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# Clinical Follow-up of a Fissure Sealant Placed Using Different Adhesive Protocols: A 24-month Split-mouth Study

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### Clinical Relevance

The use of self-etch adhesive alone prior to fissure sealant application might not be a good choice for a predictable clinical performance.

## SUMMARY

**The purpose of this study was to evaluate the retention rates of a fissure sealant placed using different adhesive protocols over 24 months. Twenty-four subjects with no restorations or caries received fissure sealants (Clinpro Sealant, 3M ESPE) placed using different adhesive protocols. A total of 292 sealants were placed as follows by two previously calibrated dentists using a table of random numbers (n=73): group I, acid-etch/without adhesive; group II, with a self-etch adhesive (Adper Easy Bond, 3M ESPE); group III, with an etch-and-rinse adhesive (Adper Single Bond 2, 3M ESPE); group IV, with acid + self-etch adhesive (Adper Easy Bond). Two other calibrated examiners independently evaluated the sealants at baseline and at six-, 12-, 18-, and 24-month recalls. Each sealant was evaluated in terms of caries formation being present or absent and retention using the following criteria: 1 = total retention, 2 = partial loss, and 3 = total loss. Pearson's $\chi^2$ test was used to evaluate differences in retention rates among the sealants for each evaluation period. At the end of 24 months, total retention rates were 57.5%, 27.4%, 84.9%, and 76.7% in the acid-etch, self-etch adhesive, etch-and-rinse adhesive, and acid + self-etch adhesive groups, respectively. Although there were no statistically significant differences between the retention rates among the adhesive protocols at 6 months ($p$=0.684), significant differences were observed at the 12-, 18-, and 24-month evalua-**

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DOI: 10.2341/17-055-C

**tions. At 24 months, the lowest retention rates were observed in the self-etch group ($p<0.05$). No caries development was observed in any of the groups. The retention rate of sealants placed using self-etch adhesive was poor compared with the other groups.**

## INTRODUCTION

Dental caries is a multifactorial disease that affects most populations throughout the world, and it is still the primary cause of oral pain and tooth loss. The occlusal surfaces of posterior teeth are the most vulnerable sites for dental caries due to their anatomy.[1] Dental sealants were introduced in the 1960s to protect pits and fissures on the occlusal tooth surfaces from dental caries.[2] Pit-and-fissure sealant therapy is a procedure that places a liquid material into the pits and fissures of teeth that are susceptible to caries, mainly the occlusal tooth surfaces.[3] The hardened material forms a strong micromechanical bond to etched tooth enamel and acts as a barrier that prevents the accumulation of caries-producing bacteria and the onset of dental caries.[4] Resin-based fissure sealants are the best choice and the most common preventive applications against caries progression in everyday clinical practice.[5,6] It has been reported that loss of sealant is directly related to subsequent caries development.[7] If the sealant is fully retained, then recurrent caries or progression of caries beneath the restoration is negligible.[2]

It is generally accepted that the efficacy of sealants in caries prevention depends on long-term retention of sealant.[8] Traditionally, fissure sealants are placed after cleansing and phosphoric acid etching of the fissure enamel. Pit-and-fissure sealants require enamel acid etching to allow material infiltration into porosities, which yields mechanical strength and clinical retention.[9,10] Phosphoric acid etching at a 30%-40% concentration is still the most common strategy prior to fissure sealant placement to obtain maximum retention because it removes contaminants, creates an irregular microporous enamel surface that is infiltrated by the resin-based fissure sealant material, and increases the surface free energy of enamel.[11,12]

To enhance the longevity of pit-and-fissure sealants, several materials and techniques have been developed, including the use of adhesive systems under sealants. However, there is still debate regarding this use. Although some studies have shown improved results when an intermediate bonding layer was applied between enamel and sealant, which increases retention,[13-15] some have reported no difference in terms of retention and caries formation.[14,16,17]

Modern adhesives combine conventional conditioning, priming, and bonding steps (etch-and-rinse adhesives) together into one or two bottles (self-etch adhesives) to simplify adhesive protocols. However, it is still unclear whether modern self-etch adhesives have bonding capacity equal to that of the conventional etch-and-rinse systems.[18] Therefore, clinical trials are necessary to evaluate the long-term adhesive performance of self-etch adhesives compared with the conventional etch-and-rinse ones.

Researchers are still attempting to ascertain whether techniques for use in modifying the application of sealant therapy can improve the retention and effectiveness of sealants. Furthermore, there is still no consensus in the literature on which type of adhesive to use, probably due to the lack of comparative data regarding the use of self-etch and etch-and-rinse adhesives before resin-based fissure sealant application. Although many studies have evaluated the retention rates of fissure sealants, only a limited number of long-term clinical studies have been performed evaluating the new materials and comparing the conventional and current adhesive systems.[15,19-21]

Therefore, the primary objective in this clinical study was to evaluate the sealant retention rate and caries-prevention efficiency with or without an adhesive system. The second objective was to compare fissure sealant retention rate applied with etch-and-rinse adhesive versus a self-etching adhesive system over a 24-month period. The null hypotheses were as follows: 1) the sealants placed without any adhesive (acid-etch) would have lower retention rates than the sealants placed with any of the adhesive protocols, 2) the retention rates of fissure sealants bonded with etch-and-rinse adhesive would be better than those of sealants placed using self-etch adhesives, and 3) there would be no difference between the retention rates of fissure sealants bonded with the self-etch adhesive either with or without acid etch.

## METHODS AND MATERIALS

The protocol and consent form of this study were reviewed and approved by the Human Ethics Committee of Hacettepe University (protocol HEK 10/13-9). The clinical trial registration number is NCT02998814. A written informed consent for

involvement in the study was obtained from all the participants.

A total of 24 subjects (19 females and five males) who were seeking routine dental care at the restorative dentistry clinics at Hacettepe University School of Dentistry were selected. Patients who participated in the current study had good general and oral health and hygiene. They had no detectable caries, bruxism, malocclusion, previously placed restorations, or sealants on the fissures and no allergies to resins, and they were willing to return for follow-up examinations. The mean age of the patients was 21 years, ranging from 20 to 23 years.

Bitewing radiographs were taken, and intraoral examinations were performed. The plaque and debris were removed with slurry of pumice applied with a bristle brush in a slow-speed handpiece. Each tooth was isolated with standard cotton rolls and suction to avoid saliva contamination. Using a table of random numbers, two previously calibrated dentists (EOB and EE) placed a total of 292 sealants on the permanent premolars and molars using different adhesive protocols (group I, acid-etch/without adhesive; group II, one-step self-etch adhesive [SE]; group III, etch-and-rinse adhesive [ER]; group IV, one-step self-etch adhesive after acid-etching [acid + SE]). Because of the split-mouth study design, each selected patient had at least four molar or premolar teeth to receive fissure sealants. Finally, 73 sealants were included for each adhesive protocol group. The adhesive protocols were performed as follows. Group I (acid-etch/without adhesive): the occlusal surface (including all of the pits and fissures) was etched with a 37% phosphoric acid (Total Etch, Ivoclar Vivadent, Schaan, Lichtenstein) for 30 seconds. Then the surface was gently rinsed with water for 30 seconds and air-dried until an opaque appearance was obtained on the enamel. Group II (self-etch): one drop of SE adhesive, Adper Easy Bond (3M ESPE, St Paul, MN, USA), was applied on the previously cleaned occlusal surface with the help of a disposable application brush for 20 seconds. The adhesive was gently dried by air for five seconds and cured with a light-emitting-diode (LED) curing unit (Radii Plus SDI, Victoria, Australia) for 10 seconds prior to sealant application. Group III (etch-and-rinse): the etching protocol of the surfaces was performed in the same way as in group I. The etch-and-rinse adhesive Adper Single Bond 2 (3M ESPE) was applied on the etched enamel surface in two consecutive coats using a fully saturated applicator, gently air thinned for five seconds to evaporate solvents, and cured with the same LED unit for 10 seconds. Group IV (acid + self-etch): following the same etching protocol as in group I, the same self-etch adhesive, Adper Easy Bond, was applied by the technique described for group II.

After completion of the adhesive application, a low-viscosity fluoride containing resin-based sealant (Clinpro Sealant, 3M ESPE) was applied and gently teased through the fissure with the tip of a periodontal probe to prevent voids and air entrapment. Then the applied fissure sealants were polymerized using a LED unit (1500 mW/cm$^2$; Radii Plus SDI). The complete coverage and retention of the sealant were checked with an explorer. The occlusion was checked with articulation paper. Finishing and polishing were performed using fine-grit diamond burs (Diatech, Swiss Dental, Heerbrugg, Switzerland) and rubber cups (Edenta AG, Au, St.Gallen, Switzerland). All of the materials were used according to the manufacturers' instructions (Table 1).

Two other calibrated examiners (ARY and GO), who were unaware of which adhesive protocol had been used, independently evaluated the sealants at baseline and at six-, 12-, 18-, and 24-month recalls. At the beginning of the study, κ values were calculated to test intra- and interexaminer reproducibility. The κ values were high (0.95) and showed powerful intra- and interexaminer agreement.

All examinations were carried out using a mouth mirror and explorer, using the visual and tactile method. Sealant retention was recorded according to the following criteria[21]: 1, total retention (TR); 2, partial loss (PL); 3, total loss (TL). Each sealant was evaluated in terms of presence or absence of caries formation. Loss of enamel translucency along the margins, softness at the base of exposed fissures, and defects along the margins with discoloration were denoted as dental caries.[22]

In the present study, when partial/total loss of sealant was observed, it was repaired/replaced, and those teeth were subsequently excluded from the study.

Statistical analysis was carried out using IBM SPSS for Windows (Version 22.0, SPSS Inc, Chicago, IL, USA). Pearson's $\chi^2$ test was used to evaluate differences in the retention rates of the sealants used with different adhesive protocols for each evaluation period at a 5% level of significance. The total retention rates between baseline and all recall times for each group were compared using Cochran Q test and McNemar's test with Bonferroni correction ($p<0.001$). Additionally, Kaplan-Meier survival

Table 1: *Materials Used in This Study*

| Brand Names | Types | Manufacturer | Compositions | Batch No. |
|---|---|---|---|---|
| Clinpro Sealant | Low-viscosity fluoride containing resin based sealant | 3M ESPE | Bis-GMA, TEGDMA, ethyl 4-(dimethylamino) benzoate, diphenyliodonium, hexafluorophosphate, DL-camphorquinone, butylated hydroxytoulene, dichlorodimethylsilane reaction product with silica, tetrabutylammonium tetrafluoroborate, titanium dioxide, rose bengal sodium | 12637 |
| Adper Easy Bond | Self-etch adhesive | | HEMA, Bis-GMA, methacrylated phosphoric esters, 1,6 hexanediol dimethacrylate, methacrylate functionalized polyalkenoic acid (Vitrebond Copolymer), finely dispersed bonded silica filler with 7-nm primary particle size, ethanol, water, initiators based on camphorquinone, stabilizers | 385180 |
| Adper Single Bond 2 | Etch-and-rinse adhesive | | Bis-GMA, HEMA, dimethacrylates, ethanol, water, a novel photoinitiator system and a methacrylate functional copolymer of polyacrylic and polyitaconic acids | 9XN |

*Abbreviations: Bis-GMA, bisphenol A diglycidylmethacrylate; HEMA, 2-hydroxyethyl methacrylate; TEGDMA, triethylene glycol dimethacrylate.*

analysis and the log-rank (Mantel-Cox) test were used to estimate the probability of adhesive protocols' success ($p<0.001$).

## RESULTS

A total of 292 teeth were sealed in 24 patients in the present study. All patients attended all visits, and the recall rate was 100% for all evaluation periods. A flow diagram of the patients is presented in Figure 1.

The distribution of sealant retention rates in each evaluation period is given in Table 2. The sealant retention rate, along with total retention and partial and total loss of sealants, is depicted in Figure 2. At the six-month recall, only two fissure sealants from the self-etch group were completely lost, and no difference was observed among the groups ($p=0.684$). At the 12-month recall, of the sealants placed with the etch-and-rinse protocol, the complete

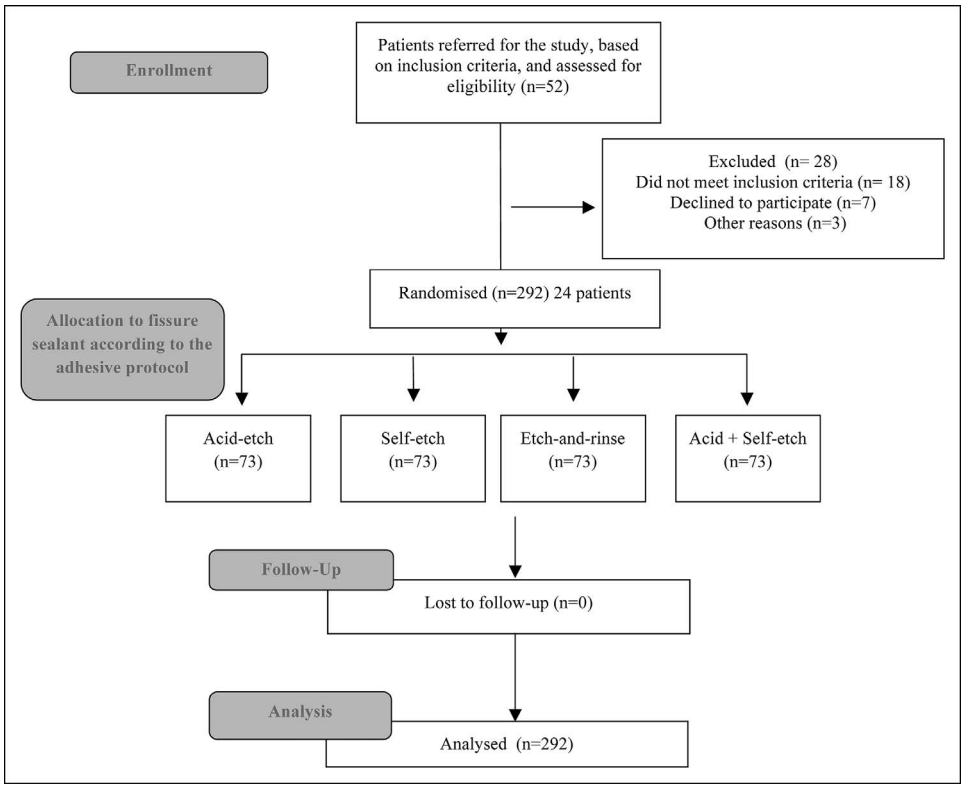


Figure 1. *Flow diagram of patient recruitment.*

Table 2: *Retention Rates of the Groups at Baseline and Six-, 12-, 18-, and 24-month Recalls*

| Groups | Baseline, n (%) | | | 6 Months, n (%) | | | 12 Months, n (%) | | | 18 Months, n (%) | | | 24 Months, n (%) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | TR | PL | TL | TR | PL | TL | TR | PL | TL | TR | PL | TL | TR | PL | TL |
| Group I (acid-etch) | 73 (100) | 0 | 0 | 70 (95.9) | 3 (5.5) | 0 | 62* (84.9) | 9 (12.3) | 2 (2.7) | 46* (63) | 8 (11) | 19 (26) | 42* (57.5) | 9 (12.3) | 22 (30.1) |
| Group II (self-etch) | 73 (100) | 0 | 0 | 70 (95.9) | 1 (1.4) | 2 (2.7) | 60* (82.2) | 5 (6.8) | 8 (11) | 26* (35.6) | 7 (9.6) | 40 (54.8) | 20* (27.4) | 8 (11) | 45 (61.6) |
| Group III (etch-and-rinse) | 73 (100) | 0 | 0 | 72 (98.6) | 1 (1.4) | 0 | 71 (97.3) | 2 (2.7) | 0 | 68 (93.2) | 3 (4.1) | 2 (2.7) | 62* (84.9) | 6 (8.2) | 5 (6.8) |
| Group IV (acid + self-etch) | 73 (100) | 0 | 0 | 70 (95.9) | 3 (4.1) | 0 | 69 (94.5) | 4 (5.5) | 0 | 57* (78.1) | 11 (15.1) | 5 (6.8) | 56* (76.7) | 10 (13.7) | 7 (9.6) |

*Abbreviations: PL, partial retention; TL, total loss; TR, total retention.*
** Significant difference in comparison with baseline according to Cochran Q test for total retention rates (p<0.05).*

retention rate was 97.3%, which was not significantly different from that of the acid + self-etch group, with a retention rate of 94.5% ($p>0.05$). No significant difference was observed between the acid-etch, self-etch, and acid + self-etch groups ($p>0.05$).

At the 18-month recall, the lowest retention rate (35.6%) was observed in sealants that were placed with self-etch adhesive, and it was significantly different from the other groups ($p<0.05$). Although the retention rate of the etch-and-rinse group (93.2%) was significantly higher than that of the acid-etch (63%) and self-etch groups (35.6%) ($p<0.05$), no difference was observed with the acid + self-etch group ($p>0.05$).

At the 24-month recall, the best retention rates were for the etch-and-rinse adhesive and acid + self-etch groups (84.9% and 76.7%, respectively). There was no statistically significant difference between these groups ($p>0.05$). With a retention rate of 57.5%, the acid group showed statistically similar results with the acid + self-etch group ($p>0.05$). In the self-etch group, only 20 teeth remained fully sealed over the 24-month follow-up period, and the retention rate of this group (27.4%) was significantly lower than that of the other tested groups ($p<0.05$).

Differences between the baseline and each recall time within each group are displayed in Table 2. There were no statistically significant differences between the baseline and six-month recall for all

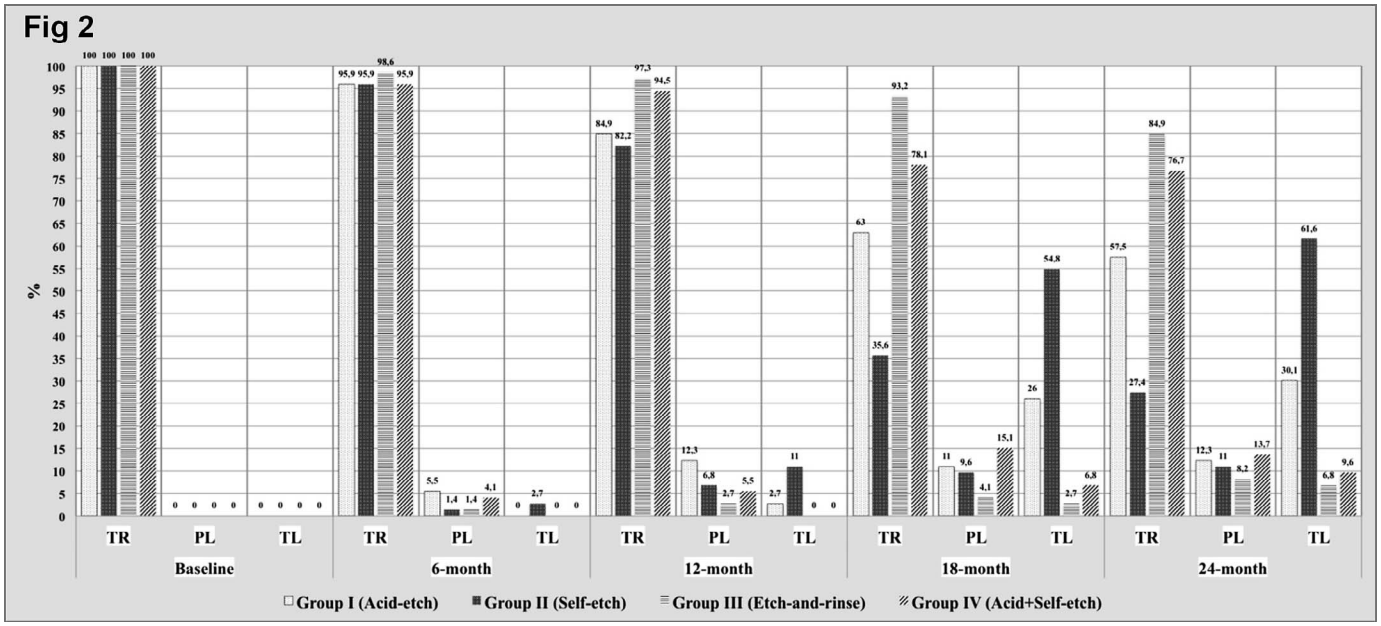


Figure 2. *Sealant retention rates at baseline and 6, 12, 18, and 24 months.*

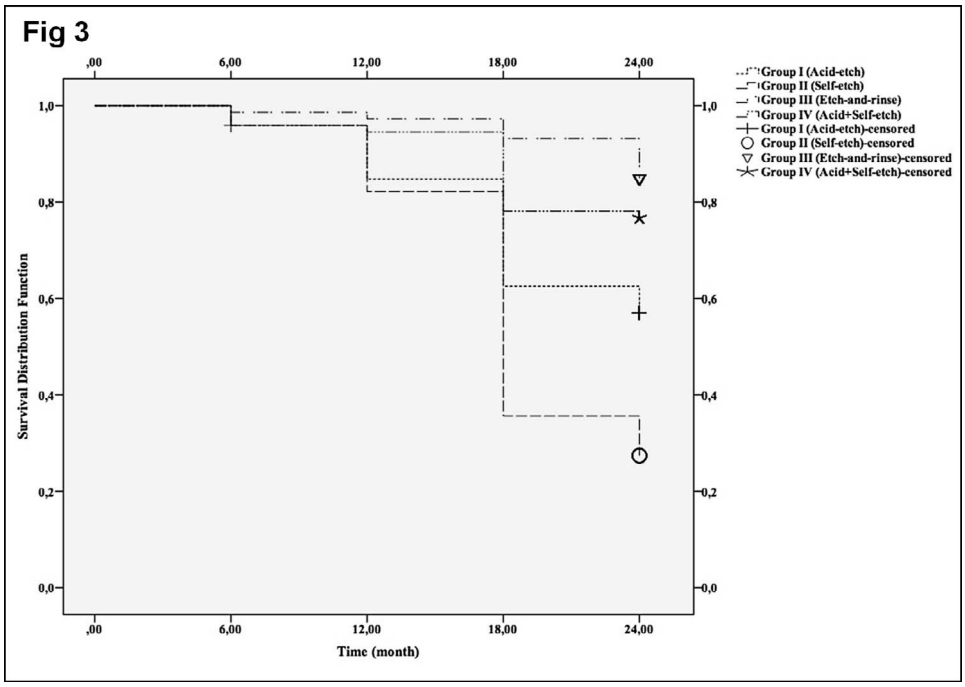


Figure 3. *Cumulative survival analysis of the adhesive protocols.*

groups ($p>0.001$). For groups I (acid-etch) and II (self-etch), significant differences were observed between the baseline and each recall time. There were statistically significant differences between baseline and the 24-month recall in group III (etch-and-rinse) and between baseline and the 18-month recall and between baseline and the 24-month recall in group IV (acid + self-etch).

Figure 3 shows the retention possibilities. The Kaplan-Meier survival analysis and log-rank test revealed that significant differences were found between the tested adhesive protocols ($p<0.001$), and it was observed that the longer the period of time, the higher the failure rate when considering the self-etch group.

Caries were not observed on any of the sealed teeth throughout the 24-month period of follow-up.

## DISCUSSION

In the present study, the clinical success of a resin-based fissure sealant placed with conventional acid-etching, self-etch adhesive, etch-and-rinse, and acid + self-etch adhesive applications was compared. There are still some controversies about the use of adhesive prior to the placement of fissure sealants, as retention has a great influence on the success of sealants.

Nazar and others[16] found no differences in teeth sealed with primer and bond compared with teeth sealed without primer and bond in enhancing sealant retention and preventing caries. They recommended applying fissure sealants without using an adhesive, as this method is more cost-effective and less time-consuming. Similar findings were also reported by Khare and others[14] and Boksman and others.[17] In contrast, some studies favor the use of adhesives before sealant placement.[22,23] In one of them, it was reported that the use of adhesive prior to fissure sealants significantly improved the success rate of sealants over sealant-alone groups.[23] Feigal and others[22] also mentioned the importance of using a bonding agent layer between sealant and saliva-contaminated enamel for adequate bond strength and improvement of resin sealants' retention. These observations have been confirmed by Sakkas and others.[24] It has been assumed that the advantage of using an adhesive prior to the application of a sealant is based on the moisture-chasing effect of hydrophilic primers and increased flexibility of the combined adhesive–resin complex. This feature is important especially where saliva contamination takes place.

In the present study, at 24-month recall, because the sealants placed without any adhesive (acid-etch) had lower retention rates than the sealants placed with etch-and-rinse adhesive but higher than with self-etch adhesive, the first tested null hypothesis should be partly accepted. In other words, even without the use of an adhesive system, acid-etching yielded better results than did the sole application of self-etch adhesive. Thereby, we can assume that the

benefit of using an adhesive beneath the sealant differs according to the type of adhesive used.

However, we just tested one type of self-etch adhesive. The results might vary if different brands of self-etch with different compositions and pH are used. In a previous study, the clinical performance of sealants placed with the self-etch adhesive Adper Prompt L-Pop and conventional phosphoric acid-etching was compared,[25] and it was concluded that replacing acid-etching with self-etch adhesive did not compromise sealant retention in primary teeth after one year. However, we cannot directly compare our results with those of that study, as ours was only a short-term clinical evaluation. Even in our study, at 12-month follow-up we did not find significant differences between the acid-etch, self-etch, and acid + self-etch groups. Furthermore, in contrast to ours, primary teeth were evaluated in that study.

With the ease of application, reduced operation time, and nonsensitive technique, the placement of sealants with the use of self-etch adhesives has become a hot topic in recent years. Especially for children at younger ages, self-etch adhesive might be preferable due to the elimination of rinsing, cooperation difficulties, and field isolation. Although many studies have been published that compare etch-and-rinse and self-etch adhesives for the placement of fissure sealants, no consensus has been reached.[15,21,26-28]

In our study, the placement of sealants with the use of self-etch adhesives did not appear to be practical due to the high retention loss of sealants observed. In other words, there might be a problem in terms of retention, because 45 sealants were completely lost in the self-etch group. As sealants placed with etch-and-rinse adhesive showed better performance that did those placed with self-etch adhesive, the second hypothesis tested should be accepted. Therefore, it might be speculated that the use of self-etch adhesives prior to application of sealant still presents a challenge, and this finding might be related to the inappropriate surface pattern obtained for sealant infiltration and tag formation.

Similar results were also obtained in a study conducted by Sakkas and others.[24] In their 36-month clinical study, they reported that fissure sealants placed with the use of fourth- and fifth-generation adhesive systems (three- and two-step etch-and-rinse adhesives) yielded better performance than a sixth-generation adhesive (one-step self-etch) in terms of retention rate and caries development. Even using an acid-etch technique without an adhesive provided better results than did the one-step self-etch adhesive, which is in agreement with our observations. The low retention rate of self-etch adhesive bonded sealants was explained by the uncured acid monomers from the oxygen-inhibited layer of cured adhesive. Another reason was the self-etch adhesive's inability to dissolve remaining organic debris entrapped in fissures. In another study, the effect of a self-etching primer (Xeno III, Dentsply, De Trey, Konstanz, Germany) and an etch-and-rinse adhesive on the clinical performance of fissure sealant was compared over a six-month period.[29] They found that sealant retention was poorer with the use of self-etch.

Yazici and others[20] also applied sealants in patients with a mean age of 20 years. They reported that the use of an etch-and-rinse adhesive prior to the placement of sealants gave better retention than did the use of a self-etch adhesive. Even in their 48-month clinical evaluation study, they obtained the same results.[21] They attributed these results to the insufficient etching capacity of the self-etch adhesive on intact prismless enamel surfaces. The self-etch adhesive used in that study was a mild adhesive with a pH of 1.4. In the present study, even though the pH of the used adhesive system (Adper Easy Bond) was stronger (0.7-1.0), higher failure rates were again observed in the self-etch group. The less pronounced microretentive etching pattern obtained with even more acidic self-etch adhesives might be the reason. On the other hand, contrary to our findings, in a study that compared two adhesive systems, Adper Single Bond (an etch-and-rinse adhesive system) and Clearfil SE (a two-step, self-etch adhesive, Kuraray, Tokyo, Japan), on sealant retention in newly erupted teeth, no difference was observed between the adhesive systems tested in terms of the success of the sealants under isolated and contaminated conditions.[23] The opposite result obtained might be related to the age and composition of the teeth. In our study, the sealants were applied on fully erupted and highly mineralized teeth, which are quite different in terms of mineralization and isolation from the teeth in the mentioned study.

In the present study, when comparing the self-etch and acid + self-etch groups, poorer results were obtained in the self-etch group at the end of 24 months, and therefore the third hypothesis should be rejected. It is not surprising that self-etch with prior acid-etching showed better results, as separate enamel etch is generally recommended for self-etch adhesive when used on unprepared enamel. It is known that phosphoric acid used to superficially

demineralize the hydroxyapatite of enamel increases the surface area available for bonding. In a recent study, an improvement in sealant retention rates was observed when self-etch adhesives were used with prior acid-etching.[15] Many *in vitro* findings confirm this statement even though most of them were obtained from prepared teeth.[27,30] In one study, the same self-etch adhesive (Adper Easy Bond) that we used in our study was evaluated, and pre-etching enamel with phosphoric acid improved the bond strength significantly.[30]

In the present study, the complete retention rates were 84.9% and 76.7% for the etch-and-rinse adhesive and acid + self-etch groups, respectively, and no difference was observed between these two groups. Our results are in line with those given by Erbas Unverdi and others,[15] who reported similar retention rates in their self-etch group with prior acid etching and etch-and-rinse group.

There are two recently published reviews regarding the use of adhesives and the type of adhesive for improving the success of fissure sealants.[31,32] In one of them, the clinical studies that compared the retention rate of sealants placed on occlusal surfaces following the use of self-etch adhesive systems with traditional acid etching with or without the application of an adhesive system were analyzed.[31] Regardless of the use of adhesive systems, it was reported that occlusal sealants applied with self-etch systems showed lower retention over time than sealants applied in the conventional approach. In the other one, Bagherian and others[32] systematically reviewed the literature to evaluate fissure sealant retention with and without the use of an adhesive system and to compare fissure sealant retention using etch-and-rinse adhesive systems versus self-etch adhesives. They concluded that the use of adhesive systems beneath fissure sealants can increase the retention of fissure sealants and etch-and-rinse systems were preferable.

There are also some *in vitro* studies that evaluated the efficacy of the use of different adhesives on the bond strength of sealants.[27,28] In an *in vitro* study, the effect of phosphoric acid and a self-etch adhesive on the bond strength of a sealant to unground primary and permanent enamel was compared.[27] No significant difference was noted in bond strengths between the phosphoric acid-etch and the self-etch adhesive groups nor between the one-week and one-year results. They concluded that the self-etch adhesive could be an attractive alternative to the acid-etch technique for sealant retention, especially in young children. On the other hand, another study reported that using either self-etch or etch-and-rinse adhesive provided bond strength values higher than those obtained with acid-etch only without adhesive.[28] Similar bond strength values were achieved with self-etch and etch-and-rinse adhesive. However, these studies were conducted on ground enamel, whereas sealants in clinics are generally applied without any fissure preparation and self-etch adhesive might have been less effective on unground enamel and yielded poorer results. Both of the studies mentioned above were conducted under *in vitro* conditions, and therefore these findings cannot be directly extrapolated to clinical situations because all clinical factors such as field isolation and patient factors are omitted.

In the present study, isolation was accomplished using cotton rolls and a saliva ejector. In most studies conducted in older patients, similar to ours, cotton rolls were used for isolation.[19-21,33] Proper isolation is generally hard to achieve in pediatric patients, and therefore the risk of contamination is higher compared with in adults. As this study was conducted in teenagers with a high ability of contamination control, we used cotton roll isolation, which is more convenient in terms of patient acceptance and placement time. Moreover, in a three-year clinical study, no difference was noted between the retention rates of sealants placed under rubber dam isolation or not.[34]

No caries development was observed in teeth that had sealant at any evaluation period in the present study. This could also be related to the regular attendance of patients to their recall appointments and their high motivation for dental care. Moreover, the lack of any restoration or carious lesion up to that age is another sign of the good oral hygiene habits of the participants. In a systematic review, it was reported that children and adolescents who received sealants in sound occlusal surfaces or noncavitated pit-and-fissure carious lesions in their primary or permanent molars (compared with a control without sealants) experienced a 76% reduction in the risk of developing new carious lesions after two years of follow-up.[35]

This is just a short-term clinical study. Thus, our findings need to be confirmed by further long-term studies with different self-etch adhesives.

## CONCLUSION

Within the limitations of the current clinical study, it can be concluded that resin-based fissure sealant, in conjunction with etch-and-rinse adhesive, showed

better retention rates than did self-etch adhesive over a 24-month period. However, no significant differences were observed between the retention rates of fissure sealants bonded with etch-and-rinse adhesive and acid + self-etch adhesive. The self-etch adhesive system did not provide a sufficient retention rate compared to other adhesive protocols. Additional long-term clinical investigations are necessary to confirm these results.

### Regulatory Statement

This study was conducted in accordance with all the provisions of the local human subjects oversight committee guidelines and policies of the Hacettepe University. The approval code for this study is HEK 10/13-9.

### Conflict of Interest

The authors of this manuscript certify that they have no proprietary, financial, or other personal interest of any nature or kind in any product, service, and/or company that is presented in this article.

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