

Factors Related to Short-term Retention of Sealant in Permanent Molar Teeth Provided in the School Mobile Dental Clinic, Songkhla Province, Southern Thailand

Sukanya Tianviwat^{*,**} Janpim Hintao^{*,**}
Virasakdi Chongsuvivatwong^{***} Songchai Thitasomakul^{*}
Banyen Sirisakulveroj^{****}

ABSTRACT

The aim of the study was to determine factors affecting the short term retention of sealant provided by mobile dental clinics to Thai schoolchildren in the southern region of Thailand. The study was carried out in Songkhla from April 2008 to February 2009. The survey was conducted 6 months after the application of sealant. 347 teeth of 206 grade 1 schoolchildren were examined for retention of sealant. Retention of sealant was classified into two categories: full retention and loss of sealant retention. The respective percentages were 67.7 and 33.3. The result from logistic regression showed that significant factors affected the short term retention including the position of teeth (odds ratio = 2.10), the presence of assistance (odds ratio = 2.29) and the checking procedure after the application of sealant (odds ratio = 2.75). The improvement of sealant retention could be applied by reallocating dental manpower and sealant training to emphasize sealant checking procedure.

Key words: Short-term sealant retention, factors, mobile dental clinic

J Public Health 2011; 41(1): 50-58

Correspondence: Assist. Prof. Dr. Sukanya Tianviwat, Department of Preventive Dentistry, Faculty of Dentistry, Prince of Songkla University, Songkhla 90112, Thailand. E-mail address: sukanya.ti@psu.ac.th

* Department of Preventive Dentistry, Faculty of Dentistry, Prince of Songkla University, Songkhla, Thailand

** Common Oral Diseases and Epidemiology Research Center, Faculty of Dentistry, Prince of Songkla University, Songkhla, Thailand

*** Epidemiology Unit, Faculty of Medicine, Prince of Songkla University, Songkhla, Thailand

**** Songkhla Provincial Health Office, Songkhla, Thailand

Introduction

The sealants are highly effective in preventing pit and fissure caries by filling in deep pits and fissures and reducing this depth so that they are more shallow and less prone to decay. The success in preventing caries is directly related to the complete retention rate of the sealants¹⁻⁴. The use of dental sealant to prevent occlusal pit and fissure caries has obtained considerable success⁵ and The American Association of Community Dental Programs has recommended a public sealant program which is either a school-based or school-linked sealant program⁶.

Community sealant programs, especially school sealant programs, have long been successfully employed in many countries⁷⁻⁹. In Thailand, such programs have been implemented in many areas via mobile dental clinics in order to increase accessibility to sealants. However, the results revealed a questionable preventive effect. The results of a six-month study showed a relative high rate of loss of sealant in 33-65%¹⁰⁻¹². Therefore, mobile dental clinic conditions which implement sealants under limited resources produced low retention rates of sealant, and thus demonstrated a need to assess factors which affect retention of sealant in order to improve the success of sealant program.

Factors related to sealant retention were reported in many clinical studies which included the types of sealant, position of teeth in mouth, skill of the operator, stage of eruption of the tooth, age of the child and

sealant procedure. Most of these studies were done in a well controlled clinical setting¹³. The factors which influence sealant retention in mobile dental clinics might be different. Identification of these factors can help to improve the school dental sealant program in developing countries where accessibility is a major problem.

Songkhla is one of the most urbanized provinces in the southern part of Thailand; it also has a high incidence of caries both in primary dentition and in permanent dentition. In the year 2002, the Dental Division, Ministry of Public Health reported that the average dmft was 7.4 among 5-6 year-old children and the average DMFT was 1.9 among 12 year-old children¹⁴. There are 12 Contracting Units for Primary Care (CUP) which have implemented mobile dental services, including sealants. These school-based services were carried out by the dental health section of the community hospital visiting all schools for 1-2 days in each of their geographic areas of responsibility. The portable field equipment was transported from the CUPs to the schools in a van, which included a dental chair, a portable artificial light, an operating stool, a master unit with slow-speed and high-speed headpieces with a triple syringe, a portable suction and a light polymerization unit. The temporary clinics were usually set up in an available area at the schools.

The objective of the present study was to identify the factors which related to retention of sealant implemented through mobile dental clinic conditions.

Materials and methods

The design was a follow up descriptive study on a school-based sealant programme using opaque light cured sealant. The application of sealant was carried out according to the manufacturer's instructions. After the first sealant application, the follow up for retention of sealant was performed at six months.

The target population of the sealant program was first grade primary school children who had fully erupted and caries-free first permanent molar teeth. Multi-stage random sampling was employed. Six out of 12 CUPs were randomly selected and then one or two schools from 12-40 schools in each CUP were used. Finally, there were 11 schools. All eligible children with parental or guardian consent were included. For all children, the selected teeth were sealed by six dental nurses who had attended a refresher course at the Faculty of Dentistry, Prince of Songkla University. For sample size calculation, the following formula was used¹⁵; $n = \frac{z^2pq}{d^2}$ where, n was a minimum sample size, p was proportion of children with full sealant retention, q was $(1 - p)$ or the proportion of children with loss of sealant retention teeth (both partial and total loss), and d = half size of the 95% confidence interval. The estimate p , obtained from a pilot survey, was 0.65, $d = 0.065$ and Z at 95% confidence = 1.96. Therefore, the minimum sample size was 208. The acquired sample size in this study was 206 children with 347 teeth.

Data on factors related to the sealant application condition included the position of

teeth (upper/lower), the presence of assistant (yes/no), children cooperation (yes/no), and the checking after application of sealant (retention and occlusion/retention only). The children cooperation was classified as "yes" when the child followed the provider's instruction and the procedure done without moisture contamination to the sealed area. Data were collected by the trained dental nurses who applied the sealant in the sealant record form.

Data on oral hygiene, based on the debris index of Simplified Oral Hygiene Index¹⁶, and sealant retention was classified as fully retained and partial or total loss of sealant based on Simonsen's criteria¹⁷. The examination was carried out under the field conditions using a standard oral health examination set which consisted of a dental chair, an operating stool, an assistant stool, an artificial light, a mouth mirror, a standard explorer and a periodontal probe. Prior to the examination, reproducibility of examination results were tested over two examinations, 3 days apart, on 15 children. The Kappa value was 0.75 for retention of sealant.

All data were analysed using the R programme with unit of analysis is tooth. Descriptive statistics were used to report the frequency and percentage of sealant retention and factors. The Chi-square test and logistic regression were used to identify associated factors to the retention of sealant. The outcome variable was retention of sealant, and the related factors included in the logistical analysis were position of teeth (upper/lower), the presence

of an assistant (yes/no), child's cooperation (yes/no), checking after the application of sealant (retention only/retention and occlusion) and oral hygiene status (good/fair/poor).

The study was approved by the Ethical Committee of the Faculty of Dentistry, Prince of Songkla University (Ethical Approval number 1226). After examination, oral health education was provided and caries cases were referred to responsible CUPs for further treatment.

Results

This study included 206 children (89 boys and 117 girls) with 347 sealed first permanent molar teeth from 11 schools in 6 districts in Songkhla. The distribution of sealed teeth were 64 upper left teeth, 68 upper right teeth, 103 lower left teeth and 112 lower right teeth. The retention of sealant at 6 months was 67.7% for full retention and 33.3% for a loss of sealant retention.

The studied factors which were classified by retention status are presented in Table 1. The position of teeth and the checking procedure after sealing were significantly related with retention status while the presence of an assistant, child cooperation and oral hygiene were not related. Lower molar teeth presented higher full retention than upper

molar teeth and teeth which were checked for retention and occlusion after sealing showed a higher number of full retention than teeth which were checked only for retention after sealing.

Table 2 presents results from a linear logistic regression. The results from multivariate analysis showed three significant factors toward sealant retention: the position of teeth, the presence of an assistant and the sealant checking procedure. The result confirms significant factors related to sealant retention as shown in bivariate analysis, except for the presence of an assistant which showed non-significance in bivariate analysis, but in multivariate analysis the result was of marginal significance. The sealant checking procedure presence the highest OR, 2.8 and the OR of the position of teeth and the presence of assistant were approximately 2.1 and 2.3, respectively. The full retention of sealant increased significantly, 2.8 times, when the providers checked for both occlusion and sealant retention against checking for sealant only. The presence of an assistant increased full retention 2.2 times when compared with the teeth which were sealed without an assistant. Whereas the lower sealed molar teeth had full retention 2.1 times greater when compared with upper sealed molar teeth.

Table 1 Number and proportion of molar teeth with sealants by types of sealant retention and factors related to method of application

Factors	Retention Status: Frequency (%)		<i>p-value</i>
	Full retention	Sealant loss	
Position of teeth			
Upper	72 (20.75)	60 (17.29)	<0.001*
Lower	164 (47.26)	51 (14.70)	
Presence of assistant			
No	45 (12.97)	15 (4.32)	0.226
Yes	191 (55.04)	96 (27.67)	
Child cooperation			
No	82 (23.63)	44 (12.68)	0.403
Yes	154 (44.38)	67 (19.31)	
Oral hygiene			
Good	144 (41.50)	62 (17.87)	0.654
Fair	61 (17.58)	32 (9.22)	
Poor	31 (8.93)	17 (4.90)	
Check after sealing			
Retention only	52 (14.98)	8 (2.31)	<0.001*
Retention and occlusion	184 (53.03)	103 (29.68)	

* statistical significance at $\alpha = 0.05$

Table 2 Factors associated with sealant retention results from logistic regression

Variable (reference)	Adjusted OR	95%CI	P-value
Jaw (upper)	2.105	1.287-3.442	0.003*
Assistant (no)	2.289	1.029-5.092	0.042*
Oral hygiene: fair (good)	1.294	0.633-2.647	0.480
Oral hygiene: poor (good)	1.175	0.542-2.548	0.683
Children cooperation (yes)	1.462	0.811-2.638	0.207
Sealant check (retention only)	2.752	1.196-6.328	0.017*

* statistical significance at $\alpha = 0.05$

Discussion

In this study, the context factors relating to short term retention of sealant provided in mobile dental clinics were the position of teeth, the presence of an assistant and the sealant checking procedure after application.

In remote areas where high caries were prevalent and there existed an inadequate presence of oral health personnel, school mobile dental clinics are the best strategy to increase preventive dental services. From the review, low effectiveness was found in many studies in rural Thai areas¹⁰⁻¹². The study of factors relating to sealant application in the mobile dental clinic might be used to improve the program. The factors include the position of teeth, the presence of an assistant, the cooperation of the child, the oral hygiene and the checkup procedure after application were selected because early loss of sealant was related to sealant application procedures which are sensitive to moisture control.

The position of teeth was a significant factor for sealant retention. This result was consistent with previous studies^{12,13}. Application of this factor should be included and increased attention and awareness on the part of the provider when applying the sealant must be insured. The presence of an assistant was also a significant factor. However, a shortage of manpower is a normal occurrence for public health situations. Even though the ideal sealant application with a dental assistant was known by dental professionals, the shortage of resources and the hospital director's policy emphasis on in-service treatment were big problems^{18,19}.

In cases of unfilled sealant, an occlusion check might be unnecessary²⁰. However, in the context of this study, the relationship between the retention and an occlusion check gave a higher full retention rate than a retention check only. Therefore, both checks of sealant retention and occlusion after sealing are suggested.

From a public health perspective, an application of the results might be the negotiation between the public health authority, the provider and the hospital director to identify the optimization of resources used which would provide the best result for this preventive program, such as allocating dental assistants from a hospital-base to a mobile-base dental clinic, and increasing the awareness of the provider when providing the sealant in upper teeth which are susceptible to loss of retention. Another solution might be increasing the awareness of the provider by implementing a quality control program such as a feedback system.

Acknowledgement

This study was supported by Thailand Research Fund and Office of the Higher Education Commission (MRG5280196). The authors are grateful to the directors of the primary schools, the dental nurses and the children for their co-operation.

References

1. Chestnutt IG, Schafer F, Jacobson PM, Stephen KW. The prevalence and effectiveness of fissure sealants in Scottish adolescents. *Br Dent J* 1994; 20: 125-9.
2. Bravo M, Osorio E, Garcia-Anllo I, Llodra JC, Baca P. The influence of dft index on sealant success: a 48-month survival analysis. *J Dent Res* 1996; 75: 768-74.
3. Feigal RJ, Hitt J, Splieth C. Retaining sealant on salivary contaminated enamel. *J Am Dent Assoc* 1993; 124: 88-97.
4. Gwinnett AJ. The bonding of sealants to enamel. *J Am Soc Prev Dent* 1973; 21-9.
5. ADA Council on Access, Prevention and Interprofessional Relations; ADA Council on Scientific Affairs. Dental Sealants. *J Am Dent Assoc* 1997; 128: 485-8.
6. American Association of Community Dental Programs. Seal America: The prevention invention. Cincinnati: AACDP, 1995.
7. Mertz-Fairhurst EJ, Schaster GS, Fairhurst CW. Arresting caries by sealants: result of a clinical study. *J Am Dent Assoc* 1986; 112: 194-7.
8. Chestnutt IG, Schafer F, Jacobson PM, Stephen KW. The prevalence and effectiveness of fissure sealants in Scottish adolescents. *Br Dent J* 1994; 177: 125-9.
9. Cohen LA, Horowitz AM. Community-based sealant programs in the United States. Results of a survey. *J Public Health Dent* 1993; 53: 241-5.
10. Boonyaves K. The efficiency of using dental sealant in 6-9 year old children at different depth of fissure. *Taksin Med J* 1994; 13: 7-15. (in Thai)
11. Prashaya K. The comparative study the retention of a auto polymerizing sealant and a visible light activated sealant. *J Central Hospital* 1993; 30: 95-102. (in Thai)

12. Tianviwat S, Chongsuvivatwong V, Sirisakunweroj B. Loss of sealant retention and subsequent caries development. *Community Dent Health* 2008; 25: 216-20.
13. Ripa LW. Sealant revisited. An update of the effectiveness of pit and fissure sealant. *Caries Res* 1993; 27 (Suppl): 77-82.
14. Dental Division Ministry of Public Health. The 5th Thailand national oral health survey report. Health Department, Bangkok. Thailand. 2002. (in Thai)
15. Daniel WW. *Biostatistics: A foundation for analysis in the health sciences*. 7th ed. New York: John Wiley and sons; 1999.
16. Green JC, Vermillion JR. The simplified oral hygiene index. *J Am Dent Assoc* 1964; 68: 7-13.
17. Simonsen RJ. Retention and effectiveness of dental sealant after 15 years. *J Am Dent Assoc* 1991; 122: 34-42.
18. Tianviwat S, Hoerup N. Evaluation of an outreach oral health service and use of mobile dental equipment in Southern Thailand. *J Public Health*. 2002; 32: 167-77.
19. Tianviwat S, Chongsuvivatwong V, Birch S. Estimating unit costs for dental services delivery in institutional and community-based settings in Southern Thailand. *APIPH* 2009; 21: 84-93.
20. *Primary preventive dentistry*. 5th ed. Harris NO, Garcia-Godoy F. Stamford, CT: Appleton and Lange, 1999.

ปัจจัยที่มีผลต่อการติดอยู่ระยะสั้นของสารเคลือบหลุมและร่องฟัน ในฟันกรามแท้ที่ทำในหน่วยทันตกรรมเคลื่อนที่ จังหวัดสงขลา ภาคใต้ของประเทศไทย

สุกัญญา เขียววิวัฒน์*** จันทร์พิมพ์ หินท้าว*** วีระศักดิ์ จงสุวิวัฒน์วงศ์***
ทรงชัย ฐิตโสมกุล* บานเย็น ศิริสกุลเวโรจน์****

บทคัดย่อ

การศึกษานี้มีวัตถุประสงค์เพื่อระบุปัจจัยที่มีผลต่อการติดอยู่ระยะเริ่มแรกของสารเคลือบหลุมร่องฟันซึ่งให้บริการแก่นักเรียนในหน่วยทันตกรรมเคลื่อนที่ โดยการสำรวจฟันที่ได้รับการเคลือบหลุมร่องฟันเป็นระยะเวลา 6 เดือน จำนวนฟันที่ได้รับการตรวจ คือ 347 ซี่ จากเด็กนักเรียนชั้นประถมศึกษาปีที่ 1 จำนวน 206 คน การติดอยู่ของสารเคลือบหลุมร่องฟันแบ่งเป็น 2 ระดับ คือติดอยู่อย่างสมบูรณ์และมีการหลุดไปของสารเคลือบหลุมร่องฟัน ฟันที่ได้รับการเคลือบหลุมร่องฟันมีการติดอยู่อย่างสมบูรณ์ ร้อยละ 67.7 และมีการหลุดไปของสารเคลือบหลุมร่องฟัน ร้อยละ 33.3 ปัจจัยที่มีผลต่อการติดอยู่ในระยะเริ่มแรกของสารเคลือบหลุมร่องฟันอย่างมีนัยสำคัญ คือ ตำแหน่งของฟัน ($OR = 2.1$), การมีผู้ช่วยทันตแพทย์ ($OR = 2.29$) และขั้นตอนการตรวจหลังการเคลือบหลุมร่องฟัน ($OR = 2.75$) การปรับปรุงการติดอยู่ของสารเคลือบหลุมและร่องฟัน อาจทำได้โดยการเกลี่ยอัตรากำลังเพื่อให้มีผู้ช่วยทันตแพทย์ และการฝึกอบรมการเคลือบหลุมและร่องฟันเพื่อให้เห็นความสำคัญของขั้นตอนการตรวจหลังการเคลือบหลุมและร่องฟัน

คำสำคัญ: การติดอยู่ระยะสั้นของสารเคลือบหลุมร่องฟัน ปัจจัย หน่วยทันตกรรมเคลื่อนที่

วารสารสาธารณสุขศาสตร์ 2554; 41(1): 50-58.

* ภาควิชาทันตกรรมป้องกัน คณะทันตแพทยศาสตร์ มหาวิทยาลัยสงขลานครินทร์

** สถานวิจัยโรคที่พบบ่อยในช่องปากและวิทยาการระบาด คณะทันตแพทยศาสตร์ มหาวิทยาลัยสงขลานครินทร์

*** หน่วยระบาดวิทยา คณะแพทยศาสตร์ มหาวิทยาลัยสงขลานครินทร์

**** สำนักงานสาธารณสุขจังหวัดสงขลา อ.เมือง จ.สงขลา