Abstract: Part 2 of this series of two articles addresses the Hall Technique for preformed metal crowns. It will discuss the need for an effective child and dentist friendly method to restore carious primary molars. The technique is described in detail and the evidence for its effectiveness and acceptance by children, parents, dentists and dental educators is presented.

CPD/Clinical Relevance: Dentists and dental care professionals should be aware of the evidence to support the adoption of the Hall Technique.

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In the previous paper the indications, evidence and use of the ‘conventional technique’ for placing preformed metal crowns (PMCs) were described. This second article on the use of PMCs will discuss the Hall Technique. In England, 27.9% of 5-year-olds have experience of dentinal caries at an epidemiological level.1 More significantly, the Care Index (the percentage of teeth which require restoration, which are restored) is only 11.2%. The true prevalence is of course much higher, as a thorough clinical examination supported by radiographs would detect many more lesions, at a time when they would be more likely to result in a successful restoration because the caries would be less advanced than those presenting later, when the carious teeth are unrestorable. Reasons suggested for a lack of restoration of primary teeth include:

- Patients’ expectations;
- Dentists’ training and experience;
- Remuneration system;
- The child’s ability to co-operate; and
- The desire not to frighten him/her by instilling a negative dental relationship.2,3

Furthermore, the success of restorations placed in primary dental care has previously been questioned in a retrospective case note study.4 Conversely, a much larger cohort study has clearly demonstrated, in 2,654 British children aged 4–5 years at baseline, that the survival of restored primary molar teeth is much better than for unrestored molars.5

The vast majority of primary care dentists and paediatric dentistry specialists, when asked, believe that carious primary teeth should be restored, and the literature indicating the success of restorations shows that there is a need for a child and dentist friendly method to allow for this.2 This is where the Hall Technique has great potential.

History

While undertaking a service review of child dental care in North-Eastern Scotland in the late 1990s, Dr Dafydd Evans (University of Dundee) and his co-workers found that one general dental practitioner (Dr Norna Hall) was placing PMCs on primary molars without local anaesthetic, any caries removal or other tooth preparation. This discovery led to a study reviewing Dr Hall’s records and a pilot study prior to a randomized controlled trial, to investigate the method further. The record review of 978 crowns placed in 259 children revealed an 80.5% tooth
3. Success (no further treatment needed).

2. Hall Technique PMCs; and

1. Conventional compomer restorations (with and without local anaesthesia, almost half the former); Hall Technique PMCs; and opening the lesion, then applying fluoride.

At one year, the teeth restored with the Hall Technique performed significantly better than those treated with either of the other options, with no episodes of irreversible pulpitis or abscesses. One secondary care study has compared complete caries removal/pulpotomies with Hall Technique/indirect pulp capping. What is unique about this study is that it is the first to have PMCs in both arms, 104 of 428 restorations in the conventional arm and 388 of 408 in the other arm. This study found no difference in the effectiveness of the techniques after a mean follow-up of 14 months.12

Acceptability

A number of trials have looked at the acceptability of the Hall Technique to the patients, parents and dental professionals. In the initial pilot study at the University of Dundee, Evans et al found the technique to be acceptable to patients, parents and dentists. All 45 children found the technique acceptable;8 as did all the dentists involved in the initial Hall Technique RCT.13 Similarly, specialists reported finding the patient’s behaviour better during the placement of Hall Technique PMCs than conventional intra-coronal restorations, even if the children themselves did not report any statistical difference in pain experience between the two methods.14

Bell et al’s paper which principally looked at the acceptability of the crowns placed using the conventional technique, but did include some Hall Technique PMCs, was discussed in Part 1. This showed high levels of acceptance with only a small number of parents (5%) reporting strong concerns about the appearance.15 In the first of these papers, it was discussed that one of the reasons that dentists don’t place crowns is a perception that they are not well accepted by parents and children; this appears to be ill-founded.16 In fact, the children reported regarding the tooth as special, using terms such as ‘princess tooth,’ ‘pirate tooth’ and ‘special’ to describe their crowned teeth.

Similar results have been reported by a New Zealand study, focusing only on Hall Technique PMCs. This study asked children and parents about their experience of the crowns.17 Issues that this addressed in addition to those discussed above were:

- That the majority of children reported minor discomfort when separators were used;
- That children found the trying in of different crowns uncomfortable but not the actual placement; and
- That the crown felt slightly ‘high’ initially.

Overall, the Hall Technique PMCs were very well accepted by these parents and children.

Finally, there is increasing acceptance of the use of the Hall Technique in undergraduate teaching in the UK.18 For example, all students graduating from the University of Sheffield will have used the Hall Technique as the first choice restorative option for carious primary molars.

Rationale

The Hall Technique is successful because it is based on the principle that

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Conventional intra-coronal restoration</th>
<th>Hall Technique PMC</th>
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<tbody>
<tr>
<td>Major failure</td>
<td>15 (16%)</td>
<td>3 (3%)</td>
</tr>
<tr>
<td>Minor failure</td>
<td>29 (29%)</td>
<td>4 (5%)</td>
</tr>
<tr>
<td>Success</td>
<td>47 (47%)</td>
<td>84 (92%)</td>
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</tbody>
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Table 1. Outcome of the clinical and radiographic assessment of the Hall Technique RCT at 48 months (n = 91 pairs of teeth). Major failure = tooth non-vital; Minor = tooth vital; Success = no further intervention required.
caries does not progress when isolated from the biofilm present on the surface of the lesion. This biological approach to caries management has strong evidence to support it.19

**Hall crown technique: crown placement**

Planning for the placement of PMCs is important due to various factors detailed below.

A discussion must be had with the parent beforehand about the appearance of the crown and the fact that the occlusion will be altered temporarily. Lack of this discussion can lead to problems later as some parents will not be happy with the colour of the crown or the fact that the child may complain of an altered occlusion. All parents and children must be shown the crown before agreeing to the procedure and it can be helpful to have demonstration crowns to enable children to feel the crown — showing them how smooth it feels and how shiny it looks.

Trying it on their finger can give them a better idea of how it will fit on their tooth and help to relieve anxiety. Children can relate to it being ‘a princess crown for their tooth’ or ‘a superman hat’. The success and ease of the treatment is improved if the child is prepared for the procedure beforehand.

Children must also be aware that they need to help the dentist by biting down on the crown. This must be practised prior to crown placement. Children must also be aware that the ‘tooth glue’ to help the crown to stick to and mend their tooth can taste a bit like ‘salt and vinegar crisps’ but that the dentist will then get rid of the taste as soon as possible. It is then helpful to ascertain whether children like the taste of toothpaste and, if so, a small amount of toothpaste can be placed afterwards.

Although Hall Technique PMCs can be fitted onto primary molars that are in contact with adjacent teeth, as the periodontal ligament has enough elasticity to accommodate this, it does make the procedure slightly less pleasant and predictable. Therefore, if the teeth are not spaced, placing orthodontic separators in the contact points 3–14 days before the visit for the crown fit can help. This will also help dentists to assess patients’ suitability for the technique as, if they cannot cope with the placement of separators, they may not cope with crown placement. Separators can be described to a child as being like ‘loom bands’ or ‘small coloured bands to make room for your special crown’. If children understand that the band may feel slightly tight initially ‘like having a small piece of apple stuck between their teeth’ and that it will involve a quick ‘wiggle’ to get it in they are usually very accepting.

Separators can be placed using either lengths of floss on either side of the separator in order to stretch it between the contact points (Figure 1) or using separator placement forceps (Figure 2). The separator must be placed through the contact point on either side of the tooth to be crowned. It must be stretched and then flossed through the contact until just the first half has been heard to ‘pop’ through the contact point.

If children are warned of a ‘popping’ noise then they can join in in listening out for it. If separators are placed these can be removed easily at the fit visit with a probe. Care must be taken to ensure that the separator has not slipped completely below the contact point.

Hall Technique PMCs should not be fitted at the same visit to opposing (occluding) teeth but can be fitted on contralateral teeth in the same or an opposing arch.

Below is a guide to placement.

**Step one**

Protecting the airway: It is imperative to ensure that the airway is protected. This can be ensured by having the patient sitting upright, using gauze to protect the airway or attaching tape to the crown.

**Step two**

Choosing the correct crown size: although it is possible to measure the mesio-distal space, crown size is more commonly determined using trial and error. This can be described to the child as ‘we just need to find the right size for your tooth – it’s like finding the right size of shoe – do you know what shoe size you are?’ In general, a size 4 crown is a good average size to start with. Care should be taken to ensure that the smallest size possible is used to reduce failure rates. In particular, it is important to ensure that there are no overhanging margins when cementing a crown on a second primary molar when the first permanent molar is un-erupted/partially erupted.

The crown must fit over all cusps and approach the contact points with slight spring back (Figure 3). Care
must be taken not to push the crown fully through the contact points during try-in as it can then be difficult to remove the crown, which can distress the child. If you cannot find the correct size it can help using the opposing arch crown (eg lower crown for an upper tooth). If the tooth is in between sizes or requires adaptation, the crown shape can be altered using crown crimping pliers to make it slightly smaller or change the shape, although it is often simpler to use gentle finger pressure (Figure 4).

**Step three**

When the correct size has been chosen the crown and tooth must be dried prior to placement. If the child dislikes the 3-in-1 syringe, this can be done using cottonwool rolls. The crown can then be filled with a glass ionomer luting cement. The crown must be filled with about ¾ of cement and care must be taken to ensure that the cement covers all the internal surfaces.

**Step four**

At this stage it must be remembered that the working time of glass-ionomer cement is limited. Children must therefore be fully prepared for what they need to do and what will happen and operators must be confident and work quickly and efficiently. Before placing the crown ensure it is orientated correctly (with the labelling facing buccal). Always place the crown first on the area where there is the tightest contact. The crown must be placed over the tooth and then pushed down, either with the help of the child biting on cottonwool or by the dentist using finger pressure (Figure 5). Children can be warned that they may feel a little push like when they ‘push their feet into shoes’.

If the crown does not seat adequately or, as often happens, it seats mesially but not well distally or vice versa, an orthodontic band seater or wooden tongue depressor can be used to direct the bite force. If the crown cannot be placed easily, it is important to remove it with a large excavator or flat plastic before the cement sets. If the crown is not fully seated, it may be necessary to remove the crown with a high-speed handpiece, which can be traumatic for the patient.

**Step five**

It is now important to remove the excess cement as soon as the crown is seated, before it fully sets. The child can be warned that the dentist ‘just needs to get rid of the special glue and get rid of the funny taste’. The excess can be removed by wiping the crown with damp gauze or washing the tooth with the 3 in 1. Ensure firm pressure on the crown whilst removing excess cement and until the cement is set as it is possible that the crown can spring back slightly before the cement has set (Figure 6). Afterwards, a small amount of toothpaste can be placed over the crown to improve the taste for the patient (as long as the child likes the taste of the toothpaste!). Floss can be used to remove cement from the contact points.

**Step six**

The parent and patient must be warned that the bite may be altered but that the child will usually get used to this within a few days and that the occlusion will adjust to normal within a few weeks (Figure 7).

One further tip is to gain your confidence with the technique by crowning second primary molars and teeth where cavities do not extend onto the lingual or buccal surface. Further information can be found in the Hall Technique Manual.20

**Concerns**

The only issue other than the appearance of the crowns themselves is that, because there is no tooth preparation when using the Hall Technique, the bite is propped open. Dento-alveolar adaption, by intrusion of the crowned tooth and its opposing tooth, returns the occlusion to normal within 15−30 days.21 Figure 7 shows the initial slight increase in vertical dimension following crown placement.

In the first of these articles, tooth-coloured crowns were discussed. Currently available tooth-coloured
crowns cannot be used as part of the Hall Technique because they are not flexible and therefore will not ‘spring over the contact point’ and frequently they are too bulky to pass through the contact point.

Conclusions

Hall Technique PMCs are well accepted by dentists, patients and parents. To date, although there is increasing evidence in support of Hall Technique PMCs, there is a need for further large scale trials to confirm these initial promising results, such as the FiCTION Trial.12

The Hall Technique offers an effective child-friendly method to restore carious primary teeth, which has the potential to revolutionize the dental care of children.

References