

Hall technique in pediatric patients: case study and clinical-radiographic follow-up

Dayane Jaqueline Gross,¹ Danyanie Manosso Samways,¹ Mariane Rodrigues de Melo,¹ Denise Stadler Wambier,¹ Ana Claudia Chibinski¹

¹School of Dentistry, State University of Ponta Grossa, Ponta Grossa, PR, Brazil

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ABSTRACT

Objective: to describe the Hall technique for restoration of primary molars with extensive coronal destruction. **Case Report:** a case with clinical and radiographic follow-up of three years was described. **Results:** the tooth was successfully restored by the Hall technique, with no clinical or radiographic signs of pulp pathologies.

Conclusion: the Hall technique was an effective restorative procedure for primary teeth, preserving the vitality and function of the restored tooth. It is an atraumatic treatment, which is easily accepted by the child, and that has been proven a good option for the everyday use in Pediatric Dentistry.

Keywords: Molars; Dental caries; Primary teeth.

Introduction

Dental caries is one of the greatest oral health problems worldwide and, despite its decline in recent times, many children with lower social indicators are still affected by this disease. According to the latest epidemiological survey carried out by the Ministry of Health in Brazil, the ceo-d caries index (total sum of decayed, extracted and filled teeth) decreased from 2.8 in 2003 to 2.3 in 2010 in primary teeth, but 80% of these teeth were not treated, which indicates need for treatment.¹

Several techniques have been described in the literature for the treatment of carious lesions in primary teeth.² However, extensive coronal destruction and complex cavities constitute a clinical problem that challenges the longevity of conventional restorations with composite resins and adhesive systems. In addition, conventional tooth preparations and restorations with complete removal of carious tissue eventually result in removal of sound tooth structure and do not create favorable conditions for a biological response of the tooth in reorganizing the affected dentin.

The Hall Technique has been proposed as an alternative to conventional restorative techniques. This technique was introduced to the scientific community in 2000 in the electronic journal of the Dundee School of Dentistry in the UK, Tuith Online (<http://www.dundee.ac.uk/tuith/Articles/index.htm>), which presented results from a pilot study developed by a group of researchers.³ The study was performed after analysis of the data collected by Dr. Norna Hall, who retired in 2006 after 15 years using an alternative technique for placement of stainless steel crowns in Scotland.⁴

The technique involves the cementation of prefabricated stainless steel crowns on the dental remnant in an atraumatic manner, without the need of anesthesia, removal of carious tissue or preparation of the dental structure.⁵⁻⁷

The highlight of this technique is the combinations of the minimum intervention principles with the use of pre-

fabricated stainless steel crowns. In this way, the Hall technique adopted the most recent concepts for the control and treatment of dentin caries. Breaking the paradigm of the need for complete removal of carious tissue (often at the expense of pulp vitality), this technique shows that carious lesion progression can be slowed, arrested or even reversed if the cavity is adequately sealed.⁵

Retrospective studies have shown crown durability over the years, with satisfactory rates compared with other conventional restorations.⁸ A study using the Hall technique in children from New Zealand found a lower failure rate (about 6%) in the group that received the stainless steel crowns compared with the group treated with conventional restorations (32%).⁹ Another study, in Scotland, evaluated the survival of teeth treated using the Hall technique and reported a similar success rate to that of conventional techniques.³

Therefore, the purpose of this study was to describe the Hall Technique for restoration of primary molars with extensive coronal destruction, and to evaluate clinically and radiographically a tooth treated with the technique in order to determine its performance over time.

Case Report

A pediatric patient attending the Pediatric Dentistry Integrated Clinic of Ponta Grossa State University was selected for treatment after their parents signed an informed consent form.

The patient presented a deep carious lesion in a primary molar involving more than three surfaces, 2/3 or more of root structure and no signs or symptoms of associated pulp pathology, such as spontaneous pain, fistulas, abscess, increased mobility, internal or external inflammatory resorptions, periapical or furcation bone rarefaction. These criteria were diagnosed by clinical and radiographic examination.

Clinical Procedures

The clinical procedures were performed as described below (Figure1):

1. Dental prophylaxis with pumice and Robinson brushes;
2. Careful removal of carious tissue only from the cavity edges using dentin excavators (this procedure was a modification of the original technique);
3. Selection of the prefabricated stainless steel crown based on the mesiodistal and cervico-occlusal dimensions of the tooth to be restored;
4. Crown adaptation by trimming its cervical margin where it was necessary and adjustments with #114 pliers to improve fitting at the cervical tooth region;
5. Cementation with high viscosity glass ionomer cement. The material was inserted with a spatula until the crown was completely filled; the crown was placed on the tooth; crown setting was achieved by maintaining digital pressure and/or the child's bite; excess cement during crown adaptation was removed with an explorer and dental floss;
6. Immediate radiography after the procedure.

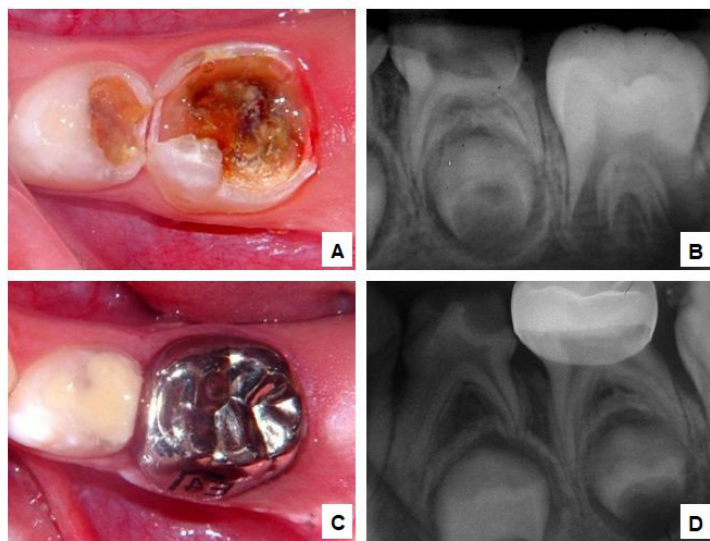


Figure 1. In "A", tooth 75 selected to receive the stainless steel crown. In "B", the initial radiographic aspect of tooth 75. In "C", the cemented stainless steel crown. In "D", the initial radiograph of tooth 75 after crown cementation

The patient was reevaluated after 3 years. It would be considered clinical failure if, after clinical examination, it was detected the presence of marginal gingivitis, biofilm accumulation in the cervical region, worn and/or damaged-crown and inadequate adaptation of the crown (verified with the use of a #5 explorer). Radiographically, it was considered failure if there was bone rarefaction in the periapical or furcation region, periodontal ligament thickening, internal or external pathological resorption, inappropriate adaptation of the crown. As seen in Figure 2, the tooth is functional and it has no signs or symptoms of alterations.

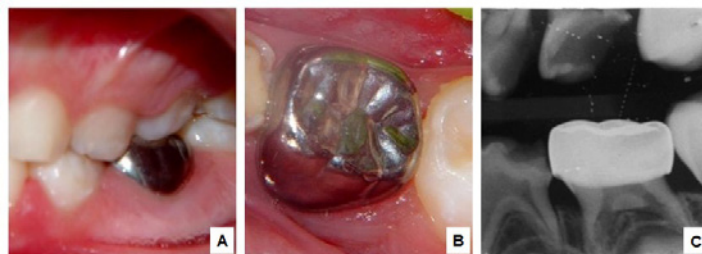


Figure 2. The patient's occlusion after 3 years of follow-up can be seen in "A"; In "B", we can see that the stainless steel crown allowed the correct positioning of the permanent first molar, as well as the wear of the atraumatic restoration after 3 years in function; the radiographic aspect of the after 3 years is seen in "C"

Discussion

In this work, there were no adverse pulp reactions, discomfort or complaints from the patient or parents regarding esthetics. Obviously, such satisfactory results are obtained only with an accurate initial diagnosis of the tooth to ensure preservation of pulp vitality and good biological response. Placement of a stainless steel crown on a molar with extensive coronal destruction eliminates the contact of the biofilm associated with the carious lesion by promoting an effective seal of the cavity, which favors the dentin restructuring and arrestment of the carious process.⁴ Therefore, the Hall Technique seems to be a possibility for the restoration of molars with significant coronal destruction using a minimally invasive approach, renewing the concepts for the use of stainless steel crowns.

Studies regarding partial carious tissue removal have shown that remineralization/reorganization of carious dentin underneath the restoration is feasible.¹⁰ Partial compared with total removal of carious tissue reduces the risk of pulp exposure and has higher success rates when compared with pulpotomy in primary teeth.¹⁰ In this way, carious tissue can be maintained in deep cavities if there is a good seal and a biocompatible restorative material is used, like glass ionomer cement.

Glass ionomer cements are indicated for cementation of stainless steel crowns due to their antibacterial properties of fluoride release and pH, and mainly because of their biocompatibility with the dentin-pulp complex.¹¹

Stainless steel crowns do not need a laboratory phase for their preparation, which facilitates the procedure and shortens the working time. Furthermore, they are inexpensive and restore tooth function, maintaining the space in the arch until exfoliation of the primary tooth.¹²

Nevertheless, stainless steel crowns also present disadvantages such as poor aesthetics and failure in intercuspation due to their standard occlusal anatomy¹², "which could be a reason for questioning their use.

The Hall technique is still not widely used because of dentists' little knowledge of this technique, lack of confidence in

its longevity and preference for more conventional materials, such as amalgam and composite resin.¹³

The perception of general and pediatric dentists regarding the clinical application of Hall technique has also been evaluated.¹⁴ A group of 14 professionals with little experience in the use of stainless steel crowns was selected. They used the Hall technique after training and reported that they would use in their practice because it is a simple and effective technique well accepted by patients.¹⁴

A questionnaire was sent to Scottish dentists to assess their knowledge and use of Hall technique in the daily clinical practice. The results were unexpected and showed that a large number of professionals had already used this technique. Among clinicians who treated children, 86% had knowledge of the technique and 48% had already used the technique. Regarding the frequency of Hall technique use, responses were grouped as sometimes (35.8%), frequently (15.9%) and very frequently (7.9%). Among those who had never used (51%), the result was interesting to show that a good part would like to start using Hall technique (46%). Reasons for not using Hall technique were: lack of confidence and technical knowledge (26%), lack of materials (8%) and preference for another treatment (8%).¹³

It is also important to note that most children and their parents also show preference for this treatment compared with conventional restorations. In the 2000 pilot study,¹⁵ patients and their parents classified the procedure as “fast and easy”, citing as advantages the absence of burs and local anesthesia. After 23 months, the stainless steel crowns installed using the Hall Technique caused less discomfort when compared with conventional restorations and were preferred by 77% of the patients, 83% of the parents and 81% of the professionals.⁵ In a study comparing amalgam, composite resin and atraumatic restorations with stainless steel crowns installed by Hall Technique with respect to parents’ and patients’ opinion, all restorations performed satisfactorily but children preferred the stainless steel crowns while parents preferred esthetic restorations.¹⁶

Longevity of the stainless steel crowns installed according to the Hall technique protocol has also been investigated. A randomized split-mouth clinical study compared the performance of conventional composite resin restorations (CRRs) and prefabricated stainless steel crowns (PSCs) installed by Hall Technique.⁵ After 23 months of follow-up, 124 CRRs and 124 PSCs were evaluated clinically and radiographically. Major failures, such as signs and symptoms of irreversible pulp pathology, were observed in 15% of CRRs and 2% of PSCs; loss of restoration or progression of carious lesion were presented by 46% of CRRs and 5% of PSCs; and pain was associated with 11% of CRRs and 2% of PSCs. These data were statistically significant and led to

the conclusion that the Hall Technique presented a better performance than the conventional restorative technique and appears as an option for restoration of primary molars with carious lesions. After 5 years, 176 teeth were evaluated again.⁶ There were 3 major failures in PSCs and 21 in CRRs. With such data, the authors stated that the Hall technique is a suitable method for treatment of primary molars, overpassing the conventional restorations. Another study, comparing Hall technique stainless steel crowns with resin restorations achieved the same results; after 25 months, the failure rate was 32% for conventional restorations and 3% for stainless steel crowns.¹⁷ Clinical (97.4%) and radiographic (94.9%) success was also demonstrated in a recent study after a mean evaluation period of 20.1 months.¹⁸

Despite the positive results, some points must be considered in relation to Hall technique, such as the lack of occlusal preparation, which could lead to premature contacts due to the vertical increase. In this regard, in the first publication about the Hall Technique, Evans *et al.*¹⁵ evaluated 49 cemented crowns and stated that open bite is a common consequence, but it should not be considered a problem since it returns to normal within a few weeks, probably because children’s occlusion accepts easily this type of disharmony. Discrepancies of up to 1.5 mm have been reported as possible of self-adjustments in a short period of time,¹⁹ which could be considered as a cutoff limit for the clinical application of the technique, i.e., the limit over which the crown should not be maintained in the oral cavity.

In fact, vertical increase has been observed in a clinical study that evaluated 48 children before and after cementation of stainless steel crowns installed by the Hall technique. In this situation, the open bite originated immediately after the procedure decreased after 15 days and returned to normal at 30 days. Even so, the authors encouraged studies with larger samples.¹⁸ Patient follow-up is mandatory, with biweekly re-examinations, until normalization of the occlusion is achieved.¹⁹

Analyzing the clinical and radiographic outcomes of the present case in the light of the results reported in the literature, it might be concluded that stainless steel crowns installed by the Hall technique are an acceptable and adequate alternative for the restoration of primary molars with extensive coronal destruction.

Conclusion

The Hall technique was proven an effective restorative procedure for a primary molar with extensive coronal destruction in the present case, preserving the vitality and function of the treated tooth.

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Mini Curriculum and Author's Contribution

1. Dayane Jaqueline Gross - DDS. Contribution: effective scientific and intellectual participation for the study; data acquisition, data interpretation; preparation and draft of the manuscript.
2. Dannyanie Manosso Samways - DDS. Contribution: technical procedures, preparation and draft of the manuscript.
3. Mariane Rodrigues de Melo - DDS. Contribution: technical procedures, preparation and draft of the manuscript.
4. Denise Stadler Wambier - DDS and PhD. Contribution: critical review and final approval.
5. Ana Claudia Chibinski - DDS and PhD. Contribution: critical review and final approval.

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Corresponding Author

Dayane Jaqueline Gross

E-mail: dayanejgr@hotmail.com

