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The hall technique in pediatric patients: A literature review

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Abstract

Introduction: The contemporary approach to carious lesion treatment emphasizes less invasive techniques, among which is the Hall Technique (HT). HT involves seating and cementing stainless steel crowns on primary molars without dental preparation, caries removal, or local anesthesia.

Methodology: A comprehensive search on Pubmed using keywords such as hall technique, early childhood caries, minimal intervention, silver diamine fluoride, pediatric dentistry, oral hygiene, dental pulp, and stainless steel crowns yielded significant findings.

Results: HT reduces discomfort and is preferred by both patients and parents. However, notable adverse consequences include an unsightly appearance and increased plaque accumulation in cases of suboptimal adaptation. The successful application of HT requires careful case selection and an evaluation of pulp status. The methodology involves an exhaustive search for relevant keywords on Pubmed, ensuring a comprehensive review of the available literature on the Hall Technique and related topics in pediatric dentistry.

Conclusion: HT is a safe option for the treatment of teeth with caries lesions, as well as in molars affected by hypomineralization, it does not cause the patient pain, trauma, or negative dental experiences, fulfilling the ideal function of a stainless steel crown. It requires little time and is usually more economical than the conventional technique, showing favorable results and being well accepted by parents/caregivers.

Keywords: Hall technique, early childhood caries, minimal intervention, pediatric dentistry, stainless steel crowns

1. Introduction

In the past, dental caries was viewed as an infectious disease, leading to treatments involving the complete removal of infected dental tissue. However, recent developments in cariology have shifted the paradigm towards minimally invasive interventions, recognizing dental caries as a result of imbalances in tooth structure demineralization and remineralization due to plaque biofilm metabolism and dietary sugars [1]. Rather than eliminating infected tissue, the focus is now on managing the biofilm and cariogenic environment.

While traditional approaches for deep carious lesions aim at pulpal interventions to maintain tooth functionality, Minimal Intervention Dentistry seeks to preserve vitality, function, and asymptomatic state until exfoliation [2]. The contemporary approach emphasizes less invasive treatments, particularly biofilm change. The Hall Technique (HT) presents an alternative for treating primary molars by seating stainless steel crowns without tooth preparation, caries removal, or local anesthesia, effectively halting cavity progression [3, 4]. Introduced by Dr. Norma Hall in Scotland [5], HT is recognized for treating early to moderately advanced active caries lesions in primary molars with evidence of effectiveness and acceptability [6].

In a biological approach, most restorations involve stainless steel crowns through HT (95%), followed by selective removal to firm dentin (5%) [7]. While awareness of HT is high globally (92.32%), its utilization varies widely among countries (50.6%) [8]. Amid the COVID-19 pandemic, dental procedures, including the Hall technique, witnessed an increasing trend, with a focus on minimally invasive treatments in pediatric dentistry to preserve tooth structure and alleviate patient anxiety [9, 10].

This study aims to analyze the advantages, disadvantages, indications, and contraindications of HT.

2. Methodology

The results of a comprehensive PubMed search were presented along with some critical comments when necessary. The review focuses on general information about the Hall Technique and its application in pediatric dentistry, using keywords or combinations of words such as hall technique, early childhood caries, minimal intervention, silver diamine fluoride, pediatric dentistry, oral hygiene, dental pulp, stainless steel crowns, among some other phrases to collect and select articles including reviews, clinical trials and studies. In addition, all of them will be analyzed to select the relevant ones and exclude those that are irrelevant.

3. Results

3.1 Description

In contemporary dentistry, there is a notable shift towards biological and minimally invasive treatments for primary and permanent teeth, deviating from conventional restorative approaches involving complete removal of carious lesions^[11]. In 1997, Dr. Norna Hall introduced an unconventional method for treating decayed primary molars using preformed metal crowns, a technique known as the Hall Technique (HT). HT doesn't involve local anesthesia, cavity removal, or tooth preparation. When applied, it seals the superficial plaque layer with the carious lesion, isolating it from external nutrients in the oral cavity. This alters the plaque biofilm composition, creating a less cariogenic environment and potentially halting or slowing caries progression in primary teeth^[4]. Minimally invasive treatments, such as HT, offer the advantage of preserving tooth structure and maintaining maximum dentin thickness on the cavity floor, minimizing damage to pulp tissue^[12]. Successful treatment planning relies on accurate detection, assessment, and diagnosis of carious lesions, integrating this information with a comprehensive history and understanding of treatment indications and contraindications^[13].

In the application of HT, considerations include the use of orthodontic separators for non-spaced teeth, determining crown size through measurement or trial and error, and caution during the cementation process to avoid protruding margins. Alterations in bite and occlusion may occur temporarily but usually normalize within days to weeks. The molar, "sealed" beneath the crown during the two-session procedure, effectively arrests the caries process. HT, well-tolerated by children, provides long-lasting restorations with high survival rates^[14, 15].

Furthermore, individual prevention guidance accompanies the HT procedure. Some modifications to the technique, such as partial caries removal or cutting proximal teeth, have been reported by investigators^[16]. Proficiency in the technique is crucial for correct execution, emphasizing step-by-step explanations to parents/caregivers and addressing any concerns about the treatment.

3.2 Advantages

The Hall Technique (HT) presents dentists with a swift and definitive treatment, effectively minimizing patient anxiety^[17]. By eliminating the need for local anesthesia, HT aims to enhance child compliance and operator comfort. Beyond cavity sealing, it anticipates providing a less traumatic dental experience early in a child's life, fostering a likelihood of their return for more complex treatments in the future^[18]. HT

combines the biological management of carious lesions, achieved by sealing bacteria and depriving them of nutrition, with the restorative benefits of preformed metal crowns^[19]. Comparisons between conventional techniques and HT reveal similar behavior in terms of marginal leakage, suggesting that complete caries removal is not imperative for achieving a good seal^[4]. The use of preformed metal crowns through HT in managing dentinal caries in primary teeth reduces the risk of pain and restoration failure. HT has demonstrated a reduction in discomfort, earning preference from both patients and parents^[2]. Notably, HT boasts a shorter treatment duration, enhanced cost-effectiveness, and higher acceptability among parents compared to conventional techniques^[20].

Children treated with HT overwhelmingly reported positive experiences immediately after treatment, with nearly 90% expressing enjoyment. A retrospective study in the United States demonstrated similar success rates in clinical and radiological outcomes for stainless steel crowns used in restoring primary molars with carious lesions, comparing the conventional technique and HT^[21]. HT is well-tolerated by children, acceptable to parents, and associated with minimal adverse effects^[22]. When applied alongside silver diamine fluoride and atraumatic restorative treatment (ART), HT gained high acceptance from parents/caregivers^[23]. Its restoration survival rate was nearly three times higher than ART (93.4% compared to 32.7%) for occluso-proximal dentin lesions in primary molars after three years^[24].

Furthermore, HT demonstrates cost-effectiveness, with significantly lower total cumulative costs compared to the conventional technique. Long-term practice-based trials affirm HT's superior cost-effectiveness, as it maintains longer with fewer complications at lower costs^[25]. Positioned as a cost-effective approach, HT contributes to anxiety reduction in dental caries treatment^[26].

In summary, HT offers a multitude of advantages, notably alleviating fear and anxiety during consultations, preserving dental tissue, and providing operational simplicity that is generally well-tolerated by patients, thereby avoiding unpleasant dental experiences.

3.3 Disadvantages

The Hall Technique (HT) is not without drawbacks, with its chief adverse consequences encompassing an unsightly appearance and increased plaque accumulation when optimal adaptation is lacking^[27]. Major failures, such as irreversible pulpitis or dental abscess, are infrequent but significant (CR 29; HT 4). Cases involving the loss of restoration or crown, rendering the tooth unrestorable, are rare^[28]. Both major failures (irreversible pulpitis, dental abscess, periradicular radiolucency, and loss of crown with non-restorable tooth) and minor failures (loss of crown and restorable tooth, crown perforation, secondary/marginal caries, and reversible pulpitis) have been documented^[29]. Additionally, cases of the ectopic first permanent molar adjacent to the crowned tooth have been reported^[30], and in rare instances, internal root resorption can occur^[31].

Stress distribution in tooth-supporting tissues is noted to be greater with HT within the initial 2 weeks compared to the conventional crown placement technique, where settling occurs within 2 days^[32]. Concerns about increased occlusal vertical dimensions with HT are addressed by evidence showing occlusion equilibration after 30 days without long-term problems^[21]. Parents or legal guardians in clinical practice commonly express apprehension about unremoved

caries with HT^[33]. Another potential adverse outcome is the perforation of the occlusal surface^[34].

A significant disadvantage lies in the lack of parental acceptance, attributed to the fact that carious tissue is not eliminated. Furthermore, certain patients, categorized as definitively non-cooperative, pose challenges for HT implementation, necessitating more invasive techniques alongside dental sedation.

3.4 Guidelines

The Hall Technique (HT) necessitates meticulous case selection and evaluation of pulp status. Determining pulp status involves a comprehensive approach, including medical history, clinical examination, mechanical tests (probing, blowing air), test cavities, percussion, and radiography. In situations where children cannot cooperate or obtain diagnostic images, the extent of decay and pulp vitality (vital or non-vital) becomes crucial for deciding on a treatment modality^[33]. Excellence in diagnosis, treatment planning, and follow-up is pivotal for success.

HT is not a "fit and forget" technique. Teeth should exhibit no symptoms of pulpal pathology, such as irreversible pulpitis, when considering Hall crowns. If a Hall crown is inadvertently placed due to diagnostic error or reaches the pulp causing irreversible pulp disease, prompt detection during reviews is essential^[35]. Hall crowns should be placed only when clinical examination and radiographic investigation indicate a very low risk of irreversible pulpal pathology^[6].

Recommended applications include occlusal caries (non-cavitated) if fissure sealant, partial caries removal, or conventional restoration is not accepted. Proximal cavitated or non-cavitated caries are suitable if the patient rejects partial caries removal or conventional restoration^[18]. Asymptomatic proximal primary molars with multisurface caries, asymptomatic occlusal lesions, hypoplastic primary molars, and asymptomatic carious lesions in primary molars (active or inactive) are also candidates for HT^[36]. It is applicable to children and adults with intellectual/physical disabilities^[37].

Specific criteria for HT include caries limited to occluso-proximal surfaces extending to dentin, accessible to hand instruments used in Atraumatic Restorative Treatment (ART), absence of pain, fistula, or abscess near the selected tooth, no pulpal exposure, and cavity size less than 2.0 mm mesiodistally and 2.5 mm in the occlusocervical and buccolingual directions, measured with a WHO-classified periodontal probe^[38]. Additionally, restoring teeth affected by Molar Incisor Hypomineralization (MIH) is challenging, but HT provides a non-invasive option by sealing carious lesions without removing decay or preparing teeth^[39].

Proper diagnosis is paramount for creating an appropriate treatment plan, considering pulp status. Emphasizing the importance of post-treatment follow-up to parents/caregivers is crucial, as ongoing monitoring is necessary to detect any failures promptly.

3.5 Contraindications

In a study, 34% believed there were no medical contraindications to Hall Technique (HT) use. Among those recognizing contraindications, immunocompromised and cardiac diseases were commonly cited, with additional mentions of leukemia, brain tumors, and other serious special needs conditions^[40]. HT is contraindicated when signs or symptoms of irreversible pulpitis, dental abscess/fistula, radiological signs of pulp involvement, or periradicular pathology are present. It is not recommended when there is no

cooperation due to the risk of corona aspiration or swallowing. Contraindications also include patients at risk of infective endocarditis, immunocompromised children, severely destroyed crowns with non-restorable cavities, very young children unable to understand or tolerate the procedure without local anesthesia, allergy or vulnerability to nickel, a temporary tooth close to exfoliation, x-ray evidence of more than half tooth root resorption, pulp exposure during treatment, excessive tooth mobility, pulp necrosis, or dental abscess^[36, 41-44].

Hall crowns require careful follow-up after placement, with prompt treatment of pulp pathology if it develops. While HT is not a universal solution for providing oral health care to disadvantaged or underserved populations^[45], the patient's medical history should always be analyzed to consider any medical alerts contraindicating the treatment. In young children, analyzing pulpal behavior can be challenging, underscoring the importance of adequate post-treatment follow-up and clear communication with parents/caregivers about expectations.

4. Conclusion

The Hall Technique emerges as a significant advancement in pediatric dentistry, offering a non-invasive alternative to traditional restorative methods for managing carious lesions, particularly in primary molars. Its innovation lies in its ability to encapsulate carious lesions within stainless steel crowns, thus halting the progression of decay without the need for local anesthesia, dental drills, or the removal of carious tissue. This approach not only diminishes the immediate stress for young patients but also circumvents the negative connotations associated with dental treatments, fostering a more positive attitude towards oral health care. Clinical outcomes have been predominantly favorable, showcasing the technique's effectiveness in caries management and its potential in preserving the masticatory function of primary teeth until their natural exfoliation. Moreover, the economic advantages presented by the Hall Technique cannot be overlooked. Requiring fewer resources and less chair-time, it stands as a cost-effective alternative for both dental practices and families, which is particularly relevant in under-resourced communities or health care systems with limited dental funding. However, its success is contingent upon accurate patient selection, meticulous technique execution, and rigorous follow-up. It is paramount for dental professionals to conduct comprehensive examinations, incorporating both clinical and radiographic assessments to identify suitable candidates for the technique. Furthermore, the Hall Technique demands a clear understanding and communication with the patient's caregivers, ensuring they are informed about the nature of the technique, its benefits, and limitations. Despite its merits, the Hall Technique is not without challenges. Its reliance on the sealing properties of stainless steel crowns means that any breakdown in the marginal seal could lead to treatment failure. Hence, the role of regular dental check-ups ascends in importance, ensuring the integrity of the crowns and the absence of secondary caries. The technique's acceptance by the dental community and parents is influenced by cultural perceptions and the traditional emphasis on caries removal. Advocating for a paradigm shift in caries management, ongoing education and dissemination of evidence-based research are crucial to its broader acceptance. Looking ahead, further long-term studies and continuous monitoring of outcomes will serve to validate the technique's efficacy and adapt it to a wider range of clinical scenarios. As

pediatric dentistry advances, the Hall Technique stands as a testament to the evolving nature of dental care, where patient comfort and evidence-based practice converge to redefine standards and expectations.

In essence, the Hall Technique should be considered a valuable addition to the pediatric dentist's arsenal, one that aligns with the contemporary goals of minimally invasive dentistry and supports the psychological well-being of the child, paving the way for a lifetime of positive dental experiences.

5. Conflict of Interest

None

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None

7. References

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