Comparative Assessment of The Retention Characteristics of Glass Ionomer and Resin Based Fissure Sealants: A One-Year Clinical Trial

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ABSTRACT

Objective: To comparatively assess the retention of glass ionomer and resin-based fissure sealants on the occlusal surface of molars in children.

Methods: A comparative, prospective, assessor-blinded randomized clinical trial. A split-mouth design wherein two fissure sealants, a light cure Bis-GMA resin-based sealant and a glass-ionomer sealant were placed on 50 matched pairs of permanent first molar teeth. The primary outcome was for sealant to either be completely retained, CR; Partially Retained, PR or completely lost, CL and the secondary outcome was for the prevention of pit and fissure caries. Data was analyzed using SPSS version 21.0 and the level of significance was $p<0.05$

Results: Fifty children aged 6 to 10- years took part in the study. At 12 months review, 32(69.6%) of resin sealed tooth surface had CR, 13(28.3%) were PR and 1(2.2%) was completely lost. The glass ionomer sealed tooth had 27(58.7%) CR, 17(37.0%) PR and 2(4.3%) as CL. Partial components of the resin sealants, mesio-occlusal (MO)/Central occlusal (CO) and Central occlusal (CO)/disto-occlusal (DO) had 30.8% each while MO and CO had 15.4% each; glass ionomer sealant had 47.1% of MO/CO and 23.5% of CO/DO and CO alone was 17.6%. There was no statistically significant difference between both groups. P=0.84

Conclusion: The retention of resin sealant was superior to that of the glass ionomer sealant. Moreso, the central occlusal portion (CO) was the most recurring anatomical site for the partially retained sealant. Both sealant materials were effective in prevention of pit-and-fissure caries

Keywords: Retention, Glass ionomer, Resin, Fissure Sealant

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INTRODUCTION

Dental caries is a preventable disease of the calcified tissues of the teeth. It has a multifactorial aetiology which is related to the interactions over time between tooth substance, oral micro flora and dietary factors.[1] Acid produced is a result of the interplay between these factors and may lead to the demineralization of the tooth and subsequent breakdown. The sequelae of dental caries include pain, problems with mastication, aesthetics and function; which may restrict activities at school, work and at home, resulting in loss of school and work hours globally.[2]

Although dental caries is prevalent in all age groups, socioeconomic status and races, the incidence of dental caries in the primary and permanent

dentitions of Nigerian children is well above epidemic threshold.[3] It appears to be more endemic on the pits and fissures of the occlusal surfaces of erupting and young permanent posterior teeth.[4] The enamel, during this period is not fully matured and it may be difficult for the child to clean the erupting tooth surfaces, especially the pits and fissures. In some cases, the width of pit and fissure is less than 0.2mm in diameter and more difficult to clean because a single tooth brush bristle will be too large.[5] This probably explains the high susceptibility of pits and fissures to caries as a result of improper mechanical cleaning as well as stagnation of food and plaque. Another probable factor responsible for the high incidence of occlusal caries is the increase in surface tension of saliva resulting in reduced accessibility into pits and fissures.[6] As a result, the cleansing, buffering action and fluoride uptake is less effective in pits and fissures when compared to smooth surface.[6] The traditional methods which include mechanical cleaning, remineralisation with fluoride and chemical methods have not been very successful in high risk caries patients including those with deep and retentive pit and fissure morphology.[7]

Fluorides have been found to be extremely effective in preventing caries on the smooth surfaces of teeth, but are less effective on the occlusal surfaces.[8] Sealants appear to be the most effective clinical technique to prevent occlusal caries and accounts for a 71% reduction in occlusal caries after a single application.[9] This is achieved because sealants act as a physical barrier that prevents oral bacteria and dietary carbohydrates from creating the acidic conditions that result in caries. Numerous studies have shown sealants to be efficient and cost effective in the reduction of occlusal caries even in recently erupted teeth.[10]

Literature is scarce on the evaluation of fissure sealant use among Nigerian or West African children despite the reported incidence of dental caries in Nigerian children,[3] and the mandibular first permanent molar accounted as the most susceptible tooth to caries.[4] Resin based materials have since been in use as sealants but the introduction of glass ionomer as a sealant later evolved. The advantages of glass ionomer sealant include direct adherence to tooth substance, the release of fluoride over time and a less technique sensitive procedure, unlike the resin-based sealants.[11]

In a study by Ninawe et al.[6] a 1-year clinical evaluation of fissure sealants on first permanent molars demonstrated a complete retention rate of 80% and 56% for resin and glass ionomer (GI) sealant respectively. The Helioseal-F sealant was better than the Glass ionomer Fuji VII sealant with respect to retention. In another study by Prashanth et al,[12] the 12th month evaluation showed extensive loss of sealant in 44% of the glass ionomer sealant, whereas none of the teeth scored extensive loss for light cure resin-based sealant. Resin-based sealant had better adaptation (88%) when compared to glass-ionomer sealant (28%). Authors concluded that the retention, marginal integrity and surface structure of glass ionomer are lower than that of resin-based sealant.

This study aimed to assess and compare the retention characteristics and caries prevention of glass ionomer and resin-based fissure sealants on children presenting at the University of Benin Teaching Hospital, Benin City over a 12-month period.

MATERIALS AND METHODS

Study design/setting: This study was a comparative, prospective, assessor-blinded randomised clinical trial conducted at the Paediatric Dentistry Unit, Department of Preventive Dentistry, University of Benin Teaching Hospital, Benin City, Edo State. A split-mouth design was used in which two fissure sealants; Clinpro®, a light cure Bis-GMA resin-based sealant and GC Fuji Triage®, a glass-ionomer sealant was randomly placed in fifty matched contralateral pairs of permanent first molar teeth.

Study Population: Children attending the Paediatric Dentistry Unit, Department of Preventive Dentistry, University of Benin Teaching Hospital, Benin City, Edo State.

Inclusion criteria: Children in the high caries risk group, aged 6 to 10 years and with at least 2 sound unsealed/untreated lower first permanent molars (ICDAS II code 0, 1, 2)

Exclusion criteria: Highly uncooperative children, those with obvious caries (ICDAS II code >2) or with hypoplastic or developmental anomalies on the lower first permanent molars. Children whose medical history precludes inclusion (i.e. those with a history of hospitalization for asthma, or severe allergies), those with long-term regimen of medication that could affect the salivary flow and diet modification. Also, those that were in another clinical trial involving an investigational medicinal product or with known sensitivity to any of the product ingredients

Sample size/Sampling: The minimum sample size calculated using the formula for comparative study with related group with the use of a P value from similar work by Prashanth et al,[12] plus 10% attrition

was 50 and a systematic random sampling was used to select all the participants eligible for the study

Tools for Data Collection: A self-administered questionnaire, Mouth mirror, CPI probe, gloves, facemask, tweezers, cotton wool pellets and Data collection sheet.

Trial Intervention: Eligible tooth was randomised to receive either resin or glass ionomer sealant and remained on the intervention to which they have been randomised throughout the duration of the study.

Clinical Intervention: This trial intervention was actually for twelve (12) months but lasted for fifteen (15) months because all the study participants were not recruited at once but over a 3-months duration before the 12 months follow up period. The study participants were seated on the dental chair in the clinic, the researcher having randomly selected and coded which side of the jaw will receive either of the materials; solely placed the two sealant materials in one visit. The coding slip for each child was safely kept out of reach to all concerned during this study but recourse was made to it at the end of the study.

Steps in Resin sealant placement: Occlusal surface of tooth was cleaned using brush and pumice/water for gross debris removal, tooth was isolated with a rubber dam. Etchant was applied for 20 seconds, rinsed with water and dried using oil free air according to manufacturer's instruction. The tooth surface was checked for white frosty appearance to confirm etching and the resin-based sealant, Clinpro(R) was applied directly on the etch surface (manufacturer's instruction) and with the use of a carver tip, then light-cured for 20 seconds. Once cured, the sealant was examined with an explorer to make certain that no void was seen and that all pits and fissures were sealed. Rubber dam was removed and high point was checked with an articulating paper and adjusted where necessary with finishing bur.

Steps in Glass Ionomer Sealant Placement: Tooth was cleaned using brush and pumice/water for debris removal, tooth was isolated with a rubber dam and dried with a cotton pellet. Cavity conditioner was applied with a micro brush for 10 seconds, dried by blotting with a cotton pellet. Material was mixed according to manufacturer's instruction and placed on the pits and fissure, taking care to ensure that all the pits and fissures were covered and that no air bubble was introduced. A protective coat (petroleum jelly) against moisture was applied with a finger pressure immediately after setting, rubber dam removed. Sealed surface was checked for high point and adjusted where necessary.

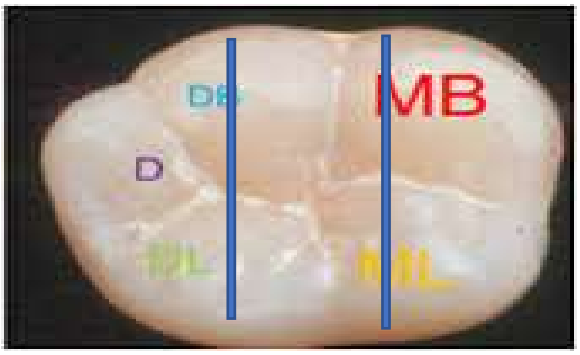
At the end of each procedure, the participants were discharged and instructed not to eat or drink anything for 30 minutes. For Children who were enrolled into the study but have registered with a General Dental Practitioner (GDP), the GDP was formally informed of the child's participation in the study and requested not to apply either resin or glass ionomer cement or any other treatment on the two first permanent mandibular molars for the duration of the trial.

Clinical Evaluation and Outcome: The calibrated assessors were blinded to the tooth treatment allocations. Clinical evaluation of the sealant was carried out at baseline, 3-, 6-, and 12-months recall appointments using the modified Pardi's criteria[13] and with the authors sub- classification of the partial retention (PR) [Figure I].

Authors sub- classification of the partial retention (PR) into 3 occlusal sites.

MO (mesio-occlusal) CO (central-occlusal) and DO (disto-occlusal)

See below, two imaginary lines used to divide the occlusal surface into three equal parts (Figure 1).



Disto-occlusal Central-occlusal Mesio-occlusal

Figure 1: Division of Occlusal surface of molar

Assessment Criteria for Evaluation of Clinical Performance of Fissure Sealant

Criteria for Sealant Retention Evaluation		Criteria for Sealant Caries Evaluation	
Code	Criteria	Code	Criteria
CR	Complete Retention	(–)	No visible Caries
PR	Partial Retention	(+)	Caries Present
CL	Complete Loss		

Complete Retention (CR): The total retained sealant category did not address sealant wear. If some peripheral fissures were uncovered following sealant wear, but no ledges were present, the sealant was classified as total retained (ledges indicate bulk loss of some adjacent sealant).

Partial Retention (PR): Those where, following either wear or material loss, part of a previously sealed pit/fissure was exposed.

Complete Loss (CL): Where no trace of sealant was detectable

The researcher took clinical photographs and also evaluated the participants at baseline and at recall appointments. A consensus reading between assessors and researcher was used when any of the parameters was in question. Discussions among all team members were held regularly to standardize recordings. At the 12-month recall appointments, teeth with partial and completely loss sealants were re-sealed

Statistical Analysis: Data analysis was conducted with the Statistical Package for Social Sciences (SPSS version 21.0 for Windows, 2012. SPSS Inc, Chicago, IL, USA). The statistical tools used for analysis were the paired t-test and the Fisher exact test. A P value of < 0.05 indicated statistical significance

Ethical consideration: The protocol for this study was reviewed and approval granted by the Ethics and Research Committee of the University of Benin Teaching Hospital, Benin City, Nigeria. Written informed consent was obtained from participants and guardian of minors using the Nigerian National Health Research Ethics Code model.

RESULTS

A total of fifty (50) children, age range 6 to 10 years with a mean of 8.14 + 1.3 years participated in the trial intervention. The sample comprised 28 males (56%) and 22 females (44%). Figure 2 shows the frequency distribution of the study participants. The distribution of study participants and type of sealant used according to age and gender is depicted in table 1. At the commencement of the study, sealant was applied to 50 children of whom all were available at the 3rd month for evaluation, 49 children were available at the 6th month and 46 children at 12th month evaluation for sealants retention and, presence or absence of enamel demineralization or caries.

Retention characteristics

For Resin Based Sealant: At 3 months evaluation, 38 (76%) of the sealed tooth surface had complete retention (CR), 12(24%) had partial retention and none had complete loss (CL). At 6 months evaluation, 34(69.4%) was CR and 15(30.6%) PR and none had complete loss (CL). At 12 months 32(69.6%) had CR, 13(28.3%) PR and 1(2.1%) was completely lost. Glass Ionomer Sealant @ 3 months review evaluation, 39 (78.0%) of the sealed tooth surface had complete retention (CR), 11 (22.0%) had partial retention and none had complete loss (CL). While at 6 months evaluation, 33 (67.3%) was CR, 15(30.6%) PR and 1 (2.0%) was CL. At 12 months 27 (58.7%) had CR, 17 (37.0%) PR and 2 (4.3%) was completely (Table 2 A). [Figure 3 (CR Resin) and Figure 4 (CR GIC)]

For the sub-Classified Partial Retention for resin sealant: At 3 months evaluation, 5(50%) of PR was located at central occlusal and disto-occlusal sites (CO/DO), 4(33.3%) at mesio-occlusal and central occlusal (MO/CO), 2(16.7%) at (MO) alone. At 6 months, 7(46.7%) was located at CO/DO, 5 (33.3%) at MO/CO, 2 (13.3%) at MO alone, 1 (6.7%) at CO alone. At 12 months, 4 (30.8%) were located equally at MO/CO and CO/DO, similarly, 2 (15.4) at MO and CO alone. The sub-Classified Partial Retention for glass ionomer sealant @ 3 months evaluation, 5 (45.5%) of PR was located at MO/CO, 4 (36.4%) at CO/DO, 2 (18.1%) at (CO) alone. At 6 months, 5 (33.3%) was located at MO/CO, 4 (26.7%) at CO alone, 3 (20.0%) at CO/DO, 1 (6.7%) at MO/DO. And at 12 months, 8 (47.1%) was located at MO/CO, 4 (23.5%) at CO/DO, 3 (17.6%) located equally at CO and MO alone. (Table 2 B) [Figure 5 (PR Resin) and Figure 6) (PR GIC)]

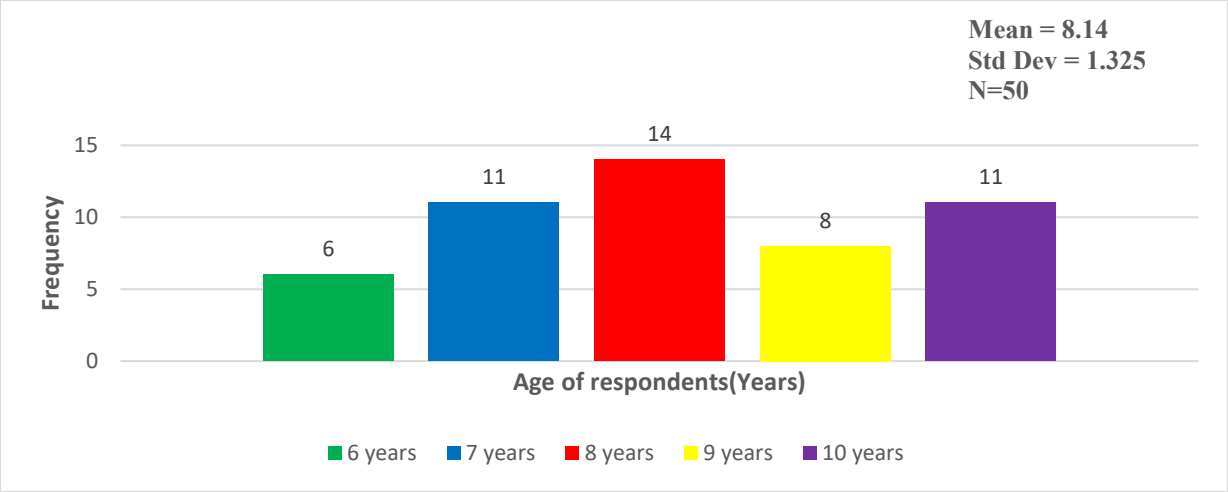


Figure 2: Frequency distribution of age of respondents

Table I: Distribution of study participants and type of sealant used according to age and gender

Gender	Age (years)	Type of sealant	
		Glass ionomer sealant n (%)	Resin based sealant n (%)
Male	6	3(10.7)	3(10.7)
	7	3(10.7)	3(10.7)
	8	9(32.1)	9(32.1)
	9	5(17.9)	5(17.9)
	10	8(28.6)	8(28.6)
Total		28(100.0)	28(100.0)
Female	6	3(13.6)	3(13.6)
	7	8(36.4)	8(36.4)
	8	5(22.8)	5(22.8)
	9	3(13.6)	3(13.6)
	10	3(13.6)	3(13.6)
Total		22(100.0)	22(100.0)

Table 2A : Retention characteristics of resin- based and glass ionomer sealant

Evaluation period Months	Complete Retention (CR)		Partial retention (PR)		Complete loss (CL)		Grand Total
	Resin no (%)	GIC no (%)	Resin no (%)	GIC no (%)	Resin no (%)	GIC no (%)	
3	38 (76.0)	39 (78.0)	12 (24.0)	11 (22.0))	0 (0.0)	0 (0.0)	50
6	34 (69.4)	33 67.4)	15 (30.6)	15 (30.6)	0 (0.0)	1 (2.0)	49
12	32 (69.6)	27 (8.7)	13 (28.3)	17 (37.0)	1 (2.1)	2 (4.3)	46

Table 2B : Sub-classified partial retention for resin- based and glass ionomer sealant

Partial retention sub classification	Partial Retention At 3 months		Partial Retention At 6 months		Partial Retention At 12 months	
	Resin no (%)	GIC no (%)	Resin no (%)	GIC no (%)	Resin no (%)	GIC no (%)
MO/CO	4(33.3)	5(45.5)	5(33.3)	5(33.3)	4(30.8)	8(44.4)
CO/DO	6(50.0)	4(36.4)	7(46.7)	3(20.0)	4(30.8)	4(22.2)
MO/DO	0(0.0)	0(0.0)	0(0.0)	1(6.7)	0(0.0)	0(0.0)
MO	21(16.7)	0(0.0)	2(13.3)	2(13.3)	2(15.4)	3(16.7)
CO	0(0.0)	2(18.1)	1(6.7)	4(26.7)	2(15.4)	3(16.7)
DO	0(0.0)	0(0.0)	0(0.0)	0(0.0)	1(7.6)	0(0.0)
Total	12(100.0)	11(100.0)	15(100.0)	15(100.0)	13(100.0)	18(100.0)

Comparison of the retention of resin based and glass ionomer-based sealants.

Table 3 shows the comparison of the two sealant retention characteristics at 3,6 and 12- months evaluation period. There was no statistically significant difference between both groups with p values of 0.813, 0.956 and 0.484 respectively.

Comparison of Sub-Classified Partial Retention of resin and glass ionomer sealant

Table 4 demonstrates partial retention at 3, 6 and 12 months respectively. There were no statistically significant findings at 3, 6 and 12 months with p values of 0.288, 0.366 and 0.843 respectively.

Occurrence of occlusal caries on the sealed teeth

At 12 months evaluation, no caries or enamel demineralization was observed on visual and tactile examination of resin based sealed tooth surface. Similarly, no caries or enamel demineralization was observed on visual and tactile examination of glass ionomer based sealed tooth surfaces

DISCUSSION

In this study, fifty (50) children aged 6 to 10-years were considered owing to caries high risk attack on the pit and fissure of teeth during the first few years after their eruption,[14] and fully erupted permanent mandibular first molars were selected to ensure the standardization of the procedure. Moreso, these teeth had a higher susceptibility to caries among the population.[4] This may be due to their deep occlusal surfaces, compromised access to cleaning and removing debris as a result of the inability of the tooth brush bristle to permeate the depth of the occlusal pits and fissures.[5]

In this era of preventive dentistry, arrays of dental materials available are oriented towards primary prevention of dental diseases but the complex morphology of the occlusal pit and fissure jeopardizes mechanical plaque removal and proven preventive measures thus demand for specific prevention of occlusal caries.[15] Although the occlusal surfaces constitute only 12% of the tooth surface, they are about eight times as vulnerable as smooth surfaces to caries,[16] and as such, the prevention of occlusal caries assumes paramount importance in the preservation of tooth structure.

The use of dental sealants has proved to be highly effective in the prevention of pit and fissure caries. This caries-preventive property of sealants is based on the establishment of a seal which prevents nutrients from getting to the fissure microflora, which is maintained as long as it remains completely intact and bonded in place.[17] They act as a physical barrier thereby preventing the development of acidic conditions which result in dental caries

The most appropriate period for the placement of occlusal sealants is soon after eruption of the permanent molars, because recently erupted teeth are less mineralized than those exposed to oral environment for several years. Such teeth have also not undergone the benefits of post eruptive maturation of the enamel and may thus be more prone to acid attack. In such conditions, early placement of sealants may prevent the development of carious lesions on occlusal pits and fissures.[18] This further explains why the age group, 6 to 10 years selected in this study was appropriate.

Evaluation period	Clinical observation	Remark
AT BASELINE PRE-OPT		
AT BASELINE POST OPT		TOTAL RETENTION
AT 3 MONTHS REVIEW		TOTAL RETENTION
AT 6 MONTHS REVIEW		TOTAL RETENTION
AT 1 YEAR REVIEW		TOTAL RETENTION

Figure 3: Resin sealant complete retention review appointments

Evaluation period	Clinical observation	Remark
AT BASELINE PRE-OPT		
AT BASELINE POST OPT		TOTAL RETENTION
AT 3 MONTHS REVIEW		TOTAL RETENTION
AT 6 MONTHS REVIEW		TOTAL RETENTION
AT 1 YEAR REVIEW		TOTAL RETENTION

Figure 4: Glass ionomer sealant complete retention review appointments

Evaluation period	Clinical observation	Remark
AT BASELINE PRE-OPT		
AT BASELINE POST OPT		TOTAL RETENTION
AT 3 MONTHS REVIEW		PARTIAL RETENTION
AT 6 MONTHS REVIEW		PARTIAL RETENTION
AT 1 YEAR REVIEW		PARTIAL RETENTION

Figure 5: Resin sealant partial retention at review appointments

Evaluation period	Clinical observation	Remark
AT BASELINE PRE-OPT		
AT BASELINE POST OPT		COMPLETE RETENTION
AT 3 MONTHS REVIEW		PARTIAL RETENTION
AT 6 MONTHS REVIEW		PARTIAL RETENTION
AT 1 YEAR REVIEW		PARTIAL RETENTION

Figure 6: Glass ionomer sealant partial retention review appointments

Table 3: Comparison of resin and glass ionomer sealants retention @ 3,6 and 12-months

Retention criteria	@ 3- months		@ 6- months		@ 12- months	
	Resin	GIC	Resin	GIC	Resin	GIC
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Complete retention	38(76.0)	39(78.0)	34(69.4)	33(67.3)	32(69.6)	27(58.7)
Partial retention	12(24.0)	11(22.0)	15(30.6)	15(30.7)	13(28.3)	17(37.0)
Complete loss	0(0.0)	0(0.0)	0(0.0)	1(2.0)	1(2.2)	2(4.3)
Total	**50(100)**	**50(100)**	**49(100)**	**49(100)**	**46(100)**	**46(100)**
P value	0.813		0.956		0.484	

Table 4: Comparison of sub-classified partial retention for resin and glass ionomer sealants at @ 3,6 and 12-months

Sub classified Partial retention	@ 3- months		@ 6- months		@ 12- months	
	Resin	GIC	Resin	GIC	Resin	GIC
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
MO/CO	4(33.3)	5(45.5)	5(33.3)	5(33.3)	4(30.8)	8(47.1)
CO/DO	6(50.0)	436.4)	7(46.7)	3(20.0)	4(30.8)	4(23.5)
MO/DO	0(0.0)	0(0.0)	0(0.0)	1(6.7)	0(0.0)	0(0.0)
MO	2(16.7)	0(0.0)	2(13.3)	2(3.3)	2(15.4)	2(11.8)
CO	0(0.0)	2(18.1)	1(6.7)	4(26.7)	2(15.4)	3(17.6)
DO	0(0.0)	0(0.0)	0(0.0)	0(0.0)	1(7.6)	0(0.0)
Total	12(100.0)	11(100.0)	15(100.0)	15(100.0)	13(100.0)	17(100.0)
P value	0.288		0.366		0.843	

Glass ionomer and resin sealants are commonly available sealants in the market. However, resin sealant placement is technique-sensitive and is influenced by factors, such as patient cooperation, operator variability and contamination of the operating field.[19] Condò et al.[20] in their systemic review reported that, the application technique and isolation of the operative field were critical in the determination of the clinical success of resin-based sealant retention rates. Isolation using rubber dam or cotton rolls is equally effective in improving retention rates because they reduce contamination of the site from saliva and moisture.[9] In this study, rubber dam, a technique that has been referred to as absolute isolation was used, although another study stated that this is not necessary for the application of sealants as long as extreme care is taken to avoid salivary contamination of the etched surface.[21]

Several methods of cleaning the fissures have been advocated over the years, but it appears that all are relatively equal in the results they obtain. Keeping this in view, in this study; the occlusal surface of each sealed tooth was cleaned with a pumice/water and a rotary brush. Etching is required to roughen the tooth surface to produce enamel tags so that the sealant can penetrate deeply into the enamel and form an effective mechanical bond, thus retaining the sealant. Glass ionomer sealants offer similar caries-preventive effects as resin-based sealants, with easier manipulation and without the use of acid etching technique.

A 12-month follow-up of fissure sealants in the present study was relevant since the maximum loss of sealants usually occurs within the first 12 months after placement. Reported evidence of sealants requiring replacement in a study average between 5 and 10% per year.[22] In this present study, the percentage of sealant requiring replacement (CL) was 2% for resin and 4.3% for glass ionomer at one-year review. Similarly, the percentage of those that requires repair, (PR) was 28.3% and 37% for resin and glass ionomer sealant respectively. Clinical evidence suggests that sealant loss (retention failure) occurs in two phases: there is an initial loss due to a faulty technique (such as moisture contamination), followed by a second loss associated with material wear under the forces of mastication or occlusion.[23] The results from this study revealed that there is a slight difference between the retention rate of resin based and glass ionomer-based sealants. The spilt-mouth design utilized allows for a comparison between the two groups that is less biased. Also, randomization of the quadrants between the types of sealants used allows equal distribution of the

variables between the groups. There was no statistically significant difference observed in retention between the two sealant materials at any of the evaluation periods.

During a one-year follow-up period, the time intervals of three months and even at six months, glass ionomer and resin-based sealants achieved nearly similar retention results. The largest loss of sealant was found at the six-month evaluation, which is in agreement with reports by Subramaniam et al.[24] In this study, the 3-month evaluation showed 76.0% of complete retention (CR) for resin sealant, 78.0% CR for Glass ionomer sealant. The 6-month evaluation showed 69.4% CR for resin sealant and 67.3% CR for Glass ionomer sealant and the 12-month evaluation showed 69.6% CR for resin and 58.7% for glass ionomer sealant. This shows there is reasonable concordance with the high retention of RB sealants in the present study and other research.[25,26]

However, the retention rates in the present study were higher, which may be due to the improvements in the quality of the materials with time. Moreover, one factor may have contributed to this difference. This study had a robust design, in which the researcher applied pink coloured resin-based sealants and opaque coloured GIC sealants. Since adding color to the sealant improves the perception of the dentist, it is possible that this difference of methods also contributed to the divergent results of studies

Some factors would have contributed to the sealant loss in this study. Since resin-based sealants are technique-sensitive and are influenced by patient cooperation, operator variability and contamination of the operating field.[19] Loss in this study may be less likely due to technical flaws and majorly due to occlusal and masticatory force. Moreso, glass ionomer sealant low wear resistance to occlusal forces also contributed to its disintegration, by thinning and eventual erosion of material. In addition, the cement may have been exposed to saliva before it was completely set, which would predispose to surface degradation and early loss of sealant.

At 12 months evaluation, almost 70% of light cured resin sealant had complete retention. This finding is in agreement with other studies,[12,27] while studies by Karlzen-Reuterving and Van Dijken[28] reported a greater retention of 97.2% which is much higher than the results from this study. The retention rates of resin sealant after one year in the present study are comparable. This could be as a result of a comparable efficiency in the clinical technique. Similarly, at 12 months evaluation, almost 60% of glass ionomer-based sealant had complete retention, which is in agreement with study.[6] However, the retention rate obtained in this present study with glass ionomer when compared with resin-based sealant is in agreement with a previous study.[6] The superior retention characteristics of resin over glass ionomer sealant in this study is in agreement with other one-year evaluation studies.[6,12,24] Although, not statistically significant; further analysis of the partial retention component of resin and glass ionomer sealant revealed that CO/DO is the commonly retained site for resin sealant while MO/CO is the mostly retained site for glass ionomer sealant. This makes the central occlusal portion (CO), the most recurring anatomical site of partially retained sealant. It may not be unconnected with the topography of the occlusal surface of the tooth wherein, the CO portion houses the central fossa which has the largest surface area when compared with the mesial and distal fossa. It is also a concave area bounded by mesial and distal slopes and a confluence area with four grooves i.e. two central, one buccal and lingual each giving a zigzag appearance[29] and this could account for the varying retention characteristics of the two materials.

As far as the development of caries is concerned, it is important to state that fissure sealants do not eliminate dental caries, but rather predictably reduce the onset.[20] In a review, it was found that the risk of complete loss of sealant was associated with the risk of caries occurrence for resin-based sealants, but not for glass ionomer-based sealants.[17] Thus, although the performed meta-analysis has pointed out a slightly lower retention rate for glass ionomer cement sealants,[30] the retention of at least part of this material has a protective effect, unlike what occurs with resin-based sealants. This is because despite the material loss, the effect of fluoride as well as the remaining particles of the GIC sealant at the deepest part of the occlusal fissures confers caries protective effect.[31] These findings underscore the need to evaluate sealant retention with regard to partial retention, as performed in the present study.

In this study, all the fissure sealants were placed on caries-free teeth and were evaluated over a 1-year period. No dental caries was however recorded during the 12 months evaluation for both experimental groups. The finding from the present study is in agreement with Pereira et al who reported no dental caries at 12-months evaluation period.[19] Both sealant materials were effective in prevention

of pit-and-fissure caries over a 1-years period as there was no sign of caries on the occlusal surfaces where the sealants had been completely or partially lost

CONCLUSION

The retention of resin sealant, Clinpro® was superior to that of the glass ionomer sealant, GC Fuji triage. ® Moreso, the central occlusal portion (CO) of the molar tooth was the most recurring anatomical site for the partially retained sealant. Both sealant materials were effective in prevention of pit-and-fissure caries as no sign of caries was observed on the occlusal surfaces where the sealants had been completely or partially lost.

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Nil.

Conflict of Interest

None declared

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