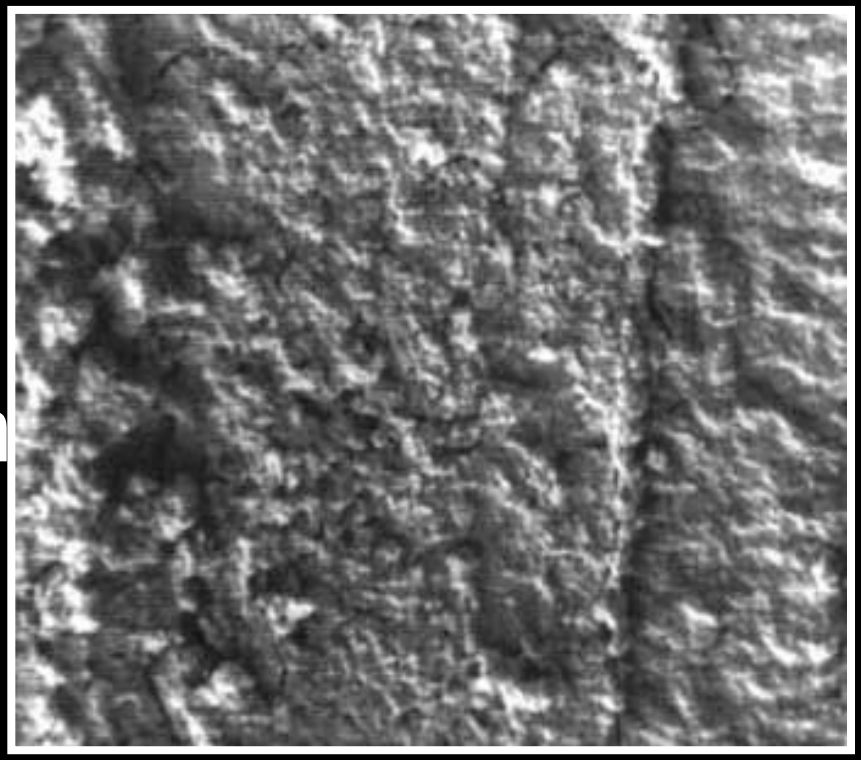
"Isolation with rubber dam is recommended"

Review

Clinical performance of cervical restorations—
A meta-analysis

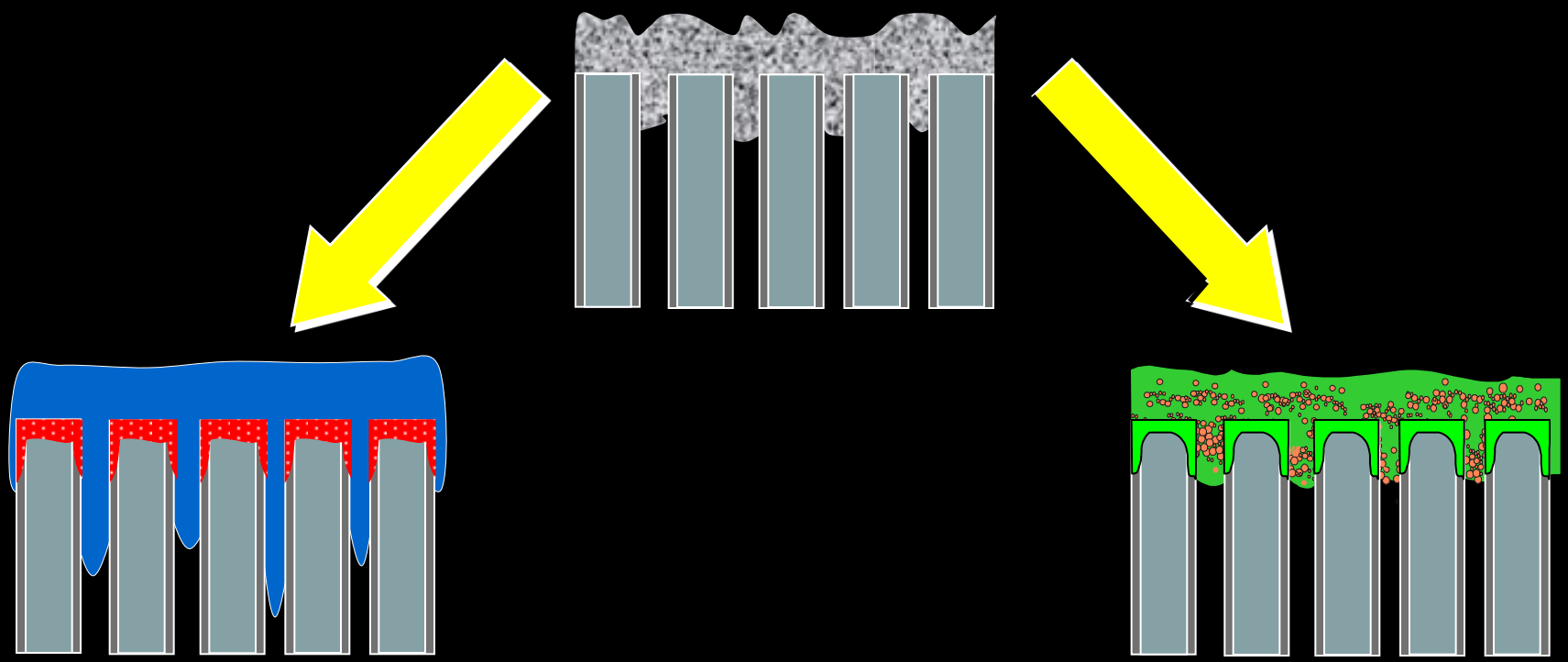
Problems in bonding to dentine: The Smear Layer

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



B. Van Meerbeek in: Summitt Fund. Oper. Dent. 2001

Previous strategies to treat the smear layer : two ways



Etch & Rinse/

Total etch

Self etch/

No Rinse

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

Nakabayashi, 2002

Until recently a classification of dentine bonding systems

1.Etch and rinse
(etch & bond, total etch)

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

…a landmark paper

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

Marleen Peumans[a]/Jan De Munck[b]/Kirsten Van Landuyt[c]/Paul Lambrechts[a]/
Bart Van Meerbeek[a]

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

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

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

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

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

J Adhes Dent 2007; 9: 7-10. *Submitted for publication: 10.07.06; accepted for publication: 16.11.06.*

CONCLUSION

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

… the new approach is therefore…. selective enamel etching

….introducing

a new group of dentine bonding agents

Universal bonding agents

Treatment of the smear layer

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

Scotchbond Universal Adhesive: Composition

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

SUGGESTION

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

Product Research and Evaluation by Practitioners

2013:

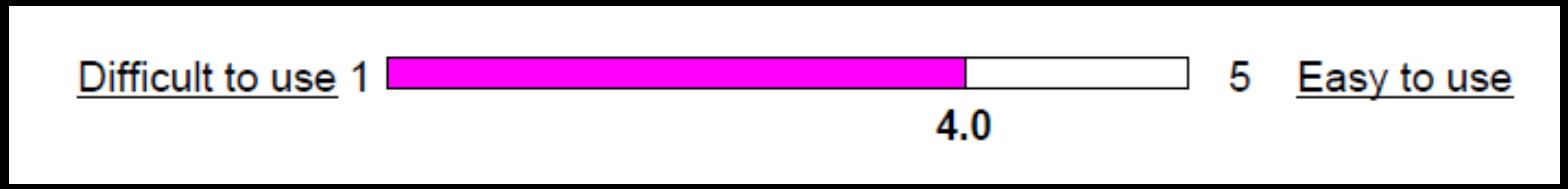
A handling evaluation by the PREP Panel

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

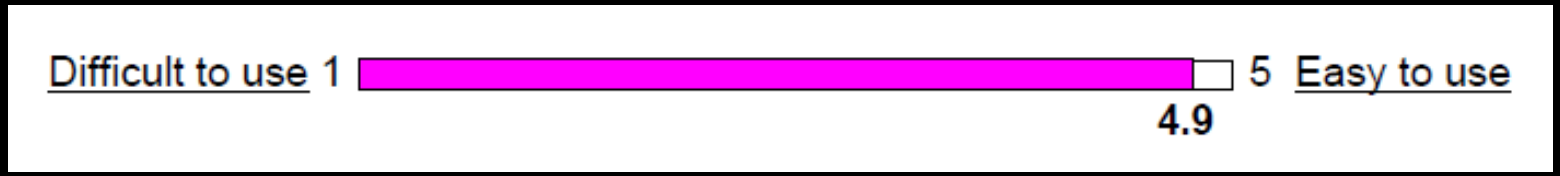
- 12 evaluators
- Variety of bonding agents used pre-study
- 875 restorations placed (Class 1:172, Class II:189, Class III:134, Class IV:178, Class V:182, Other:20) Also used for dentinal hypersensitivity, repair of fractured porcelain, bonding of posts.
- Rated material on visual analogue scales
- 75%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

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

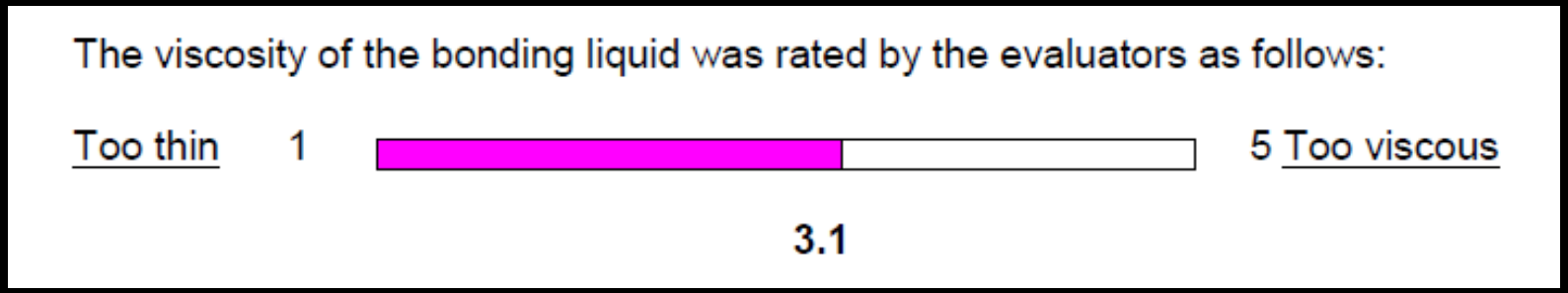
Ease of use of previous bonding agent



Ease of use of Scotchbond Universal



Viscosity of Scotchbond Universal



Handling evaluation of Scotchbond Universal by the PREP Panel: Comments

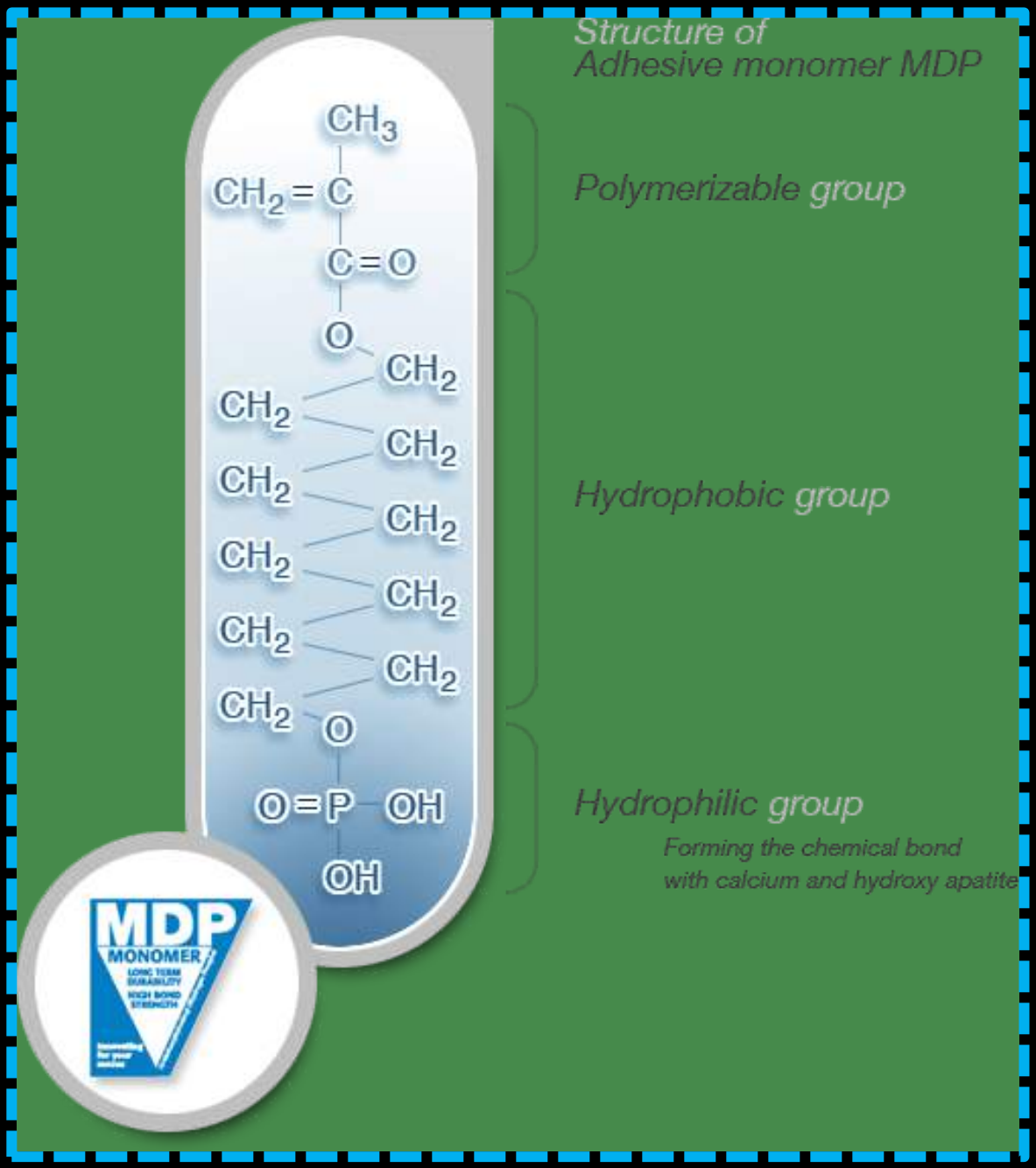
- 📖 "Disconcertingly yellow – but OK when thinned or light cured"
- 📖 "Spreads well when air applied"
- 📖 "Supposedly the lid can be opened one-handed but it is sometimes a problem"
- 📖 "First material that compares with G-Bond"

I switched to Scotchbond Universal Adhesive in September 2011

Much better adhesive performance than previously!

Other Universal Bonding Agents:

All contain 10-MDP



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

SUMMARY: Universal bonding agents:

Are compatible with direct & indirect procedures

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

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

Are suitable primers for silica & zirconia

Can bond to different substrates

FJ Trevor Burke

Anna Lawson, David JB Green and Louis Mackenzie

What's New in Dentine Bonding?: Universal Adhesives

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

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

Dent Update 2017; 44: ??? ??

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

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, **Anna Lawson**, BDS, MSc, MPDC(RCS Edin), General Dental Practitioner, Nottingham, **David JB Green**, BDS(Hons), BSc, MFDS RCS(Edin), StR Restorative Dentistry, Birmingham Dental Hospital and **Louis Mackenzie**, BDS, General Dental Practitioner, Birmingham and University of Birmingham School of Dentistry, 5 Mill Pool Way, Pebble Mill, Birmingham B5 7EG, UK.

A dentine-bonding agent should perform the following functions:[3]

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

It is the intention of this paper to update readers on the new group of Universal Dentine Bonding Agents, this being a follow-up to a paper published in 2004 giving details of the last major innovation in bonding to dentine, the introduction of the so-*called* self-adhesive dentine bonding agents[3] and to other *Dental Update* publications on the subject which readers may wish to read as background or a further update, such as those by Green and Banerjee,[7] Green, Mackenzie and Banerjee[8] and others.[9,10]

A brief history of bonding to dentine

In the past, dentine-bonding agents were classified into generations.[7] However, this means of identifying different groups of bonding agents fell into disarray because of the failure of authorities in the subject to agree on the type of bonding agent which fitted a given 'generation'. Until recently, the classification has therefore been simply, glass ionomer materials, and resin-based dentine-bonding agents, the latter being further classified into *etch and rinse* materials and *self-etch* materials, with some workers classifying the self-etch materials according to their pH.[8]

There are two principal means by which a bond to dentine may be achieved:[8]

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

Do you want to read more?

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

Conclusion:

High bond strength to dentine can be obtained under dry conditions when ethanol/H_2O and acetone based systems are vigorously rubbed on the dentine surface. On wet surfaces, light rubbing may suffice.

Take home messages

Dentine bonding is now reliable and effective

Selective etching of enamel is a good idea

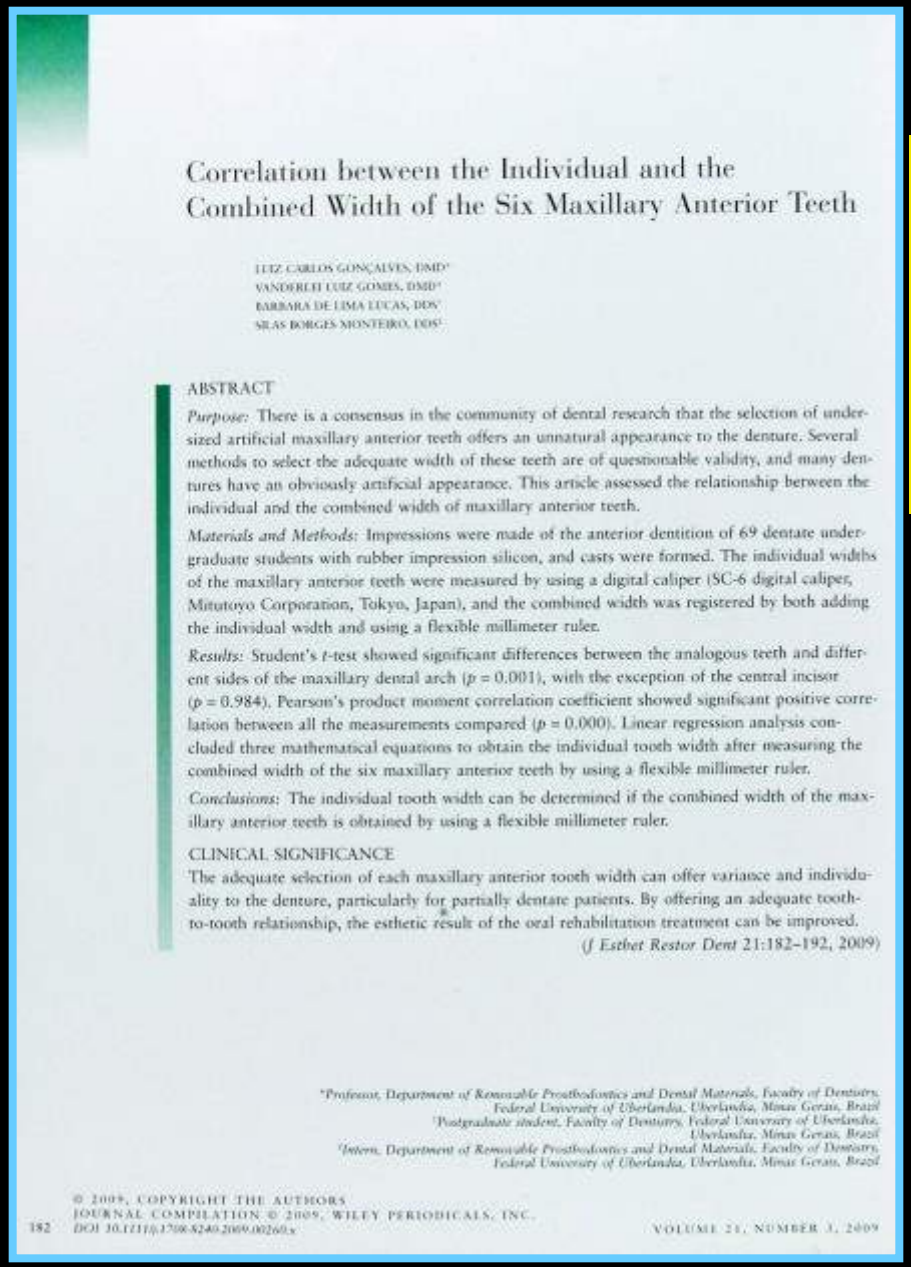
Universal bonding materials with MDP are now the business

Reasons to adopt minimal intervention

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

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

Most recently…..



Correlation between the Individual and the Combined Width of the Six Maxillary Anterior Teeth

LUIZ CARLOS GONÇALVES, DMD*
VANDERLEI LUIZ GOMES, DMD*
BARBARA DE LIMA LUCAS, DDS†
SILAS BORGES MONTEIRO, DDS‡

ABSTRACT

Purpose: There is a consensus in the community of dental research that the selection of undersized artificial maxillary anterior teeth offers an unnatural appearance to the denture. Several methods to select the adequate width of these teeth are of questionable validity, and many dentures have an obviously artificial appearance. This article assessed the relationship between the individual and the combined width of maxillary anterior teeth.

Materials and Methods: Impressions were made of the anterior dentition of 69 dentate undergraduate students with rubber impression silicon, and casts were formed. The individual widths of the maxillary anterior teeth were measured by using a digital caliper (SC-6 digital caliper, Mitutoyo Corporation, Tokyo, Japan), and the combined width was registered by both adding the individual width and using a flexible millimeter ruler.

Results: Student's *t*-test showed significant differences between the analogous teeth and different sides of the maxillary dental arch ($p = 0.001$), with the exception of the central incisor ($p = 0.984$). Pearson's product moment correlation coefficient showed significant positive correlation between all the measurements compared ($p = 0.000$). Linear regression analysis concluded three mathematical equations to obtain the individual tooth width after measuring the combined width of the six maxillary anterior teeth by using a flexible millimeter ruler.

Conclusions: The individual tooth width can be determined if the combined width of the maxillary anterior teeth is obtained by using a flexible millimeter ruler.

CLINICAL SIGNIFICANCE

The adequate selection of each maxillary anterior tooth width can offer variance and individuality to the denture, particularly for partially dentate patients. By offering an adequate tooth-to-tooth relationship, the esthetic result of the oral rehabilitation treatment can be improved.

(*J Esthet Restor Dent* 21:182–192, 2009)

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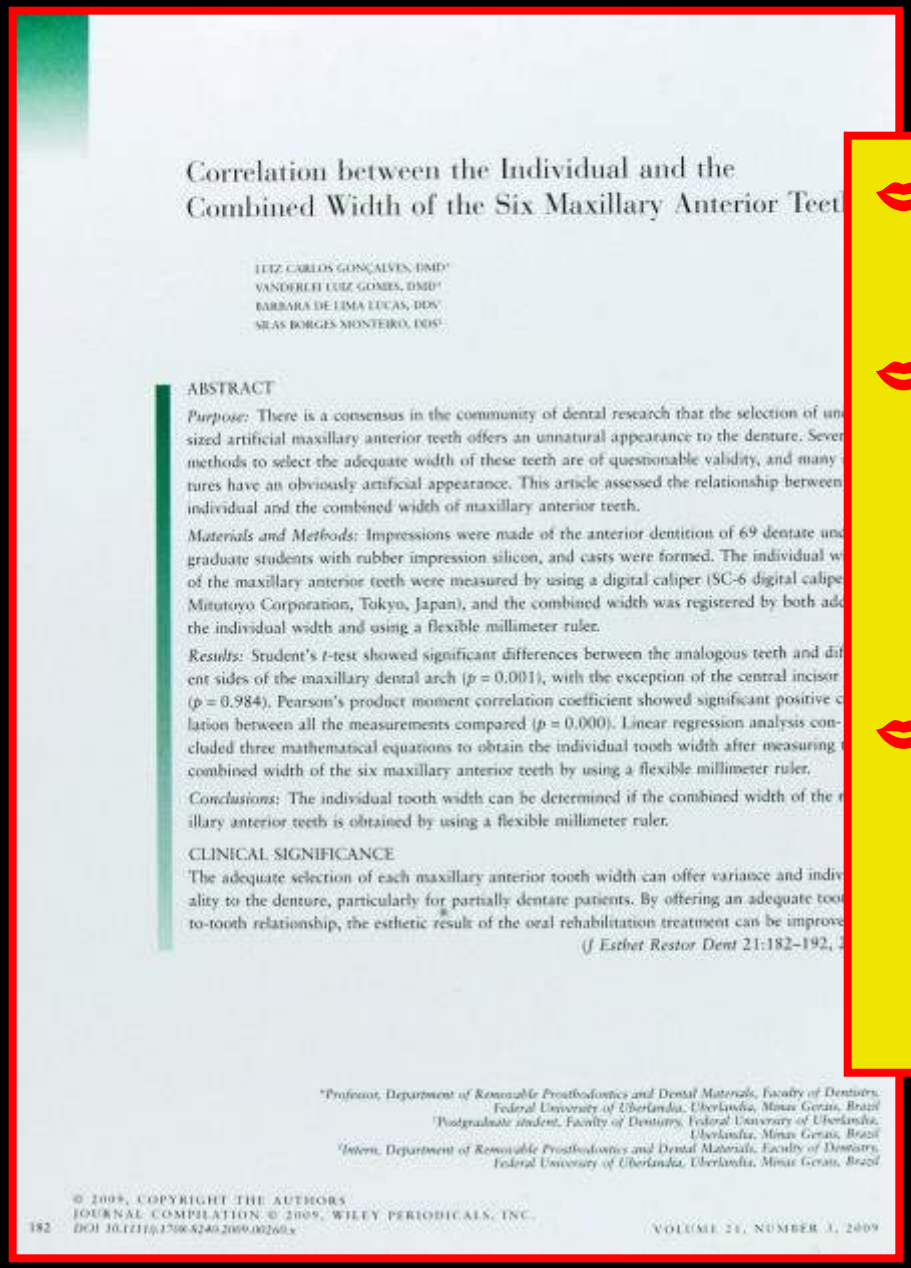
DOI 10.1111/j.1708-8240.2009.00260.x

- Impressions made of 69 dentate students in Brazil
- Anterior teeth measured with digital calipers

Conclusions



Correlation between the Individual and the Combined Width of the Six Maxillary Anterior Teet

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DOI 10.1111/j.1708-8240.2009.00260.x

- Nature is rarely perfectly predictable
- There is usually substantial variation around the fitted regression line
- When restoring teeth, symmetry of the central incisors is ***central*** to success

Sterrett JD et al. Width/length ratios of normal clinical crowns of the maxillary anterior dentition in man. J.Clin.Periodontol.1999:26:153-157

CONCLUSIONS: Within male and female Caucasians, the mean width/height ratio of the three maxillary tooth groups is 0.81

Width to length ratios:
There appears to be
wide variability, but around 0.80
seems to have the vote

BEWE: Basic Erosive Wear Examination
Bartlett D. Br.Dent.J.2010:208:204-209

A proposed system for screening tooth wear

D. Bartlett[1]

IN BRIEF

- Presents a convenient and simple way to record tooth wear in practice.
- The four levels in the proposed system can be easily understood.
- Simple associated treatment options give additional help.

PRACTIC

Table 1 Clinical sequence when using the BEWE

1. Diagnose the presence of tooth wear; eliminate teeth with trauma and developmental defects from the score
2. Examine all teeth and all surfaces of teeth in the mouth for tooth wear
3. Identify in each quadrant the most severely affected tooth with wear
4. Conduct BEWE score.

Table 2 Criteria for grading erosive wear

Score	Features
0	No erosive tooth wear
1	Initial loss of surface texture
2	Distinct defect, hard tissue loss <50% of the surface area
3	Hard tissue loss ≥50% of the surface area

Table 3 Complexity levels as a guide to clinical management[15]

Complexity level	Cumulative score of all sextants	Management
0	Less than or equal to 2	Routine maintenance and observation Repeat at 3-year intervals
1	Between 3 and 8	Oral hygiene and dietary assessment, and advice, routine maintenance and observation Repeat at 2-year intervals
2	Between 9 and 13	Oral hygiene and dietary assessment, and advice, identify the main aetiological factor(s) for tissue loss and develop strategies to eliminate respective impacts Consider fluoridation measures or other strategies to increase the resistance of tooth surfaces Ideally, avoid the placement of restorations and monitor erosive wear with study casts, photographs, or silicone impressions Repeat at 6–12 month intervals
3	14 and over	Oral hygiene and dietary assessment, and advice, identify the main aetiological factor(s) for tissue loss and develop strategies to eliminate respective impacts Consider fluoridation measures or other strategies to increase the resistance of tooth surfaces Ideally, avoid restorations and monitor tooth wear with study casts, photographs, or silicone impressions Especially in cases of severe progression consider special care that may involve restorations Repeat at 6–12 month intervals

Pathogenesis of erosive tooth wear

ACID + TEETH
minus PROTECTIVE EFFECTS
=

Demineralisation

Demineralisation occurs at a pH of less than 5

Name of drink	pH
Lemon juice	2.25
Ocean spray Cranberry	2.56
Barber's orange juice	3.61
Minute Maid Natural Energy Mango	3.34
Juicy juice apple	3.64
Tropicana grape juice	3.29
Simply lemonade	2.61
Coca Cola Zero	2.96
Coca Cola Classic	2.37
Coca Cola Cherry	2.38
Pepsi	2.39
Pepsi Max	2.74
7UP Diet	3.48
Red Bull regular	3.43

The authors purchased 379 non-alcoholic, non-dairy drinks in stores in Birmingham, Alabama.
93% had a pH of less than 4.0

Reddy A, Norris DF, Momeni SS, Waldo B, Ruby JD The pH of beverages in the United States. J.Am.Dent.Assoc.2016:147:255-263.

CASE REPORT

Dental erosion due to wine consumption

LOUIS MANDEL, D.D.S.

Background. Dental erosions can result from numerous causes, but extrinsic dietary factors are the most common. Because of wine's acidity, it may have a deleterious effect on teeth. Its use must be considered during an evaluation of erosive dental changes.

Case Description. The author examined a 56-year-old woman because her referring dentist had noted extensive erosive loss of tooth structure, mainly enamel. The author eliminated the usual causes of dental erosion. It was only after a detailed history was obtained and dietary investigation was undertaken that the author determined that the amount, manner and timing of the patient's wine drinking was the cause of the problem.

Dental erosion is defined as a superficial loss of tooth substance by a chemical process that does not involve bacteria.[1-3] The resulting chemical etching usually reflects the effect of

Inappropriate use of wine can lead to extensive dental erosions.

rior teeth not protected by the lips. Exposure to high levels of hydrochloric acid in improperly maintained chlorinated swimming pools also has been reported as a cause of erosion.[1-3] Furthermore, acid erosion can result from the prolonged oral retention of medications. Oral misuse of medications such as hydrochloric acid tablets,[3] aspirin (acetylsalicylic acid)[2,3,5] and vitamin C (ascorbic acid)[3]

has been reported to range from 3.0 to 3.8,[1,3,5,7] with white wine being slightly more acidic than red wine.[3,5] Wine derives its acidity mostly from its contained tartaric and malic acids and from smaller concentrations of citric and succinic acids.[13-15] Because the critical point at which enamel dissolves is

Dentists should be aware that wine could be a cause of dental erosion

Drinks tested:Bubbles!

- Sparkling water
- Schweppes Tonic water
- Schweppes Slimline Tonic water
- Bucks Fizz (Winemakers selection by Sainsburys) 4% vol
- Shloer Non alcoholic sparkling white grape juice
- Alska Nordic berries cider (Swedish Cider Company, Stockholm) 4.0% vol
- Orchard Premium Irish Cider 4.5% vol
- Asti Vino Spumante Dolce (S.Orsola) 7% vol
- Prosecco Extra dry (Valdobbiadene) 11% vol
- Champagne Monsigny Brut (Philizot et fils) 12% vol
- Lanson Brut Rose (Reims France) 12.5% vol
- Saumur Rose Brut (Bouvet , Saumur)
- Sparkling natural mineral water (Badoit, Saint Galmier, France)
- Soda water

Don’t worry!

The most expensive drink was the most erosive!!

Drinks with bubbles might be bad for your teeth!!

Rose sparkling wine and rose champagne seem to be worst!

Don’t worry!

Of course, as well as pH and neutralizable acidity, it’s also a volume thing

There may also be other health hazards

Is erosion an increasing problem?

Conclusion

YES!

Other causes of erosion: regurgitational erosion

- **Anorexia nervosa**
- **Bulimia**
- Voluntary reflux phenomenon (regurgitation and swallowing)
- Occasional sickness (pregnancy sickness:alcohol induced vomiting)
- GORD

Signs of erosive activity

- Sensitivity
- Loss of surface anatomy
- Cupped surfaces of anterior teeth
- Chipped incisal edges/Incisal translucency
- Loss of palatal enamel

Signs of erosive activity

- Unstained surfaces

NOTE:

If the dentine surface is stained, there has been sufficient time for teeth to take up stains from coffee, ***red*** wine, nicotine, etc., therefore urgency of treatment decreases.

Summary:composite for TW

- Sufficient number of shades & translucencies
- Enamel shade valuable when only rebuilding incisal edges
- Good polishability
- Non-slump and non-sticky materials facilitate easy freehand placement

Layering composite …before placement:

- Look at colour and translucency
- Look carefully from different angles
- Look at shape required
- Consider palatal matrix
- Correct thickness of each layer essential
- Consider *effect* shades – stains, opalescence

Layering composite …palatal matrix

- Gives palatal contour and incisal edge (length and bucco-palatal position)
- Should minimise adjustment
- 2 or 3 layer technique
- ??Use Memosil transparent vinyl polysiloxane

Dahl appliance

- First types were removable
- Later types cemented to teeth and removed
- Contemporary types *may* use the permanent restoration to gain the space

These were made to obtain space for the restoration of worn teeth

“Dahl” appliance (cemented) 2.5mm thick, is used for obtaining space for restorative materials on palatal of anterior teeth where posterior teeth are satisfactory

Dahl Appliance

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

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
youngest age
of the splint
function. Lis

Key-words:

*Bjørn L. Dah
1109, Blinde

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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.

Is it sinful to cement restorations high?

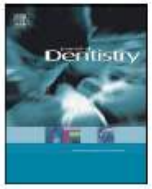
The 2016 version of Declan Anderson's work!

Journal of Dentistry 45 (2016) 26–31

Contents lists available at ScienceDirect

Journal of Dentistry

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



Effect of placing intentionally high restorations: Randomized clinical trial

Olga Gerasimidou[a], Timothy Watson[b], Brian Millar[c,*]

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[b] Biomaterials & Restorative Dentistry, King's College London Dental Institute, London, United Kingdom
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Remodeling

ABSTRACT

Objective: The aim of this study was to examine the behavior of posterior teeth restored with single-tooth restorations with intentionally high occlusal contacts.
Methods: Consent was obtained from 17 patients who were seen a total of 5 times over 3.5 years. The restorations placed were all full occlusal coverage gold restorations. Tooth mobility was recorded using the Periotest device and tooth movement was determined from impressions and 3D imaging. Patients were randomly assigned into two groups, the control group which received restorations with no intentional increase of the occlusal vertical dimension; or the treatment group where they received intentionally high restorations in 0.5 mm supraocclusion.
Results: Statistical analysis showed no significant difference in mobility between visits for both the control and the treatment groups while a significant dependency and difference in tooth movement was observed between the subjects of the two groups. Most patients from the treatment group reported discomfort but no pain for the first 7–10 days after the restoration was fitted, which subsided over a period of couple of weeks. At review, 3 years later, no mobility or additional movement was observed.
Conclusions: Cementation of an intentionally high single-tooth restoration causes no increase in tooth mobility while occlusal adaptation re-establishes and restores the occlusal plane.

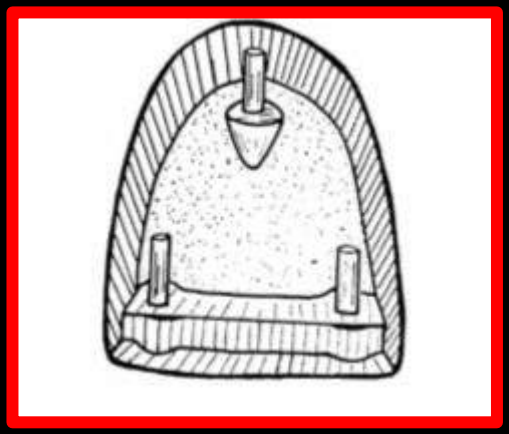
Is it sinful to cement restorations high?

The 2016 version of Declan Anderson's work!

In conclusion, the cementation of a single-tooth fixed restoration with cuspal coverage at an increased vertical dimension of 0.5 mm does not cause a statistically significant increase in tooth mobility. A combination of intrusion of the restored tooth and its opposing tooth combined with extrusion of other teeth restores the occlusal plane. Subjects who received high restorations reported a discomfort that lasted up to 10 days. The study supports this treatment option where occlusal space is required and tooth reduction is not desirable.

- One patient in the control group had mild discomfort while chewing
- 6 of 8 patients in "high" group reported discomfort but no pain for 7 days, subsiding after 2 weeks
- The occlusion had "adapted" after one month

…after treatment with the “Dahl appliance”: types of permanent restoration



- Oxidised gold castings
- Gold pinlays (Dahl, 1975)
- Palatal porcelain laminate veneers
- Palatal indirect composite veneers
- Directly placed resin composite

Preventive advice for patients with an erosive element to their diet

- Reduce the amount & frequency of intake
- Avoid “frothing” or swishing drinks
- Avoid brushing teeth at least 30mins after drinking
- Chill the drink
- Avoid such drinks before bedtime or during the night

Preventive advice for patients with an erosive element to their diet

- Explain that there is increasing evidence that some toothpastes may help

Oxford English Dictionary Online

pragmatist

Noun:

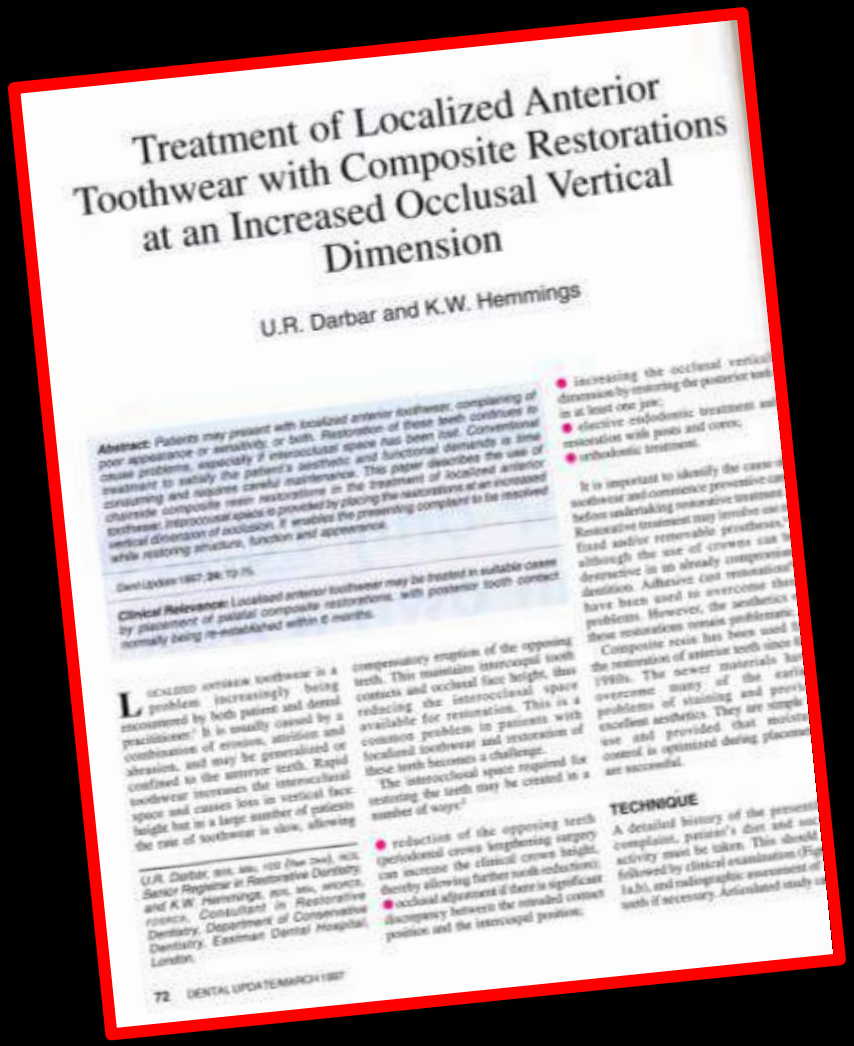
Taking a practical approach to problems

Being concerned with the success or failure of one’s actions

Concerned with making decisions which are useful in practice and not just in theory

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

Using the restoration as the appliance

But, patients must be advised that treatment is to protect their worn and wearing dentition, not necessarily to improve the appearance of their teeth

33 year old female

Filtek Supreme XT

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

How to do it!

Filtek Supreme XTE A2 Enamel/Scotchbond Universal

Diagnosis:erosive TW – patient was a bulimic

Polydent strips (£9 for 3 metres) come in two thicknesses/ stiffnesses. The stiffest is most useful for interdental separation.

A week later: occlusal adjustment in ICP, lateral & protrusive excursions

Filtek Supreme XTE A2 Enamel/Scotchbond Universal

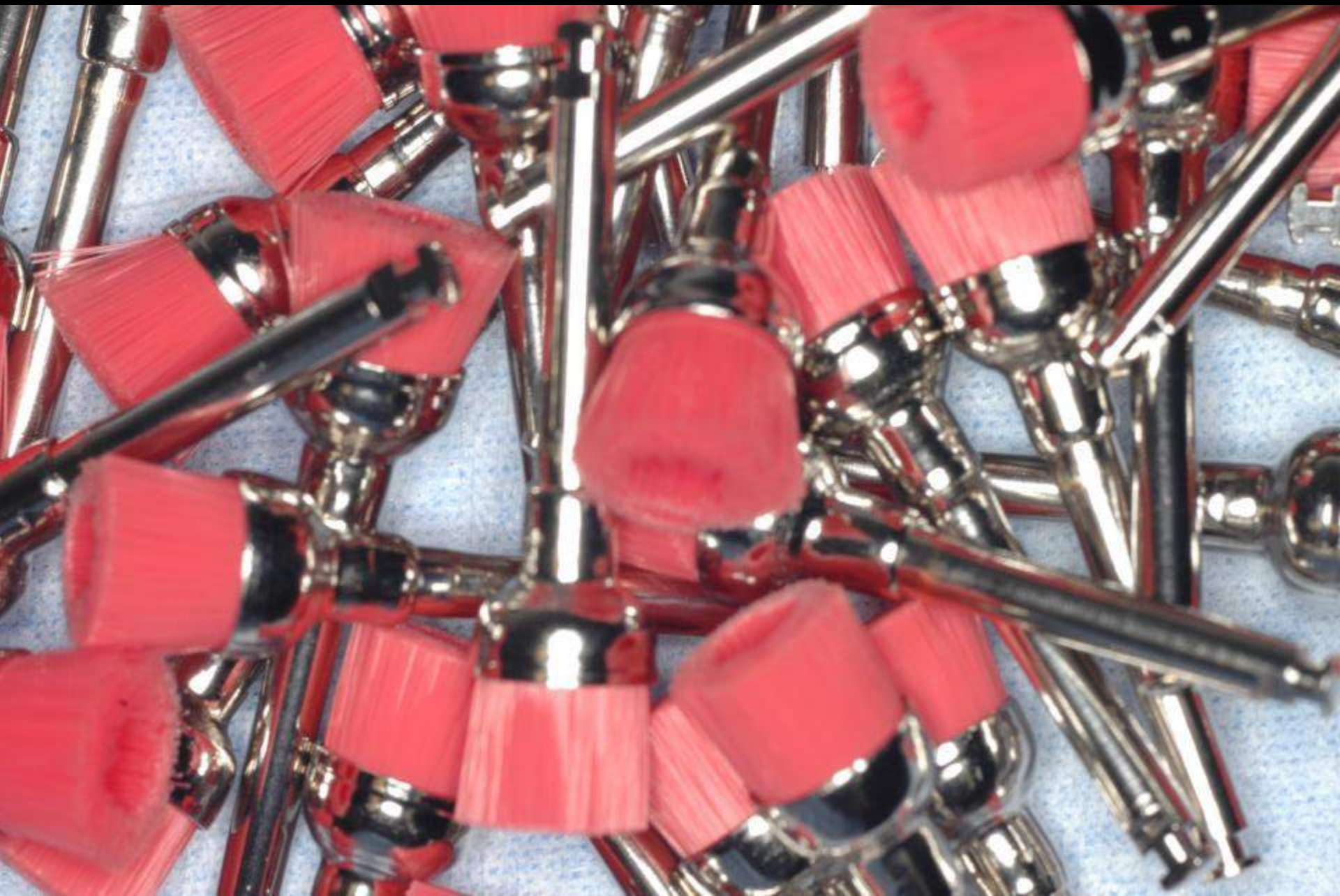
Polish with Hi-Luster (Kerr)

Blue (aluminium oxide) first, then grey (plastic impregnated with diamond powder)

Final polish with Soflex discs (all grades except black) and Kerr Hi Luster

Mycerium Shiny paste also does a good job

Pink soft brushes from Henry Schein



3M Science. Applied to Life.™

Polish with diamonds. Skip the paste.

Sof-Lex™ Diamond Polishing System

How much time and effort do you spend creating beautiful smiles? Whether you currently use a rubberized finishing and polishing system or an intraoral diamond polish, the process can be time-consuming. And, even with your best effort, the gloss may not last. 3M has a simple solution for both problems, using two of our innovative technologies.

Restore with Filtek™ Supreme Ultra Universal Restorative.
Unsurpassed esthetics is just one reason why doctors use this nanocomposite. Thanks to 3M's true nanotechnology, it is easy to polish and offers unsurpassed polish retention.

Polish with the Sof-Lex™ Diamond Polishing System.
Forget the messy paste. Our pre-polishing spiral prepares the restoration for final gloss, while our diamond-impregnated polishing spiral gives your restorations that gorgeous paste-like gloss. The system offers the convenience of a rubberized system while also adapting to all tooth surfaces.

You'll be happy to know that while the spirals are effective, they're also kinder to gingival tissues*—and maintain the integrity and anatomy of your restorations!

When patients leave your office smiling, you'll marvel at how simple it's become to create beautiful, natural-looking esthetics.

*Compared to other finishing and polishing tools.

A difference that you can see!

Filtek™ Supreme Ultra Universal Restorative polished with Sof-Lex™ Diamond Polishing System (left) vs. TPH Spectra® Universal Composite polished with Enhance® Finishing System and PoGo® Polishing System (right). Notice a clearer reflection with the Sof-Lex™ Diamond Polishing System.

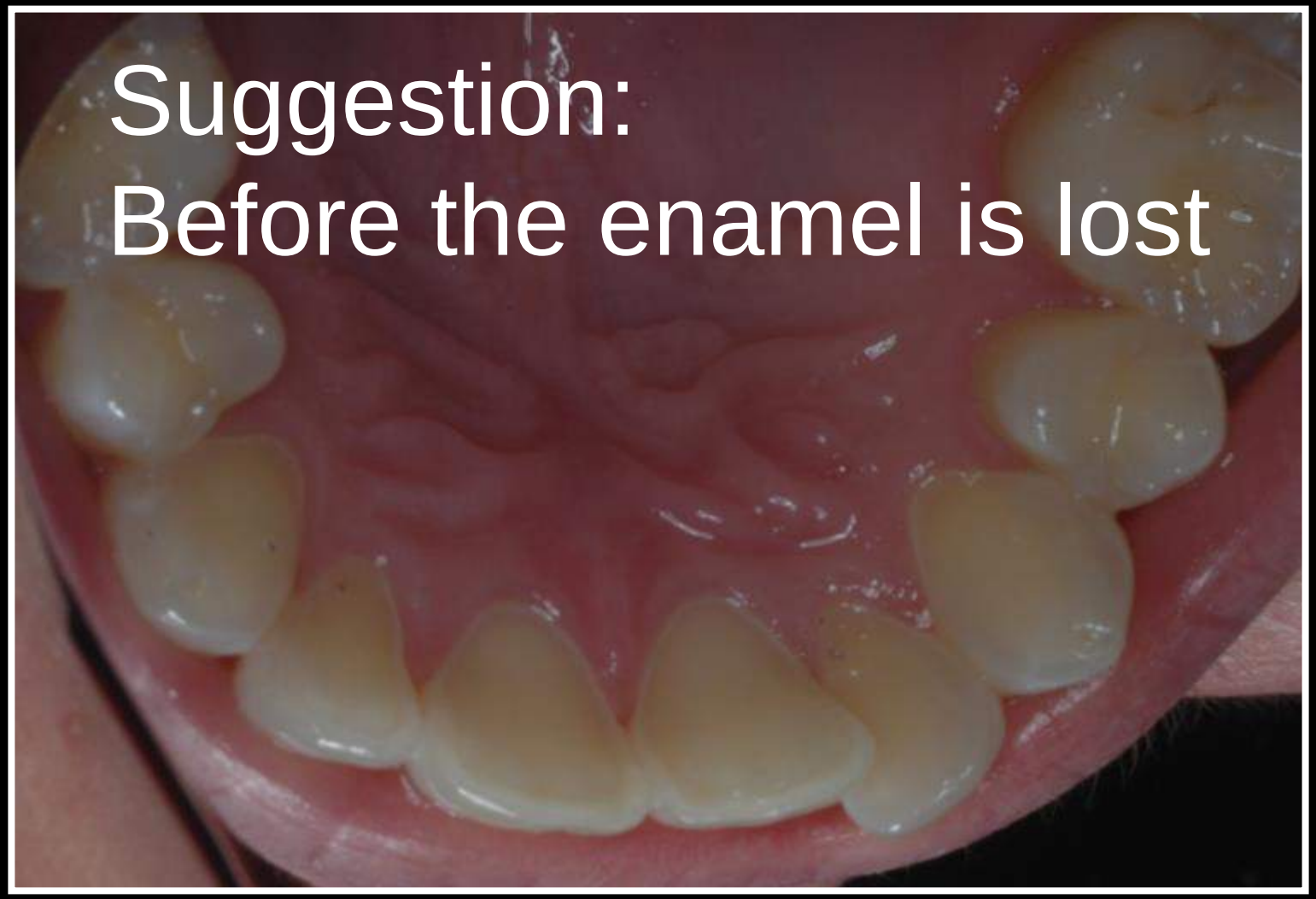
You can create a diamond paste-like gloss with just two steps.

Summary of advantages

- Imparts paste-like gloss in the convenience of a rubberized system
- Unique, flexible shape adapts to all tooth surfaces
- Fast and easy to use
- Multi-use, can be sterilized and reused
- High, long-lasting gloss when used with Filtek™ Supreme Ultra Universal Restorative

I think that the Soflex Diamond Spiral is terrific!

At what stage should we treat bulimic patients?



It's not perfect,
it's pragmatic
aesthetics!

Dent.Update:2014:41:28-38.

RestorativeDentistry

FJ Trevor Burke

Information for Patients Undergoing Treatment for Toothwear with Resin Composite Restorations Placed at an Increased Occlusal Vertical Dimension

which will be subject to axial orthodontic tooth movement, and difficulty in chewing on the posterior teeth if these are discluded. It is therefore important, as with any treatment, that the advantages and disadvantages are fully explained to the patient. This paper therefore describes the clinical technique and presents a Patient Information Leaflet that the author has used for over five years.

Clinical Relevance: Patients should be advised regarding the disadvantages and advantages of any technique.

Dent Update 2014; 41: 28-38

The paper contains the PIL

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 should therefore cut your food into small pieces to avoid intestinal symptoms

Your back teeth will eventually erupt so that you will be able to chew on them again after 3 to 6 months

The change in shape of your upper anterior teeth might cause lisping for a few days

Your front teeth may be a little tender to bite upon for a few days

Your “bite” will feel very unusual for several days and you may find difficulty in chewing for this period, as 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 restorations may require occasional polishing

Occasionally, chipping of the restorations may occur

Chronology of tooth wear treatment

Decision to treat

"Live" mock up if appearance to be changed

Patient understands treatment, inc.disadvantages

Composite build ups

1 week later, occ. Adjustment/polish

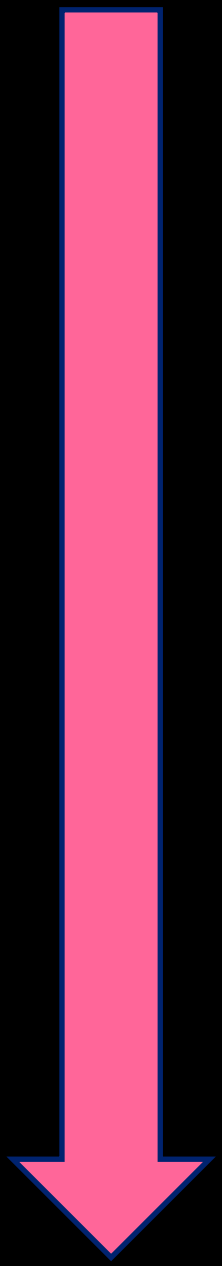
Review after 3 months

At three month review

Ask if comfortable and happy with appearance

If yes,

If no, consider crown lengthening surgery and crowns



Choice of patient for “Dahl” technique

- Worn anterior teeth, space needed for restorations to cover dentine
- Treatment is to prevent further wear, not necessarily to improve appearance
- Capable of opening the OVD on minimum of 4 (??3) teeth
- Patient accepts short-term disadvantages
- Patient accepts that crowns may be indicated later for aesthetic reasons

Choice of patient for “Dahl” technique

- Patient requests treatment of wear, and/or improvement in appearance and/or function
- There are no TMJ problems
- There is ***NO*** periodontal disease/ teeth have no mobility
- OH satisfactory
- Sufficient tooth substance (enamel) for bonding

Information for Dahl technique patients

May cause lisping
Teeth may be painful
No posterior occlusion, so food must be cut into small pieces
Time for re-establishment of occlusion =??

Information for Dahl technique patients

At first visit ask patient to check restorations with tongue
Warn that will not be able to eat, chew etc
Final occlusal adjustment will be done second visit

Information for Dahl technique patients

For patients with bridges, warn that the bridge may not erupt into position:
Ditto implants.
The cost implications must be discussed.

Advice for patients with large anterior composite Restorations:

Restorations may need occasional refinishing and polishing

Incidence of pulp death nil

Incidence of debonding is approx 2%

Bond strength will be better in 10 years time!

Composite wears at the same rate as enamel

Information for patients receiving extensive composite restorations:

Restoration may require maintenance,
for example, finishing and polishing
(patient should expect to pay for this!!)

Patient Information Leaflet
Available to subscribers of Dental Update

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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 restorations may require occasional polishing

Occasionally, chipping of the restorations may occur

Results from 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.

Redman CDJ, Hemming KW, Good JA. The survival and clinical performance of resin-based composite restorations used to treat localised anterior tooth wear. Br.Dent.J. 2003:194:566-572.

Gow AM., Hemmings KW. The treatment of localised anterior tooth wear with indirect Artglass restorations at increased occlusal vertical dimension. Results after 2 years. Eur.J.Prosthodont.Rest.Dent.2002:10:101-105.

Treatment of TW in Liverpool

Journal of Dentistry 44 (2016) 13–19

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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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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

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”

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.

TW Treatment: Clinical tips on wax up or direct placement

after Milosevic Prim Dent.J.2016:5:25-28

Make thick or wide incisal edges, particularly in edge to edge occlusions, so that guidance is flat and composite is in compression

Bevel the incisal edge (where possible)

Roughen the dentine (and etch for 30 seconds longer)

Use available labial (enamel) surfaces of the upper incisors as a ferrule to improve resistance to torqueing forces on the composite

TW Treatment: Clinical tips on wax up or direct placement

after Milosevic Prim Dent.J.2016:5:25-28

Warn the patient that the build ups wil be shorter than natural teeth

Keep the palatal surface guiding surfaces shallow to minimise sheer forces on the composite

Build one tooth at a time

Dental dam not always indicated as upper anterior teeth can be kept dry with cotton rolls

Don’t forget to ask patients about bleaching before you start the build-ups! Patients start being interested in how their teeth look!

There is no reason to fear that modest 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 accommodate material thickness of 1.5 to 2mm in either jaw are well tolerated

Dahl et al,1993

University of Birmingham Masters in Advanced General Dental Practice

Six modules

Informed & informing clinician (20 credits)

Contemporary dental practice (20)

Medical and surgical management of oral disease (20)

Oper. Dent 1:Aesthetic dentistry and endodontics (20)

Oper. Dent.2:Fixed and Removable Prosthodontics (20)

Running a clinical business (20)

Case study 30 credits, Audit project 30 credits:
When completed, a total of 180 PG credits = MSc

Dentistry is changing!

Bonding composite
to worn teeth,
using the principle of
pragmatic aesthetics,
is part of the process

my new web site
www.fjtburke.com

- Handout
- contains
- the
- bullet point
- lists

f.j.t.burke@bham.ac.uk

0044 121 466 5476

www.fjtburke.com