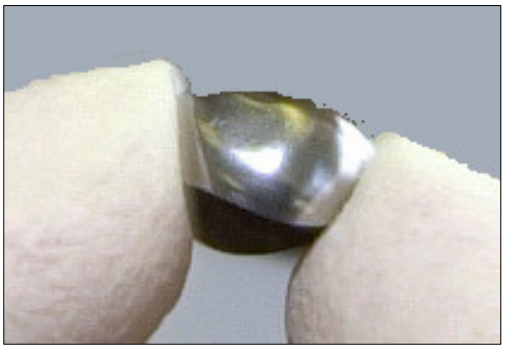
University of Dundee

The Hall Technique

A minimal intervention and child friendly approach to managing the carious primary molar

A Users Manual



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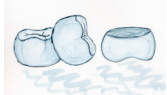


Introduction

The Hall Technique is a novel method of managing carious primary molars by cementing pre-formed metal crowns over them (see Figure 1) The technique does not require local anaesthesia, caries removal or any tooth preparation.

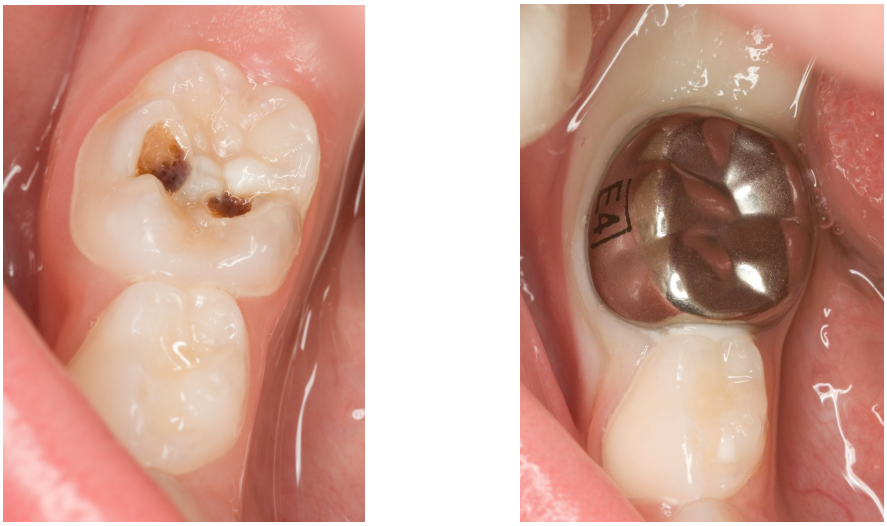


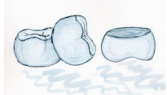
Figure 1. Provision of a preformed metal crown for a lower right E (tooth 85) using the Hall Technique; before, and immediately after the crown being fitted.

Clinical trials have shown the technique to be effective, and acceptable to the majority of children, their parents and clinicians. The Hall Technique is ***NOT***, however, an easy, quick fix solution to the problem of the carious primary molar. For success, the Hall Technique requires careful case selection, a high level of clinical skill, and excellent patient management. In addition, it must ***always*** be provided with a full and effective caries preventive programme (see Appendix 1.).

This manual provides information on:

- the background to the Hall Technique;
- details of the evidence behind the Hall Technique;
- information on case selection; and
- a “how to” guide on using the technique.

The Hall Technique will not suit every tooth, every child or every clinician. It can, however, be a useful and effective method of managing carious primary molars. This manual is intended as a guide to developing some skills in the application of the technique.



Background to the Hall Technique

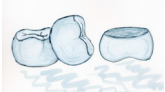
How did the Hall Technique come about?

The technique is named after Dr Norna Hall, a general dental practitioner from Scotland, who developed and used the technique for over 15 years until she retired in 2006. A retrospective analysis of the outcomes for the teeth she treated in this way was published in the British Dental Journal in 2006 (see bibliography). This showed the technique to have outcomes comparable to conventional restorative techniques and led us to investigate it further through a randomised control trial (detailed later).

How does the Hall Technique relate to conventional crowns for primary molars?

Preformed metal crowns (PMCs), sometimes referred to as stainless steel or Nickel Chrome crowns, have been used for restoring primary molars since 1950, and have become the accepted restoration of choice for the primary molar with caries affecting more than one surface, with a proven success rate as a restoration. Although popular with specialists, many clinicians find PMCs difficult to fit using the conventional approach, which requires the use of local anaesthetic injections and extensive tooth preparation. There is also an issue of potential damage to the adjacent first permanent molar when preparing a second primary molar for a PMC. For these, and other reasons, PMCs are not widely used in the UK, forming less than 1% of all restorations provided for children.

Provision of a conventional preformed metal crown



How does the Hall Technique get around some of these difficulties?

With the Hall Technique, the process of fitting the crown is quick and non-invasive. The crown is seated over the tooth with no caries removal or tooth preparation of any kind, and local anaesthesia is not required.

For decades, conventional teaching has been that all carious tooth tissue should be removed before restoring the tooth, unless there is a high risk of pulpal exposure.

How can leaving all the caries in the tooth be acceptable?

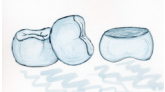
To answer this, it is worth firstly reviewing how and where caries begins. For many years it was assumed that all that was needed was to put a tooth surface, plaque and sugar together, add a little time, and caries would result. This combination can undoubtedly, under the right circumstances, cause caries, but what is remarkable is that *so few* tooth surfaces seem to be susceptible to carious attack. Clinicians will be aware that, except in extreme cases, the majority of tooth surfaces are relatively immune from caries, despite many of these surfaces often having prolonged coverage by plaque; for example, the labial and buccal cervical margins of teeth as they approach the proximal surfaces.

Low caries susceptibility *High caries susceptibility*

In fact, almost all caries begins at sites which collectively make up only a tiny proportion of the total area of enamel available for colonisation; the base of fissures, and just below the contact point of proximal surfaces. The enamel here is almost identical in composition to that of the labial surfaces, so why the difference? What differs is that these caries susceptible surfaces provide a very sheltered environment where the ecological niche favours *cariogenic* plaque maturation. Once caries has caused cavitation of the tooth, the availability of sheltered surfaces suitable for plaque colonisation and maturation dramatically increases, and so the caries continues through the tooth.

This points to the community of micro-organisms within plaque being extremely sensitive and responsive to changes in its environment. For cariogenic plaque, if the environment can be altered to be unfavourable for cariogenic bacteria within the community, plaque can lose its cariogenic potential.

Plaque is far from the bland, homogenous material it appears to the naked eye. Given time, and a stable environment, plaque will mature into a complex, organised structure, with channels and pores. Its bacterial population will shift and change in composition, with symbiotic relationships developing between some species, while other species will be gradually squeezed out by their neighbours. In the deeper layers, organic acids formed as a



by-product of bacterial metabolism, will favour a shift in the bacterial composition from non-cariogenic species such as *Streptococcus oralis* and *Streptococcus salivarius* to more cariogenic species such as the mutans streptococci and lactobacilli. Plaque has been described by Marsh as a "city of slime". This is a useful analogy because just as a city is a complex structure, whose smooth functioning can be interrupted by a change in the supply of any number of factors (food, water, oxygen, power, light), so can the cariogenic potential of plaque be altered by changing the supply of carbohydrates, oxygen, or pH.

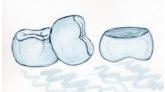
After Marsh

The Hall Technique manipulates the plaque's environment by sealing it into the tooth, separating it from the substrates (essentially, nutrition) it would normally receive from the oral environment. There is a possibility that the plaque may continue to receive some nutrition from perfusion through the dentinal tubules. However, there is good evidence that if caries is effectively sealed from the oral environment, the bacterial profile in the caries changes significantly to a less cariogenic community, and the lesion does not progress.

What about the soft dentinal lesion?

It is easy to see how an enamel lesion can be reversed but it can be difficult to imagine how we can influence a change in the soft dentinal lesion. However, most clinicians will be familiar with this clinical picture. Perhaps because the cavity has become self cleansing, or the child's diet has changed, the caries has arrested, with the colour changing to dark brown or black. This lesion was once soft and active and is now hard and arrested. The evidence that caries can arrest is visible to us on a daily basis, yet we continue to provide management therapies (conventional restorative treatment) based on its complete excision.

There is a Cochrane systematic review which summarises the clinical evidence around sealing caries into teeth (see Bibliography).



How does the pulp react to caries?

Just as it is becoming increasingly clear that dental caries is a dynamic process, it is also being recognised that the dentine/ pulp complex is far from passive when exposed to dental caries. Instead, these tissues mount an active defence response from the earliest stages of carious lesion formation in the enamel. An increase in pulpal blood flow allows an increased response from the immune system, and odontoblasts are stimulated to lay down a layer of secondary dentine in an effort to distance the pulp from the approaching carious lesion, an effect readily observed, at a gross level, on radiographs.

The dentine/ pulp complex has a greater reparative potential when subject to dental caries than has previously been thought. If the progress of the caries can be halted before the pulp is overwhelmed, then the pulp may well survive. See Figure 2.

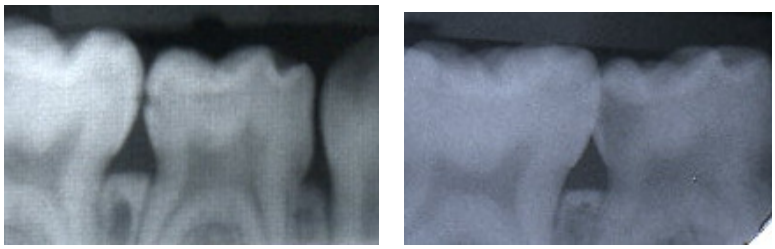
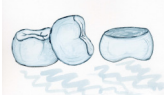


Figure 2. Radiographs taken 12 months apart which show the pulp horn of the lower D (tooth 84) shrinking from the advancing caries (reactionary dentine had been laid down giving this appearance).

Summary

Not all plaque is cariogenic. Plaque which has matured in a sheltered environment to achieve cariogenic potential can lose that potential if its environment is altered. The bacteria within the community respond to the environment and in an unfavourable environment, cariogenic bacteria will not continue to flourish. Effective sealing from the oral environment can cause the necessary environmental change, resulting in plaque losing its cariogenic potential *for as long as the seal is maintained*. The Hall Technique is one method of achieving that seal for primary molar teeth.



Evidence behind the Hall Technique

Is the Hall Technique effective?

To answer this question, a clinical trial set in nine general dental practices in Tayside, Scotland looked at outcomes at two years for teeth where a Hall crown was fitted, compared to teeth which had undergone conventional restorative treatment.

The trial was a split mouth randomised control design, so teeth were matched on each side of the arch for type of lesion and extent of caries. The dentists telephoned a distant operator to be told which tooth to provide a Hall crown and which to fit first, in order to reduce any bias in the trial. 132 children were enrolled in the trial and followed up every year clinically and with bitewing radiographs. The outcomes for the 124 patients seen at 2 years (8 patients failed to return for 2 year appointments) are shown in Figure 3.

A full report of the clinical trial can be found at http://www.biomedcentral.com/1472-6831/7/18.

Clinical outcomes

As well as recording episodes of pain, the outcomes were broken into two categories;

- **major failures -** This included the instances of irreversible pulpitis; where an abscess developed requiring pulpotomy or extraction; an inter-radicular radiolucency seen on radiographs; and where the restoration was lost and tooth was now unrestorable
- **minor failures –** this category included failures which could be resolved by replacing a failed restoration; new or secondary caries; where the filling/crown had become worn, lost or was requiring another intervention to repair it; where the restoration was lost but the tooth was restorable; it also included instances of *reversible* pulpitis which were treated simply by replacing the restoration and not requiring pulp therapy or an extraction to resolve.

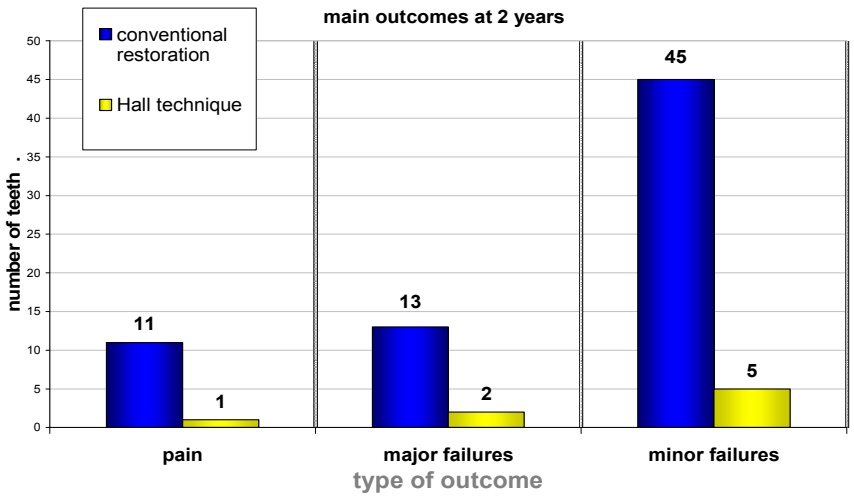
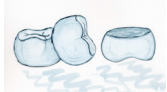


Figure 3. 2 year results for 124 teeth treated with the Hall Technique compared to 124 conventional restorations in a split mouth study with matched caries lesions prior to treatment.



And is the Hall Technique acceptable to children, their parents and dentists?

In the same clinical trial, the children, their parents/ carers and dentists stated whether they preferred the Hall or conventional restoration when both procedures were completed (see Figure 4).

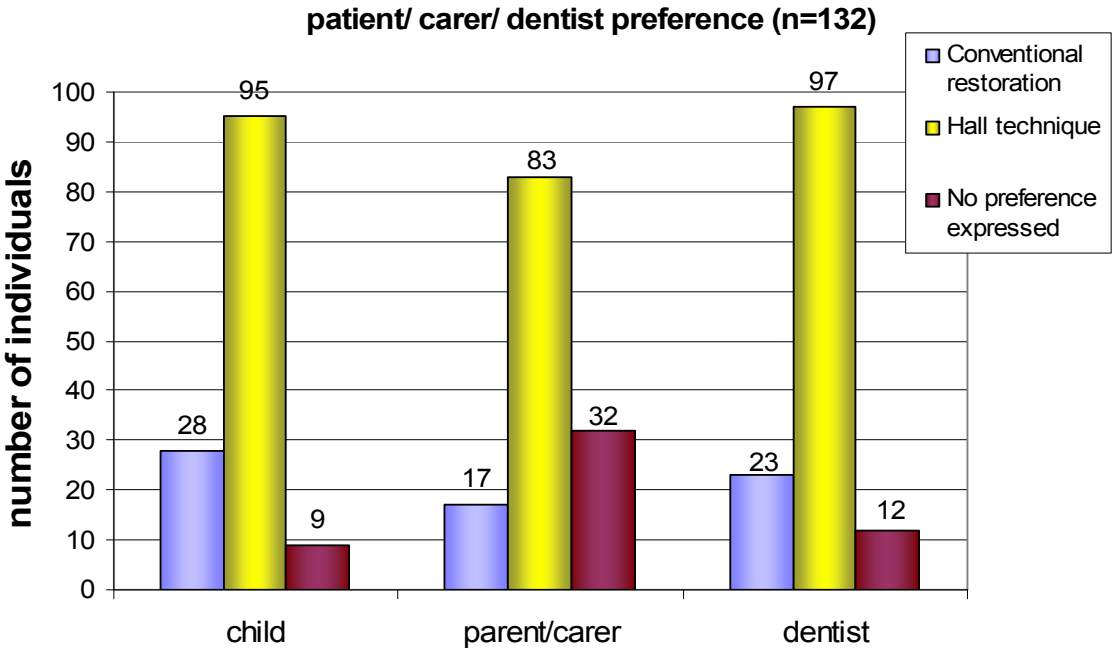


Figure 4. Patient, carer and dentist preferences for Hall Technique or conventional restorations in a split mouth study for 132 children (264 teeth). Data from same study discussed above.

Summary

This study showed the Hall Technique to be more effective than the restorations placed by the dentists, and an effective restoration in its own right. In addition, the study showed that the Hall Technique was preferred to conventional restorations by the majority of the children, their parents, and dentists.

Case selection; using the Hall Technique in clinical practice

Treatment planning for Hall crowns, and some important information

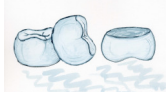
Hall crowns **<u>are not</u>** a universal answer to managing all carious primary molars. They are also not a "Lazarus restoration", used to resurrect a tooth with a poor prognosis, when all conventional techniques have failed, or are impossible to provide. Instead, the Hall Technique can be an effective management option for primary molar teeth affected by dental caries. The Hall Technique will not suit every dentist, every child, or every carious primary molar in that child. Other caries management methods are available, and should be considered as appropriate. As with every treatment decision, clinicians should use their own clinical judgement in deciding which method is appropriate for their patient and within their own clinical capabilities to deliver, with consent being obtained from the patient, and parent, before delivering that treatment.

To begin with, exclude irreversible pulpal involvement…

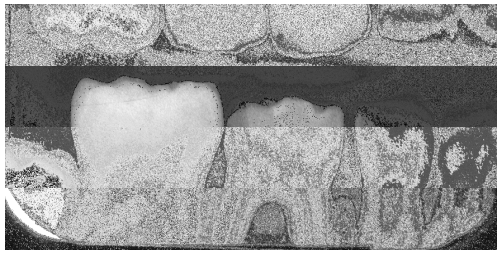
A full history and clinical examination, ***including bitewing radiography***, should be carried out. Vitality testing of primary molars with Ethyl Chloride is unreliable. Instead, dentists should rely on their clinical acumen to assess the viability of a dental pulp, based on a thorough assessment, including:

- Clinical signs or symptoms of irreversible pulpitis, or dental abscess
- Radiographic signs or symptoms of dental abscess
- Non-physiological mobility, assessed by placing the points of a pair of tweezers in an occlusal fossa, and gently rocking the tooth bucco-lingually, and comparing with a healthy antimere
- Obvious carious, or clinical, exposure of pulp chamber

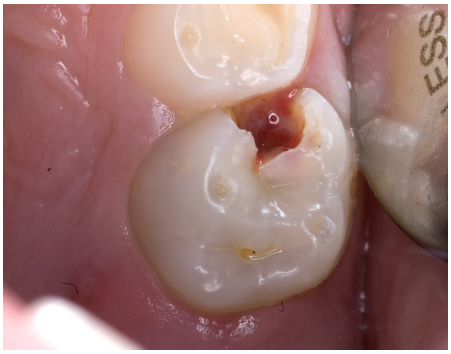
For example, the following are indicators of irreversible pulpal involvement, and would ***contra indicate the placement of a Hall crown*** without pulp therapy:



There is a buccal sinus associated with this lower D (tooth 74).

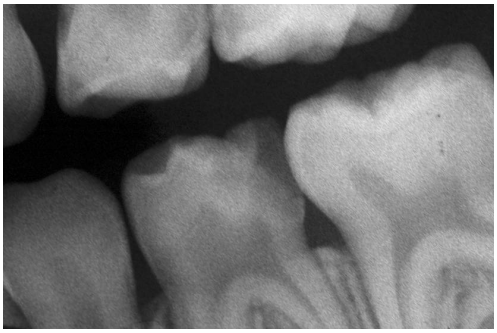


This lower D (tooth 84) has inter-radicular pathology visible on the radiograph, indicative of a dental abscess.

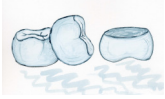


This maxillary E (tooth 15) has an extensive MO cavity, and has been painful, keeping the child awake at night. This is indicative of an irreversible pulpitis, or even an abscess developing.

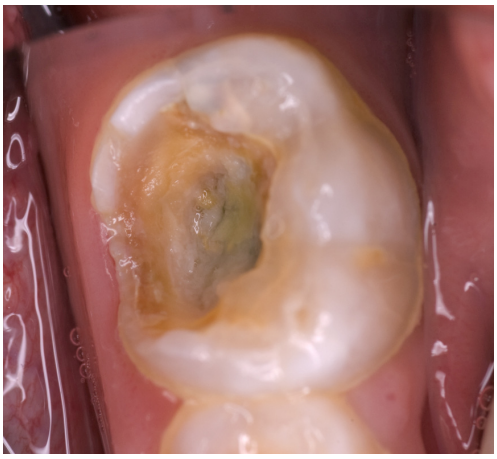
Here, a lower D (tooth 84) which has given occasional pain, but is currently symptomless, is found to have non-physiological mobility. This, with the DO cavity and history, indicates a dental abscess.



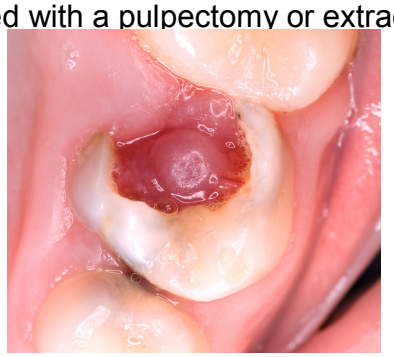
This lower D (tooth 84) has a large DO cavity, assessed clinically and radiographically. Although symptomless, and with no inter-radicular pathology visible, the pulp is almost certainly non-viable, and the tooth should have pulp therapy if a crown is to be placed.



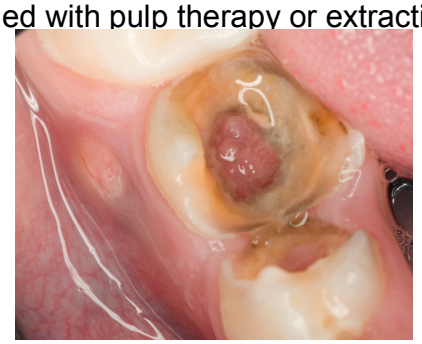
This upper D (tooth 14) has a large DO cavity, with clinical exposure of a non-vital pulp chamber. Even in the absence of symptoms, the tooth should either be managed with a pulpectomy or extraction.



This lower E (tooth 75) has a large occluso-lingual cavity which clearly involves the pulp chamber. Even in the absence of symptoms, the tooth should either be managed with pulp therapy or extraction.



This upper D (tooth 14) has a pulp polyp. The pulp, although exposed, is vital. In the absence of symptoms, and clinical and radiographic signs, of sepsis, it would not be unreasonable to simply monitor the tooth.

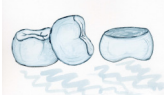


However, although this lower E (tooth 85) has a similar pulp polyp associated with the mesial root, there is clearly a sinus associated with a non-vital distal root, and the tooth should be managed by pulpectomy or extraction.

Clinicians should continue to monitor all primary molars managed with Hall crowns for signs or symptoms of pulpal disease at every recall visit, just as they should for all carious primary teeth managed with conventional restorations.

So, ***contra indications*** for fitting Hall crowns include:

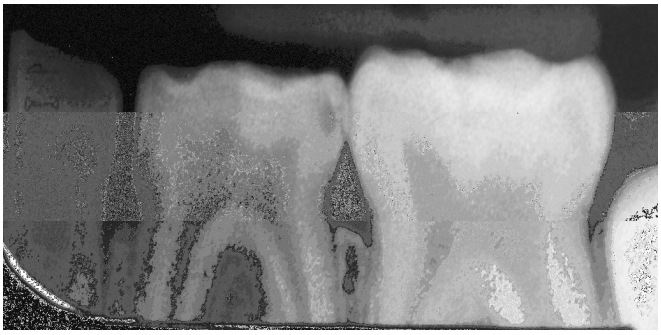
- Irreversible pulpal involvement (discussed above)
- Insufficient sound tissue left to retain the crown



- Patient co-operation where the clinician cannot be confident that the crown can be fitted without endangering the patient's airway
- A patient at risk from bacterial endocarditis. In such situations, the tooth should be managed with a conventional restoration which would include complete caries removal
- Parent or child unhappy with aesthetics. This should become apparent though at the treatment planning stage when treatment options are being discussed and agreed with the parent and child.

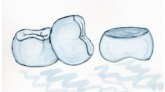
When can Hall crowns be a suitable management option for carious primary molars?

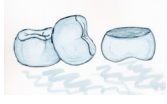
Hall crowns are a treatment option for early to moderate Class II (proximal), active carious lesions in Ds and Es, which have no signs or symptoms of pulpal involvement. Here, the disadvantages of the aesthetics and the bite propping will generally be counter balanced by the effectiveness of the restoration, for which there is a good evidence base.



This lower D (tooth 74) is approriate for a Hall crown. The moderate distal lesion has been diagnosed reasonably early, by appropriate use of radiographs. The radiograph shows a band of sound dentine between the lesion and pulp, and no intra-radicular pathology. Separators have just been removed, and the Hall crown will be easily fitted.

Hall crowns can also be suitable for the moderately advanced Class I lesion where the extent of the cavity would make it difficult to obtain a good seal with an adhesive restorative material, following partial caries removal.





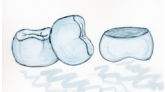
When is there no need to fit Hall crowns?

Both Ds (tooth 54 and tooth 84), although cavitated, are clearly going to be shed soon, so are unlikely to cause pain or sepsis before exfoliation.

The mesial cavity on this E (tooth 75) is accessible, and can be managed with partial caries removal, sealing the cavity with an adhesive restorative material, avoiding both the aesthetics and bite propping of a Hall crown. Although in a child with limited cooperation, where moisture control might be difficult to achieve, a Hall crown would be appropriate.

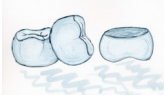
The cavitated Class I lesion on this lower E (tooth 85) could be well managed with partial caries removal, and sealing with an adhesive restorative material.

This lower E (tooth 85) has several non-cavitated Class I lesions; it could be managed with a good quality, well maintained fissure sealant.



This mesial lesion on an upper D (tooth 64) is arrested. As the lesion is cleanable, there is no need for any management option other than prevention. However, this does depend on the carers/child continuing thorough cleaning and the tooth and lesion must be monitored for signs of the lesion progressing.

There is insufficient tooth tissue on this lower E (tooth 75) to allow placement of any restoration. However, the caries is arrested, the pulp is shining pink through the floor of the cavity, and in the absence of symptoms, this could probably be managed with prevention, and monitoring.

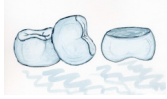


Summary

Indications and **contra-indications** for using the Hall Technique for managing primary molars with carious lesions assessed as at risk of causing pain/ sepsis before exfoliation

Indications include teeth with:	• Class I lesions, non-cavitated
	  ○ if patient unable to accept fissure sealant, or conventional restoration
	• Class I lesions, cavitated
	  ○ if patient unable to accept partial caries removal technique, or conventional restoration
	• Class II lesions, cavitated or non-cavitated

Contra-indications include teeth with:	• signs or symptoms of irreversible pulpitis, or dental sepsis • clinical or radiographic signs of pulpal exposure, or periradicular pathology • crowns so broken down that they would normally be considered as unrestorable with conventional techniques

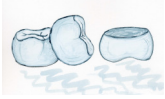


Fitting Hall crowns; a practical guide

Although apparently very simple, the Hall Technique requires a confident, skilled approach from the operator if the crown is to be successfully fitted. In addition, there are some primary molars where, for a combination of reasons, even clinicians very familiar with the Hall Technique would have difficulty successfully fit a crown.

For example, should these lower first primary molar become carious, their unusual morphology would complicate the fitting of a PMC of standard shape.

Again, common to all clinical procedures, it is important that the clinician has a clear understanding of what to do to retrieve a situation which is not proceeding as planned, for example when a Hall crown is not seating properly onto a tooth or appears to be the wrong size or shape and will not fit correctly over the crown of the tooth. These issues are dealt with at the end of this section.



The appointment for fitting the crown

Preparation is everything! The child and parent should be briefed on the procedure. Children should be shown a crown, and allowed to handle a spare one if felt beneficial. Young children sometimes respond to the idea of the crown being “a shiny helmet”, or “just like soldiers wear to protect their heads”, or “a precious, shiny, princess crown” or it being a “twinkle tooth”.

It is important that the child knows that:

a) they will have to help, by biting the crown into place when asked to do so

b) the cement will not taste nice and can be a bit like Salt & Vinegar crisps

Instruments to have ready

Essential:

- Mirror
- Straight probe
  - to remove separators, if used
- Excavator
  - to remove crown if necessary, and
  - useful for cement removal
- Flat plastic
  - to load crown with cement
- Cotton wool rolls
  - for child to bite down on and push crown over tooth, and
  - to wipe away cement

Useful:

- Orthodontic biting stick
  - can be useful in seating crowns
- Band forming pliers
  - can be useful for adjusting crowns, particularly where the primary molar has lost length mesio-distally due to caries
- Gauze to protect the airway and wipe off excess cement

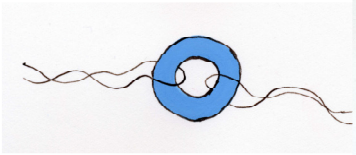
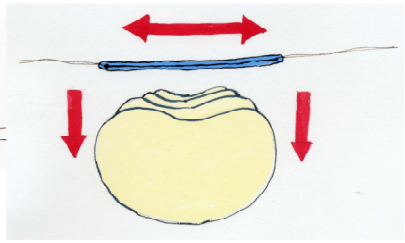
Assessing the shape of the tooth and its contacts

Tight contact points

If the contact points are tight (examples of this are shown in the three photos below),

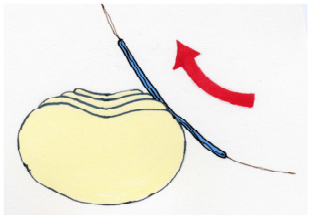


or there has been loss of mesio-distal width of a tooth due to marginal ridge fracture,placing orthodontic separators through the mesial and distal contacts can be useful when fitting crowns with the Hall Technique, although it does mean the patient will have to make a second visit. Two lengths of dental floss should be threaded through the separator.

The separator should then be stretched taut, and "flossed" through the contact point briskly and firmly until the leading edge *only* is felt "popping through" the contact point.

If the separator is cut by sharp cavity margins, it may be found helpful to pull the separator "up, into & through" the contact area, approaching from the cervical margin.

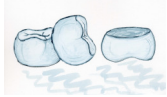


The floss should then be removed, and the patient seen 3 to 5 days later for removal of the separator.

If the separator appears to have fallen out, the inter-proximal area of the gingiva should be inspected to check that the separator hasn't worked its way below the contact point. Separators are usually brightly coloured to facilitate this.

Separator appears to have fallen out…

On close inspection has fallen below contact



Marginal ridge breakdown

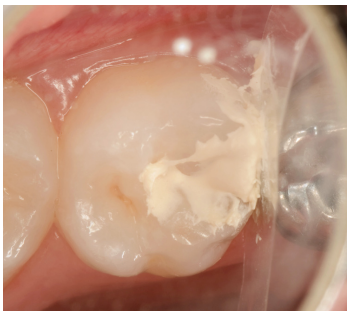
Often where there is marginal ridge breakdown in one molar, there is concurrent breakdown of the adjacent tooth's marginal ridge. In molars where this has happened there can be migration of the adjacent molar into the cavitated area. The picture below shows an example of this. If the missing tooth walls are imagined, they will be seen to overlap. This can make placing a Hall crown difficult without making some adjustments to the tooth itself or the crown.

There are several ways of managing this problem if a crown cannot be fitted in the usual way. These are;

1. placement of a temporary restoration to rebuild the marginal ridge and allow a separator to be placed to make space for the crown to be fitted; and
2. adjustment of the skirt of the crown to make it fit the shape of the tooth.
3. use a different crown

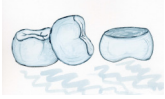
1. Placing a temporary filling to allow placement of a separator

Here, a mesial cavity on an upper E is gently excavated

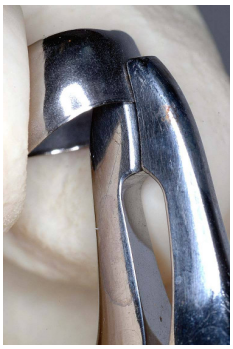


Following insertion of a celluloid matrix strip, a Zinc Polycarboxylate dressing is placed.

10 minutes later, when the cement is fully set, a separator is placed



2. Adjusting the crown with band forming pliers

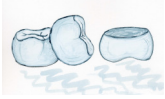


Using orthodontic band forming pliers, which have a curved surface, the margins of the crown may be adjusted. Adams pliers can also be used to adjust the crown but do not have the same curve.

Gently pinching the proximal margin of the crown with the pliers the “wrong way round” can give a concavity which may accommodate the intruding margin of the adjacent tooth.

3. Try a different crown

A small lower E crown may fit an upper D where there has been significant tooth loss.



The procedure

The first step before fitting the crown is to ensure there will be no danger to the child's airway through them inhaling a crown that is being fitted in their mouth (the same precautions as should be taken when fitting a conventional crown).

1. Protecting the child's airway

   - This is most easily done by sitting the child upright. However, for upper teeth, working with the child seated upright means that the optimum operator working position has to be compromised. For lower teeth, the operator can simply move to the front of the child.

   - There are additional ways of protecting the airway. A gauze swab square can be placed between the tongue and the tooth where the crown is to be fitted. It should extend to the palate and round the back of the mouth in front of the fauces. Alternatively, a clean piece of Elastoplast tape can be secured to the crown (see below).

     If you are not confident about being able to control the crown at all stages until it is cemented, then **do not** use the technique.

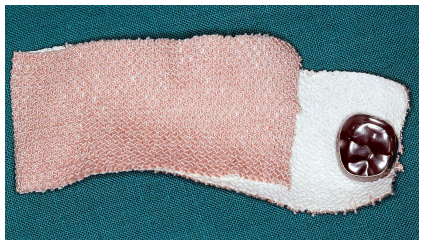
Airway protection using a) a gauze square

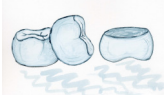
Orientation of guaze

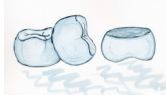
Positioned in mouth

b) Elastoplast

Elastoplast tape securing crown







The 6 stages of fitting a crown

These can be summarised as follows:

Size, Fill, Locate and seat, Wipe, Seat further, Check and clean

1. **Size**

   Sizing the crown

   - You should aim to fit the smallest size of crown which will seat. Select one which covers all the cusps, and approaches the contact points, with a slight feeling of "spring back".
   - ***Do not attempt to fully seat the crown through the contact points; they can be very difficult to remove for cementation!***

2. **Fill**

   Preparing the crown for cementation

   - Dry the crown, and fill with glass-ionomer luting cement, ensuring the crown is well filled, with no air inclusions
   - Dry the tooth if possible prior to cementing, but otherwise there is no caries removal or tooth preparation of any kind. No local anaesthetic injection is given.
   - If the cavity is large, some cement may be placed within it, just before placing the crown.

3. **Locate and Seat**

   Fitting the crown

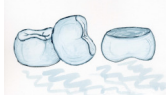
   - Place the crown over the tooth. ***Fully seating the crown is a key stage!*** It is not always easy, and requires a committed, positive approach from the clinician. The child needs to have complete confidence that you know exactly what you are doing; that what you are asking them to do is perfectly reasonable, and that it will not be uncomfortable. Remember that our research found that, surprisingly, most children do not find the procedure painful, and prefer it to conventional fillings. There are two main methods of seating the crowns:

     a) the clinician seats the crown by finger pressure

     b) the child seats the crown by biting on it

   A combination of these two methods may be necessary or preferred.

   - Some clinicians will seat the crown with firm finger pressure alone. For mandibular teeth, a useful method is to place your thumb on the occlusal surface of the crown, with the four fingers of your hand placed under the border of the mandible to spread the force as you apply ***firm*** pressure with your thumb. For maxillary teeth, the child's head may be supported by the back of the dental chair, or sometimes by



placing your other forearm gently on the top of their head to balance the force applied when fitting the crown.

- Often, the child will seat the crown themselves by biting it into place. It can be useful to verbally encourage the child to apply the necessary pressure ("Bite hard, like a Tiger! Grrrrr…..!), and to rehearse this before fitting the crown. If using this method, be aware that some children's resolve might falter a little, leaving the crown not fully seated. Here, a timely "That was great! Now let me just check it for you! Ooh, well done, and I'll just give it a little squeeze….., Excellent!" can help.
- Some clinicians partially seat the crown until it engages with the contact points, allowing the finger to be removed without risk of the crown falling off, and the child then being encouraged to bite the crown into place. It must be remembered that your working time with glass ionomer cements is limited, and whatever method is used, you must work smoothly and efficiently. Crowns cannot be seated, no matter how hard you or the child tries, if the cement has started to thicken.
- It is crucial that the orientation of the crown relative to the tooth is checked either during, or immediately after, seating the crown. If it does not appear to be going on straight, then you must give the crown some physical encouragement to go in the correct direction. If it is not possible to seat it then it should be removed before the cement sets.

4. Wipe

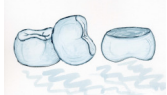
- With either technique, excess cement will be extruded from the crown margins, and the taste of this can upset children. In anticipation of this, as soon as the crown is seated, the child should be asked to open their mouth, and the cement wiped off with a cotton wool roll held ready for this purpose. If a gauze swab has been used to protect the airway, this can be used to wipe away excess cement from the lingual/ palatal side of the tooth as it is being removed.
- If it is obvious that the crown has not seated, and finger pressure fails to seat it, then it should be removed immediately using the large excavator which you should have placed within easy reach. If you do not work swiftly, you may have to section the crown to remove it (see later).

5. Seat further

- Once excess cement has been removed, the child should be asked to bite firmly on the crown for 2-3 minutes, or the crown should be held down with firm finger pressure as an alternative. This is important, because the crowns can spring back a short way, sucking back the cement form the margins and potentially causing breaches in the seal.

6. Check and clean

- Remove excess cement, floss between the contacts.
- Give the child a sticker.



Pictures and description of the steps in fitting a Hall crown

Remove any separators that have been placed.

1. Size

Try on crowns until one is seen to cover the occlusal table of the tooth but not impinge on the teeth on either side and there is a feeling of “spring back”.

2. Fill

The glass ionomer is mixed to the consistency of a regular crown luting cement (a thick paste).

Load crown generously (it should be almost full with cement). Take care fill the crown from the base upwards and ensure that there is cement around the walls. Be careful to avoid air blows and voids.
The photograph below shows what happens if you don’t.

3. Locate and seat

Some glass ionomer may be wiped on the tooth or placed in any cavitation to improve the seal. The crown is placed evenly over the tooth and engaged in the approximal contact points using finger pressure to secure its position. The child then bites down on the crown. Some operators find biting on a cotton wool roll helps the process.Care is taken to ensure the crown seats evenly over the tooth.

4. Wipe

As soon as the crown is fitted, the child should be asked to open to allow the crown position to be checked and excess glass ionomer can be wiped away.

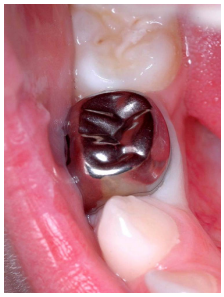
5. Seat further

When you are satisfied that the crown is in the optimal position, and whilst the cement is still soft, the child should be instructed to bite down again on the crown or cotton wool. It is likely that some more glass ionomer will be extruded. The child should keep pressure on until the cement has set, this prevents the crown from rising back up.

6. Check and clean

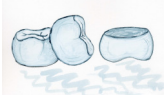
The fit of the crown should be checked. Excess cement can be wiped away whilst wet or a hand excavator used when dry. Dental floss should be used to clear the contacts of any excess.

Blanching usually disappears within minute. The occlusal discrepancy (here it is minimal) should resolve in a few weeks.



A satisfied customer, with a restored occlusion!

If the crown does not seat sufficiently, then remove it using the excavator before the cement sets. If the cement has set, a high speed handpiece can be used to section the crown through the buccal and occlusal surface, following which it can easily be peeled off and remaining cement trimmed as necessary.



Some additional notes

1) The crowns used in the research presented here were Ni-Cro Primary Molar Crowns, cemented with AquaCem, both from 3M/ESPE. Any adjustment of the crowns was minimal, and was limited to re-moulding the crown margins in some cases with orthodontic pliers. No crown had the margin trimmed.

2) Crowns will try to follow the path of least resistance, and so may tilt towards the "easier" of the contacts, making it almost impossible then to ease the crown through the tight contact. Concentrate on seating the crown through the tight contact, and the easy one should take care of itself.

3) If the crown does not seat sufficiently, then remove it using the excavator before the cement sets. If the cement has set, a high speed handpiece can be used to section the crown through the buccal and occlusal surface, following which it can easily be peeled off.

4) Patients and parents should be reassured that the child will be used to the feeling within 24 hours. It is the authors' experience that analgesia is not required. The occlusion tends to adjust to give even contact on both sides within weeks.

5) Patients should be reviewed on a normal recall schedule, and the Hall Technique should be used in conjunction with a full preventive programme.

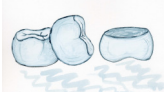
6) If fitting crowns to Es, particularly maxillary Es, before the 6s are erupted, keep an eye out for the 6s becoming impacted against the crown margin as they erupt. This can occur even if crowns haven't been fitted, and there is no evidence from the authors' clinical trial that there is an increased risk of this. Nevertheless, if it does occur, it can often be managed with orthodontic separators if detected early.

7) If a molar fitted with Hall crown becomes non-vital, a pulpotomy can be carried out through the crown without needing to remove it.

8) In the authors' experience, it is usually not possible to fit a crown using the Hall Technique to a D and an E in the same quadrant at the same appointment; they will need to be fitted at separate appointments.

9) Occasionally a crown will wear through occlusally. If this occurs, it can be repaired with composite material.

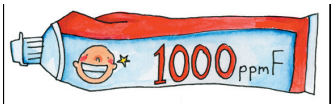
10) Opposing teeth should NOT both be fitted with Hall crowns as the same appointment. Allow a minimum of 3 months for occlusal equilibration to take place and stabilise.



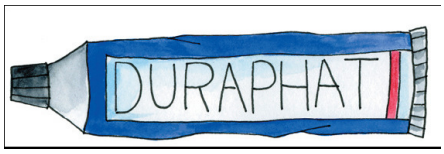
Appendix 1.
Some basic prevention…

There are several ways of helping children reduce the risk of developing further dental decay. Four very important methods are:

Brushing

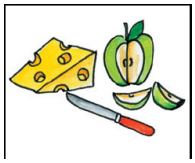


Topical fluoride varnish



Fissure sealants

Diet advice

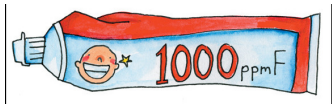


The following are the key points for each method. For further information regarding the evidence base for these recommendations, look at SIGN Guideline 83, available at www.sign.ac.uk

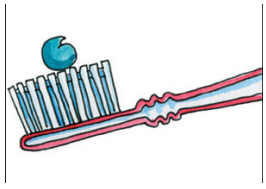
Brushing

Fluoridated toothpaste (1000ppmF from 6 months of age if the child is assessed as being at risk of developing caries, then 1,500ppmF when 7 years or older)

Twice daily



Pea sized amount if under 7 (smear if < 2 years of age)

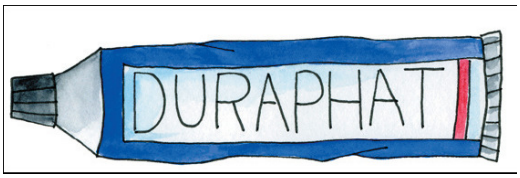


Spitting out, NOT rinsing, after brushing

Supervised if < 7 years of age

Topical fluoride varnish

Apply 2 to 3 times a year for children you think are at risk of developing caries
Follow manufacturers instructions:

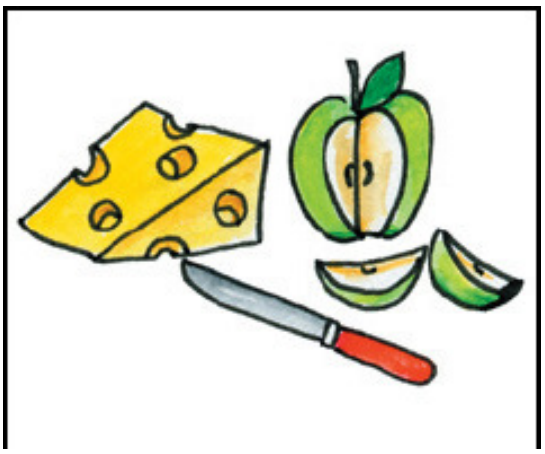


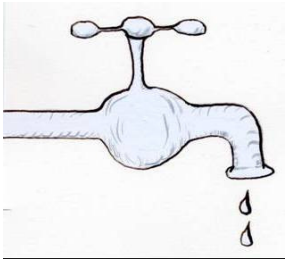
Fissure sealants

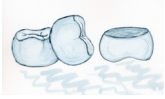
Fissure seal all susceptible pits and fissures in children you think are at risk of developing caries

Diet advice

Sugar and sugar containing foods and drinks should be restricted to meal times. Between meals, children should snack on fresh fruit or cheese, and drink milk or water







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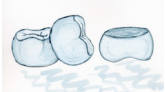
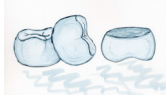


Final note

The field of cariology and together with it, the management of caries in the primary dentition, is rapidly changing. Please let us know of your thoughts and comments regarding the Hall Technique, or on any other matter relating to management of the carious primary dentition.

We also welcome feedback on this manual and how it might be improved.

Dafydd Evans d.j.p.evans@dundee.ac.uk Nicola Innes n.p.innes@dundee.ac.uk



Further copies of this manual can be obtained free of charge by download from the Scottish Dental website (http://www.scottishdental.org/)

at http://www.scottishdental.org/resources/HallTechnique.htm