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ORIGINAL ARTICLE

Efficacy of Sealing with Glass Ionomer Cement and Transversal Brushing Technique in Erupting First Molars: 18-Month Clinical Follow-Up

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Abstract

Objective: To verify the effectiveness of sealing with glass ionomer cement and transversal brushing in the prevention and treatment of initial caries lesions in erupting permanent molars of children aged 5-7 years. **Material and Methods:** Healthy teeth with ICDAS scores 1 or 2 were selected. One hundred and thirty-one children (79 teeth in the control group - 75 teeth in the test group) were randomly assigned into the two experimental groups: (1) transversal brushing technique for plaque control with conventional flat bristles and fluoridated dentifrice or (2) sealing the occlusal surfaces with glass ionomer cement (Vitro Molar®). Follow-up was performed for 18 months and the survival analysis was applied to test the occurrence of lesion progression. **Results:** The mean age of children was 5.4 years and it was verified that, by examining the initial tooth condition, the probability of progression was 66% lower when the tooth had initial caries lesions than when it was healthy; the probability of molar progression was about 74% lower in the test group compared to the control group. The mean time for lesion development in the test group (16.8 months; SD = 0.5) was greater than that in the control group (16.5 months; SD = 0.5; p=0.008). **Conclusion:** Sealing reduces the progression of caries disease in initial lesions when compared to the transversal brushing technique.

Keywords: Dental Caries; Toothbrushing; Pit and Fissure Sealants; Molar.

Introduction

From the 1960s and 1970s, especially in developed and developing countries, there was a continuing decline in caries disease among children [1], but it is still one of the most prevalent diseases in the world population, being a serious public health problem [2,3].

The reduction of the caries index was mostly observed in the smooth and proximal surfaces [4]. However, prevention with oral hygiene and fluoridated treatments is not totally efficient in preventing disease in pits and fissures when compared to smooth surfaces [5]. Therefore, the introduction of preventive measures that minimize the onset and progression of caries disease, especially in school children is necessary, since they have permanent molars in the stage of eruption [6-8].

The first erupting permanent molars are the teeth that present the most favorable conditions for the accumulation of biofilm [9-11]. This has been pointed out as the most relevant criterion due to the strong relationship between eruption degree and biofilm accumulation [6,12] due to the difficulty of access, presence of gingival tissue on the occlusal surface, infraocclusion and incomplete maturation of the post-eruptive enamel [10,13,14].

The transversal brushing technique, specifically directed to these teeth, is effective in controlling the local biofilm and at the same time contributes to the maintenance of small amounts of fluoride in the oral environment [13,15]. In addition, sealing of pits and fissures has been shown to be highly effective with regard to the prevention of caries lesions [7,13]. Although studies have shown resinous materials as the material of choice, there are still gaps in showing the best evidence to put into clinical practice [16-20]. Previous studies have shown that transversal brushing and ionomeric sealing techniques may have similar efficacy [13,21]. After that, the important relevance of the theme by comparing techniques in social actions was verified and thus, to fill the gaps and make feasible the planning and execution of social programs aimed at the oral health of the population. Considering the reality of the Brazilian public health system, it is extremely important to develop studies that involve national materials that fit into the financial budget of basic health units.

Therefore, the aim of this study was to compare ionomeric-sealing techniques with the transversal brushing technique using fluoride dentifrice with 1100 ppm fluoride (F-) in the prevention and treatment of caries disease in erupting permanent first molars.

Material and Methods

This study was conducted in the municipality of Vila Velha, Brazil, and according to the Municipal Health Department, public water supply has been artificially fluoridated since 1972 at appropriate levels with an average of 0.7 ppm F-.

Initially, the research was disclosed by the professional (JFC) through lectures in the Vila Garrido neighborhood, which has 8,338 inhabitants and 1,909 are children aged 0-14 years.

Inclusion and Exclusion Criteria

The inclusion criteria were: age group from 5 to 7 years; TCLE signed by parents or guardians; present at least one erupting first permanent molar in the infra-occlusion phase, healthy or with initial caries lesion (0, 1 or 2 scores according to the International Caries Detection and Assessment System - ICDAS method).

The teeth excluded from the study were those that presented lesion with unmistakable cavity, unsupported enamel, or detectable softening of the floor or wall and were referred for treatment in the city's public service for proper treatment.

For the accomplishment of the clinical procedure of data, the presence of an appraiser / examiner was necessary. The allocation of patients was according to the inclusion criteria and was performed by drawing in a dark envelope considering the tooth as the experimental unit. If the patient presented more than one tooth that was included in the study, they were allocated to the same group, since fluoride release from the glass ionomer cement could influence the oral cavity, as well as the presentation of only one brushing technique per child.

The sample was divided into two experimental groups: Group 1: Transversal brushing technique - the technique consists of circular movements in the buccal-lingual direction on the erupting tooth with conventional brush, of flat bristles (Condor SA, São Bento do Sul, SC, Brazil) and fluoride dentifrice at 1100 ppm F- (Tandy®, Colgate-Palmolive, São Paulo, SP, Brazil); Group 2: Application of Vitro Molar® ionomeric pit and fissure sealant (DFL Ind. e Com. S.A., Rio de Janeiro, RJ, Brazil). In both groups, the same oral hygiene and prophylaxis guidelines were performed.

After 3, 6, 12 and 18 months, oral hygiene instruction and prophylaxis were performed in both groups; as well as clinical control, verifying the effectiveness of techniques through the ICDAS visual method. In Group 1, patients were again instructed to perform the transversal brushing technique.

Data Analysis

The Student's t test was used for variables of normal distribution (age) and the Chi-square test was used to compare the initial condition between groups 1 and 2 in dichotomous variables (gender, income, visit to the dentist, tooth, hemi-arc and ICDAS). The significance level was $p < 0.05$.

During the evaluation of the efficacy of techniques, the transitions between ICDAS scores were considered: a) score 0 for any other score; b) scores 1 and 2 for score 3 or higher. Survival analysis was used to compare the occurrence of lesion progression in the different groups. For this, all returns could be considered (3, 6, 12 or 18 months). Progression was considered at any return where it was observed. In case it was not observed in any of the returns, the non-occurrence of the outcome was recorded at 18 months. If the patient did not appear until 18 months, the non-occurrence of the outcome was recorded in the longer follow-up period. Patients who did not perform any return were considered as losses.

In a second moment, the transitions between ICDAS scores were also considered: scores 0, 1 and 2 for scores 3 or greater, that is, survival analysis was used to compare the occurrence of lesion

progressions to enamel or dentin in different groups. For this, all returns could be considered. Progression was considered in any return that it was observed. In case it was not observed in any of the returns, the non-occurrence of the outcome was recorded at 18 months. If the patient had not appeared until 18 months, the non-occurrence of the outcome was recorded in the longer follow-up period. Patients who did not return were considered as losses for this analysis. Kaplan-Meier curves were made using the Medcalc statistical software version 11.2.0.0 (MedCalc Software, Mariakerke, Belgium), the two types of treatment and the above mentioned outcome. Curves were compared by the Logrank test. Then, Cox regression analyses were performed using the Stata 13 software (StataCorp LP, Statcorp, Texas, USA). Firstly, univariate analyses were performed, considering the type of treatment, as well as other possible independent variables. Subsequently, multiple models were tested in the multiple model according to the Forward Stepwise technique, always considering the treatment and the other variables with significance up to 20%. As more than one tooth was considered per patient, adjustment was considered using the shared frailty command. The Hazard Ratios values were also calculated with 95% confidence interval (HR, 95% CI).

Ethical Aspects

The project was approved by the Ethics Research Committee of the Faculty of Dentistry - University of São Paulo (CAAE - 06521313.0.0000.0075). The Free and Informed Consent Form was signed by parents / guardians.

Results

Initially, 139 children with average age of 5.4 years were screened, of which 131 met the inclusion criteria and 8 were excluded for specific reasons (refusal to participate in the research and cavity with characteristics that do not fit the research) (Figure 1). Groups were similar and comparable for all variables examined, resulting in 66 children in Group 1 and 65 children in Group 2. Only 2.5% of children lost all returns and were excluded. Notably at 3 months, sample loss was 4.5%, at 6 months, 9.1%, at 12 months, 13.4% and at 18 months, 13.4% (Table 1).

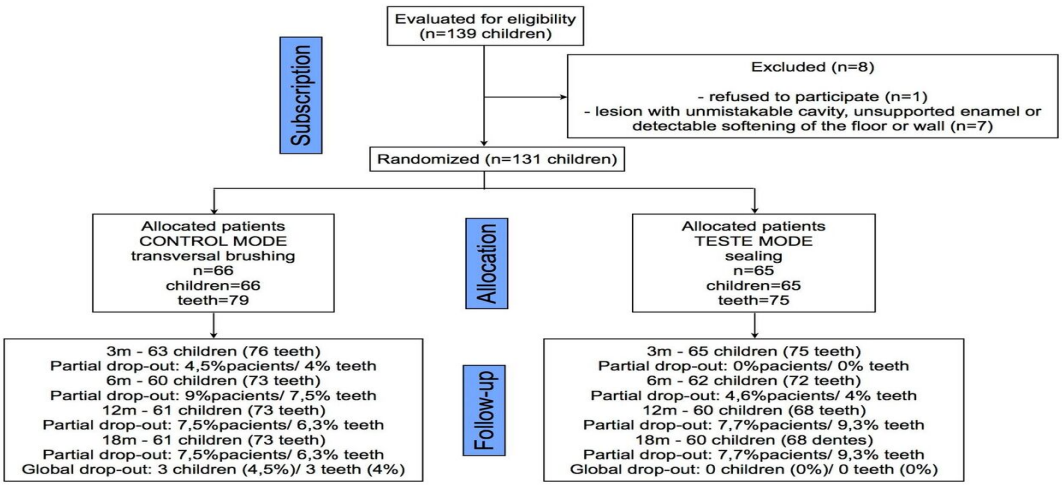

Figure 1. Flowchart.

Table 1. Initial characterization of the groups.

Variables		Control N	Control %	Test N	Test %	p-value
Related to the Child						
Gender	Female	33	50.0	30	46.0	0.79
	Male	33	50.0	35	54.0	
Age	Mean ± SD	5.8 ± 0.7		5.9 ± 0.7		0.51
Income*	1	13	19.0	6	9.0	0.22
	2	21	32.0	22	34.0	
	3 ou more	32	49.0	37	57.0	
Visit to the Dentist**	Yes	36	54.0	37	57.0	0.92
	No	30	46.0	28	43.0	
Related to the Tooth						
Arch	Lower	35	45.0	38	50.0	0.52
	Upper	44	55.0	37	50.0	
Side	Right	43	54.0	37	50.0	0.64
	Left	36	46.0	38	50.0	
ICDAS Baseline	Score 0	12	15.0	21	28.0	0.11
	Score 1	48	61.0	42	56.0	
	Score 2	19	24.0	12	16.0	

SD: Standard Deviation; *in Minimum Wages - 1 Minimum Wage = R$ 678,00; **in the last 6 months.

Examining the initial tooth condition, the probability of progression was 66% lower when the tooth was in initial lesions than when it was healthy. Considering the outcome for any progression, the observed rate was 19% (n = 25 teeth) at 18 months for patients who necessarily completed the follow-up returns regardless of group. When this progression was evaluated in any follow-up period the patient returned, 24% of the occlusal surfaces (n = 19) of Group 1 showed progression, against only 8% of the occlusal surfaces (n = 6) in Group 2 (p = 0.016). Thus, the probability of molar progression was about 74% lower in Group 2 compared to Group 1. This result in the multiple model was independent of the arc and molar side treated (Table 2).

Table 2. Survival analysis of the efficacy of treatments to control the general progression of caries lesions in erupting molars.

Independent Variables	Outcome N	Outcome %	Crude HR (95% CI)	p-value	Adjusted HR (95% CI)	p-value
Group						
Control (ref.)	19	24.0	0.32	0.016	0.26	0.007
Sealing	6	8.0	(0.13 to 0.81)		(0.10 to 0.69)	
Arch						
Upper (ref.)	13	18.0	0.87	0.73	**	**
Lower	12	15.0	(0.39 to 1.95)		**	**
Side						
Right (ref.)	10	12.0	1.73	0.19	**	**
Left	15	20.0	(0.76 to 3.94)		**	**
Initial Condition						
Healthy (ref.)	9	27.0	0.41	0.05	0.34	0.015
Initial Lesions	16	13.0	(0.17 to 0.1.0)		(0.14 to 0.81)	

N outcome = 25; HR: Hazard Ratio; CI: Confidence Interval.

The outcome for any lesion progression according to survival analysis, mean time for lesion development in experimental Group 2 (16.8 months; SD = 0.5) was greater than the experimental Group 1 (16.5 months; SD = 0.5; p=0.008) (Figure 2).

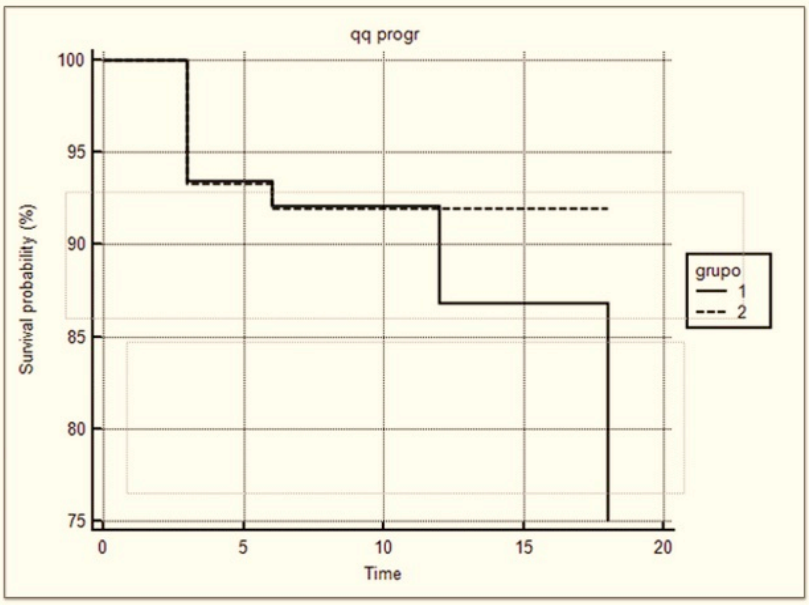

Figure 2. Kaplan-Meier curves comparing control (solid line) and test (dashed line) modes as well as any progression of caries lesions.

Regarding the outcome of lesion progression for unsupported lesions, mean progression time was also higher in Group 2. The same trend was observed in experimental Group 1 (17.6 months; SD = 0.3) and in Group 2 (17.1 months; SD = 0.4; p=0.04) (Figure 3).

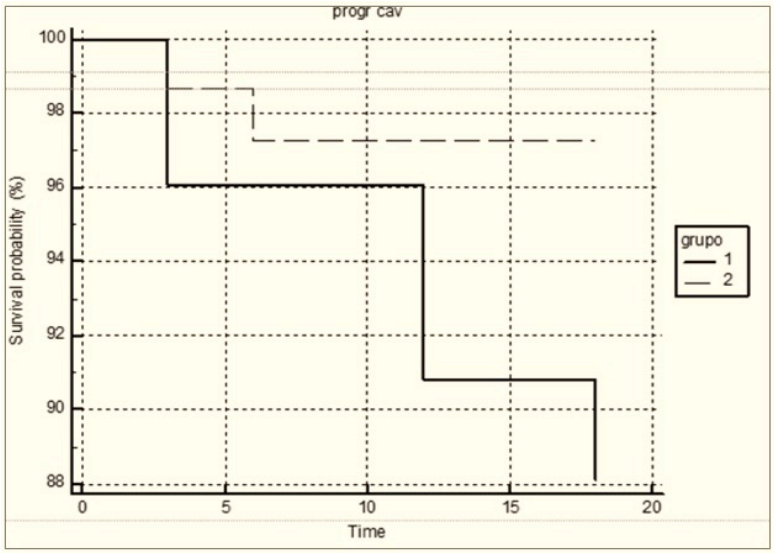

Figure 3. Kaplan-Meier curves comparing control (solid line) and test (dashed line) modes regarding progression for unsupported lesions.

Discussion

Although there are advances in technology, some simple and low-cost methods are important in the prevention and treatment of early carious lesions. Therefore, this work is of great relevance because it shows two options to control caries disease: glass ionomer cement used in the public service and the transversal brushing technique. The null hypothesis was that there would be no difference between the two different techniques: transversal brushing and glass ionomer cement, but it was rejected in the present study.

Some studies have demonstrated that the transversal brushing technique, directed to the erupting first molar, is effective in the control of occlusal surface biofilm and in the progression of caries lesions in the long term [13,22]. This technique, even having a reduction of the child's clinical time in the dental chair, was inferior in this work. However, the child's collaboration must be taken into account.

This study can be compared to other studies that evaluated glass ionomer cement with only in the effectiveness, since labels are different and retention can vary according to it. Vitro Molar® glass ionomer cement was used because it is low cost and easily accessible in the public service. Thus, it presented better efficacy in the prevention and treatment of caries lesions when compared to transversal brushing.

Other longitudinal studies observed that partial or total loss of the material occurred, but retention did not influence treatment success [13,21,23], and although they are not noticed, sealant particles are retained and block the deeper parts of pits and fissures releasing fluorine [17,24].

The criterion used in this study to classify caries lesions in follow-up examinations was ICDAS [25], a simplified visual diagnostic method to evaluate the occlusal surface in its entirety. The follow-up period was shorter than the required and stipulated time (24 months) for the main outcome of caries lesions progression to occur [26]; however, as the initial tooth condition was healthy or initial caries lesions (score 1 or 2), which have the capacity of high lesion paralysis and there is often no need for intervention, shorter follow-up time was required (18 months), which is shorter than that required to identify more severe caries lesions [26].

The initial condition of the occlusal surface influenced the outcome studied, that is, surfaces with caries lesions progressed less when compared to healthy surfaces regardless of treatment, corroborating results observed in another study [27].

Survival analysis was performed to minimize long-term losses because some patients, knowing that they did not manifest the disease in a severe stage, underestimated the importance and did not obey the established periods for attendance in returns [28]. This analysis uses non-fixed time intervals and determined by the failure or progression of lesions. Thus, even if there are significant losses in any particular callback, it will not interfere with the outcome and will increase the reliability of results.

Regarding the mean time of any progression, statistical difference of 10 and 15 days before in Group 1 compared to 2 was observed. However, this difference is so small and not relevant when it is taken to the clinical practice of dental care.

With the high prevalence of caries in permanent first molars, the results obtained encourage new studies using a greater number of individuals and materials easily accessible in public health units.

Conclusion

The use of the ionomer sealing technique reduces the progression of caries disease in initial lesions of erupting permanent molars when compared to the transversal brushing technique.

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