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Longevity of posterior restorations in primary teeth: Results from a paediatric dental clinic

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ABSTRACT

Objectives: The aim of this retrospective study was to evaluate the longevity of restorations in the posterior primary teeth of children attending to a public paediatric dental clinic and to test the factors associated with failures.

Methods: Patient records of 329 children (162 boys and 166 girls) were used for collecting and analyzing data. A total of 565 restorations in primary teeth were included in the study. All children enrolled in the study were classified as high caries risk. The longevity of restorations from their placement until failure (up to 4 years of follow-up) was assessed using the Kaplan–Meier survival curves with log-rank test. Multivariate Cox regression analysis with shared frailty ($p < 0.05$) was used to assess the factors associated with failures.

Results: Up to 4 years of follow-up, the annual failure rates were 9.5% for composite fillings, 12.2% for light-cured glass ionomer restorations, and 12.9% for conventional glass ionomer restorations with statistical difference between the materials ($p = 0.014$). Glass ionomer restorations had a higher risk of failure over time compared with composites (HR 1.86, 95% CI 1.17–2.97). In crude analysis, Class II restorations showed lower survival rate than Class I restorations ($p = 0.031$) but lost significance after adjustments.

Conclusions: Our findings suggested that the material influenced the survival rate of primary posterior restorations, with composite presenting the best performance.

Clinical significance: Differences were observed between restorative materials with different properties in primary teeth up to 4 years of follow-up. This study provides valuable information regarding the primary teeth posterior restoration longevity in a paediatric population with restorations performed under daily life clinical environment.

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1. Introduction

Although a decrease in caries prevalence has been observed worldwide, the placement of restorations, especially in posterior teeth is frequent in dental offices.[1,2] Amalgam restorations were used in the past but, nowadays, have been replaced by restorations with adhesive properties to reduce the amount of the remaining tooth structure removed and increase the strength of the remaining.[3] The longevity of direct posterior composite restorations is well established for permanent teeth.[4–6] The size of the cavity, the caries, and occlusal risks are some factors that affect significantly composite restoration survival.[5,7] However, the placement of restoration in carious deciduous teeth and the longevity of these restorations are still under discussion.[8] In addition, the loss of deciduous teeth by dental caries can cause malocclusion because of the wasted space.[9] Thus, the restoration of decayed primary teeth could be an option to solve these problems.

Besides composite resin, another tooth-coloured direct materials used in posterior teeth are the resin modified glass ionomer cements (RMGIC) and conventional glass ionomer cements (GICs). Although in permanent teeth, the performance of glass ionomer products is inferior to composite,[10] there are few studies comparing the performance of RMGICs and GICs to composite restorations in primary teeth, with controversial results,[11–13] and most of the available studies were randomized clinical trials performed under optimal condition.

Because of relatively lack of data available on the longevity of restorations in the primary dentition, it would be important to investigate the longevity of different materials used to restore posterior primary teeth in conditions closer to the clinical daily life. Thus, this study aims to evaluate the survival of restorations performed by fourth year dental undergraduate students, with different materials in posterior primary teeth in children with high caries activity treated in a paediatric dental clinic, and to assess factors associated with failure.

2. Methods

The research protocol (12/2013) was approved by the Research Ethics Committee, School of Dentistry, Federal University of Pelotas, Brazil.

A retrospective longitudinal study was conducted. The target population consisted of children assisted in the Paediatric Clinic of the School of Dentistry, Federal University of Pelotas, which were seen during the year 2012. This clinic offers free dental care and assists mainly patients with low familiar socioeconomic status. The children were assisted by fourth year dental undergraduate students, closely supervised by professors, who are specialists in Paediatric Dentistry. All the information used in this study was collected from clinical records. Permission to use patient data was obtained through the informed consent form by parents or legal guardians at the first dental visit. To be included in the study, children should have received at least one restoration (Class I or Class II) in a posterior primary teeth between 2009 and 2012. In addition, patients should have at least one visit at the clinic after the placement of the restoration.

2.1. Restorative procedures

Restorative material included in the study was composite resin (Charisma – Heraeus Kulzer, Hanau, Germany, Herculite XR – Kerr, Orange, CA, USA and Z100 – 3M ESPE, St. Paul, MN, USA), RMGICs (Vitro Fil LC – DFL, Rio de Janeiro, Brazil), and GICs (Vitro Fil – DFL, Rio de Janeiro, Brazil). Although some procedures were performed under rubber dam, most of the restorations were placed under relative isolation, using cotton rolls and saliva aspirator to avoid direct contact of the restorative procedure with the saliva. Cavities were prepared with low-speed drills and dentine excavators for caries removal and high-speed carbide burs for removing enamel and unsatisfactory restorations when necessary. Preparation was restricted to removal of caries. In very deep cavities, the region close to the pulp was protected with calcium hydroxide cement (Hydro C; Dentsply, Petrópolis, RJ, Brazil). Composite restorations were restored using etch-and-rinse adhesive systems. Dentine and enamel were etched with 37% phosphoric acid gel and covered with the adhesive system Adper Single Bond 2 (3M ESPE, St. Paul, MN, USA). RMGICs and GICs were handled following manufacturer's recommendations. For all restorations, finishing and polishing were performed using fine-grained diamond burs, sandpaper strips, and siliconized tips with a paste of aluminium oxide.

2.2. Data collection and variables

The information evaluated included individual and tooth-level variables. Demographic (sex), socioeconomic, and oral health variables were included at individual level. Mother's school level was collected in years and dichotomized (up to eight years of formal education or more than eight years). Dental caries experience was assessed by dmft index (WHO, 1997) and categorized in quartiles. Then, three lower quartiles were considered as ''moderate caries group'' (dmft 0–8), and high quartile was considered as ''high caries group'' (dmft greater than 8). The variable ''pulp intervention'' was collected in dichotomous form (''yes'' when child had undergone to at least one endodontic intervention during the time of treatment and ''no'' when child had not undergone endodontic intervention). At the tooth level, the variables collected were the restorative material used in restorations (CR, RMGIC, and CGIC – CIV) and type of cavity (Class I, when only the occlusal surface was involved, or Class II, with two or more surfaces involved, including a proximal surface or cavities only involving the proximal surface).

The outcome of the study was the failure of posterior restorations in primary teeth. Failures were assessed by checking the records of the patients and were considered in the presence of loss of restoration or fracture requiring a reintervention (restoration repair or replacement) or symptoms requiring pulp intervention or tooth extraction.