

# **Effectiveness of Fissure Sealant in Preventing Caries in Children**

*FUAD AL-SABRII, PhD.<sup>(1)</sup>*

## *Abstract*

*The main aim of this study was to evaluate the retention and effectiveness of fissure sealant Fisseal Extra (ProMedica, Germany) in prevention of caries in school children in Thamar, Yemen. Eighty five children aged 5- 12 years were selected randomly from different schools of Thamar and examined. Using a split-mouth design, the experimental teeth (maxillary and mandibular premolar and molar) were sealed with fissure sealant; while, teeth of another side of mouth acted as control group. The retention and effectiveness of sealant were carefully inspected after 1, 3, 6 and 9 months. The results revealed that, after 9 month, the retention and effectiveness rate was 98.3 and 96.9 percent respectively. Statistically, there was no significant difference between the different groups ( $P < 0.05$ ). The fissure sealant showed high rate of retention and effectiveness and this could be useful in control and prevention of caries in school children.*

*Key Words: Caries; Children; Effectiveness; Fissure Sealant; Prevention*

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<sup>(1)</sup>Head Department of Operative Dentistry, Faculty of Dentistry, Thamar Universit, Yemen. E-mail :alsabrifuad@yahoo.com

## Introduction

Dental caries is a process that may take place on any tooth surface in the oral cavity where a microbial biofilm (dental plaque) is allowed to develop over a period (Nilchian, 2005).

Dental caries is a chronic non-communicable disease (Hujoel, 2009) and continues to be a major public health problem. It may also be the source of considerable pain and suffering for many. It is one of the few chronic diseases which effected also children, and its management represents a large proportion of the health resources worldwide (Petersen, 2003; Petersen, 2004).

The tooth is most susceptible to plaque stagnation during eruption because at this time the occlusal surface is below the line of the arch and easily missed with the toothbrush. (Pickard et al., 2003). The brush and fluoride toothpaste have no access inside pits and fissures, where chewing forces food to be trapped where accumulation of the bacteria. Occlusal caries accounts for between 80 and 90 percent of caries in children; teeth at highest risk for carious lesions are the first and second permanent molars. Two factors are considered important for plaque accumulation and caries initiation on occlusal surfaces are the stage of eruption-functional status and tooth specific anatomy (Hellwig et al., 2003).

The caries susceptibility is related to the form and depth of pits and fissures. Fissures are more susceptible to cries attack than smooth surfaces because fissure anatomy favours plaque maturation and retention (Ripa, 1993; Summitt et al., 2006).

A pit is a small pointed depression in dental enamel while a fissure is a developmental line fault related to genetic factors, which is usually found in the chewing surface or cheek side of a tooth. These pit and fissures can be deep or shallow that it is difficult for the bristles of a toothbrush to clean the

plaque deposits in the area (Kotsanis and darling, 1991; David and Mitchell, 2005).

Several methods have been recommended for caries prevention, including the introduction of pit and fissure sealants, which has provided a preventive method for minimizing occlusal caries (Heller et al., 1995; Handelman et al., 1996; Tulunoglu et al., 1999; McDonald et al., 2004, Muller et al., 2006).

Fissure sealants were first introduced in 1967 by Cueto and Buonocore (1967) and their effectiveness was recognized by the American Dental Association in 1971 (Anonymous, 1971).

Currently, there are two types of pit and fissure sealants available. i.e. self-cured and light-cured sealant materials based on urethane Dimethacrylate or Bis-GMA resins ( Theodore et al., 2002).

Pit and fissure sealants are a safe and effective preventive treatment for caries. They help control caries by forming a physical barrier that prevents the metabolic exchange between fissure microorganisms and the oral environment; therefore, the clinical success of fissure sealants is related to their retention rates, integrity and good clinical techniques used ( Jeronimusand, 1975; Mertz, 1984). The most important criteria mentioned, as the key point for a successful result is complete isolation of the teeth from saliva contamination ( Locker, 2003).

The information on efficacy of fissure sealants in prevention of caries in children in Yemen is based on the reports available from other regions of the world; therefore, this study was carried out to evaluate the effectiveness of the Fisseal Extra ( ProMedica, Germany) in school children.

## Materials and methods

This study was carried out in school children in Thamar, Yemen. Eighty five children ( 5-12 years old, male and female) with fully erupted permanent premolar and molars were selected randomly to receive the fissure sealant. Using a split-mouth design, the experimental teeth were sealed with fissure sealant Fisseal Extra ( ProMedica, Germany); while, teeth in another part of mouth acted as the control group.

Application of fissure sealant Fisseal Extra (ProMedica: Germany) on experimental teeth was carried out according to techniques described by Houpt and Shey (1979). Briefly, the experimental tooth was chosen randomly to receive the sealant and was isolated with cotton rolls, dried briefly, and etched with phosphoric acid for 30-60. It was then washed again and dried thoroughly, followed by fissure sealant application according to the manufacturer's instructions.

Immediate postoperative retention of the sealant was checked by trying to pry the sealant off with an explorer. In a few cases, a defect was noted, or the sealant was partially or totally dislodged, and it was reapplied after etching again for seconds.

The children were recalled after 1, 3, 6 and 9 months for examination and 73, 68, 65 and 60 children were subjected for clinical investigation, respectively. Evaluation of the sealant at each recall appointed involved visual examination with aid of a dental explorer and intraoral mirror.

The retention of the sealant and the presence of carious lesions were checked in the control and experimental teeth. Effectiveness of the sealant Fisseal Extra ( ProMedica, Germany) was calculated according the formula given by Houpt & Shey (1979).

$$\text{Percent effectiveness} = \frac{\text{carious control} - \text{carious treated}}{\text{carious control}} \times 100$$

## Data analysis

The data obtained from this study were analyzed using SPSS 15.0 program me. In all analyses  $P < 0.05$  was for significant.

## Results

Eighty five patients were subjected to examination. The distribution of treated teeth is presented in Table 1, as shown, 38 premolars and 47 molars were selected randomly for examination.

**Table.1. Distribution of treated teeth**

| Teeth    | Right | Left | Total |
|----------|-------|------|-------|
| Premolar | 20    | 18   | 38    |
| Molar    | 30    | 17   | 47    |
| Total    | 50    | 35   | 85    |

After 1, 3, 6 and 9 months from application of fissure sealant 73, 68, 65 and 60 children were recalled and examined respectively, as presented in Table 2. After 1, 3, 6, months no caries developed or sealant lost; while, after 9 month one sealant was lost. The retention rate after 1, 3, 6 months was 100% .100% and 100% whereas 98.3 % after 9 months respectively (Table 2). Statically, there was no significant difference ( $P < 0.05$ ) in retention rates among the different groups.

**Table2. Retention of sealant on premolar and molar**

| Time     | Examined | Retained sealant | Percent % |
|----------|----------|------------------|-----------|
| Baseline | 85       | 85               | 100       |
| 1 Mon    | 73       | 73               | 100       |
| 3 Mon    | 68       | 68               | 100       |
| 6 Mon    | 65       | 65               | 100       |
| 9 Mon    | 60       | 59               | 98.3      |

The effectiveness rate of sealant Fisseal Extra (ProMedica, Germany) in prevention of caries in children is presented in Table 3. As shown, after 1, 3, 6, and 9 months, the rate was 100, 100, 100 and 96.9 percent respectively. Statistically, No significant difference ( $P < 0.05$ ) was observed between different groups examined.

**Table 3. Effectiveness of sealant in prevention of caries**

| Time     | Treated group |              |                 | control group |        |            |
|----------|---------------|--------------|-----------------|---------------|--------|------------|
|          | Examined      | Carries/loss | Effectiveness % | Examined      | Caries | per cent % |
| Baseline | 85            | 0            | 100             | 85            | 0      | 0          |
| 1 Mon    | 73            | 0            | 100             | 73            | 0      | 0          |
| 3 Mon    | 68            | 0            | 100             | 68            | 5      | 7.4        |
| 6 Mon    | 65            | 0            | 100             | 65            | 20     | 30.8       |
| 9 Mon    | 60            | 1            | 96.9            | 60            | 32     | 53.3       |

## Discussion

The effectiveness and retention rate of sealant Fisseal Extra ( ProMedica, Germany) in prevention of caries in school children in Yemen was evaluated by split- mouth experiment. The results of this study revealed that, application of sealant had more retention rate on permanent teeth of experimental groups. In this study, after one month, the retention rate recorded was 100 per cent; whereas, 98.3 percent was recorded after 9 months. No significant difference was observed among different groups.

The retention rate of fissure sealants of different compounds was evaluated by many workers in different parts of the word ( Kargul et al., 2009; Francis et al., 2008; Pilar et al., 2007). The retention rate recorded by these workers ranged from 76.3 to 95 percent. The results of the current study are in agreement with the findings of the above workers. The higher retention rate recorded in this study may be due to duration period of experiment and High adhesive property, excellent marginal tightness and chemical compound nature of Fisseal Extra (ProMedica, Germany)

Long-term clinical studies indicate that pit and fissure sealants provide a safe and effective method of preventing caries. Sealants are most effective in children when they are applied to the pits and fissures of permanent posterior teeth immediately upon eruption of the clinical crowns ( Simonsen, 1987; Swift, 1988; Theodore et al., 2002). The results of this study revealed that the effectiveness rate of Fisseal Extra ( ProMedica, Germany) was 100 percent after one month of study and 96.5 percent after 9 months. This result are in agreement with findings of Francis et al. (2008) and who evaluated the retention and effectiveness of fissure sealants in Kuwaiti school children and partially in agreement with findings of Houpt and shey (1979) who studied the effectiveness of fissure sealant in school children in USA, the effectiveness rate recorded by these workers was 78 percent. The higher value of efficacy of Fisseal Extra (ProMedica, Germany) recorded in this study could be attributed to the differences in materials and to the different techniques used.

## Conclusion

It could be concluded that, after 9 months of experiment, Fisseal Extra (ProMedica, Germany) is an excellent fissure sealant with a high degree of retention and effectiveness in prevention of caries.

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