

Analysis of the difference of caries occurrence between resin based and glass ionomer based pit and fissure sealant on young permanent teeth oral presentation

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ABSTRACT

Background : Caries is a major problem in dentistry. One of caries preventive material is pit and fissure sealant. Pit and fissure sealant is effective in area with narrow anatomical shape which facilitate plaque and bacterial growth. Materials used for this action material is the form of resin based and glass ionomer cement. Objective : To compare the white spot index (ICDAS-II) after application of resin based and glass ionomer fissure sealant among the types of materials that are more effective in the long term Method : Design of this study was experimental pre-test and post-test. Population were students of class I, II, and III in Elementary School 02, Cupak Tengah, Padang. Samples were taken by using purposive sampling. There are two groups of samples, each consisted of 30 children given application resin based sealant and glass ionomer. After a month post application, white spot index was measured with ICDAS-II index. Data were analyzed with SPSS 17 using unpaired t-test. Result : There is no significant difference between applications resin based sealant and glass ionomer cements after 1 month ($p=0,45$). Conclusion : Resin based sealant and glass ionomer cement are effective pit and fissure sealant material

Keyword : pit and fissure sealant , resin based, glass ionomer, white spot index

INTRODUCTION

Caries and periodontal disease is the oral cavity disease which ranked highest in Indonesia. According to Household Health Survey (SKRT), caries prevalence in 2004 reached 90.05%. According to Basic Health Research (RISKESDAS) in 2013, DMF-T index (decayed, missing and filled teeth) reached 4.6, for West Sumatra province were 4.7. DMFT increases as age. At the age of 12 years DMFT index is 1.4, while at the age of 15 years reaches 1.5, and at the age of 18 years is 1.6. Data of Padang based RISKESDAS 2007 showed that caries is the first of ten most common diseases suffered with prevalence 52%. Recent data showed prevalence in 2013 reached 56%.

White spot lesions are the initial clinical manifestations of caries. White spot is the damage of enamel surfaces. White spot on the enamel surface appear in 4 weeks. Changes

from white spot into caries happen in 6 months.¹ The incidence of white spot into caries in permanent dentition is 59.1% , while in primary dentition is 71.7%.²

Caries can damage the body health either locally or systemically. In children, caries incidence is due to mother's lack of knowledge about mixed dentition phase and mechanical capabilities of immature children to clean their teeth. Caries affects chewing food and aggravates the digestive system, so the nutrients that are needed by the body for growth will not be completely absorbed. Caries in the oral cavity will increase the number of bacteria retention and affect the body systemically through the bloodstream causing vital organs infection e.g heart. Efforts should be made to reduce the prevalence of caries include promotive, preventive, curative and rehabilitative . Curative and rehabilitative efforts are generally carried out in the health service, but in reality, communities who received treatment are only 31.1%.

Prevention of dental caries can be done through fluoridation of drinking water, application of topical fluoride on enamel development phase, and the plaque control program for each individual. It is not proven effective in reducing the incidence of caries in pits and fissures that are the most vulnerable parts of caries, because of its anatomical narrow shape.³

Administering topical and systemical fluoride does not cause much effect on reducing the incidence of caries pit and fissure because of pit and fissure is a protected basin area. Condition of pits and fissures is the influencing factor of caries development process. Preventive way to prevent pit and fissure caries is called pit and fissure sealant.⁴ Giving pit and fissure sealant material at the beginning of tooth eruption is expected to prevent bacteria colonization in pit and fissure.⁵

The aim of sealant is the penetration of ingredients into the pits and fissures and polymerizes and sealed off the area of bacteria and debris.² Sealant material must have a good retention capability and durability, low solubility of the oral fluid, biocompatible with the tissue cavity mouth, and easy to apply.⁶

Indication of pit and fissure sealant is a young new permanent tooth eruption around 1-3 years in the age range of 6-9 years, free of caries and have anatomical structure with deep pits and fissures. Molar teeth of the most often damaged even loss occurs at an early age. The teeth are erupted permanent teeth first so often ordinary people pay less attention because they are still the primary teeth, also first molar is occlusion key .

Two sealant material that is often used is resin-based sealant and glass ionomer cement based sealant (GIC). Resin-based sealant materials polymerize through autopolymerization and photopolymerization. While glass ionomer cement usually autopolymerized.⁵

Resin-based sealants last longer and stronger because it has the ability to penetrate better. This is because the process of etching the tooth enamel which results in better contact between the surface of the resin material with enamel.⁷ Etching eliminates mineral tooth enamel and produces resin tags and clinically appears whiter and fade. Sealant material given in the etched area will penetrate into the resin tag. This can improve the mechanical retention of sealant material to the surface of the tooth enamel.⁸

Glass ionomer sealants have the ability to prevent caries as well as the resin-based sealant. Glass ionomer cement sealant is easier to manipulated because it doesn't require stages of etching on the surface of the tooth.⁹ Glass ionomer cement sealant materials perform specific interactions with tooth enamel by releasing calcium, strontium and fluorine ions that are cariostatic also reduce the caries development in areas where sealant was given.¹⁰

objectives

The authors are interested to compare the caries index in the application of resin-based fissure sealant with sealant glass ionomer cements as pit and fissure sealing material on the surface of the young permanent teeth for a month usage

METHODS

Design of this study was an experimental pre-test and post-test. The study population were students of class I, II, and III in the Elementary School 02, Cupak Tengah, Padang. Samples were taken by using purposive sample has met the inclusion criteria, first molar maximum of 4 years after the eruption; free of caries; deep pit and fissure; ages 5-7 years. Sample exclusion criteria are students are not at school while doing research; there is a congenital disease; students are not willing to be a subject of research. There are two groups of samples. The first group consisted of 30 children given application-based pit and fissure sealant resin. The second group consisted of 30 children given a pit and fissure sealant applications based glass ionomer. Before the application of pit and fissure sealant, teeth cleaned with a brush and pumice. Teeth were isolated with cotton rolls, dry surface for 20-30 seconds.

In the first group, the tooth surfaces were etched, rinsed for 60 seconds, then dried with air. Check the etching with air, etched surface will appear whiter. Dry with air for 30 seconds. Sealant material is applied, polymerization with light curing. Check occlusion with articulating paper.

In the second group, dentin conditioner is applied for 10-20 seconds to remove plaque and pellicle and prepare cement to adapt well toward the tooth surface and provide good adhesion. Tooth is rinsed with water for 60 seconds. Drying with air conditioner dentin surface after application of pit and fissure done flushing for 20-30 seconds. GIC application in pit and fissure then apply varnish. Check occlusion with articulating paper, if there is excessive contact, carried out spot grinding.

After a month post pit and fissure sealant application, white spot index were measured with ICDAS-II index. Score of ICDAS-II :

- 0 = sound tooth surface, no evidence of caries after 5 seconds air drying
- 1 = first visual change in enamel : Opacity or discoloration (white or brown) is visible at the entrance to the pit or fissure seen after prolonged air drying
- 2 = Distinct visual change in enamel visible when wet , lesion must be visible when dry

- 3 = localized enamel breakdown (without clinical visual signs of dentinal involvement) seen when wet and after prolonged drying
- 4 = underlying dark shadow from dentine
- 5 = distinct cavity with visible dentine
- 6 = extensive (more than half the surface) distinct cavity with visible dentine

Data were analyzed with SPSS 17 unpaired t-test to analyze comparative pit applications and fissure sealant resin with glass ionomer-based.

RESULT

Subject of the study consisted of 63% male, average age 14.18 ± 7.15 and 27% female, average age of 8.20 ± 5.91 . The number of samples is 30 samples were applied based pit and fissure sealant resin and 30 samples of pit and fissure sealant were applied glass ionomer-based glass.

Table 1. The average age of the subjects by gender

Age	Gender	n	%	Mean
6-9 years old	Male	38	63	$7,15 \pm 14,8$
	Female	22	27	$8,20 \pm 5,91$

From the collected data, ICDAS-II index was measured based white spot on usage-based fissure sealants with glass ionomer resin after 1 month of use.

Table 2. Index-II ICDAS white spot on usage-based fissure sealants with glass ionomer resin after 1 month of use.

Variable	n	Mean \pm SD
F.S. Resin	30	$0,00 \pm 0,00$
F.S. Glass Ionomer Cement	30	$0,00 \pm 0,00$

Further analysis test conducted by using test t to see the difference between the usage-based fissure sealants with glass ionomer resin after 1 month of use.

Table 3. Results of statistical unpaired T-Test of ICDAS-II

Variable	n	Mean \pm SD	p- value
F.S. Resin	30	$0,00 \pm 0,00$	0,45*
F.S. Glass Ionomer Cement	30	$0,00 \pm 0,00$	

significance $p < 0,05$

Based on statistical test results as shown in Table 3, the value $p = 0.45$ which is < 0.05 , which means there is no significant difference ICDAS-II between the use of 1 month fissure sealants and glass ionomer-based resin.

DISCUSSION

Research conducted on elementary school students Cupak Tengah 02 on the age of 6-9 years old. Thirty students were applied resin-based pit and fissure sealant and thirty students were applied glass ionomer cement pit and fissure sealant.

Based on the results of research on the index of caries in children with fissure sealant and glass ionomer-based resin-based fissure sealant, it is known that there is no significant differences between the glass ionomer-based fissure sealants and fissure sealant based resin with value of $p = 0.45$ ($p < 0.05$).

The occlusal surfaces of posterior teeth are the areas most prone to the occurrence of caries. Anatomical form allows plaque retention and maturation. Bacteria activity causes pH fluctuations. Conditions of pH rising causes teeth remineralization, while the drop in pH will result in the loss of tooth mineral. Loss of these minerals is a process of demineralization of hard tissue that becomes the signs and symptoms of caries.⁵

Early symptoms of an enamel caries can be seen macroscopically in the form of white patches. These patches have colors that appear very different from the surrounding healthy enamel. Sometimes it would appear brown lesions caused by the material around them absorbed into the pores. Both patches of white or brown spots can last annual duration.⁶ The damage begins with an overview in the form of white lesions on the surface of the tooth enamel which is called white Spot lesions, measured using ICDAS-II (international caries detection and assessment system). The occurrence of white spot on the enamel surface for 4 weeks. Changes into a white spot caries will occur for 6 months.¹ After the enamel was exposed with caries, it takes about 3-4 years to grow until reaching the dentine caries. The development of clinically detectable caries depending on the thickness of the enamel loss and morphological pit and fissure formation.¹²

Pits and fissures of posterior teeth are considered to be highly susceptible to the adhesion of micro-organisms and consequently, to caries. Therefore, a significant amount of tooth decay occurs at these sites. Fissure sealants are used to prevent occlusal caries. 70% percent of occlusal decay being preventable after a once-off fissure sealant application.⁷ The most commonly used sealant material is resin composite.¹⁴ Its caries-preventive effect relies on the sealing of pits and fissures through micro-retention, created through tags after enamel acid etching. However, these are easily destroyed by saliva contamination, which reduces micro-retention and, consequently, the caries-preventive effect.¹⁵

Under the generally wet conditions in the oral cavity, Glass Ionomer Cement (GIC) offers an alternative. Owing to its hydrophilic properties, GIC is not as moisture-sensitive as hydrophobic resin.¹⁵ Many researchers confirm that the Glass ionomers are separately be preferable for sealing newly erupted teeth. Glass ionomer sealants offer similar caries-

preventive effects as resin-based sealants, with easier manipulation and without the use of acid etching. The glass ionomer may be valuable as a sealant in cases of difficult operating conditions i.e. difficulty with moisture control in partially erupted teeth or in children with management problems or in very young children.⁹

Within the limitation of this study, it is concluded that the ICDAS-II index is not different between application of resin based and glass ionomer cement pit and fissure sealant. Each material has the different effectiveness over 1 months. Etching roughens the tooth surface and produces a honeycomb-like structure so that tags of sealant can penetrate deeply into the enamel and form an effective mechanical bond, thus retaining the sealant. While glass ionomer cement could be a good alternative when and where resources for resin sealant placement are not readily available, and difficult to isolate the teeth due to hypersalivation.

CONCLUSION

There is no significance different of caries index ICDAS-II between application of resin based and glass ionomer cement pit and fissure sealant for 1 month usage. Both of materials are effective as pit and fissure sealant

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