

Hall technique for the treatment of hypomineralized second primary molars: case report

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Abstract: Introduction: Hypomineralized second primary molar (HSPM) is an enamel defect that affects one to four second primary molars. Treating affected teeth is challenging due to the high failure rate of conventional restorations. As an alternative, the Hall Technique (HT) has shown relatively better outcomes for teeth with enamel defects. Therefore, the aim of this study is to describe the use of the HT in rehabilitating a severely affected second primary molar in a patient with HSPM and to emphasize the importance of clinical monitoring in the management of fractures and carious lesions. **Case report:** A 9-year-old boy presented with painful and sensitive teeth. Clinically, creamy-white opacities were observed on the buccal surfaces of the second primary molars. The lower right second primary molar showed restoration failure involving the occlusoproximal surfaces. The lower primary molars exhibited enamel defects with post-eruptive breakdown (PEB), but without dentin exposure. A diagnosis of HSPM was made. Preventive treatment was performed, followed by dental restoration using the Hall Technique. Follow-up visits were scheduled every 3 months, and a 12-month recall appointment revealed treatment stability. **Conclusion:** HT may be considered a feasible alternative for restoring HSPM-affected teeth with post-eruptive breakdown or occlusoproximal lesions.

Key words: Molar Hypomineralization; Developmental Defects of Enamel; Tooth abnormalities.

Técnica Hall para tratamento de segundos molares decíduos hipomineralizados: relato de caso

Resumo: Introdução: A hipomineralização do segundo molar decíduo (HSMD) é um defeito do esmalte que afeta de um a quatro segundos molares decíduos. O tratamento desses dentes é desafiador devido à alta taxa de falhas das restaurações convencionais. Como alternativa, a técnica de Hall (TH) tem apresentado melhores resultados em dentes com defeitos de esmalte. Portanto, o objetivo deste estudo é descrever o uso da TH na reabilitação de um segundo molar decíduo gravemente afetado em um paciente com HSMD, além de enfatizar a importância do acompanhamento clínico no manejo de fraturas e lesões cariosas. **Relato de caso:** Um menino de 9 anos apresentou queixas de dor e sensibilidade dentária. Clinicamente, observaram-se opacidades branco-creme nas superfícies vestibulares dos segundos molares decíduos. O segundo molar inferior direito apresentava falha em uma restauração envolvendo as superfícies ocluso-proximais. Os molares decíduos inferiores mostraram defeito de esmalte com perda pós-eruptiva (PEB), mas sem exposição dentinária. Foi diagnosticada hipomineralização dos segundos molares decíduos. Realizou-se tratamento preventivo, seguido de restauração pela técnica de Hall. As visitas de acompanhamento foram agendadas a cada 3 meses, e uma consulta de revisão após 12 meses revelou estabilidade do tratamento. **Conclusão:** A TH pode ser considerada uma alternativa viável para restaurar dentes com HSMD que apresentem desintegração pós-eruptiva ou lesões ocluso-proximais.

Palavras-chave: Hipomineralização Molar; Defeitos de Desenvolvimento do Esmalte Dentário; Anormalidades dentárias

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Técnica de Hall para el tratamiento de hipomineralización del segundo molar primario: reporte de caso

Resumen: **Introducción:** La hipomineralización del segundo molar primario (HSMP) es un defecto del esmalte que afecta de uno a cuatro segundos molares primarios. El tratamiento de los dientes afectados representa un desafío debido a la alta tasa de fracaso de las restauraciones convencionales. Como alternativa, la técnica de Hall (TH) ha mostrado mejores resultados relativos en dientes con defectos del esmalte. Por lo tanto, el objetivo de este estudio es describir el uso de la TH en la rehabilitación de un segundo molar primario gravemente afectado en un paciente con HSMP y enfatizar la importancia del seguimiento clínico en el manejo de fracturas y lesiones cariosas. **Reporte de caso:** Un niño de 9 años se presentó con quejas de dolor y sensibilidad dental. Clínicamente, se observaron opacidades blanco-cremosas en las superficies bucales de los segundos molares primarios. El segundo molar inferior derecho presentó una falla restauradora que involucraba las superficies ocluso-proximales. Los molares primarios inferiores mostraron defectos del esmalte con pérdida post-eruptiva (PPE), pero sin exposición dentinaria. Se diagnosticó hipomineralización de los segundos molares primarios (HSMP). Se realizó un tratamiento preventivo, seguido de la restauración dental mediante la técnica de Hall. Las visitas de control se programaron cada tres meses, y una cita de revisión a los 12 meses reveló un tratamiento estable. **Conclusión:** La técnica de Hall puede considerarse una alternativa viable para restaurar dientes con HSMP que presentan pérdida post-eruptiva o lesiones ocluso-proximales.

Palabras clave: Hipomineralización Molar; Defectos del Desarrollo del Esmalte; Anomalías dentarias.

Introduction

Hypomineralized second primary molars (HSPM) is an enamel defect that affects 1 to 4 second primary molars,¹ and manifests itself as white, cream, yellow or brown opacities². These alterations may lead to post-eruptive enamel breakdown (PEB), atypical restorations and caries lesions³.

Several studies have reported widely varying prevalence rates of HSPM⁴⁻⁶. This variation is likely due to differences in socio-behavioral and environmental factors in the studied populations, as well as the diagnostic criteria used⁷. However, a recent systematic review highlighted a global prevalence of HSPM of 6.8%⁵.

Clinically, the restoration of hypomineralized teeth remains challenging. Several treatment options are available⁸. The irregular shape of the PEB cavities, poor bond strengths to adhesive restorative materials and

difficulty obtaining adequate anaesthesia make it difficult to achieve successful outcomes using traditional approaches^{9, 10}. The choice of treatment depends on the severity and symptoms of hypersensitivity associated with the hypomineralized tooth^{10, 11}. Resin composite and glass ionomer cement (GIC) have been reported, however the enamel-adhesive interface in hypomineralized teeth is more porous, which can cause enamel cracks and a weak bond strength. As a consequence, cohesive failure is often observed in these restorations¹². For this reason, in most severe cases, the restoration of first choice for a HSPM molar is a preformed metal crown (PMC) which helps prevent further tooth loss, reduces hypersensitivity pain, and maintain tooth space¹³.

The Hall Technique (HT) is a method of using PMCs to manage carious and hypomineralization lesions in primary molars, by placing a stainless-steel crown

over the tooth and sealing the cavities using a glass ionomer cement. Local anesthesia, tooth preparation and carious tissue removal are not required¹⁴. The HT is more acceptable to pediatric patients and also to their parents. It also helps the clinicians to limit the anxiety of children, thereby making them more cooperative. It is a child-centered approach that causes less discomfort than conventional treatment approaches¹⁵.

Patients diagnosed with HSPM need special dental treatment considerations and an oral care regime focused on prevention. Recommendations for the routine use of topical remineralization agents have been reported.

Thus, the aim of this case report is to describe the restoration of a hypomineralized primary tooth in a patient with structural loss, carious lesions, and sensitivity, using the Hall technique and a 12-months follow-up.

Case report

A 9-year-old boy attended the Pediatric Dental Clinic at the Brazilian Association of Dentistry with his parents, who reported esthetic problems and painful, sensitive teeth. The medical anamnesis revealed he had been repeatedly hospitalized due to a respiratory tract infection during early childhood and has frequently been prescribed amoxicillin because he suffers from asthma. During the first dental visit, the patient was scared and sullen, which is why the behavior was classified as “negative” according to the Frankl scale. Informed consent was obtained from the legal guardian, and an age-appropriate assent form was also signed by the child for the case report.

The extraoral examination revealed no facial asymmetry, normal soft tissues, and a shy smile (Figure 1). During dental examination, demarcated white and creamy opacities were observed on the buccal surfaces of the second primary molars (teeth 55, 65, 75 and 85) and on the cusps of the maxillary permanent first molars (teeth 16 e 26). The mandibular primary molars showed an enamel defect with PEB but without dentin exposure. The right mandibular primary molar presented

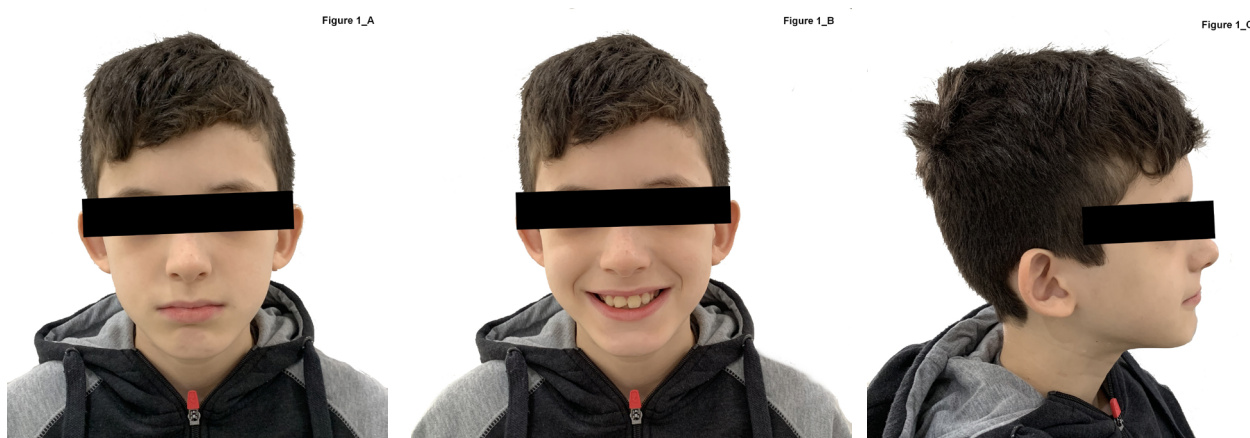


Figure 1. Initial extraoral photographs. A – Frontal; B – Smiling; C – Profile

failure of the restoration involving the occlusoproximal surfaces (Figure 2). Considering both clinical and medical history, MIH and HSPM were diagnosed according to the criteria defined by Ghanim and Elfrink^{7, 16}.

The treatment plan was individualized and divided into phases to facilitate organization, assist in case prognosis, and improve patient understanding. Accordingly, the treatment involved the following stages: preventive, restorative, and maintenance. The preventive phase started by approaching the child and his parents with appropriate dietary advice. Oral hygiene instructions included recommending the use of a fluoridated toothpaste containing over 1,000 parts per million of fluoride, to be used twice daily. Esthetic enhancement of the anterior teeth was accomplished by direct composite restorations for maxillary incisors. A 10% casein phosphopeptide-amorphous

calcium phosphate plus 0.2% sodium fluoride paste (900 ppm fluorine) (MI Paste Plus, GC) was prescribed to reduce the sensitivity of MIH-affected teeth and to promote the mineralization process. Extraction of the left mandibular primary molar was recommended due to high level of mobility (75). PMC was prescribed to restore the right mandibular primary molar in the next stage.

The restorative phase included the placement of a stainless-steel crown. Initially, an orthodontic separator (Morelli, Sorocaba-SP) was positioned between the primary molar and the first permanent molar for three days (85). During the next appointment, the separator was removed, and a professional prophylaxis was performed. A suitable PMC (3M Espe, Minnessota- USA, E6) was selected to perfectly fit the crown width and to give a feeling of 'spring back' when seated up to the contact points. The tooth was isolated

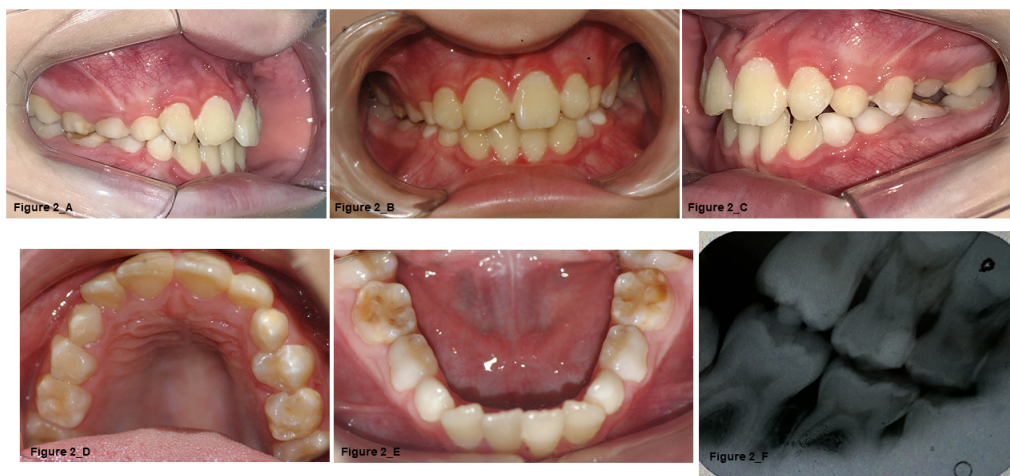


Figure 2. Intraoral pretreatment photographs and bitewing radiograph. A - Left side (75 - failure of the restoration involving the occlusoproximal surfaces); B - Front view; C - Right side (85 - failure of the restoration involving the occlusoproximal surfaces); D - Upper occlusal view; E - Lower occlusal view; F - Bitewing radiograph

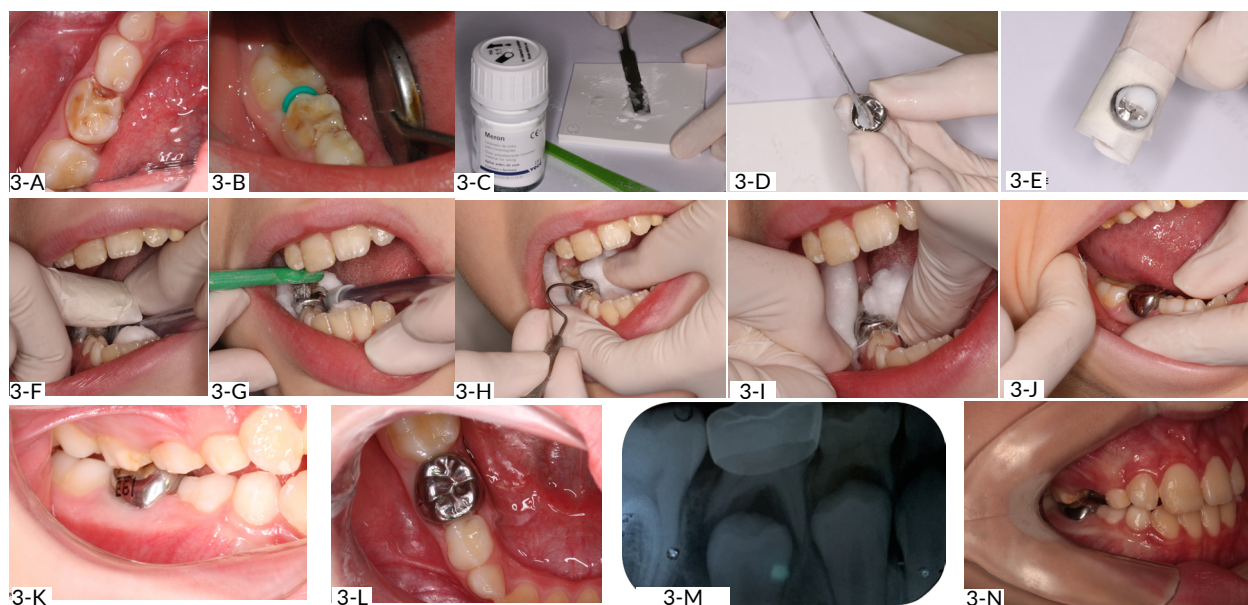


Figure 3. Hall technique procedure. A - Initial condition; B - Orthodontic separator between the primary molar and the first permanent molar; C - GIC preparation; D - Crown filled with GIC; E - Crown adhered to masking tape; F - Crown pressure over the tooth; G - Orthodontic band pusher helping to fit the crown H - Cement excess removal; I - Dental floss to remove cement excess; J - Final aspect; K - Occlusion check and overbite dimension; L - Final occlusal view; M - Radiographic evaluation; N- Overbite dimension after one month

with cotton rolls, and the crown was filled with GIC (Meron Combipack – Voco) and pressed firmly until fully seated. The patient was asked to bite down on to the crown to seat it fully and encouraged to keep biting on the PMC for two minutes to allow the cement to set. A final check of the crown was made and excess GIC was removed. Dental floss was used to remove cement on proximal surfaces. Radiographic evaluation confirmed the successful result by showing well-adapted crown margins with no visible gaps or overhangs, adequate contact with adjacent teeth, and the absence of bone rarefaction in the periapical or furcation regions, periodontal ligament thickening, or internal and external pathological resorption. The overbite was measured by marking the most incisal point of

the maxillary canine on the mandibular cuspid. The vertical distance between this marked point and the most prominent incisal point of the mandibular cuspid was then measured using a Williams probe (SS White Inc., New Jersey, USA). The overbite measurements were taken at three key points: pre-operatively, immediately after crown placement, and one month post-operatively during a follow-up appointment. The values recorded were 2.6 mm, 1.7 mm, and 2.5 mm, respectively.

The maintenance phase involved scheduling visits every three months to reinforce dietary and oral hygiene recommendations and to check the retention of the PMC. A recall appointment 12 months later revealed that the patient maintained good oral hygiene, with stable PMC treatment.



Figure 4. One year follow-up (Intraoral photographs). A - Left side (75); B - Front view; C - Right side (85 - patient maintained good oral hygiene, with stable PMC treatment. The teeth were free from caries, and no PEB was observed); D - Upper occlusal view; E - Lower occlusal view

The teeth were free from caries, and no PEB was observed. The success of the treatment was evaluated based on the criteria proposed by Innes, which include: 1) the restoration appears satisfactory; 2) no further intervention is required; 3) no clinical signs or symptoms of pulpal pathology are present; and 4) no visible pathology is seen on radiographs (Figure 4). Fluoride varnish (Colgate Duraphat®) was applied to dental elements 55 and 65, while dental element 75 was extracted due to the eruption of its permanent successor.

Discussion

The present clinical case report describes the restorative treatment of HSPM-affected tooth using the Hall Technique. The process of enamel formation is known as amelogenesis. Enamel matrix

proteins are secreted into the enamel space by ameloblasts and later degraded and removed through proteolytic processes, also performed by ameloblasts. Tooth development is highly susceptible to environmental disturbances¹⁷. Consequently, any insult to the ameloblasts can result in detectable defects in the mature enamel¹⁸.

The development of the second primary molars begins earlier than that of the first permanent molars, with an overlap in their developmental periods. During this overlap, if risk factors are present, hypomineralization can affect both primary and permanent teeth¹⁹. The patient in this case presented with enamel defects in both primary and permanent molars, supporting studies that indicate children with HSPM are 5-6 times more likely to develop MIH²⁰. The etiology of HSPM is considered multifactorial but remains inconclusive.

Literature reports associations with pre-, peri-, and post-natal events. Factors such as asthma¹⁸ and antibiotic intake¹⁸ may have influenced or increased the risk of HSPM development in the patient described in this case report.

Hypomineralized enamel is characterized by a reduced quantity and quality of minerals, diminished hardness, lower modulus of elasticity, increased porosity, and a higher protein content compared to sound enamel²¹. These structural deficiencies, combined with the presence of post-eruptive breakdown (PEB), frequently result in hypersensitivity and pain, posing significant challenges for the restoration of affected teeth²². In the case presented, the patient exhibited hypomineralized second primary molars (HSPM) with pronounced PEB, which exacerbated hypersensitivity and discomfort. This underscores the importance of a comprehensive approach by dentists, which includes not only preventing further enamel breakdown and secondary caries but also carefully evaluating the selection of therapeutic strategies. Choosing the most appropriate materials and timing for intervention is critical to managing the unique biomechanical and aesthetic needs of these patients, ensuring both functional restoration and patient comfort²³.

There are different restorative options available for patients with HSPM: GIC, Resin Modified Glass Ionomer Cements (RMGIC), composite resins (CR), and PMCs. Our patient presented PEB, carious lesion and sensitive pain. For this reason, we decided to offer PMC and perform the Hall technique to restore the affected primary tooth. Preformed metal crowns have been used for many years to cover

teeth with enamel defects, and they are still recommended as a treatment option for HSPM teeth²⁴. Their advantages include the ability to prevent further tooth structure loss, control hypersensitivity, and establish proper interproximal and occlusal contacts. Additionally, PMCs are cost-effective, require minimal preparation, and can be inserted in a relatively short time, making them a practical and efficient option for both clinicians and patients²⁵. This combination of durability, simplicity, and therapeutic benefits highlights PMCs as a gold standard for the restoration of severely affected primary teeth, particularly in cases where enamel integrity is compromised.

When addressing occluso-proximal surfaces in primary dentition, the longevity of restorative materials is generally shorter compared to occlusal cavities. This is often attributed to the increased biomechanical demands and challenges in achieving optimal marginal adaptation in these areas. High failure rates have been reported regardless of the restorative material used, including glass ionomer cements (GIC) and composite resins²⁶. To address these limitations, our treatment approach prioritizes a minimally invasive and biologically oriented technique over conventional methods that require the complete removal of carious tooth tissue. This strategy focuses on preserving the remaining tooth structure, controlling the biofilm, and promoting the arrest of carious lesions²⁷. By adopting this approach, we aim to balance the preservation of dental tissues with the effective management of caries, ultimately enhancing the long-term outcomes for the patient.

PMC have shown significant clinical success and are considered as a favorable restorative

option for carious lesion involving two or more surfaces of primary molars²⁴. Previous reports have shown a 5-year survival rate of up to 100%²⁸. However, fitting a crown can be demanding in terms of both of clinical skill and child co-operation. For this reason, the HT may be a better option, as minimally invasive procedures are preferable. For this technique, local anesthesia, tooth preparation and carious tissue removal are not necessary³. PMCs isolate the lesion from biofilm deposition and dietary challenges, leading to caries lesion arrestment²⁹. Hall technique is a not only a predictable restorative option but it has significantly outperformed the conventional method of treatment of primary molars. The success rate of the HT is five times higher than that of the conventional restorative techniques²⁴.

The Hall Technique (HT) does not involve tooth preparation or caries removal, which can lead to an initial increase in the occlusal vertical dimension following crown placement. However, clinical studies have consistently shown that the occlusion tends to self-adjust and normalize within 15 to 30 days³⁰. In the present case, a noticeable reduction in overbite was observed immediately after crown cementation, but this dimension returned to baseline within one month. This adaptive response may result from a combination of factors, including the intrusion of the restored molar and its antagonist, as well as compensatory eruption of adjacent or opposing teeth³¹. These findings highlight the ability of the stomatognathic system to accommodate changes induced by HT, reinforcing its clinical applicability and effectiveness in managing carious primary molars.

After crown placement, the pain associated with hypomineralization was eliminated. This can be attributed to the fact that a metal crown provides physical isolation of the hypomineralized tooth from the oral environment, thus preventing thermal, chemical, and mechanical stimuli from happening and consequently preventing pain³¹.

The Hall Technique (HT) has demonstrated high acceptance among pediatric patients, offering a child-centered approach that minimizes discomfort and anxiety compared to conventional restorative methods. This technique is particularly advantageous in managing hypomineralized teeth, as preformed metal crowns (PMCs) not only prevent further structural degradation but also effectively alleviate hypersensitivity while reestablishing proper interproximal and occlusal relationships. These benefits underscore the importance of regular follow-up appointments, which are essential for monitoring the long-term stability of the treatment, ensuring optimal oral hygiene, and providing professional prophylaxis to maintain overall oral health. This approach highlights the dual role of the HT in both therapeutic and preventive pediatric dentistry.

Conclusion

HT may be considered a feasible alternative to restore hypomineralized primary molars with post-eruptive breakdown or occluso-proximal lesions. Its minimally invasive nature and positive outcomes make it an effective treatment option. However, regular follow-up and maintenance are crucial to maintain the treatment's success and prevent fractures.

Practice relevance

The HT is a minimally invasive and child-centered approach that causes less discomfort compared to conventional treatments;

PMC for hypomineralized teeth prevent tooth loss, control sensitivity, and establish correct interproximal and occlusal contacts.

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Conflict of interest:

The authors declare that they have no conflicts of interest with respect to the publication of this article.

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