An evidence based approach to managing children with a carious primary dentition

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Nyborg, Denmark, September 2014

Where does the Hall Technique fit in?

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God eftermiddag mine damer og herrer

• Jeg beklager, men mit danske er forfærdeligt, så jeg vil tale på engelsk. Tålig mag

Average DMFT in children (permanent residents)
16 communities of the Canton of Zurich
4 yly surveys since 1964


Decayed, missing and filled teeth (dmft) for 5 year old children in England

Child oral health care in Scotland

• The good news; it’s free, for all children!
• The bad news; we don’t have a bespoke service & the quality of care provided by general dentists for children is not always very good
• The Care Index for 5 year olds is 11%
• Very unusual to take X rays
• Poor survival of conventional restorations in primary molars

17% Major failures, 46% Minor failures

Innes NP, Evans DJ, Stirrups DR. Sealing caries in primary molars: randomized control trial, 5-year results. J Dent Res. 2011 Dec;90(12):1405-10

NHS Scotland spend 655 million on general dental care for children last year

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Number</th>
<th>Cost (£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deciduous fillings</td>
<td>135,012</td>
<td>1,089,671</td>
</tr>
<tr>
<td>Preformed metal crowns</td>
<td>6,559</td>
<td>144,767</td>
</tr>
<tr>
<td>Deciduous RCT</td>
<td>4,698</td>
<td>147,507</td>
</tr>
<tr>
<td>Extractions I &amp; II</td>
<td>109,000</td>
<td>1,098,622</td>
</tr>
</tbody>
</table>

http://www.isdscotland.org/Health-Topics/Dental-Care/General-Dental-Service/
**Evidence**

- Lack of high quality evidence
- The evidence that does exist is limited and so cannot be easily generalized
- Therefore, uncertainty...

**Care Index for P7 children in Scotland**

**Mean Care Index 52.8%**

(34.7–70.8 by NHS Boards)

**The environment for oral health in Scotland**

Therefore, uncertainty...

- National Dental Inspection Programme 2012 - Report of the 2012 Detailed National Dental Inspection Programme of Primary 1 Children and the Basic Inspection of Primary 1 and Primary 7 Children.

**NDIP 2011**


**Challenges**

- The environment for oral health in Scotland
- The nature of paediatric dental care itself

- Compared with the other Scandinavian countries, the data collection system in Denmark appears more functional and has adopted more modern concepts of disease management
- Enamel caries is included in the "SCOR system" at stage 1 or 2
  - 80% of dentists intervening

**Caries distribution in 3-year-old groups in Oslo showing differences in caries skewness**

- 27% of children live in poverty
- 1 in 3 households in Glasgow have no one in employment
- 11 year difference in male life expectancy between high deprivation and low deprivation areas

- High quality dental care for children
  - Not just this into this,
  - But this, into this!
What might be the barriers to providing high quality care using the surgical approach?

Children find the surgical approach challenging

And the approach can be difficult to deliver

Evidence that children don’t like rotary instruments and injections

• comparing discomfort with bur and hand excavation (non-bur)
• behaviour and heart rate
• patients in non-bur group more relaxed (significant during deep preparation)
• comparing rotary instruments and hand excavation of cavities
• bur-group 2x more pain than non-bur group
• behaviour and heart rate
• patients in non-bur group more relaxed (significant during deep preparation)


Administration of 190 local anaesthetic injections

<table>
<thead>
<tr>
<th>27 gauge needle</th>
<th>30 gauge needle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crying</td>
<td>37 (19.0%)</td>
</tr>
<tr>
<td>No crying</td>
<td>58 (61.1%)</td>
</tr>
</tbody>
</table>

“Our study showed that the vast majority of children rated the injection experience as positive, although there were objective signs of pain like crying. This may be explained by the fact that in a good dentist-child rapport the child may want to satisfy the caregiver”. Ram D et al. (2007) Reaction of children to dental injection with 27- or 30-gauge needles Int J Paed Dent 17(5); 383-387

What is the best way to respond to this?

The mother’s response is defensive:

You see, Jack? This is what happens if you don’t brush your teeth! I blame his Granny, always giving him sweets; it really annoys me

What is the best way to respond to this?

Key MI concepts to look for – Reflective listening? Affirmation or judgemental ? Open or closed questions? Directive, or seeking permission/guiding?

I appreciate it must be difficult for you. Have you tried talking with his father about the sweets?

Assessment of Attitudes & Priorities

Best Practice Prevention

Caries Management

Defining Goals & Agreeing Care Plans

Motivational Interviewing and its use for teeth brushing instruction

Dr Dafydd Evans & Dr Nicola Innes
University of Dundee

Can I borrow your car?

Get them onside

Develop your arguments, counter any objections

When they relent, close with a ‘thanks’ and claim your prize

Elicit “change talk”, then act on it

Gain empathy

Develop discrepancy, roll with resistance

Dr Dafydd Evans & Dr Nicola Innes
University of Dundee

Project

Project
The Hall Technique

Why does 99% of all decay begin on just two, extremely small sites, which form < 1% of the tooth surface area?

because actively cariogenic plaque is not like this…

But like this

A crown placed using the Hall Technique

- no caries removal
- no local anaesthesia
- no tooth preparation

- Adult dental disease begins in childhood
- Managing the lesions should NOT be confused with managing the disease
- Only the highest quality of dental care is acceptable in the care of children

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The Hall Technique: a pilot trial of a novel use of preformed metal crowns for managing carious primary teeth. Tuith Online 2000 http://www.dundee.ac.uk/tuith/Articles/rt03.htm


British Dental Journal, 2006(8), pp. 451-454

Pediatric Dental Care Audit – Highlands of Scotland

Hall Technique procedure; crown fitting appointment

preparation is everything!
- explain the procedure to the child ( & parent)
- show the child the crown (allow them to handle one)
- “a bit of bling”, “princess crown”, “twinkle tooth”

Explain procedure to the child

- try crown for size
- fill with cement
- locate and push on (bite)
- clean
- push further (bite again)
- check and clean

I see it!

Dusty is taking your tooth, but how does it stay in place?

Try to think of a crown as a crown!

5. may I please use your crown to look at decay? Is it looks just the right shape?

Of course!

I’ll use my special tool to fill it up to the right size. Halen diestures look like a bit of stuff that have already been there.

6. a bit of glue will hold the crown on tight

It looks like something you’ve never seen before!
Hall Technique procedure

1. Fill with glass ionomer luting cement, ensuring the crown is well filled and there are no air bubbles.
2. Dry the tooth if possible.

Place crown over tooth and partially push to fit until crown engages with the contact points. Encourage the child to "bite" the crown into place. Or, fully push on the crown with firm finger pressure alone.

If the crown does not fit, ask the child to open and clean extruded cement as quickly as possible. The taste can upset the child.
once cement has been quickly cleaned but is still soft, ask the child to close their teeth together again...

and bite firmly on the crown for 2 – 3 minutes
Or
hold the crown with firm finger pressure:
› crown often goes further down
› prevents crown from moving back upwards
sucking back the cement from the margins potentially reduces effective seal

reassure child and parent that:
› the crown is supposed to fit tightly and the gum will adjust
› child will get used to the feeling of the crown within 24 hours
› the occlusion tends to adjust to give even contacts bilaterally within a few weeks

Generalisability
efficacy vs effectiveness
hospital vs general dental practice
Conventional Restoration

Number of teeth
(14%)

Major failures

- irreversible pulpitis, abscess, swelling requiring pulpotomy or extraction
- tooth broken down and unrestorable

Hall Technique

- NNT  - 10
- no repeat failures
- reversible pulpitis
- filling requires replacement or addition to
- secondary caries
- crown worn through

Randomised control trial

Control standard restoration

Intervention Hall Technique PMC

Allocated by randomisation

Allocated by centralised randomisation

Allocated by centralised randomisation

Allocated by centralised randomisation

Allocated by centralised randomisation

Immediate outcomes

Major clinical failures

- irreversible pulpitis, abscess, swelling requiring pulpotomy or extraction
- tooth broken down and unrestorable

Patient preferences / discomfort

Children

Age 3-6;
Matched decay in similar teeth
Hall technique

Major failures

- irreversible pulpitis, abscess, swelling requiring pulpotomy or extraction
- tooth broken down and unrestorable

Conventional rest.

<table>
<thead>
<tr>
<th></th>
<th>Major failures</th>
<th>Success</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hall Technique</td>
<td>3</td>
<td>76</td>
</tr>
<tr>
<td>Conventional</td>
<td>12</td>
<td>76</td>
</tr>
</tbody>
</table>

McNemar’s Test P=0.05
Absolute risk reduction 0.102
NNT  - 10
3.2.1 Study: 3 Caries management techniques for 2 surface lesions in 1st teeth

- Randomized controlled trial
- Compares three caries management strategies (in primary molars of 3 to 8 year-old children):
  - Conventional Restorations
  - Hall Technique
  - Non-Resorative Caries Treatment

- dentists rated children's behaviour (Fankiel scale)
- children's preferences (Visual Analog Scale of Faces)
- techniques' acceptability to parents and dentists (5-point Likert scale)

- 169 children with approximal caries in a primary molar

Children's behaviour “Definitely Negative” or “Negative”

- Conventional Restoration group (37%)
- Non-Resorative Caries Treatment (31%)
- Hall Technique (13%)

- Mean decision score: Hall Technique > Non-Resorative Caries Treatment > Conventional Restoration

Acceptability of different caries management methods for primary molars in a RCT

- “Very low” for 65% of conventional restorations and 54% of Hall Technique

Minor failures

- Conventional rest.
  - 36 failures
  - 1 repeat failure

- Hall Technique
  - 36 minor failures
  - 5 repeat failures, 45% success

- McNemar's test (p=0.001)

Greifswald clinical trial – Ruth Santamaria & Christian Splieth

In the hands of specialists - how does the Hall Technique compare to standard care and non-restorative management?

Generalisability efficacy vs effectiveness hospital vs general dental practice

Conventional
1 year results for randomised trial

148 children (88%) over 11 months follow-up

> reversible pulpitis: filling, removal of restoration
> irreversible pulpitis: abscess, swelling
> crown wear through
> occluso-proximal lesions into dentine (ICDAS codes 3 to 5)

MINOR FAILURES

- 20 teeth - at least
  - Conventional = 11 (7%)
  - NRCT = 8 (5%)
  - Hall = 1 (1%)

MAJOR FAILURES

- 9 teeth - at least 1
  - Conventional = 5 (3%)
  - NRCT = 4 (2%)
  - Hall = 0

Irreversible pulpitis, abscess, swelling requiring pulpotomy or extraction

Tooth broken down and unrestorable

Reversible pulpitis filling requires repacement or addition

Secondary caries
crown wear through

Why?

Occlusion

Tayside Trial Innes & Evans

First primary molars: 2.29mm
Second primary molars: 2.49mm
1 year follow up
crown re-established on both sides

Occlusion equally re-established on both sides

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Reversable pulpitis: filling, removal of restoration

Irreversible pulpitis: abscess, swelling

Crown wear through

Occluso-proximal lesions into dentine (ICDAS codes 3 to 5)

1 year follow up

Forward trial

First primary molars: 2.29mm
Second primary molars: 2.49mm
1 year follow up
crown re-established on both sides

Occlusion equally re-established on both sides

1. Approximately how many weeks does it take for the dental occlusion, in children who have had Hall Crowns fitted, to re-establish and how does the resolution occur?

2. How does the resolution of the dental occlusion occur?

3. Which of the four methods (Direct Intra-oral Measurement using an orthodontic ruler, Clinical Photographs, 3D Scanner, and Wax Bite Registration) used to measure occlusal changes occurring after fitting of Hall Crowns is the most precise and accurate (reproducible)?

4. Are the alterations confined to the arch in which the crowns were fitted, or do they include the opposing arch?

The Research Questions

Deborah So
BMSc Anatomical Sciences
School of Dentistry
Dr Ralph Jones
Dr Philip Henry
Dr Edward Evans

Objectives

To measure the time period within which occlusal contact is re-established in a similar situation as original measurements following placement of Hall Crowns, by comparing serial measurements of the dentition

To determine the movement involved in the occlusal re-equilibration by measuring intrusion and eruption of the crowned tooth, the opposing tooth, teeth and adjacent teeth using 3D scanning technology

To compare for methods for reliability and clinical ease of use (Direct Intra-oral Measurement using an orthodontic ruler, Clinical Photographs, 3D Scanner, and Wax Bite Registration) for measuring occlusal changes

Three/ four visits

Direct Intra-oral Measurement

Clinical Photographs, standard orthodontic views

Study models (Impressions)

Before and after crown fitting then repeated at appointments 2 and 3 (2 and 6 weeks later)

Child 1 scanned models superimposed; before crown fitted and immediately after crown fitted
Before crown fitted & 2 weeks later
Before & immediately after crown fitted
Before & 2 weeks later
Before & 6 weeks
Before & 6 months
Before & immediately after crown fitted
Before & 2 weeks later
Before & 6 weeks
Before & 6 months

Occlusion change over time in 9 patients (from scanned models)

Bone levels in 100 patients before and after crown fit [minimum of 1 year follow up]

To Crown or Not to Crown: Acceptability of the Hall Technique in New Zealand children. 
Lyndie A Foster Page, Dorothy H Boyd, Sarah E Davidson, Samantha E McKay, W Murray Thomson, Nicola P Innes.

FEAST-HB (Feasibility Trial – Hawkes Bay)

Parents of children who just had Hall crowns fitted
One focus group
10 telephone interviews
Grouped the information into themes
Asked children about their visit to the clinic that day


What did parents and children think of the Hall crowns?

Results:
Common themes; appearance, pain, the procedure, and general opinions on acceptability
Nearly all (90%) of the children responded positively about their visit to the clinic

Conclusion:
High degree of acceptability among both parents and children for placing stainless steel crowns using the Hall Technique

Indications and contra-indications for the Hall Technique

- Why a crown could not be safely placed without risk of inhalation (behavioural or physical constraints)
- Children at risk of bacterial endocarditis or immuno-compromised
Indications for the Hall Technique

**Indications**
- Approximal lesions, cavitated or non-cavitated
- Fissure caries lesions, non-cavitated
  - If patient unable to accept fissure sealant, partial caries removal technique or conventional restoration
- Fissure caries lesions, cavitated
  - If patient unable to accept partial caries removal technique, or conventional restoration

Contra-indications for the Hall Technique

**Contra-indications**
- Signs or symptoms of irreversible pulpitis, or dental sepsis
- Clinical or radiographic signs of pulpal exposure, or periapical pathology
- Crowns so broken down that they would normally be considered as unrestorable with conventional techniques
- Teeth with arrested caries
- Teeth close to exfoliation
- Child at risk of endocarditis

Retrospective analysis of case notes from DDH paediatric dentistry dept (convenience sample n=100 over 2 to 5yrs)

<table>
<thead>
<tr>
<th>Indications</th>
<th>Contra-indications</th>
<th>Success Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signs of symptoms of irreversible pulpal, or dental sepsis</td>
<td>Signs or symptoms of reversible pulpal, or dental sepsis</td>
<td>Very high chance of success</td>
</tr>
<tr>
<td>Clinical or radiographic signs of pulpal exposure, or periapical pathology</td>
<td>Clinical or radiographic signs of pulpal exposure, or periapical pathology</td>
<td>Around a 2/3 chance of failure</td>
</tr>
<tr>
<td>Crowns so broken down that they would normally be considered as unrestorable with conventional techniques</td>
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<td>Very high chance of success</td>
</tr>
<tr>
<td>Teeth with arrested caries</td>
<td>Teeth with arrested caries</td>
<td>Very high chance of success</td>
</tr>
<tr>
<td>Teeth close to exfoliation</td>
<td>Teeth close to exfoliation</td>
<td>Very high chance of success</td>
</tr>
<tr>
<td>Child at risk of endocarditis</td>
<td>Child at risk of endocarditis</td>
<td>Very high chance of success</td>
</tr>
</tbody>
</table>

Where a clear band of dentine can be seen between caries lesion and pulp there is a very high chance of success. Where no band of dentine can be seen between the caries lesion and the pulp there is around a 2/3 chance of failure.
Tooth selection
Teeth that are suitable for Hall Crowns

Tooth selection
Teeth that are NOT suitable for Hall Crowns

Tooth selection
Teeth that are suitable for Hall Crowns

Tooth selection
Teeth that are NOT suitable for Hall Crowns

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- Teeth with arrested caries

Summary
- The Hall Technique manages the cavities, not the disease!
- The Hall Technique is only one of many methods for managing cavities in primary teeth


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