

A clinical trial of the effectiveness and retention of a resinous sealant and a glass ionomer cement- a 6 months recall

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ABSTRACT

Purpose: To evaluate the effectiveness and retention of a resinous sealant and a glass ionomer cement clinically applied. **Materials and Method:** Two hundred teeth from 50 children aged 7 to 9 were selected, who had four sound and completely erupted first permanent molars. They were divided into two groups: G1 – 100 teeth (16 and 26) sealed with Fluroshield (Dentsply); G2 – 100 teeth (26 and 46) sealed with Fuji IX (GC). After the teeth were cleaned up with children's toothbrushes and water, they were isolated with cotton rolls. The materials were applied according to the manufacturers instructions. **Results:** After 6 months of the material placement 28% and 24% of partial retention, 2% and 0% of total loss and 70% and 76% of total retention were found, respectively, for Fluroshield and Fuji IX. The data were submitted to the Chi-square and Wilcoxon tests ($P < 0.05$). There was no statistically significant difference between the retention of the studied materials. There was no increment in the decay indexes in the studied period for both materials. **Conclusion:** Based on the results it could be concluded that both materials were efficient to prevent caries lesions on the occlusal surfaces.

UNITERMS

Occlusal sealants; preventive methods; glass ionomer cement.

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RESUMO

Objetivo: Avaliar a efetividade e retenção de um selante resinoso e um cimento de ionômero de vidro. **Materiais e Métodos:** Foram selados 200 primeiros molares permanentes, de 50 escolares da faixa etária de 7 a 9 anos. Os grupos foram distribuídos de acordo com a localização do dente em: Grupo 1- foram selados 100 dentes (16 e 36) com Fluroshield (Dentsply); Grupo 2 – foram selados 100 dentes (26 e 46) com Fuji IX (GC). Os dentes foram selados após realizada limpeza da superfície oclusal e isolamento com rolos de algodão. Os materiais foram aplicados de acordo com as instruções dos fabricantes. **Resultados:** Após 6 meses da colocação, encontrou-se 70% e 76% de retenção total, 28% e 24% de retenção parcial e 2% e 0% de perda total dos materiais, para o Fluorshield e Fuji IX, respectivamente. Os dados foram submetidos ao teste Chi-quadrado e Wilcoxon ($P < 0,05$). Não foi observada diferença estatisticamente significativa quanto à retenção, para os materiais estudados. Não se verificou incremento de cárie no período do estudo. **Conclusão:** Baseados nos resultados pôde-se concluir que ambos os materiais, embora exibindo baixos índices de retenção total, apresentaram-se eficazes como selantes de fósulas e fissuras oclusais.

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UNITERMOS

Selantes oclusais; métodos preventivos, cimento de ionômero de vidro.

INTRODUCTION

The dental decay is an infectious contagious and multi-factorial disease that shows as etiological infectious factor the presence of specific bacteria (*S. mutans* and *L. acidophilus*) on the dental surface. Concerning all decay lesions in dental surfaces a half of the decay lesions begins in occlusal surfaces³. The depth of the pit and fissures, also favoring the retention of debris and the formation of bacterial plaque, hinders its correct cleaning. In addition, the saliva's action is reduced in those areas since it does not reach the deepest portion of the occlusal fissures easily.

Thus, the development of the pit and fissure sealant associated to the use of etching agents on the dental surface, proposed by Buonocore in 1955² revolutionized the preventive and restorative dentistry. Since then, researches have been made with the objective to evaluate the benefits generated by the sealant use in relation to the reduction in the decay indexes in comparison to not sealed teeth.

One of the methods of evaluating the effectiveness of the sealant use is directly related to the retention of the material along the time and the reduction of the occlusal caries lesions indexes can be seen, too¹³.

According to Menaker⁹ (1984), the fluoridated water reduces the incidence of caries lesions significantly on smooth and free surfaces; even so, it just propitiates a discreet reduction in the incidence of occlusal lesions, responsible for 50% of all the lesions. In programs of public health, the sealant use became an important resource in the prevention to the occlusal lesions. Simonsen et al.¹⁵ (1986), demonstrated that the cost of restorative treatments is much higher than preventive procedures.

Besides the auto and light cured resinous sealants, the glass ionomer cement has been used in the sealing of occlusal fissures, too. They have been demonstrating good clinical results when used in the occlusal sealing^{7,8,10,14,18}. In spite of presenting a higher retention rate when compared to the glass ionomer cement, the resinous sealants have the di-

sadvantage of being more sensitive to the moist contamination¹¹.

Övrebö & Raadal¹² (1990) compared the flowing extension between a glass ionomer cement and a diluted composite and they observed a higher flowing of the glass ionomer along the whole surface compared to resinous material.

The use of the glass ionomer has been indicated for patients that present high risk of dental caries, and also for the erupting teeth in which the appropriate isolation is committed, due to the largest tolerance of the ionomer to the moist contamination¹¹. This study was carried out to compare the effectiveness and the retention between a resinous sealant (Fluroshield) and a glass ionomer cement (Fuji IX), used in the occlusal sealing of permanent molars.

MATERIAL AND METHOD

This study was accomplished in Piracicaba - Sao Paulo state, whose water is fluoridated at optimal level (0.7ppm F).

Two hundred permanent molars, sound and completely erupted from fifty children aged seven to nine were sealed, after the post-information consent of their legal Guardians/Parents was obtained. The sample was divided in two groups: G1 group - Fluroshield (Caulk/Dentsply) was used in the sealing of hundred teeth (26 and 46); and, G2 group - Fuji IX (GC) glass ionomer cement was used in the sealing of hundred teeth (16 and 36). In order to simulate the public health treatment, the occlusal surfaces were cleaned up previously to the sealing with children's brushes and water in both groups.

In G1 group, after the cleaning of the occlusal surface, the relative isolation was carried out with cotton rolls and saliva ejector, which were maintained by another operator. The enamel etching of the occlusal surface was accomplished with 37% phosphoric acid gel for 30 seconds, later on removed with water spray for 15 seconds. Immediately after the washing up, the cotton rolls were changed and the occlusal surface was dried through air jet. Next, the enamel conditioning effectiveness was verified. Then, the Fluroshield was applied using an explore probe, after that, the light curing was proceeded for 60 seconds.

In G2 group, after the tooth had been cleaned and the isolation had been done, the occlusal surface was sealed according to the manufacturer's instructions. A cotton pellet soaked in the liquid of the glass ionomer cement was applied in the occlusal surface for 20 seconds, with no subsequent washing up. Then, the glass ionomer cement was applied using an explore probe as it follows: it was previously agglutinated with a # 24 spatula in a glass plate using a proportion of one drop liquid/_ powder portion, according to manufacturer's instruction, in order to obtain a flowing consistency. After the initial set of the material it was protected with a layer of colorless nail varnish (Colorama), applied using a disposable paintbrush.

It should be emphasized that no information was given to children regarding the diet control neither other preventive measures were implemented in this sample; they just were recommended to brush their teeth.

Six months after the sealant placement the recall was made. A clinical exam using an explore probe and a clinical mirror was carried out. It was

verified the retention and efficacy of those materials observing the partial or total retention, total loss and secondary caries presence. In case of the partial or total loss the material was applied again. The data were submitted to a Likelihood ratio Chi-square and Wilcoxon tests ($P < 0.05$).

RESULTS

It can be observed in Table 1 the results obtained in the half-year evaluation for the comparative study between the resinous and the ionomer sealants, followed by its respective statistical treatments. The data indicate the indexes of retention for each treatment. No statistically significant difference was observed between both materials as retention and caries prevention. It was verified 70 and 76% of total retention for Fluorshield and Fuji IX, respectively. In the average, both materials presented 26% of partial retention, 73% of total retention and 1% of total loss. The dental caries indexes were null during the analyzed period for both materials used in this study.

Table 1 – Retention rates (%) after six months recall.

	Partial Retention	Total Retention	Total Loss	Total
Fluroshield	28%	70%	2%	100%
Fuji IX	24%	76%	0%	100%

Likelihood ratio Chi-square – 0.189

Wilcoxon – 0.3048

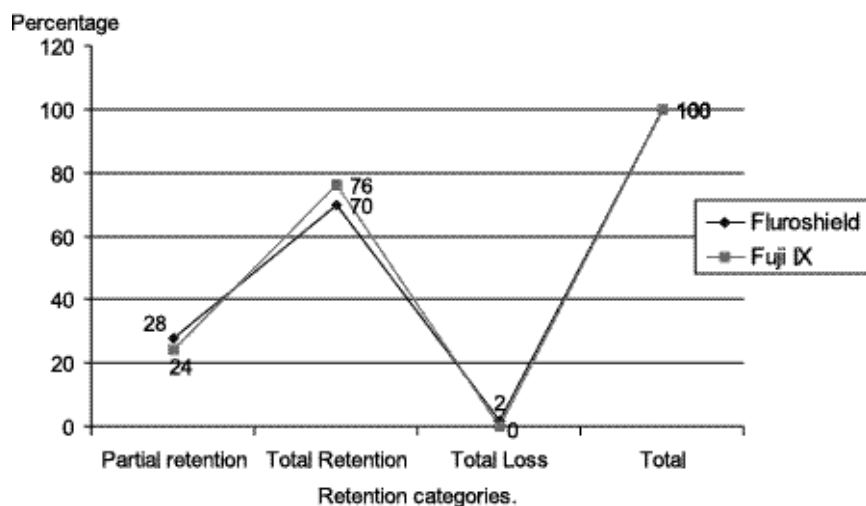


FIGURE 1 - Retention rates (%) after 6 months recall.

DISCUSSION

In programs of oral public health the sealant use has been an important resource in the dental decays prevention, even so it is known that the use of absolute isolation in these conditions is practically null. Thus, this study was accomplished using a relative isolation in order to simulate the conditions of public health treatment. Also for that reason abrasive agents or rotating instruments, such as a pumice slurry and Robinson brush, were not used in the cleaning of the occlusal surface procedure prior to the application of the sealant being limited this cleaning up to the use of children's toothbrush and water.

The comparison between a resinous sealant and conventional glass ionomer cement used as a sealant was made due to the influence that the moist contamination provides on the first material mentioned. In spite of presenting a higher retention rate when compared to the glass ionomer, the resinous sealant presents the disadvantage of being more sensitive to the moist conditions attributed to its hydrophobic characteristics.

The retention values found in this study for Fuji IX concerning to retention were similar to those found in the literature¹⁸. Weerheijm et al.¹⁸ (1996) compared the retention between two cements of glass ionomer used as sealants, Fuji III and Fuji IX, obtained respectively, 46% and 72% of total retention after six months application. The ionomer sealant used in this study is indicated for atraumatic restoration treatment (ART) and it has presented better results related to the retention rates when compared to the other ionomer types thoroughly used in the occlusal sealing, such as Fuji III, Fuji II, at the six months recall. McKeena & Grundy⁸ (1987) demonstrated 93% and 82.5% retention indexes after six months and one year respectively, using Ketac Fil. Mills & Ball⁹ (1993) demonstrated that the use of a silver reinforced ionomer was capable of promoting larger indexes of retention when compared to the use of a conventional resinous sealant. Shimokobe et al.¹⁴ (1986) obtained a low retention index at the six-month recall using Fuji III, although they observed a reduction in the dental caries risk, even after the material loss along the time, in comparison to the control group.

The preventive potential, verified when glass ionomer cement is used, is attributed to one of the

main properties of those cements, which is the fluoride release, in larger intensity in the first hours after the material manipulation, and it tends to stabilize after 24 hours. Even so, such constant fluoride released to the oral environment does not allow the demineralization of the enamel adjacent to the material. Some studies have demonstrated that even when total loss of the material is clinically detected, the retention of microscopic lines of the material in the deepest portion of the fissure may occur which what can contribute to an anti-decayed action of the glass ionomer, as mentioned by Garcia-Godoy & Aranda⁶ (1995).

The adhesion of the glass ionomer to the dental structure occurs due to the acid-base reaction, when the liquid (polimalaic acid) etches the surface of the enamel, so that the hydrogen ions react with the mineralized surface of the enamel, moving calcium and phosphate ions, and promoting a chemical bonding between the ionomer material and the tooth. Besides, the consistency of the material should be adequate in order to allow the sealant to flow inside the fissures. For that reason the occlusal surface etching with the liquid of glass ionomer is indicated, prior to the application of the material, looking for a larger effectiveness in the retention of the ionomer to the enamel.

Rock et al.¹³ (1996) obtained 85.2% of total retention at the 6th month and 76.6% at the 12th months after Fluroshield application under relative isolation, and it was applied previously in a surface polished with prophylactic paste with no fluoride and rotating instrument. These retention indexes are higher in relation to the present study, probably due to the previous cleaning of the teeth and the adversary conditions as the maintenance of occlusal surface drying. In this study only children's toothbrush and water were used to clean up the occlusal surfaces, simulating the public health treatment. The presence of bacteria plaque or alimentary remains in the deepest portion of the fissure decreases the enamel conditioning area, reducing the retention of the material along the time. Besides, the sealing was done during the school period, when the children often ate snacks at the break, which were sometimes difficult to be removed.

Nóbrega & Vertuan¹¹ (1994) obtained 71.6% of total retention of the Fluroshield sealant after the

six-month recall, compared to two other resinous sealants that obtained lower retention indexes, respectively 68.6% and 65.7% for Delton and Concise.

A study about the retention and the penetration of Fluroshield demonstrated excellent adaptation of the material to the inter-cuspidic inclined plans at the polarized light microscope¹⁶. The low viscosity present in the Fluroshield sealant facilitates its uniform penetration inside the conditioned dental enamel.

In order to increase the retention indexes Chosack & Eidelman⁴ (1988) and Rontani & Ando¹⁴ (1993) found that it was necessary a waiting time of 10 seconds after the application of the resinous sealant before the light curing with halogen light, so that its appropriate penetration is allowed into the micro porosities of the enamel conditioned to obtain a satisfactory mechanical retention.

Sundfeld et al.¹⁶ (1994) obtained a higher retention index of Fluroshield (96.8%) after the six-month recall but it should be noticed that the sealants were applied using rubber dam and prophylaxis with pumice plus water.

The saliva contamination of the conditioned surface is one of the main causes of failing in the retention and of marginal infiltration of the resinous material. Boren & Feigal¹ (1994) used an adhesive system (Scotchbond-3M) in conditioned teeth that were later contaminated by saliva, and they obtained significant reduction of marginal infiltration compared to the teeth sealed with no adhesive system application after the saliva contamination of the occlusal surface. Dorignac⁵ (1987) in a clinical study obtained a higher retention index (97.84%) after a two-year recall in comparison to the sealing with no intermediary adhesive layer (Scotchbond) (81.20%).

Many researchers studied the risks of occlusal decay along the life and they concluded that the susceptibility to the decay is continuous, and that among children and adolescents the occlusal decay presents a very high rate (80 to 90%) in relation to the interproximal decays (10 to 20%). Such disco-

veries suggest that the child will have benefits with the sealing and that reapplying should be accomplished. In the study made by Simonsen¹⁶ (1989), he verified that the decay prevention reaches at 74% after 15 years. In this study, the prevention index to the decay (100%) observed is in accordance to the mentioned author¹⁵, even so a long time evaluation is necessary in order to make a more detailed comparison.

The statistical analysis of this study demonstrated that there were no statistically significant differences in all the retention levels (partial loss, total loss and total retention) for both materials, showing the similar performance as retention and decay prevention. Both materials used in this study could be indicated as a preventive decay procedure, even in controversial situations as the public health service in which there are no ideal technique conditions of sealing.

Despite of the positive results found in this clinical trial, other studies with longer follow-up periods should be made in order to verify the performance of both materials on the caries prevention.

CONCLUSIONS

Based on the obtained results, it can be concluded that:

- the retention levels were considered adequate for the groups G1 and G2 due to the methodology used;
- there was no statistically significant difference among the types of treatment used;
- CPOD obtained at the end of the study justifies the application of education programs and occlusal sealing.

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