



A comparison of Fluroshield with Delton fissure sealant: four year results

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Abstract

Purpose: The purpose of this study was to evaluate the retention rate and the caries increment differences between a light cured, F releasing filled fissure sealant and a non-F nonfilled one.

Methods: The two different fissure sealants (Fluroshield, Delton) were placed on all 4 caries-free first permanent molars of 112 children aged 7-8 years, under a half-mouth experimental design. All the children were seen in 6 month intervals where a preventive program, including regular topical fluoride application was applied. The sealants were not reapplied if they had been lost between examinations.

Results: After 48 months 162 teeth in the F sealant group and 162 in the conventional sealant group were evaluated. Regarding sealant retention, 124 teeth (77%) in the first group and 144 (89%) in the second were fully sealed, and 23 (14%) compared to 9 (6%) were partly sealed ($P=0.01$). Regarding caries development, 14 teeth (9%) had developed caries in the first group and 19 (10%) in the second ($P>0.1$).

Conclusion: In a regular biannual preventing program including topical gel application, F-releasing filled sealant (Fluroshield) appears to have a declined full retention rate, after four years, when compared with a non-F nonfilled one (Delton). However, total sealant loss and caries increment was similar in both groups. (*Pediatr Dent* 21:429-431, 1999)

The effectiveness of fissure sealants to prevent caries has been well demonstrated over the last 20 years. Studies of third generation sealants have been reviewed recently¹ and they reveal a full retention rate of 53-97% for periods of six months to 24 months when third generation sealants were tested alone, and 43-98% for periods of eight months to 60 months when tested in comparison with second generation sealants. One of the latter studies² reported a 48% full retention rate for photopolymerized Delton after a 60 month clinical trial.

Efforts to incorporate F into the sealants in order to further enhance their preventive abilities started in the late 70s³. Subsequently, taking into account the fact that small quantities of fluoride reduce enamel solubility and enhance remineralization, sodium fluoride was incorporated into the fillers of some sealants to act as reservoirs from which the added fluoride is gradually released into the oral cavity.⁴

There are few in vitro studies that have shown the ability of fluoride to be released from these fluoride sealants and de-

posited to the underlying and adjacent enamel,⁵⁻⁹ and it is still questionable whether this released fluoride will have any future clinical effect on caries increment. Additionally, fluoride releasing sealants do not appear in vitro to have any significant difference when compared to conventional nonfilled ones, concerning adaptation, tag formation, microleakage, and shear bond strength.¹⁰

Although the in vitro information of the fluoride sealants abilities could be considered adequate, very little is known concerning their clinical performance and their additional benefits in the form of caries inhibition. A one year clinical trial¹¹ comparing a F-releasing filled fissure sealant with a non-fluoride containing analogue has shown no significant difference in retention between the two sealants, with Fluroshield revealing a 87% full and 12% partly full retention rate. The authors conclude that the fluoride released into the saliva did not decrease the retentiveness of the material. More recently, a three year clinical study comparing Fluroshield with a GIC material revealed 70% complete retention of Fluroshield in first permanent molars.¹²

The purpose of this study was to further evaluate the retention rate and the caries increment differences after four years, between a light cured filled F releasing fissure sealant and a nonfilled one.

Methods

One hundred and twelve children aged seven to eight years, having all four first permanent molars fully erupted and caries free, were selected to participate in the trial. The selected children had a mean dft caries index of 1.94 and a mean DI-S index of 0.45. Upon parental consent, fissure sealants were placed on all the first permanent molars, under a half-mouth experimental design. According to this method, the F-releasing sealant (Fluroshield, Caulk/Display) was applied on randomly assigned upper and lower first permanent molars of one side of the mouth, and the conventional one (Delton, Johnson and Johnson) on the same teeth on the other side. The method of application of the two sealants was exactly the same and included cotton rolls isolation, mechanical preparation of pits and fissures using a No. 0 round bur in a slow hand-piece,¹³ cleaning of the occlusal surface using a bristle brush and non-fluoridated paste, etching with 37% orthophosphoric acid for 60 seconds, washing with air water spray for 15

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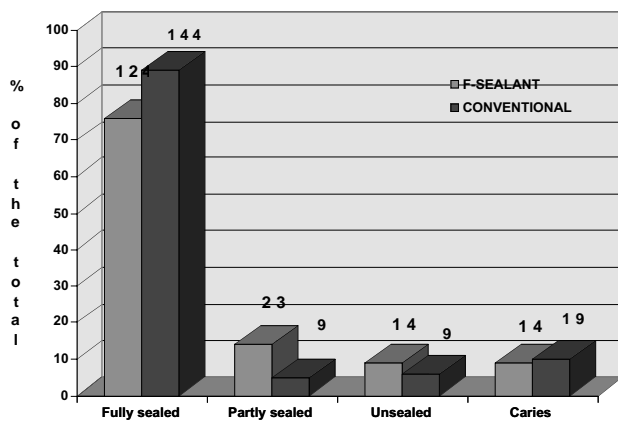


Fig 1. Retention of sealants and caries development after four years. Numbers in columns represent number of teeth.

seconds, and drying for 30 seconds. The sealants were then applied according to the manufacturer's instructions and photopolymerized for 30 seconds. All the sealants were applied by the first author (NAL).

All the children were seen thereafter in six month intervals where a preventive program including teeth cleaning, fluoride gel application (NaF gel), and oral hygiene instructions was applied. However, the sealants were not reapplied if they had been lost between examinations.

After 48 months, 324 upper and lower molars in 81 children were available for evaluation (162 in the F sealant group and 162 in the conventional sealant group). Final blind examination of the sealant was performed by the second author (KIO) who did not know the type of sealant that was placed on each tooth. The similar clinical appearance of the two different sealants, which are both white, helped in this manner. The results were scored as previously described¹³ as sealed, partly sealed, or unsealed, according to whether or not the whole fissure system or part of it was sealed.

Results

Regarding sealant retention, the two sealants showed the following success rates of retention after four years (Fig 1). One hundred and twenty-four (77%) teeth in the first group and 144 (89%) in the second were fully sealed, and 23 (14%) compared to 9 (6%) were partly sealed. There was significant statistical difference ($P=0.01$) between the retention rate of the two groups using the chi-square test ($\chi^2=9.11$). However, total sealant loss was 9% in the first group and 6% in the second, results that are not statistically significant ($\chi^2=1.62$, $P=0.20$). Regarding caries development, 14 (9%) teeth had developed caries in the first group and 19 (10%) in the second. In all cases, caries had developed in partly or unsealed teeth. This difference was not statistically significant ($P=0.35$) using the chi-square test ($\chi^2=0.84$).

Discussion

Results of previous clinical studies of Fluroshield have shown full retention of 87% after one year¹¹ and 70% after three years.¹² Previously reported preliminary results of this study after two years,¹⁴ showed a similar full retention rate of the Fluroshield (92%) when compared with a non-fluoride (90%), nonfilled fissure sealant. However, the present report after four

years of follow up of the same children revealed different results comparing the retention rate of the two sealants. The full retention rate of the fluoride sealant (77%) was significantly lower than that of the nonfilled sealant, although total sealant loss was similar in both materials. The nonfilled sealant showed full retention rate of 89%, which is well within the range reported in other studies of various light cured third generation sealants,¹ and possibly reflects the increasing familiarity of the dental profession with the use of acid-etch retained materials.

The difference in the retention rate might be attributed to their different structure. Although both are third-generation sealants, Fluroshield is a filled sealant containing 50% inorganic filler by weight and 2% NaF, whereas Delton is a nonfilled one. This difference, however, has shown in various studies that it is of little importance in clinical terms. Although in some studies¹⁵⁻¹⁷ superior resistance characteristics were found in filled materials, in other recent investigations it was concluded that the retention rates of both type of materials were similar.¹⁸⁻²⁰ Additionally, a recent in vitro study comparing Fluroshield and Delton revealed no significant differences in fissure penetration and in microleakage, whereas Fluroshield exhibited significantly higher mean shear bond strength values.¹⁰

An explanation of the present study's clinical results revealing reduced full retention rate of the Fluroshield after four years could be given by some recent data²¹ showing surface deterioration and weight loss of filled sealants when treated with topical fluoride gels (AFP and NaF). In the same study, nonfilled sealants exhibited no surface changes. The methods of this study show that all the participating children were exposed to topical fluoride application (NaF) twice a year, whereas no material reapplication was performed on lost sealants. Therefore, eight topical fluoride applications were performed in the four years of this study, whereas only 4 topical fluoride applications were performed in the two-year preliminary report¹² where the same F sealant and the conventional one gave similar retention rate figures. This possible effect is further supported by the fact that, although full retention rate of the F sealant was decreased, the total sealant loss was similar in both groups.

It should be mentioned that the increased rate of partly lost fluoride sealants in the present study was not followed by any increase in the caries increment in this group. This finding may confirm the in vitro finding⁵ that the incorporation of released fluoride into the underlying and adjacent to the sealant enamel at a depth of 10-60 μm increases the resistance to demineralization even after the sealant loss. Additionally, another in vitro study⁹ has shown that the amount of fluoride incorporated to the enamel was maintained even six months after the sealant removal, whereas the same authors also reported that the calcium release from the enamel in a cariogenic environment was decreased by 13%, when compared to that from enamel without fluoride sealant treatment.⁸

Conclusions

1. After four years in a regular preventive program including topical fluoride gel application, F-releasing filled sealant (Fluroshield) appears to have a declined full retention rate when compared with a non-F filled sealant (Delton).
2. Total sealant loss was similar in both sealants.
3. Caries increment was similar in both groups.

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ABSTRACT OF THE SCIENTIFIC LITERATURE



UNPROTECTED PROTEIN AT THE DENTIN-ADHESIVE INTERFACE

With dental bonding systems that require acid etching of dentin, inadequate adhesive penetration can leave exposed collagen at the dentin/adhesive interface. The exposed collagen could be degraded by bacterial proteases, compromising the integrity of the dentin/adhesive bond and ultimately, the composite restoration. The purpose of this study was to develop a nondestructive staining technique to identify exposed collagenous protein at the dentin/adhesive interface.

Using fourth and fifth generation dentin bonding agents, three-micron thick sections of the dentin/adhesive interface were stained with Goldner's trichrome, a classical bone stain.

Collagen that was not encased in the dentin adhesive stained a distinct red. Corollary scanning electron microscopic examination confirmed that this exposed collagen was accessible to proteolytic reagents.

In vitro identification of inadequacies in the dentin/adhesive bond is the first step in determining sites that may be vulnerable to premature breakdown under clinical conditions.

Comments: The nondestructive technique presented in this study provides an effective method for evaluating the quality of the dentin/adhesive bond. **PS**

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