CLINICAL ASSESSMENT OF THE EFFICIENCY OF TWO PIT AND FISSURE SEALANTS

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Abstract: Introduction: Pit and fissure sealing has been proved to be an effective method of preventing tooth decay. Objective: Assessment of clinical effectiveness over time of two light curing composite sealants, Fissurit FX and Grandio Seal, applied on the first permanent molars in children. Materials and methods: First permanent molars were sealed and subsequently material retention and caries occurrence were monitored over a period of two years in two groups of children. Results: The retention of Fissurit FX material was of 79.40% after two years and of 82.32% for Grandio Seal. Carious lesions occurred at a rate of 3.03% with the Fissurit FX and of 5.15% with Grandio Seal after two years of monitoring. Discussion: Both materials showed good retention and low caries rate. Conclusions: Applying two sealants was effective in preventing dental caries.

INTRODUCTION

Sealing is a method of preventing dental caries in occlusal pits and fissures of molars and premolars and also in buccal and lingual pits of molars and palatal pits of maxillary incisors, by applying a suitable material in order to mechanically isolate these areas from the acid action of plaque.(1)

Decades ago, a high prevalence of caries was found on the occlusal surface of molars in children and young adults (2) and this lead to formulate the importance of suppressing these retentive areas in order to prevent dental caries.

Pit and fissure sealing has been proved to be an effective method for preventing tooth decay, as demonstrated over the years by many clinical studies.(3) HF Albers stated that unsealed first permanent molars are 22 times more likely to develop caries than sealed molars.(4)

However, the use of dental sealants is limited, mainly due to the suspected poor retention of these materials. In developed countries, where a decreased prevalence of dental caries was achieved, studies show that dentists appreciate and regularly use sealants. F Curson et al. reported in their study that 89% of dentists sealed teeth at caries risk and 46% recommended pit and fissure sealing for teeth without carious risk.(5)

Besides fluorides, sealant materials contain no active ingredients for preventing tooth decay. Their prophylactic role is provided by the adherence to the enamel surface and by physical “filling” of the pits and fissures, isolating them from the oral environment. As long as the sealant remains undamaged, carious lesions cannot develop underneath. Therefore, retention of sealant materials is the first condition for a successful sealing.

PURPOSE

The aim of this study was to evaluate the clinical efficiency over time of two light curing composite sealant materials, Fissurit FX and Grandio Seal, applied on the first permanent molars in standard working conditions provided by a dental practice.

METHODS

The study was conducted on 245 children over a period of two years (between 2009 and 2011) and monitored the sealed occlusal surfaces of the first permanent molars that met the criteria for applying sealants.

Selection of children was made based on school grade of first class which corresponded to the age of 6 to 8 years old, with a mean age of 7 years old.

The children were divided into 2 groups depending on the applied sealant material:

- Fissurit FX group - 126 children
- Grandio Seal group - 119 children

The first permanent molars were examined by a single operator in standard lighting conditions provided by the dental unit. The clinical examination of teeth in order to check the indication of pit and fissure sealing must imply at least two clinical examinations.
CLINICAL ASPECTS

examination methods described in the literature: visual assessment, palpation, radiographic assessment, optic fibre transillumination and laser fluorescence. In the present study, visual and palpatory examination was selected.

Visual examination was performed on clean and air-dried teeth. Tactile examination was made with a rounded tip dental probe.

The dental probe was used only to remove the plaque and the food debris, as recommended in the literature, since the sharp dental explorer can break off the occlusal pits and fissures, preventing the remineralisation of the enamel surface and it can also fasten the progression of dental caries.

In situating the integrity of the occlusal tooth structure, the suspicious teeth were excluded from the study.

Inclusion criteria of permanent molars within this study were as follows:
- sufficiently erupted teeth in order to obtain the required isolation for sealant application;
- teeth with no clinically detectable carious lesions both in pits and fissures and on smooth surfaces;
- teeth without fillings and sealants;
- teeth with no hypoplasia or other developmental abnormalities;
- teeth with deep pits and fissures susceptible to tooth decay.

Both sealant materials used in this study were monocomponent light curing composite resins, with a curing time of 20 seconds. Their application is quick and easy with the use of application tips attached to the syringe that contains the flow composite. The materials are white, opaque, with optimal flowability, high stability and excellent adhesion to enamel surfaces. The main differences between the two sealant materials are: Fissurit FX is a microhybrid composite, with 55% (w/w) filler particles, fluoride release, while Grandio Seal is a nanohybrid composite resin, with a higher filler content (highest in its class) of 70% (w/w), but with no fluoride release.

Sealant application steps were performed according to the manufacturer’s instructions strictly following each working step:
- professional dental cleaning;
- rinsing with water and air-drying;
- meticulous isolation of the tooth;
- air-drying of the occlusal surface;
- enamel etching with 37% phosphoric acid gel for 30 seconds;
- rinsing with water and air-drying of the tooth;
- control of the acid etched dental surface;
- sealant application on the conditioned enamel surface;
- light curing of the sealant;
- control of marginal adaptation;
- occlusion control.

Regular post-placement evaluations were performed at intervals of 6 months and at every check-up, integrity and marginal adaptation of sealant materials were assessed through visual and palpatory examination.

At each recall visit, 4 possible situations were recorded regarding material retention:
- Complete sealant retention, that did not require retreatment;
- Total loss of sealant when pits and fissures were free from caries;
- Partially detached sealant with marginal adaptation, after excluding any underlying carious lesions, the enamel surface was roughened with a bur and sealant was reapplied to the missing areas;
- Defectuous marginal adaptation of the sealant; in case of underlying carious lesions, the patients were referred for conventional restorative treatment.

For the statistical analysis Microsoft Excel and EViews 5.1 programs were used, and the equality of two average values from independent populations was tested using Student t test.

Significance level chosen was \( \alpha = 0.1 \), and the confidence level was 90%, according to the formula C = \( 1 - \alpha \).

Results were considered statistically significant if \( p \leq 0.1 \), thus \( p \) was \( \leq 0.1 \).

RESULTS

Although in this study age group between 6 and 8 years old, the first permanent molars were specifically chosen for sealing, at baseline not all molars could be sealed due to the presence of carious lesions, fillings and incomplete eruption of the teeth. Thus, a total of 641 teeth were sealed in 245 children.

The distribution of teeth according to the sealing material and the topographical features of the teeth on dental arch are represented in table no. 1.

Table no. 1. Numerical distribution of teeth according to topography and type of sealing material used

<table>
<thead>
<tr>
<th>Dental sealant</th>
<th>No. of sealed first permanent molars</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fissurit FX</td>
<td>101 95 56 78</td>
<td>330</td>
</tr>
<tr>
<td>Grandio Seal</td>
<td>91 73 80 67</td>
<td>311</td>
</tr>
</tbody>
</table>

Retention of the two sealant materials and caries occurrence was comparatively assessed after application, after 1 year and 2 years (table no. 2).

Table no. 2. Comparative evolution of the two sealing materials

<table>
<thead>
<tr>
<th>Group</th>
<th>Sealed teeth at baseline</th>
<th>Detached sealant at 1 year</th>
<th>Complete retention at 1 year</th>
<th>Carious teeth at 1 year</th>
<th>Detached sealant at 2 years</th>
<th>Complete retention at 2 years</th>
<th>Carious teeth at 2 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fissurit FX</td>
<td>330 28</td>
<td>302</td>
<td>10</td>
<td>68</td>
<td>252</td>
<td>79,40%</td>
<td>17</td>
</tr>
<tr>
<td>Grandio Seal</td>
<td>311 30</td>
<td>281</td>
<td>8</td>
<td>55</td>
<td>250</td>
<td>82,32%</td>
<td>15</td>
</tr>
</tbody>
</table>

The two sealing materials showed no statistically significant differences in retention at one and two years after placement (p = 0.56 and p = 0.71, respectively). Collected data demonstrated that the percentage of teeth with complete retention of the sealant decreased with the increasing duration of follow-up. As sealant retention decreased, the risk of dental caries is raised.

For the Fissurit FX material, an immediate retention of 100% was recorded at baseline, 91.52% at one year and 79.40% at two years.

For the Grandio Seal material, immediate retention was also of 100%, 90.36% at one year and 82.32% at two years.

Retention over time of the two materials depending on the gender and the age of the children, upon application did not present statistically significant differences (p > 0.1).

Teeth sealed with Fissurit FX developed carious lesions at one and two years at a rate of 3.03% and 5.15%, respectively.

Teeth sealed with Grandio Seal showed carious lesions at one and two years at a rate of 2.57% and 4.82%, respectively.

No statistically significant differences were recorded between the two materials, both of them provided an efficient...
caries-preventive effect during the two years period of the study (p>0.1).

**DISCUSSIONS**

High retention rate achieved in our study may be explained based on three factors:

- Firstly, sealing materials were easily handled and spotted during placement and at periodic evaluations, thereby reducing the possibility of errors.(6)
- Secondly, all therapeutic steps and assessments were performed by a single operator, whose daily activity aims mainly at the field of preventive dentistry.(7)
- Thirdly, it was important that all instructions of the manufacturers related to the adherence of materials were strictly observed.

It is widely accepted that strictly following the manufacturer’s application technique and the experience of the operator are critical to sealant longevity.(8)

Although during the application of pit and fissure sealant, the lack of contact between the sealed tooth and saliva is mandatory (9) and rubber dam provides the best isolation, in the present study, isolation with cotton rolls and vacuum saliva ejector was used. This option was justified by the fact that sealing was done mostly on occlusal surfaces and by the several studies in the literature that had shown similar results with the two isolation methods, with no statistically significant differences.(10)

In this study, although one of the materials contained fluoride (Fissurit FX) and the other one did not have incorporated fluoride (Grandio Seal), statistically significant differences were found in terms of retention, according to several studies in the literature.(11,12) There are some studies that support the jeopardized adhesive properties of sealant materials that contain fluorides and all at maximizing the caries-protective effect.(13) The different structure of the two materials used in the study (one of them was microhybrid and the other one was nanohybrid) and the different filler contents of them did not cause differences in terms of retention.

The low rate of caries in the teeth sealed with both materials was consistent with the data of other studies (13) and could be explained by the fact that the loss of sealant would be not be complete and always a small amount of material would remain at the terminal end of the fissure that will continue to protect the area against carious attacks.(14) Another recent study concluded that in case of partial or complete sealant loss, there is a higher carious risk than in the teeth with no sealant.(15)

Persistence over time of the two materials in the pits and fissures allows the conclusion that strictly following the application steps of the sealant materials in standard conditions of a dental practice provides long term retention of the sealant.

The retention of the two materials over time leads to the prevention of dental caries in pits and fissures.

The regular check-ups at intervals of 6 months allow the proper monitoring of the sealed surfaces and the appropriate sealant reapplication when the material is lost.

**CONCLUSIONS**

Based on the results of this study, the application of sealants was very effective in preventing dental caries in children and reducing the prevalence of dental caries is more related to the material quality rather than to its composition.

**REFERENCES**