Anterior Tooth Preparation Course
Knowledge-Base

St. George’s University Hospital, SW17 0QT Friday 4th November 2016
How we can improve our confidence of providing predictable fixed restorations?

Within E-portfolio – you have to do crowns, perhaps a replacement conventional bridge and resin bonded bridges.
We need to understand tooth restorability and what this needs in 2016 and beyond.
What would you and I do if this was our LL6 – would we go through this? -
Has the recent focus on direct and indirect adhesive dentistry and Dahl concept compounded our indecision when planning conventional crowns and bridges and being confident to prepare teeth well?
Repair or replacement of restorations: do we accept built in obsolescence or do we improve the evidence? Sharif MO, Fedorowicz Z, Tickle M, Brunton PA.

CONCLUSION: In view of the absence of high level evidence there is a need for further well designed RCTs. To add value to the evidence base these trials should be conducted in a general practice setting which will strengthen the applicability of the research conclusions and enable dentists and patients to make informed decisions.
Patch and Direct Repair (TSL)

do as little damage as possible is my mantra – think of the next failure re-cycle
Patch and Direct Repair (TSL)

Composite – is brittle so bulk it up and it will last – might need some running repairs

Survival analysis of composite Dahl restorations provided to manage localised anterior tooth wear (ten year follow-up)

A. B. Gulamali,1 K. W. Hemmings,1 C. J. Tredwin1 and A. Petrie1

**Objective**
To evaluate ten-year survival and clinical performance of resin-based composite restorations placed at increased vertical dimension as a ‘Dahl’ type appliance to manage localised anterior tooth wear. Design A prospective survival analysis of restorations provided at a single centre. Setting UK NHS hospital and postgraduate institute. **Methods**
The clinical performance of 263 composite resin restorations on 26 patients with localised anterior tooth wear was reviewed after a ten-year follow-up period. The study used modified United States Public Health Service (USPHS) criteria for assessing the restorations. Survival of the restorations was analysed using Kaplan–Meier survival curves, the log-rank test, and the Cox proportional hazards regression analysis. Results The results indicated that the median survival time for composite resin restorations was 5.8 years and 4.75 years for replacement restorations when all types of failure were considered. The restorations commonly failed as a result of wear, fracture and marginal discoloration. The factors that significantly influenced the survival of these restorations were the incisal relationship, aetiology, material used, and the nature of opposing dentition. The biological complications associated with this treatment regime were rare. Patient satisfaction remained high despite the long-term deterioration of the restorations. Conclusion With some degree of maintenance, repeated use of composite resin restorations to treat localised anterior tooth wear at an increased occlusal vertical dimension is a viable treatment option over a ten-year period.

IN BRIEF
- Shows the clinical performance of composite resin restorations used to manage localised anterior tooth wear.
- The limited mechanical and physical properties of composite resin restorations demand a degree of maintenance.
- Biological complications related to this treatment regime are much fewer than conventional tooth preparation for crowns.
- Patient satisfaction remains high despite long-term deterioration of the restorations.
We know that aesthetic restorations can come at a biological price.

- DBC prep = 63% off tooth
- PFM prep = 72% off tooth
- PFM prep > FGC prep
- PFM prep x5 > Porcelain veneer (feathered) x3 > Porcelain veneer (butt joint)


The problem is if you do something rarely – unless you have got ‘god-given’ talent or are lucky – when you need to do it you will not be able to execute it well.
Blue Sky Thinking

2000 hours of repetitive skills training
Are there other factors that worry you?

**Top ten claims**

1. Crown and bridgework
2. Endodontics
3. Nerve damage
4. Oral surgery (other than 3, 7, 10)
5. Restorative (excluding those listed separately; mostly “perio” and claims relating to various “fillings”)  
6. Orthodontics
7. Implants
8. Dentures
9. Veneers
10. Failure to diagnose or incorrect diagnosis (mostly undiagnosed caries and undiagnosed pathology)

This appeared in my local paper
Is this what we will all be reduced to?

“Perhaps we could make ends meet if we sued each other for malpractice...?”
Conventional Retention relates to:

- Taper
- Surface Area
- Surface Roughness

Jorgensen 1955
‘Can you remind me how long you said my crown and / or bridge would last?....’ Mrs. Angry from Purley?
Prosthetic treatment planning on the basis of scientific evidence

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SUMMARY The objective of this report is to summarize the results on survival and complication rates of different designs of fixed dental prostheses (FDP) published in a series of systematic reviews. Moreover, the various parameters for survival and risk assessment are to be used in attempt to perform treatment planning on the basis of scientific evidence. Three electronic searches complemented by manual searching were conducted to identify pro-bonded bridges 87.7%. Moreover, after 10 years of function the estimated survival decreased to 89.2% for conventional FDP, to 80.3% for cantilever FDP, to 86.7% for implant-supported FDP, to 77.8% for combined tooth-implant-supported FDP, to 89.4% for implant-supported SC and to 65% for resin-bonded bridges. When planning prosthetic rehabilitations, conventional end-abutment tooth-supported FDP, solely implant-supported FDP or
Survival of Fixed Space Fillers

**Table 1. Summary of annual failure rates, relative failure rates and 5-year survival estimates**

<table>
<thead>
<tr>
<th>Type of reconstructions</th>
<th>Total number of reconstructions</th>
<th>Total exposure time</th>
<th>Mean follow-up time</th>
<th>Estimated annual failure rate</th>
<th>5-year survival summary estimate, % (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional FDP</td>
<td>2088</td>
<td>11998</td>
<td>5.7</td>
<td>1.28† (0.64–2.59)</td>
<td>93.8† (87.9–96.9)</td>
</tr>
<tr>
<td>Cantilever FDP</td>
<td>432</td>
<td>2112</td>
<td>5.2</td>
<td>1.80* (1.15–2.82)</td>
<td>91.4* (86.9–94.4)</td>
</tr>
<tr>
<td>Implant supported FDP</td>
<td>1384</td>
<td>6880</td>
<td>5</td>
<td>0.99 (0.64–1.52)</td>
<td>95.2 (92.7–96.8)</td>
</tr>
<tr>
<td>Tooth-implant supported FDP</td>
<td>199</td>
<td>976</td>
<td>5</td>
<td>0.92* (0.50–1.70)</td>
<td>95.5* (91.9–97.5)</td>
</tr>
<tr>
<td>Implant supported SC</td>
<td>465</td>
<td>2280</td>
<td>5</td>
<td>1.14* (0.76–1.70)</td>
<td>94.5* (91.8–96.3)</td>
</tr>
<tr>
<td>Resin bonded bridges</td>
<td>1374</td>
<td>8241</td>
<td>6</td>
<td>2.61* (1.68–4.06)</td>
<td>87.7* (81.6–91.9)</td>
</tr>
</tbody>
</table>

*Based on standard Poisson regression.
†Based on random-effects Poisson regression.

**RBBs drop down to 65% at 10 years (cf to 89.2% for FDP)**
Survival characteristics of 771 resin-retained bridges provided at a UK dental teaching hospital

P. A. King, L. V. Foster, R. J. Yates, R. G. Newcombe and M. J. Garrett

Objective To analyse the factors affecting the clinical performance and those influencing the survival of resin-retained bridgework provided at a UK dental teaching hospital between 1994 and 2001. Design A prospective analysis of restorations provided at a single centre using case notes with all patients invited for review to corroborate findings. Setting Department of Restorative Dentistry, University of Bristol Dental Hospital and School, Bristol, United Kingdom. Subjects and methods Between January 1994 and December 2001, data regarding 1,000 consecutive resin-retained bridges provided at Bristol Dental Hospital and School were recorded. Data was available for 805 patients at the time of the study. Following invitation, 621 patients attended for a review appointment. Life table and Kaplan-Meir survival analysis were carried out for all restorations provided. Results The five-year and ten-year survival rates estimated by the life-table method are 80.8% (95% confidence interval 78.0–83.6%) and 80.4% (95% confidence interval 77.6–83.2%) respectively. The median survival cannot be estimated for this study as the survival probability remains above 80% even at the longest follow-up. Analysis of clinical variables influencing survival revealed that design of the restoration and experience of the operator providing the restoration were significant factors. Resin-retained bridges made with minimal tooth preparation are shown to be superior in terms of longevity than those for which other types of tooth preparation is made. Patient satisfaction with their treatment was high.
Prospective outcome of 1000 consecutive RBBs in 805 patients

- Experience of Operator - Yes
- Minimal preparation - Yes
- Design of bridge – Yes
- Replacement of existing restorations - Yes

King et al. 2015
Failure characteristics – bond failure commonest failure

- 20% failed by 5 years
- Few failed thereafter even though more than two thirds were assessed for more than 10 years
- No failures of surviving bridges between 10 – 16 years
- As a result 5 and 10 year survival probability was 80% (as shown by survival curve)

King et al. 2015
What is the difference?

Fig. 1 Resin-retained bridge replacing tooth 45 with the 46 as the abutment unit

Table 1 The number of restorations that failed by each mode

<table>
<thead>
<tr>
<th>Type of failure</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dental caries</td>
<td>5</td>
<td>0.6</td>
</tr>
<tr>
<td>Debond</td>
<td>129</td>
<td>16.7</td>
</tr>
<tr>
<td>Fractured metalwork</td>
<td>3</td>
<td>0.4</td>
</tr>
<tr>
<td>Fractured porcelain</td>
<td>14</td>
<td>1.8</td>
</tr>
<tr>
<td>Other – aesthetics</td>
<td>1</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Each patient was asked to indicate whether or not they were satisfied with the appearance and function of their restoration and any specific areas of dissatisfaction were noted.

Fig. 2 Kaplan-Meier survival curve whole cohort bridges, 152 failed

Fig. 4 Kaplan-Meier survival curve for all patients comparing grade of operator providing RBB

who had not returned for routine recall were given appointments specifically for the survey. Where this failed, contact was attempted by telephone, mail or email to patients or their general dental practitioners to ensure that the restorations were either in service at the survey date of 30 March 2010 or were

d and the restoration(s) were coded. Collection of the data involved the use of a proforma chart matching a Microsoft Access database and running on a PC.

of 15.98 years, no failure occurred during the life-table method are 80.8% (95% confidence interval 78.0–83.6%) and 80.4% (95% confidence interval 77.6–83.2%) respectively. The median survival cannot be estimated for our cohort, as the survival probability remains above 80% even at the long
Median and 50% probability survival can not be calculated as survival probability greater than 80% at longest review period – hasn’t yet dropped to 50% or below

Very odd shaped bath
Results:

- Hazard ratio bigger for multi-abutments than for multi-pontics (the number of supporting teeth very important)
- Minimal preparation (m) more successful than intermediate (I) or maximal (m)
- Where existing restoration present in abutment teeth - placement of new restoration improves outcome compared to accepting old

King et al. 2015
Minimal Preparation and remove and replace existing restorations within abutment tooth

King et al. 2015
Cantilever - v - hybrid / fixed-fixed

- Difference early on
- Then both plateau off – similar survival characteristics
- Cantilever and double cantilever bridges predictable

King et al. 2015
• Prospective
• Long-term follow up
• Butterfly bridge did very well to replace 2/2
• No median survival
What factors will play a part in bringing lots of RBB studies together?

• Design of bridges
• Type and extension of ‘wings’
• Teeth replaced
• Techniques / materials / cements
• Operators
• Study design – duration, number, success / failure criteria
A review of the success and failure characteristics of resin-bonded bridges

M. Miettinen¹ and B. J. Millar²

VERIFIABLE CPD PAPER

Objectives This literature review was designed to assess and compare the success rates and modes of failure of metal-framed, fibre-reinforced composite and all-ceramic resin-bonded bridges. Materials and method A Medline search (Ovid), supplemented by hand searching, was conducted to identify prospective and retrospective cohort studies on different resin-bonded bridges within the last 16 years. A total of 49 studies met the pre-set inclusion criteria. Success rates of 25 studies on metal-framed, 17 studies on fibre-reinforced composite and 7 studies on all-ceramic resin-bonded bridges were analysed and characteristics of failures were identified. Results The analysis of the studies indicated an estimation of annual failure rates per year to be 4.6% (±1.3%, 95% CI) for metal-framed, 4.1% (±2.1%, 95% CI) for fibre-reinforced and 11.7% (±1.8%, 95% CI) for all-ceramic resin-bonded bridges. The most frequent complications were: debonding for metal-framed, resin-bonded bridges (93% of all failures); delamination of the composite veneering material for the fibre-reinforced bridges (41%) and fracture of the framework for the all-ceramic bridges (57%). Conclusions All types of resin-bonded bridges provide an effective short- to medium-term option, with all-ceramic performing least well and having the least favourable mode of failure. The methods of failures were different for different bridges with metal frameworks performing the best over time.
Results:
The analysis of the studies indicated an estimation of annual failure rates per year to be:
4.6% (±1.3%, 95% CI) for metal-framed
4.1% (±2.1%, 95% CI) for fibre-reinforced
11.7% (±1.8%, 95% CI) for all-ceramic resin-bonded bridges.
Metal frameworks

We must not abandon RBBs as a treatment option; particularly where they are likely to go well and be non-destructive.

The single unit, single retainer, cantilever resin-bonded bridge.

9 The reasons for failure of metal- and resin-bonded bridges.
Fibre-reinforced composite RBBs

Fig. 10 The reasons for failure of fibre-reinforced composite resin-bonded bridges
All-ceramic RBBs

Fig. 11 The reasons for failure of all-ceramic resin-bonded bridges
How would you design a best study to look at the three types of adhesive bridges?

- Prospective observation from the off
- Agreement of strict criteria of failure / success – is successful re-cementation failure?
- Randomised allocation
- Few operators / standard protocol
- Large number – power calculation
- Split mouth – design – the different bridges in the same mouth
- Long review – taking into consideration drop out
My Cementation Protocol for RBBs

Dycal try-in – assess fit, aesthetics and occlusion

Place retained-retraction cord – palatal / lingual

Rubber Dam – if useful

Intra-oral sandblast

Metal wing sandblast

A/E / Prime / Bond / Lute Cement / Oxyguard

Remove excess cement / polish & review

Review
Clinical Tip: Dycal (orange) try-in to see what the abutment and pontic of the CRRB look like in-situ – can try in without it disappearing down the oesophagus / right bronchus.

Dycal try-in – assess fit, aesthetics and occlusion
Back to lab if not right 35% chance

Walton Dental Arts

The Dycal try-in technique for Resin-bonded bridges.
Poyser NJ, Briggs PF.
Clinical tip: ‘if the shade is right it will look good in ‘black and white’ if not it will look wrong’
It does not always go as planned - back to the lab for alterations

Dycal 1

Dycal 2

Poyser and Briggs (2004)
Dycal Re-Try-in – assess fit, aesthetics and occlusion

Aesthetics – where opaque cement used no grey out noted – overall patient satisfaction very good (King et al 2015)
Cementation protocol of CRBB

1. Place retained-retraction cord – palatal / lingual
2. Rubber Dam – if useful
3. Intra-oral sandblast
4. Metal wing sandblast
5. A/E / Prime / Bond / Lute Cement / Oxyguard
6. Remove excess cement / polish & review
Cementation protocol – retained retraction cord and if helpful ‘open’ rubber dam

- Place retained-retraction cord – palatal / lingual
- Rubber Dam – if useful

Rubber Dam used - twice as likely to de-cement compared to no rubber dam used – less experienced operators had most failures
A/E / Prime / Bond DBA / Opaque Lute Cement / Oxyguard

Remove: excess cement / retained retraction cord / location cast location cleat and polish & review
A smart and predictable solution to non-organic pain following implant treatment UR1
Metal Rochette provisional RBBs are great to temporise around implants

Work the pointed end of a Ward’s Carver beneath the metal wing
The study shows that in the Netherlands the break even point for equal cost-effectiveness compared to conventional bridges is achieved when the 50% survival for adhesive bridges is at approximately 6.5 yr. Clinical data indicate a higher cost-effectiveness for anterior adhesive bridges.
‘….If you do everything well – it’s very smart thinking that also buys time…..’

- Likely 10 years of survival (80% survival at 15 years King et al. 2015)
- Aesthetically good
- Biologically sound
- CRRB likely to be Retractable

King et al, 2015
RBB Audits – What DFs can do

• Identify patients who will benefit from RBBs?
• Get together as a group – Outcome of DF placed RBBs over last few year – multi-centre Audit
• Materials - Cements, Dycal, Sandblaster, Alloy, etc.
• Aesthetics & fit – remakes?
RBBs struggle to restore molar teeth – avoid losers as you will damage natural teeth unnecessarily.
Conventional Bridges
Much Variation in Survival

3% over 23 years
20% over 3 years

Main problems
• caries
• endodontic
• periodontal
Approx 80% remain in service at 10 years

However, there are some studies that suggest a much more depressing tale
Evidence Based Dentistry
All as it all it seems?

Meta Analysis of 35 studies identified but only 8 could be included in the analysis.
These 8 studies are very selective & how relevant are they to general dental practice?
Only one study from UK
(Reuter & Brose, 1984)

How relevant are these studies to us?

Scurria & Badia 1998
Conclusions:
Scurria and Bader meta analysis (republished in BDJ evidence based practice 1998)
75% of abutments lasted 15 years
92% 10 years
Most failures mechanical (rather than biological)
Let’s look at the 8 studies used by Scurria et al 1998 – how relevant are they to us?

<table>
<thead>
<tr>
<th>Study</th>
<th>Provider</th>
<th>Pts</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ericson</td>
<td>UG</td>
<td>DS</td>
<td>Sweden</td>
</tr>
<tr>
<td>Cheung</td>
<td>Ug/staff</td>
<td>DS</td>
<td>HK</td>
</tr>
<tr>
<td>Palmquist</td>
<td>Pg/staff</td>
<td>DS</td>
<td>Sweden</td>
</tr>
<tr>
<td>Reuter</td>
<td>PP</td>
<td>PP</td>
<td>UK</td>
</tr>
<tr>
<td>Karlsson</td>
<td>GDP</td>
<td>Ins</td>
<td>Sweden</td>
</tr>
<tr>
<td>Randow</td>
<td>GDP</td>
<td>Ins</td>
<td>Sweden</td>
</tr>
<tr>
<td>Valderhaug</td>
<td>GDP</td>
<td>DS</td>
<td>Norway</td>
</tr>
<tr>
<td>Leempoel</td>
<td>GDP</td>
<td>GDP</td>
<td>Holland</td>
</tr>
</tbody>
</table>
Evidence Based Dentistry - Is it all it seems?

Scurria & Badia 1998

Exclusions: Bridges of more than 8 units, those with predominantly partial coverage or cantilever design prostheses
Evidence Based Dentistry - Is it all it seems?

Conclusions: Headline findings - less than 15% of FPD needed replacement over 10 years.

Actual results: at 10 & 15 years:
- 10 & 26% of FPD had been removed
- 13 & 31% had been removed or technically failed & replaced
- 4% of abutments had been lost at 10 years (but increasing fast)
The ‘bath-tub’ curve of failure

Failure = Success in the USA

How long’s your bath?
CROWNS AND BRIDGES ARE NOT FOR LIFE!

When they fail they will usually take one or more abutment(s), or at best, the pulps with them.
I hope that we now have some answers for those little questions our patients throw at us when we least expect them!

The End

Thanks for your attention and I hope you all enjoy the rest of the conference