The Hall Technique – a minimally invasive, anxiety reducing method of managing dental caries in primary molars

Professor Hanny Calache (Director Clinical Leadership, Dental Health Services Victoria)
Dr Rachel Martin (Research Fellow, Hall Technique, North Richmond Community Health Ltd, Victoria)

A relatively new method of managing young children with early childhood caries is receiving much attention across the world. This new method has been described as:

“mind blowing research, which minimizes the chance of children becoming anxious in the first place and holds the (primary) tooth stable” (Hosey, 2015) ; and the “biggest breakthrough in paediatric dentistry in the last ten years” ("Chris Deery: 'The Hall Technique will revolutionise children's dentistry'," 2014)

The method, known as the Hall Technique (HT) involves sealing early caries in primary molars with no tooth cutting, no removal of caries, and no local anaesthesia. That is “no needle "and "no drill". A preformed metal crown (PMC), also referred to as a stainless steel crown, is cemented directly over caries that does not extend radiographically beyond the middle third of dentine. The sealing of the tooth in this way prevents the carious lesion from progressing by isolating the bacteria and starving it of oxygen, simple carbohydrates, and an acidic environment. All of which are required for the proliferation of cariogenic bacteria and progression of the carious lesion within the tooth. The Hall Technique is set to revolutionise children's dentistry.

Dental caries is one of the most common chronic diseases in young children. It is largely preventable by forming positive early oral health habits. It is also easy to treat, and becoming increasingly easier, with early identification both via oral health clinicians and other early childhood professionals. In applying preventive and early intervention methods, the need for such costly management as general anaesthesia for dental treatment can be greatly reduced.

Oral health ranks highly in preventable hospital admissions data. In 2013/14 dental treatment was the second most common cause of hospitalisation, after asthma, for 0–9 year-olds, including the top cause of admission for 5–9 year olds (VHISS, 2014). The average cost per admission is AU$3,153.00 (National Hospital Data Collection, 2014) resulting in an avoidable $13 million spent in Victoria alone in 2013/14.

Recent data shows that 48% of children have experienced caries by the age of 5 years (AIHW, 2014). Childhood dental caries causes not only pain, abscesses and infection, but poorer sleep and general health. It can cause great anxiety in children and their families in their interactions with oral health services, and can have long lasting implications for social, educational and health outcomes.
The main indication for the HT is caries in a primary molar that does not extend further than the middle third of dentine and that has no signs or symptoms of pulpal involvement. A recent radiograph of the tooth must show a clear band of dentine between the advancing decay and the pulp and there must be no evidence of inter-radicular radiolucency. The HT is contraindicated where a tooth is so broken down as to be unrestorable with a PMC; if there is no obvious clear band of dentine evident on the radiograph; or if there is any evidence, radiographically or clinically, of irreversible pulpitis. Recent findings indicate a clear band of dentine on a radiograph is a good predictive marker of success for the HT (Al-Yasseen W, 2015).

The technique is simple:

1. Select the tooth carefully using bitewing radiography
2. Select the crown size.
3. Use separators where indicated (in place for half a day to up to 2 days, any longer risks separators coming out and teeth moving back into contact)
4. Use glass ionomer cement to cement the crown (Nicola P Innes & Evans, 2015).

In children with dental caries, the HT can help reduce anxiety (Calache et al., 2015; Foster Page et al., 2014) whilst managing the disease in the tooth and preventing further disease occurring on other surfaces of the tooth. Whilst ideal for managing early caries in the high risk child, it can also be used to manage hypomineralised teeth, reducing risk of decay and also sensitivity. The authors are unaware of any other material that can completely seal caries from the oral environment as well as a preformed metal crown does. Past and current research indicates that parents consider that the advantages of the HT far outweigh the silver appearance of the crown, and that children appear to have no concerns about the colour of the crown (Calache et al., 2015; Calache et al., 2014).

Concerns about the HT tend to arise from clinicians with respect to the following issues: sealing caries, increasing the occlusal vertical dimension (ie opening up the bite), and impaction of first permanent molars on the distal aspect of the crown. Traditionally, caries management involved the complete surgical excision of dental caries affected dentine and the placement of a direct restoration. Over the last twenty years, it has become evident that preservation of as much tooth substance as possible is imperative (Minimal Intervention Dentistry (MID) approach) to prevent compromising tooth strength and to maintain the health of the pulp. The caries process is driven by the plaque biofilm, located on the surface of the carious lesion. If a carious lesion is isolated from the oral environment, the plaque biofilm composition will alter to a less cariogenic flora, i.e. there will be a shift in the type, proportion and distribution of the resident plaque microflora organisms. Therefore, hermetically sealing the caries biofilm will slow, or even stop the progress of the lesion (Innes & Evans, 2013; Innes, Evans, Stirrups, Hall, & Leggate, 2006). Three types of studies have supported the approach of sealing caries to prevent its progression: sealing caries with fissure sealant (Jensen & Handelman, 1980); stepwise excavation technique studies (two steps or single step) (Bjorndal, 2011; Mertz-Fairhurst, Curtis, Ergle, Rueggeberg, & Adair, 1998); and the Hall Technique studies ( Innes, Evans, & Stirrups, 2007, 2011).
Concerns about the increase in the occlusal-vertical dimension (OVD) following placement of Hall Technique crowns have been alleviated. A number of studies have found that the occlusion re-establishes itself within 15 to 30 days following placement of the HT crown (Calache et al., 2014; Harris, Innes, Weeks, & Lamont, 2011; Innes et al., 2007; van der Zee & van Amerongen, 2010). Follow-up time varied in all studies from fifteen days to one year. And finally, the likelihood of the erupting first permanent molar becoming impacted against the distal aspect of the HT crown is low (Innes et al, 2007) and no different to the likelihood of this occurring with the placement of a conventional PMC. Impaction of first permanent molars against a PMC can be managed with separator rings, and avoided with well fitting PMCs.

The HT was first identified in Scotland in the late 1990’s by a rural dentist, Dr Norna Hall. A randomised control trial was then established to test the success and acceptability of this technique (which came to be known as the “Hall Technique”) against conventional restorations (GIC, composite resin and amalgam) in primary molars. One hundred and thirty two children were recruited for this study and each had one HT crown placed on a primary molar, and a conventional restoration placed on another primary molar in the same mouth (split mouth design). Treatment outcomes were classified as minor failure when intervention teeth contained at least one of the following manifestations: the appearance of secondary carious lesions or new carious lesions that can be detected by either clinical or radiographic examination; HT crown/restoration fracture; wear requiring intervention; or HT crown/restoration loss and tooth able to be restored. Outcomes were classified as major failure if there were clinical signs or symptoms of pulpal infection; pathological radiological change (Innes et al., 2007); or HT crown/restoration loss and tooth unable to be restored. At three year follow-up, 19% of the teeth with conventional restorations experienced major failure, compared to 3% of the teeth with Hall Technique crowns. Fifty six percent of teeth that had conventional restorations experienced minor failure compared to 6% of teeth with HT experiencing minor failures after three years. That is 75% of the conventional restorations failed after 3 years compared to 9% for the HT Crowns. This was a statistically significant finding. In addition, children, carers and clinicians exhibited a clear preference for the HT over conventional restorations (Innes et al., 2007, 2011; Innes et al., 2006). In a feasibility study of the HT in New Zealand, those children who received the HT crown (n=100) reported less dental anxiety and were more likely to report enjoying their visit than those who received a conventional restoration (n=90). After 6 months, those with conventional treatment had twice as many dental abscesses as those who had received the HT crown, and nearly three times as many replacement fillings (Foster-Page & Boyd, 2013).

A twelve month pilot study in Victoria, Australia, completed in 2013 has informed the methodology of a current larger study (Calache et al., 2014). Children aged 3 to 5 years old (N=159) were screened for suitability to join the study; 35 children were considered suitable for the HT. Children were selected if they were able to accept treatment in the dental chair, had no significant medical history, and had one or more primary molars with caries up to or less than half way through the dentine radiographically. Ultimately 14 children received 22 Hall Technique crowns in this initial study. The technique took an average time of 5 minutes and 27 seconds from crown size selection to completion of cementation. The only minor failure that occurred was debonding of the crown for one child at 12 months. Two other
crowns in one child were debonded by 18 months after cementation. Debonding is easily managed by recementing the crown. Most importantly, in the cases where debonding occurred, very clear evidence was seen both clinically and on radiographs of arrested caries in the teeth that had the HT crowns. Over an 18 month period there was no evidence of major failures that would have required extraction or pulp therapy. Results demonstrated acceptability by clinicians and parents. Themes that arose from parents feedback were that the experience was pain free, quick and easy, no need for anaesthetic or drill, and that the child could feel a sense of achievement.

“….because when he hears the noise of the "machine" he gets anxious”

“….no need for weird numb feeling”

“...very quick to put on compared to filling... this is good for little kids who don’t stay still for long”  (Calache et al, 2014_)

The current larger study being undertaken in Victoria involves three public oral health agencies, 12 clinicians and 251 children, aged 3 to 7 years old (Tonmukayakul et al., 2015). The trial aims to assess the acceptance, success and cost-effectiveness of the Hall Technique at 6, 12 and 24 months, and to develop guidelines, policy and training in the technique for oral health professionals. Currently twelve month data is being analysed, and clinical guidelines and training programs are in developmental stages.

At baseline and at all review points of the study, the Facial Image Scale (FIS) (Buchanan & Niven, 2002, 2003) is used to assess the children’s feelings about the Hall Technique. The FIS is a validated tool for assessing anxiety in children as young as three years of age. It is a five point scale, diagrammatically depicting 'very smiley', 'smiley', 'neutral', 'frowning' or 'very frowning' faces. The children who had HT crowns placed, responded overwhelmingly positively to the experience. Eighty percent of 3 year olds and 92-96% of 4 – 7 year olds chose either the smiley or very smiley face from the FIS when asked how they felt about how they were “looked after” at their visit.

“It’s cool. Looks good. Want(s) to show to friends at school.”

“It was easy and quick and the new silver tooth is slippery.” (Calache et al, 2015)

Their parents and carers were also equally positive about the ease, comfort and speed of the technique with 98% of carers saying they would be happy for their child to have HT treatment in the future (Calache et al., 2015).

Clinicians are also realising the advantages of the Hall Technique compared to the traditional filling method.

“... it’s so much better having the kids leave with the job done and no tears... I feel very confident in this technique and the parents are amazed at how easy and quick it is.”

“It's converted me! I was hesitant initially (leaving caries behind) due to 30 years of practice removing caries - I was concerned. But felt I wanted to be open-minded, so read through the literature and attended the training. Was still a little hesitant, but after the first (HT crown)
was placed I felt such a sense of achievement. Saw the benefits to the patient in terms of ease of application, comfort and minimal time taken. Patients and parents were very pleased with outcomes. The crowns look good and 'clean' in the mouth. I know that the crowned tooth will be there until it exfoliates and that the patient will not have to come back to have a filling re-done on that tooth!"

(Calache et al, 2015)

This technique promises to alleviate the suffering and anxiety that many young children feel in the dental chair, and, if implemented in the early stages of caries development, can prevent the progression of the carious lesions in primary molars from developing to a stage where it would require hospitalisation of the young child for its management. Young children don’t want to sit for a relatively long time in the dental chair experiencing the sounds and feel of teeth being drilled, oral soft tissues being punctured by needles and the subsequent numb feeling. This constitutes the general discomfort associated with conventional restorations. The placement of a HT Crown is a very simple procedure and is a lot faster and more comfortable, with less anxiety for the patient. It has the added bonus of preventing the progression of the carious lesion that is being treated and the development of new carious lesions on other surfaces of the tooth that is being managed.

Less anxiety for the child means a better experience which builds resilience and encourages good oral health habits into the future….. a future as less fearful adults who may not be so inclined to avoid having preventive dental visits.

The pilot study was funded by DHSV 2012-2013 and the current study is funded by the William Buckland Foundation 2013-2016.
REFERENCES:


Paper presented at the 25th Congress of the International Association of Paediatric Dentistry, Scottish Exhibition and Conference Centre, Glasgow, UK.


