Anterior Tooth Preparation Course
Knowledge-Base

St. George’s Hospital, SW17 0QT Friday 18th Sept 2015
How we can improve our confidence of providing predictable fixed restorations?
The problem is that broken down teeth are not like intact plastic ones are they?
We will not ask you to do anything that we cannot do ourselves
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.

Is it acceptable to patch / repair – or should we always replace restorations whatever their size on partial failure?
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

3 years – Sept 2014

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

A. B. Gulamali, K. W. Hemmings, C. J. Tredwin and A. Petrie

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, etiology, 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.
We know that aesthetic restorations can come at a biological price.

- DBC prep = 63% off tooth
- PFM prep = 72% off tooth
- PFM prep 20% > 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

We will not ask you to do anything that we cannot

Jorgensen 1955
‘Can you remind me how long you said my crown and / or bridge would last?...’ Mrs. Angry from Purley?

I’ll just look it up!
Prosthetic treatment planning on the basis of scientific evidence

B. E. Pjetursson* † & N. P. Lang† ‡  
*Faculty of Odontology, University of Iceland, Reykjavik, Iceland, †University of Berne School of Dental Medicine, Berne, Switzerland and ‡Faculty of Health Sciences, Århus University, Århus, Denmark

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)
RBBs struggle to restore molar teeth – avoid losers as you will damage natural teeth unnecessarily
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 (re-published 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

Excluded: 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.
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.
Let's discuss a case examples
# ceramic UR1 – Sept 2014
Mrs R – cosmetic challenge for challenging times

Case Discussion
Mrs R

• Fit & well 45 year old female
• Existing maxillary bridges 10 years old
• Bridges have never felt comfortable but no acute pain
• In recent months fracture of porcelain off both bridges - metal now visible and unsatisfactory
Mrs R

• Why do you think that the porcelain has fractured?
• What solutions can you suggest?
• What and where are the problems?
• How predictable will it be?
Answers please

- Why do you think that the porcelain has fractured?
- What solutions can you suggest?
- What and where are the problems?
- How predictable will it be?
Mrs R
Porcelain fracture

- Lack of metal support of porcelain
- Occlusal problem?
- Parafunctional activity?
Metal Support
Ceramic must not be allowed to slip down a metal incline – it needs horizontal support
Mrs R
Removing UL bridge

- Patients warned that we never know what might be found beneath the bridge(s)
Removing PFM – never tap off

Long diamond for the ceramic
Mrs R
Removing UR bridge

- Why has this happened and what’s the treatment?
Mrs R
Try in & Fit of UL bridge

- Be prepared to adjust restorations in excursive movements
- However the static occlusal contacts should be very close / near
Face Bow – When do we need one and why?
Do we need to take a jaw registration and if so why?
May I suggest a good paper on the subject:

Warren K. and Capp N.
A review of Principles and Techniques for Making Interocclusal Records for Mounting Working Casts
Restorations using existing intercuspal relationships

- When enough tooth contacts and working conformatively most accurate record is with no intervening record (i.e. Hand-Help Articulation) Strohaver 1972
- The accuracy of the mounting can be improved by coating the posterior teeth with separating medium and rigidly ‘fixing them’ together with impression plaster Warren & Capp 1990
Restorations using existing intercuspal relationships

- Strohaver 1972

When enough tooth contacts and working conformatively, the most accurate record is with no intervening Record (i.e. Hand-Help Articulation)

Briggsy’s three-legged Stool

Take away one leg and it will fall down. I look at jaw registrations as returning one or more of the missing leg(s) to the stool. If the stool doesn’t fall down at the start then you don’t need a jaw reg!
Principles of Working Jaw Registrations

- Always taken at the vertical dimension you plan to place your restoration(s)
- Only exception is a Remount procedure or a pre-centric C/C check record
How would you take your jaw registration to ensure that your chosen crown for LR6 is not high?
Beauty wax over the occlusal surface of distal molar refine with Temp-bond

Occlusal record packaged within safe environment for the post
So how do I do it?
Take Away Message
• The material must be placed over the tooth preparations
• It must allow the other natural teeth to come together in a coniformative fashion
• The technician needs to be able to easily mount the models at the vertical dimension to which the restorations are to fit!
• The material must be dimensionally stable at mouth temperature
• May need wax block as well if free-end saddles present
• No more use of the heated carding-wax sausage please from anyone in this room

• You need a wax that is firm at mouth temperature, dimensionally stable and easy to use
Learning point: If the stool falls down you need to put something between the teeth to ‘prop-it-up’ when the natural teeth are together in ICP.
Mrs R
post op

• There were problems along the way!
• Better metal support
• Splint given to patient at end of treatment
• Predictability - re-dos never the same as first dos!
• Good anterior guidance makes things simple
Are we doing the simple Prosthodontic things well?

- Impression taking - Storey and Coward (2013)

![Quality of the Impressions of the Prepared Teeth](image)

**Figure 2.** Quality of the impressions of prepared teeth (NHS/Private/All Contracts)
The Use of Gingival Retraction Cord

Seems that this is a common problem

Storey and Coward (2013)
Is dentistry the same as the airline industry?
Who’s to blame for these poor standards?

• How should societies like BSSPD help?
• How should dental schools help?
• How should VT training help?
• How should DF2 / CDP / Specialist training help?
We have all have packed your cord, our nurse has mixed up your hydrophobic rubber silicone impression material, you take out the cord and then what often happens?

Yes - the ‘haem’ starts
Blood = unpredictable and poor impression
Retained Gingival Retraction Cord

• Pack dry cord apical to the preparation margins
• Take the impression with cord in place
• The impression then has to come out!
Gingival Retraction Cord

- Occasionally the cord will come out in the impression - it can be easily peeled out without problem
- The cord can be left in after impression taking to facilitate construction of provisional restorations
- Remember to remove the cord before patient leaves!
The **Single Retained Cord Technique**

*Go and give it a try - and let me know what you think - I wouldn’t do it any other way when conditions are right*
When you get overgrowth of inflamed tissue over the crown margin things become more difficult for retraction cord to control - we need a different strategy - remove the excess tissue and create a gulley around the tooth in which the impression material will flow -
Plan B – I like the yellow tip for moderate cases
Electro-Surgery / Diathermy

- Sub-gingival margin(s)
- Thick gingival tissue which has rolled over the preparation margin
- Need for good quality impression in one visit – instant trough around tooth in which impression material will flow – time is money to patients and dental practices in the real world
As I have got older I get less worried and concerned about the biological width – I now feel that it is restoration fit that it most important.
We all need to be able to make good temporaries that fit and allow consolidation of gingival tissues.
Heavily broken down posterior teeth
what are the challenges?
What is the biggest factor to take into consideration for the restorability of UL6 – is it not the recording of the distal margin of the UL6?
Are you happy with this? – I used electro-surgery – after amalgam Nayyar Core and finished my preparation on sound tooth tissue
Plan B - it’s knowing when retraction cord will not be enough

- Sub-gingival margin(s)
- Thick gingival tissue has rolled over the margin
- Need for good quality impression in one visit – instant trough around tooth in which impression material will flow

![Chart Image](Image)

(Figure 2. Quality of the impressions of prepared teeth (NHS/Private/All Contracts))

(The 4 cases that did not specify contract type are included in the All Cases category)
Plan C

- Where you cannot create 3mm of crown height with shortened teeth – e.g. broken down tooth / #’d tooth / tooth wear – with soft tissue loss alone
- Where thick gingival and connective tissue are not primarily responsible for the issue
Crown Lengthening Surgery – moving the ‘whole attachment apparatus’ level up the root of the tooth
Driving up clinical standards

• What is acceptable & what is not?
• Who has the balls to be honest and talk about our problems?
• Are not young dentists surrounded by people working in ‘ivory towers’ telling them they should not be ‘touching’ teeth with burs and everything can be sorted with adhesive dentistry
‘Am I too old for a bridge?.....’

Mr. Young from Leeds
Roberts (1970) found bridges less successful in patients under 20 (when compared to the 21-35 age group).

Generally avoid conventional crown & bridgework for as long as you can!
'What are the chances that the nerves underneath my crown / bridge will die? ...'

Mrs. Concerned, Leicester

Let’s have a look
The size of the problem varies:

- 10% over 15 years (Karlsson 1989)
- 20% of non RCT’d teeth with apical pathology (Sanders & Saunders 1998)
- 50% over 10 years - with bridges – much lower with single crowns (Cheung et al. 1990)
Cheung et al. (1990)

70% of endodontic complications beneath bridges found in the anterior region (Cheung et al. 1990)
13.3% of full crowns lost vitality (in teeth previously restored)
5.1% of partial veneers non vital at 5 years
Unrestored (controls) teeth that were crowned - only 0.5% non vital at 5 years

Felton & Madison (1989)
There is a risk (that needs to be explained) of dispatching Percy Pulp to an early grave. The risk is much greater for complete crowns (particularly where teeth have existing restorations) when compared to partial crowns and bridges when compared to single crowns.
Post cementation endodontics dramatically increases bridge failure - they suggest elective RCT of questionable pulps prior to bridge manufacture.
The effect on crown retention from a palatal access cavity through an anterior crown reduces retention by 65%.
'Does it matter that the teeth supporting my future bridge are dead?...' Miss Bunty Dogood, Glossop

What do you think?
Dead teeth not good news under bridges

They have enough trouble looking after themselves, let alone lost friends!
endodontic status of abutment teeth - strongest variable on failure
‘If you are restoring canines with a bridge - then think again it is high risk ....’

Roberts (1970)
‘Surely you should use as many teeth as possible to support my bridge?’....

Mrs. Litiginous (an engineer) from Camberley, Surrey

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**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)
Foster (1991) found bridges of 5, 6 & 7 units to last 5.0, 3.7 & 4.1 years respectively.
Roberts (1970)

A long span bridge, in front of and behind the canine, has the poorest prognosis of all Anterior / Posterior combination bridge - bad news
Implants are the best fixed method in 2015 of replacing a missing canine
Case discussion 2
How this has affected me

• Until my recent visit to the dentist I had been told that another two of my teeth were also dying from inside and could fall out at anytime. This has made me very nervous when eating and upset due to the possibility of losing up to four of my front teeth.
• I was informed by the dentists at the hospital that it could be like a domino effect - this made me feel very depressed over the last year.
• I really struggle to wear the denture and find it very uncomfortable – not only does it become looser and looser, even with denture cream, it still makes me feel quite sick (as it’s very unnatural)
• I am conscious that people can see it when I talk, especially when standing or sitting near to me.
• As soon as I leave work I have to take it out of my mouth and tend not to wear it until I leave for work the next day (keeping my mouth closed all the time).
Miss LT

- Again, this is very embarrassing for me at home, and although my partner understands that I can’t bare wearing it for long periods of time, I find it very embarrassing to talk to him without covering up my mouth.
- If I am very honest, it has impacting hugely on our relationship as I feel that I am quite depressed about the whole situation, and very unconfident in myself especially in relation to being intimate with my partner (even kissing is a real struggle for me (with or without the denture) and although this is hard to admit, I have been intimate with my partner fewer than five time in the last year, which I really believe is due to my missing front teeth).
- I have briefly informed my GP but as I consider myself to be quite guarded about my feelings, I didn’t go into too much detail.
- I became at my lowest towards the end of last year when my denture broke on two occasions within the same week in front of two different sets of colleagues. As a result, I contacted the patient advice and liaison service (PALS) and broke down. Thankfully, the worker really helped me to think about all my options.
I have already asked if a bridge could be fitted to replace my denture and have been informed that this will not be possible. I am 33 and a new mum and would very much like to have a more permanent solution to my current dental situation – especially as I am now feeling conscious that my daughter sees (and recognises) me with and without teeth. Finally, I am not in a financial position which would enable me to spend a large sum of money on replacing my missing front teeth.
RBBs is it a good predictable option?
What RBB design would you be suggesting – cantilevers or FF?
If implants – a RP and NP?
Screw-retained or cemented implant crowns – what factors would you take into consideration?
Link them or single units?
What further special tests would aid your examination of Miss LT?

- Pulp testing of UR4 & UR1
- Mounted study models
What options could be used to restore UR3 – including the ups and downs of each?

- Chrome Denture
- Resin-Bonded Bridge(s)
- Conventional Bridge
- Implants
Questions

• What option would you suggest and why?
• Do you think NHS money should be used to fund her implant treatment?
Assuming there is funding and the patient wants implants – how would you go about planning it?

- Diagnostic wax up / surgical stent / PA radiographs
- Temporisation RBB 4PP1/ or RPD?
Questions

- Would you go for cemented or screw-retained crowns?
- Would you link the crowns or go for individual restorations?
How would you take a jaw registration and what would be your occlusal scheme?
What I did
Why do you think the incisal edge of the UR3 #’d? Who’s to blame?
Miss LT 2010 – in group function with better metal support of UR3 VMK
Bridge Design
One abutment at each end please
No more unless you want trouble!
Multiple abutments

- Avoid at all costs - for both conventional & adhesive bridges
- Remember the words of Randow et al. (1986)
- The same seems to apply for cantilever bridges
‘...The longevity of bridges might be increased by the use of only those retainers that are necessary...’

Randow et al (1986)
Conventional Cantilever bridges

One Abutment
One Pontic – acceptable outcome
Conventional Cantilever Bridges

- Some are concerned about the potential for periodontal damage (Rissin et al 1985)
- Laurell et al (1991) in a 12 year study found posterior cantilever bridges a satisfactory form of treatment
Budtz et al (1990) showed that posterior cantilevers are a good alternative to removable dentures (he compared both groups of patients over 5 years).
Conventional Cantilever Bridges

- **Endodontic failures**
  Double abutment cantilevers: single unit cantilevers : conventional three unit bridges = 3:1:1

- **Technical problems**
  3:2:1

Randow et al (1986)
At 10 years – conventional cantilevers nearly 10% outcome difference compared to conventional FPD

Prosthetic treatment planning on the basis of scientific evidence

B. E. Pjetursson* · ‡ & N. P. Lang† · ‡ *Faculty of Odontology, University of Iceland, Reykjavik, Iceland, †University of Berne School of Dental Medicine, Berne, Switzerland and ‡Faculty of Health Sciences, Århus University, Århus, Denmark

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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
‘Should my bridge have been made in two parts?.......’
Mr Rivet (a ship builder) from Glasgow

What’s the answer?
Bridge Rigidity

- Need good height (as related to $H^3$)
- Need it short (as inversely related to $L^3$)
- The width less important
- Cantilevers need short span & good height
‘Is my gap too big for a bridge doc?...’

Mr. Gappy, Nuneaton
More than two pontics
= forget it!
Ante’s Law

- Has been disproved (Nyman & Lindhe (1979); Nyman & Ericson (1982))
- Teeth seem able to adapt to overload (look at wear patients!)
- In general terms do not stray too far away
‘Do single crowns have a better chance of surviving compared to bridges? .......

Mr. William Hill, Aintree

What do you think?
‘Do single crowns have a better chance of surviving compared to bridges? – Yes ask Cheung’s team in Hong Kong......

What do you think?
Bridge Retainer Choice

• Partial coverage restorations are less destructive, kill three times less pulps (than crowns) and perform well

• There are aesthetic problems with partial coverage restorations
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