Fissure sealant retention and caries development after resealing on first permanent molars of children with low, moderate and high caries risk

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Abstract

AIM: This was to evaluate the retention of fissure sealants (FS) and their effectiveness after resealing on caries reduction applied to first permanent molars, in a sample of children stratified according to their caries risk status in a private practice setting. **METHODS:** The sample was 1,274 FS applied on first permanent molars (FPM) of 380 children (6 to 8 years old). Follow-up and monitoring for resealing was 3 years after FS placement, having at least one recall visit per year. Caries risk was based on baseline dmft index: low (dmft=0), moderate (dmft=1-4), high (dmft >4), with almost half of the teeth belonging to the high-risk group. All sealed teeth were evaluated and recorded for FS failure and resealing in case of partial/total loss, as well as caries development. Survival analysis using the Cox Proportional Hazards regression model was used for data evaluation. **RESULTS:** Of the 1,274 sealed surfaces, 927 (72.8%) needed no intervention 185 (14.5%) needed only resealing and 162 (12.7%) developed caries during the study. Of 162 carious surfaces, 107/ 675 (15.9 %) were from the high caries risk children, compared with 17/144 (11.8 %) and 38/455 (8.3 %) from the moderate and low caries risk group respectively. The highest number of failures, 4.9% and resealing were found at first recall, declining to 1.4% at the end of the study. Development of caries followed a steady rate of 6-8% per year. Cox proportional hazards model indicated, regardless if resealing or caries development was considered a failure or resealing was a success and caries development a failure, only the high dmft index appeared in both cases to significantly increase the chance (158% and 173% respectively) of FS failure and caries development compared with moderate and low dmft index. Other variables when inserted into the hazard model, such as age, sex and number of visits, either did not show a significant effect or only marginally affected FS retention, without modifying the association between caries risk and sealant failure. **CONCLUSIONS:** Children of a high baseline caries risk status showed lower FS retention rates and higher occlusal caries prevalence following FS loss compared with those of moderate and low risk status. Resealing does not seem to dramatically change the final outcome of the higher risk group to develop more caries, necessitating other more effective measures to increase the retention of FS on these highly vulnerable areas.

Introduction

The use of fissure sealants (FS) as an effective measure for the prevention of pit and fissure caries in children has been well documented in several clinical studies and it is highly recommended for populations with high caries prevalence [Welbury et al., 2004; Beauchamp et al., 2009]. After the introduction of FS they were mostly applied and tested for effectiveness for children and tooth surfaces. A great variability in caries reduction depended on the caries prevalence of a population [Leskinen et al., 2008]. Most studies have reported significant percentages of caries reduction, as low as 33% [Mejare et al., 2003], as high as 71% [Llodra et al., 1993] or even 100% [Leake and Martinello, 1976; Houpt and Shey, 1983], when stricter inclusion criteria were used in study designs.

Retention of FS has been highly associated with caries-preventive effect, of the posterior permanent teeth, as long as FS remains intact on sound tooth surfaces [Leake and Martinello, 1976; Thylstrup and Poulsen, 1978]. However, partial or total FS loss results in low estimates of caries risk reduction. Similar retention figures have been reported in posterior teeth with sound occlusal surfaces and surfaces with sticky fissures indicative of incipient caries [Handelman et al., 1987]. However, all relevant studies agree on a gradual decline in FS retention after a single application with the increase of the follow-up period [Ripa, 1993]. Approximately half of the sealed teeth examined after a period of 10 years presented complete FS retention after a single application of the material [Romcke et al., 1990]. The use of FS in the last 10-15 years has been questioned and some new selective criteria on placement to increase cost effectiveness have been added. The first criterion is that FS have to be used in high-risk individuals and high-risk surfaces and the second that they should be monitored closely and those that fail be resealed.

The results of studies in assessing the effectiveness of FS according to caries risk status of the patients have included either low-risk or high-risk children or a mixture of low-high risk children, but their results have been contradictory [Weintraub et al., 1993; Weintraub et al., 2001]. Some studies have shown that FS are more effective if placed on high rather than low-risk children and tooth surfaces [Leskinen et al., 2008]. Other studies have found that the higher the dft, the

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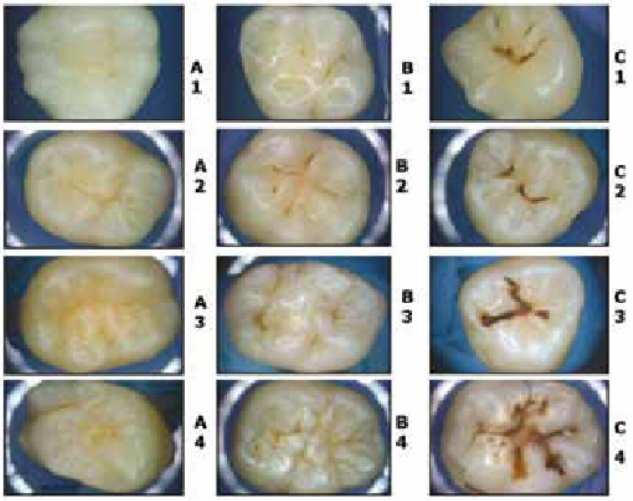
higher the FS failure [Bravo et al., 1996], and that they are not effective in preventing pit and fissure caries in high-risk children [Tickle et al., 2007] although they are effective in individuals with low or moderate caries activity [Heyduck et al., 2006]. It seems that several factors affect outcome, such as the type of sample (public vs. private clinic) used, along with the risk factor (high vs. low risk) and regular resealing. In addition the variability of occlusal surfaces as shown in Fig 1 might have contributed to such contradictory results.

Figure 1. Variability of occlusal surfaces seen in clinical practice (A: Sound B: Questionable and C: incipient)



The effectiveness of FS on a high-risk population and on teeth that need them becomes questionable and continues to be uncertain. Our hypothesis was that resealing of tooth surfaces of child populations stratified according to their low to moderate and high-caries risk status might improve the caries preventive effect of FS. Therefore, the aim of the present study was to evaluate the effect of individual caries experience (dmft) on the retention of FS and their effectiveness in preventing caries development after a routine resealing process in a cohort of children stratified in 3 groups according to their caries risk status.

Materials and Methods

Sample. The study was based on longitudinal data collected from paediatric patients, during the course of regular dental care provided in a private practice, in Athens (Greece). The patients had to have had at least one first permanent molar (FPM) fully erupted and appropriate for FS at the beginning of the treatment. All the teeth were monitored for at least 3 years with at least one recall visit per year. Patients participating in the study were healthy children with no tooth structure anomalies and of all socio-economic levels.

Recall examinations. On the first and each recall visit the teeth present in the mouth along with all carious, filled and missing teeth were recorded in standard dental records. Incipient lesions were not taken into account at calculation of the dmft index. Individual caries risk was based on the dmft index of each patient with caries registered at the cavitation level, at the visit of FS placement, considered at the initial visit for the purposes of the study. Three categories of caries risk-severity were considered: a) Children with no caries (dmft=0) were included in the low risk group, b) children with a dmft of 1-4 in the moderate, and c) children with a dmft>4 in the high-risk group. Bitewing radiographs were taken of all children on the first visit to finalize the treatment plan and FPMs with evidence of radiolucencies seen on the occlusal surfaces at the beginning, or proximal surfaces during the study, were excluded.

Restoration of all carious lesions was performed after the first and at each recall visit, when there was a definite softness or demineralization of the pit or fissure with a visually apparent defect or loss of the enamel tissue. Bitewing radiographs were not taken routinely at the recall visits unless there was an indication for occlusal or proximal dentinal lesion.

All patients were advised to follow a preventive program that included oral hygiene instructions, use of fluoridated toothpaste, diet counselling, topical fluoride treatment at the office every 6 months and daily use of fluoride mouth rinse at home. All patients were scheduled for a recall appointment every 6 months. A reminder letter was mailed one month in advance, and in case they missed that appointment, another letter was mailed 6 months later.

Fissure sealant application. Delton® light-polymerized transparent FS (Johnson & Johnson Dental Products Co., East Windsor, NJ, USA) was used as the sealant material, applied on fully erupted teeth (entire occlusal surface was exposed into the mouth with no overlying tissue operculum). FS were applied on sound tooth surfaces with no visible defects after drying and/or on questionable surfaces with dark stains or a slight explorer catch but no signs of softness, decalcification or cavitation at the base of a pit or fissure [Hamilton et al., 2001]. The application technique included tooth cleaning with pumice without fluoride, moisture control by use of cotton rolls and 'Dri-Angles', 30 seconds acid-etch with orthophosphoric acid gel, air-water spraying for 10 sec and polymerization for 40 sec.

At each recall visit, all FPMs were examined with an explorer for verification of FS retention; total retention was considered when all fissures were completely sealed. Partial or total loss was scored when part of a FS was lost or no FS was detected. In teeth with partial or total loss, FS were reapplied as needed if no sign of any lesion was present. All FS were placed by two paediatric dentists (CO, EB) with an assistant and one of them examined the children at recall visits and CO carried out the evaluation of FS retention or failure and the resealing or restoration in case of caries development, not knowing who applied the FS initially.

Data management. Survival analysis was used for data management with the sealed site being the unit of analysis.

Survival time for each sealed site was calculated corresponding to the time between FS placement and sealant failure. Only FS applied on occlusal surfaces of maxillary and mandibular FPM were included in data analysis. Data were evaluated using the Cox Proportional Hazards regression model [Cox and Oakes, 1984] with the hazard rate of FS failure and caries development evaluated separately as the dependent variable. The hazard function is closely related to the survival curve, representing the risk of dying (failure) in a very short time interval after a given time, assuming survival at time of sensor. It can therefore be interpreted as the risk of dying (failure) at time t.

The independent variables that were fused included age, sex, number of recall visits and baseline dmft (3 level factor: low, moderate, high) measured at the time the sealant was placed. Two models were used for data analysis. In the first model, the status of the occlusal surface (dependent variable) was considered a success if a FS was intact and a failure if resealing was necessary or caries was detected. This model evaluated the influence of the independent variables on FS retention. In the second model, an intact FS or the need for resealing was considered a success, while caries detection a failure. This model assessed the influence of the independent variables on caries development on the occlusal surface.

Results

Sample. Out of 380 children, 172 males and 208 females, with 1,274 occlusal surfaces (608 males, 666 females), of FPMs sealed, comprised the sample of this study (table 1). The age of the children at first FS application varied between 6 to 8 years with a mean age of 6.6±0.74 years (6.6±0.74 for males and 6.7±0.73 for females).

Table 1. Distribution of teeth based on caries risk category in a sample of Greek children in a fissure sealant study.

dmft value	Caries Risk Category	Number of 1st molars	%
0	Low	455	35.7%
1-4	Moderate	144	11.3%
>4	High	675	53.0%

Sealant failure. Table 1 shows the distribution of the sealed molars based on the caries risk category of the patient at the time the FS was placed. More than half of the teeth (53.0%) belonged to the high-risk group. At the end of the 3 year study, 927 (72.8%) of the FS teeth remained intact without any intervention; in 185 (14.5%) teeth the FS was partially or totally lost and teeth were resealed at least once; in 162 (12.7%) teeth caries developed. In the resealed teeth group there were 151 teeth with only one, 32 teeth with two and 2 teeth with 3 resealings (Table 2). There were 15 teeth that were resealed during the study and developed caries eventually, these were included only in the group that developed caries. Of 38/162 teeth that developed caries, the lowest percentage 8.3 % was found in the low risk group compared with 17 (11.8%) and 107 (15.9%) found in the moderate and high risk group respectively (Table 3). Regarding the distribution of resealed teeth according to their dmft status during each recall visit, it was found that 185 (14.5%) teeth were resealed in 221 resealing instances, and of these 185 resealed teeth, 151 (11.9%) teeth were resealed once, 32 (2.5%) teeth were resealed twice and only 2 (0.2%) teeth were sealed 3 times throughout the study (Table 4). Also, 56 (12.3%) of the resealed teeth belonged in the low-risk group where 28 (19.4%) were from the moderate-risk group and 101 (15.0%) from the high-risk group. The data from Tables 3 and 4 suggest that the number of carious teeth seemed to develop in a rather steady proportion throughout the study while there was a decline in the number of teeth requiring resealing.

Statistical analysis. In the first Cox proportional hazards model (either resealing or restoration was considered a fail-

Table 2. Number of teeth evaluated, resealed or became carious at each follow up visit

Number of recall visits	Number of teeth examined	Number of teeth w/ no intervention (%)	Number of teeth resealed once (%) and resealed again			Number of carious teeth	Carious teeth with resealing at previous recall
			1st time	2nd time	3rd time		
1st recall	1274	1181 (92.7%)	62 (4.9%)	0	0	31 (2.4%)	0
2nd recall	1274	1151 (90.3%)	54 (4.2%)	8	1	38 (3.0%)	4
3rd recall	1274	1134 (89.0%)	29 (2.3%)	5	1	42 (3.3%)	2
4th recall	1163	1086 (93.4%)	24 (2.1%)	0	0	31 (2.7%)	1
5th recall	1132	1087 (96.0%)	16 (1.4%)	6	0	17 (1.5%)	1
6th recall	1115	1095 (98.2%)	0	15	0	3 (0.3%)	7
Total			**185 (14.5%)**	**34**	**2**	**162 (12.7%)**	**15**

ure) where FS retention was evaluated, 927 (72.8%) sealed surfaces were considered successful (no FS loss or caries), while 347 (27.2%) failed (table 5). The variables age and sex, when evaluated separately, were not associated significantly to FS failure, although failure was more common among boys. On the contrary, children of the high caries risk group were found to have significantly higher chance for FS failure compared with the low caries risk children. Moderate caries risk children were also more prone to FS failure compared with low risk, with no significant difference found, based on the model used. It is noteworthy that in such a model there was two binary variables coded 0 or 1. Therefore, the hazard ratio was equal to exp(b), and the estimated hazard of a FS to fail for children in the high caries risk group was exp (0.460)=1.58 (or 158%) of children in the low risk group. The respective estimated hazard in the moderate caries risk group was exp (0.377)=1.46 (or 146%) of teeth in the low risk group.

Concerning the variable 'number of visits', this only marginally affected the retention of the FS, and not in a significant way. It appeared that the higher the number of visits, the higher the chance for a FS to fail. When all the independent variables entered the model, the only factor that affected FS retention significantly was the high dmft value (>4) – high caries risk. This finding was further confirmed by entering into the model both the variables of caries risk and number of visits.

The effect of the individual variables used on the survival probability cannot be described adequately because it depends on any one patient's values for all the variables fit the model. The combination of regression coefficients and variables values can be used as a prognostic index. The hazard and the estimated survival probability at any time depends only upon PI, not upon the values of the individual variables.

In the second hazard model (Table 6) where FS failure in preventing dental caries was evaluated, a total of 1,112 (87.3 %) successful surfaces were included (resealing was considered a success), while 162 (12.7%) surfaces failed (became carious). Age as a single variable had no significant effect on caries development after FS failure. Gender showed a marginal significance indicating that FS failure was more likely to occur in boys. Also, teeth in both moderate and high caries risk groups showed an increased chance of becoming carious compared with the low risk group; however, only the high initial dmft group showed a significant effect. The model suggested that teeth in the moderate risk group presented a exp (0.324)=1.38 (138%) higher chance of becoming carious compared with the low caries risk group. The respective estimate hazard in the high-risk group was exp (0.548)=1.73 (173%) than the low risk group. The number of visits assessed as a single factor significantly affected FS success in such a way that the more visits the patient made, the higher the chance for FS failure in caries prevention. When all the variables were fitted into the model, the high caries risk continued to show the same significant effect, while the number of visits was marginally significant and sex was not associated significantly to sealant failure.

Discussion

Fissure sealing of FPMs with resin based FS is a recommended method to prevent or arrest incipient (non-cavitated) caries of the occlusal surfaces of permanent molars, on the basis of a prior individual and tooth surface risk assessment [Welbury et al., 2004; Ahovuo-Saloranta et al., 2008]. The preventive outcome after pit and fissure sealant application varies, depending upon the caries risk of individuals and caries prevalence of the country [Leskinen et al., 2008].

Dental caries in the primary dentition, assessed as dft index has been associated positively with caries in the mixed and permanent dentition [Poulsen and Holus, 1980], and a strong relationship exists between caries prevalence in primary teeth and early fissure caries in FPMs [Raadal and Espelid, 1992]. As FS retention was studied on FPMs, a risk assessment approach based on affected primary teeth was considered appropriate at the time FS were applied. To our knowledge, this is the first longitudinal evaluation of FS failure and resealing measured separately for loss and for caries development that was based on individual baseline caries risk, in a paediatric practice setting. However, one limitation of our study might be the fact that failure of a FS was registered from the documented decision for resealing, without recording the partial or complete loss and the area from which the sealant was lost.

Based on the results of this study, the retention of FS after one application at the end of the 3 years was 72.8%, while 14.5% were partially or totally lost and resealed and a small number of FS failed and developed caries (12.7%). The fact that a fairly good proportion of FS applied under real-life conditions remained intact until the end of the study showed a success of FS in such high risk individuals and does not differ significantly from the data (64-80%) reported in other studies [Ripa 1993] when FS were applied in a low-risk group of children in the general population. Our figures are also very close to a 3-year study [Simecek et al., 2005], where resealing was performed as needed and 75.5% of the FS were found intact, 16.9% were partially or totally lost and 7.5% developed caries. The latter study was carried out on a stratified sample of young adults, and the difference in age of the sample might explain the slightly higher retention (75.5% vs. 72.8%) and slightly lower caries rates (7.5% vs. 12.5%) found between the two studies.

It is noteworthy (Table 3) that the highest number of failures and resealing were presented at the first recalls (4.9%), following a diminishing trend towards the end of the study (1.4%). The development of caries followed a steady rate of 6-8% per year and compares favourably with the 5-10% annual failure rates reported by Feigal [1998]. The finding that the highest rates of FS failures and resealing occurred

Table 3. Distribution of carious teeth (%)* according to the recall visit and dmft status in a sample of Greek children in a fissure sealant study.

Visit	Number of carious teeth n=1274	dmft=0 n=455	dmft=1-4 n=144	dmft>4 n=675
1st recall	31	2 (0.4%)*	1 (0.7%)*	28 (4.1%)*
2nd recall	38	12 (2.6%)*	3 (2.1%)*	23 (3.4%)*
3rd recall	42	12 (2.6%)*	6 (4.2%)*	24 (3.6%)*
4th recall	31	8 (1.8%)*	3 (2.1%)*	20 (3.0%)*
5th recall	17	3 (0.7%)*	3 (2.1%)*	11 (1.6%)*
6th recall	3	1 (0.2%)*	1 (0.7%)*	1 (0.1%)*
	162 (12.7%)	38 (8.3%)	17(11.8%)	107(15.9%)

* = Percentage of carious teeth from each dmft group

Table 4. Distribution of resealed teeth (%)* according to dmft group of a sample of Greek children in a fissure sealant study.

	Teeth(N)	Mean dmft	dmft=0	dmft=1-4	dmft>4
1st Reseal	151	3.4	49 (10.8%)*	24 (16.7%)	78 (11.6%)
2nd Reseal	32	5.3	7 (1.5%)	4 (2.8%)	21 (3.1%)
3rd Reseal	2	9.1	0 (0%)	0 (0%)	2 (0.3%)
Total	185	4.1	56 (12.3%)	28 (19.4%)	101 (15.0%)

*= Percentage of carious teeth from each dmft group

Table 5. Cox Proportional Hazards model results when resealing or caries was considered as failure of a fissure sealant.

		Coefficient	Standard Error	p-value
Model 1	Age	0.0021	0.005	0.658
Model 2	Sex	-0.2360	0.138	0.088
Model 3	Moderate dmft High dmft	0.3770 0.4600	0.254 0.162	0.138 0.004*
Model 4	Number of Visits	0.0870	0.057	0.125
Model 5	Age Sex Moderate dmft High dmft Number of Visits	-0.0000211 -0.2226 0.3887 0.4575 0.0897	0.005 0.140 0.255 0.162 0.059	0.996 0.111 0.127 0.004* 0.146
Model 6	Moderate dmft High dmft Number of Visits	0.3769 0.4617 0.0886	0.254 0.162 0.057	0.138 0.004* 0.119

* = signifiocant at <0.05

shortly after the application is in accordance with the findings by Dennison et al., [1990] and is probably due to technical problems of application [Ripa, 1993].

The respective FS failure rates among subjects at low, moderate or high risk of developing caries in our study of 8.3%, 11.8% and 15.9% are also in agreement with the failure rates of 8.1%, 13.9% and 17.8% respectively, found in the study by Simecek [2005], while the likelihood of FS failure and caries development was also nearly twice as high among subjects at high risk compared with subjects at the low risk group in both studies. The finding that twice as many of the teeth in the high risk group developed caries (15.9%) compared with 8.3% for the low risk group (dmft=0) is in agreement with the findings from another study [Makhija et al., 2006], where baseline caries status was associated with FS failure and caries development, or that dft=0 at the time of FS placement had a higher success of FS compared with those individuals with dft>0.

In our study, baseline caries risk was found to associate significantly to both FS retention and caries development following loss, when all the variables were included and tested for possible influence on FS failure. Age, sex and number of recall visits, when included into the hazard model, either did not show a significant effect or only marginally affected FS retention, without modifying the association between caries risk and FS failure. Retention decreased with

Table 7. Cox Proportional Hazards model results when caries only was considered as failure of a fissure sealant

		Coefficient	Standard Error	p-value
Model 1	Age	0.00597	0.00547	0.275
Model 2	Sex	-0.326	0.160	0.0415*
Model 3	Moderate dmft High dmft	0.324 0.548	0.305 0.189	0.28847 0.00373
Model 4	Number of Visits	0.148	0.0665	0.0256
Model 5	Age Sex Moderate dmft High dmft Number of Visits	0.00233 -0.29698 0.34926 0.54647 0.13976	0.00563 0.16175 0.30655 0.18899 0.06887	0.67827 0.06635 0.25457 0.00383 0.04242
Model 6	Moderate dmft High dmft Number of Visits	0.324 0.550 0.150	0.3057 0.1889 0.0666	0.28903 0.00358 0.02467

*Bold = significant

increasing caries risk, with children of a moderate or high caries risk showing approximately a 1.5 times higher chance of a FS to fail compared with low-risk children. However, the relatively steady rate of caries development throughout the study seemed to occur regardless of resealing and especially affected the high caries group. The latter, in connection to the finding that of the 162 teeth that became carious 148 (90.7%) developed caries without having received any resealing, verifies the 'inevitable' fact and the vulnerability of these occlusal surfaces to becoming carious no matter how they will be managed.

The finding from other studies [Bravo et al., 1996] that the higher the dft, the more the FS failures and caries development is also verified by our study. However, the prior caries experience influenced statistically only the higher caries group, in terms of FS failures as well as caries development. In our opinion, this might have been attributed to the resealing effect, which was evident in the low and moderate caries risk groups, while in the higher risk group we had this inevitable phenomenon. The above findings are also in agreement with the study by Heyduck et al., [2006], in which rates of 19% in lost FS and 18% in carious or filled surfaces in 3 years were reason for those authors to conclude that FS were only protective in individuals with low or moderate caries activity. This agrees with Llodra et al., [1993], who suggested that FS are less effective in high caries risk and/or that they have not been effective in preventing pit and fissure caries in these high-risk children [Tickle et al., 2007]. An explanation given by some authors [Bravo et al., 1996] for the higher FS failures on these populations and teeth was that more questionable or incipient fissure caries might have been sealed in those children. This must be taken into account when applying FS as significantly higher microleakage must be expected. According to Heller et al. [1995], sealing clinically incipient (or questionable) fissure lesions is a recommended procedure and the caries preventive effect of the FS in these surfaces was high when compared with the unsealed controls. However, such an arrest in the caries progression process depends upon the complete integrity of the FS material placed. If microleakage is higher in these cases as a result of a compromised bond, FS retention was lower and caries initiation inevitable. This increased leakage of FS might be the result of poor material adaptation to the enamel of questionable fissures and might explain the higher FS failure rates on these surfaces found in high risk children in our study.

High-risk children, who are very caries active, enamel of the occlusal pit and fissures have already undergoing tissue structure changes before FS application that might have altered the properties of the enamel surface. In support to the above is the finding by Carvalho et al. [1989] who found that many incipient lesions, due to favourable conditions for plaque accumulation, were initiated during eruption in FPM. These were arrested after eruption and when the teeth came into full occlusion. It is highly possible that etching occurs on presumably sound and healthy enamel which is in fact not sound. The difference between sound enamel and questionable surfaces, which might have been demineralised and have an arrested enamel lesion, could be the organic material incorporated in the demineralised enamel during the repeated cycles of de/remineralisation process. Such a higher content of organic material might hinder the acid penetration into deeper layers and at the same time prevents the homogeneous etching of the enamel resulting in hampering resin impregnation and shorter resin tags [Irinoda et al., 2000].

Such a series of events might have taken place in children in this study, in which a large proportion belonged to the high caries risk group. It seems therefore, that the effectiveness of FS on these high-risk surfaces, for those children that primarily need FS becomes questionable and uncertain. This means that our efforts must move from the materials and the techniques used to the type, condition and behaviour of these questionable occlusal surfaces. Occlusal surfaces that

are questionable or suspicious vary considerably in appearance. They are surfaces with deep pits and fissures, stains or decalcified walls and probably non-cavitated incipient enamel caries (Fig.1). They constitute an entirely different entity in terms of morphology, tooth structure, content and quality of the tissue compared with sound occlusal surfaces [Bader and Shugars, 2006].

Research efforts should be targeted on stained or questionable occlusal pit and fissures surfaces. Studies are needed to determine whether the materials and techniques used or the condition of the surface and the quality of the tissue make the retention of FS problematic.

Based on the findings of this study, a frequent re-evaluation of high caries risk patients should be made and include, among other entities, a careful examination of the FS integrity and retention. The enamel in the periphery of the FS material should be evaluated for caries initiation and managed accordingly, using preventive measures and/or conservative restorative techniques. Particular attention should be paid to FS margins. Minor cracks or weakening of the material caused by occlusal wear that are indicative of potential marginal failure should be repaired. Extra care is needed during FS placement in these patients to avoid technique-related compromise of the FS bond to the tooth surface. Such findings strengthen the argument for a caries risk assessment approach on individual and/or tooth selection for FS placement.

Conclusions

Initial caries risk status in children was associated positively to sealant failure and caries development on occlusal surfaces of first permanent molars. High initial caries risk showed significantly lower sealant retention rates and higher occlusal caries prevalence following sealant loss, compared to those of low risk. Children of a moderate initial caries risk showed the same tendency regarding sealant failure although not at a statistically significant level. Age, sex and number of visits were not associated significantly to sealant failure and did not change the sealant failure dependence compared to the baseline caries risk group.

Aknowledgements

A consent form was signed by the parents of the children participating in the study and the ethical approval was received from the commission of Research and Deontology of Dentistry Department of the University of Athens.

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