A Unique Moisture-Tolerant, Resin-Based Pit-and-Fissure Sealant: Clinical Technique and Research Results

Howard E. Strassler, DMD; and Joseph P. O’Donnell, DMD, MS

Sealants are highly effective at preventing pit-and-fissure caries. The primary measure of sealant efficacy is retention. Typically, sealant retention is higher on occlusal surfaces than for buccal and lingual pits and fissures. Based on clinical studies, the loss of sealant from occlusal surfaces averages 5% to 10% a year while the loss of sealant from buccal and lingual surfaces increases to 30% per year. Based on this clinical evidence of sealant retention rates, it can be deduced that the occlusal surfaces of molars are easier to protect from caries than buccal or lingual surfaces.

The decision to place a sealant should be based on caries risk. Because the occlusal surfaces of permanent first and second molars are at the greatest risk of becoming carious, practitioners face a clinical dilemma in deciding the appropriate time to place a pit-and-fissure sealant. Minimally invasive (also referred to as minimal intervention) dentistry for pit-and-fissure caries prevention involves the placement of a sealant as soon as the tooth erupts. This period of early eruption, however, presents the greatest challenge of isolating the tooth and maintaining a clean, dry, and etched enamel surface. The typical resin sealants used in the past required a completely dry field to ensure success. Thus, when isolation was very difficult or impossible, clinicians needed to wait until the tooth was more fully erupted. Timing of sealant placement is critical. In many cases when a child returns for his or her recall appointment, caries has invaded the at-risk pits and fissures. The treatment then requires an invasive tooth preparation and placement of an adhesive composite resin restoration.

Recently, resin-based sealant technology has advanced to include moisture-tolerant chemistry. While traditional sealants are hydrophobic, Embrace™ WetBond™ (Pulpdent Corp, Watertown, MA)—a moisture-tolerant resin-based sealant that does not require an additional bonding agent—is hydrophilic. On light-curing, this sealant has physical properties similar to other commercially available sealants. Its hydrophilic resin chemistry is completely different from the typical hydrophobic bio-GMA resins used in traditional sealants. EmbraceWetBond incorporates di-, tri- and multifunctional acrylate monomers into an advanced acid-integrating chemistry that is activated by moisture. When placed in the presence of moisture, the sealant spreads over the enamel surface. A traditional sealant does not spread over a moist tooth surface because of its hydrophobic nature (Figure 1). Because of its unique chemistry, EmbraceWetBond is miscible with water and flows into moisture-containing etched enamel and combines with it (Figure 2). By their nature, enamel and dentin inherently contain water.

**CLINICAL TECHNIQUE**

This new product requires a change from the traditional clinical protocol: The etched enamel surfaces of the teeth to be sealed should be slightly moist during sealant placement. Additionally, although the clinical use of pit-and-fissure sealants is relatively straightforward, errors in technique can result in premature sealant failure. For Embrace WetBond sealant, following these directions will ensure clinical success.

1. Examine and evaluate the occlusal surfaces to be considered. In the case shown (Figure 3), sealants had been placed 8 years previously. At evaluation, the mandibular first molar needed sealant reapplication while the mandibular second molar required a preventive resin restoration because of caries on the distal surface. This technique will focus on the sealant placement for the first molar.

2. Isolate the field with a rubber dam. Other methods of isolation include the use of cotton rolls, which should be changed frequently to keep the area dry, and the use of an Etch-Rite™ (Pulpdent Systems, Santa Barbara, CA), a combined bite prop/high-velocity evacuator/oral illumination device. If using cotton rolls, consider the use of a Garmers cotton roll holder to stabilize their position.

3. After isolating the teeth, clean the tooth surfaces using a water–pumice paste with a disposable prophylaxis angle in a slow-speed handpiece. Other methods for cleaning teeth before sealant placement include using a non-fluoride, pumice prophylaxis paste and an air abrasion device.

4. After cleaning, rinse the teeth surfaces thoroughly with an air–water spray and then dry.

5. Etch the teeth for 15 seconds with a phosphoric-acid etchant. In this case, Etch-Rite™ (Pulpdent Corp) was used to etch the teeth (Figure 4). Then rinse the etchant from the teeth with an air–water spray for 10 seconds, followed by very light drying of the treated surfaces. With Embrace WetBond, the typical dull, frosted appearance of the etched surface is not desired. Rather, the surface should be lightly dried and very slightly moist with a glossy appearance. To accomplish this, a cotton pellet should be used to remove the excess moisture (Figure 5). There should be no visible pooling or drops of water on the tooth surfaces.

6. Apply the Embrace WetBond sealant to the occlusal surface using the supplied applicator tip (Figure 6). After dispensing, use a microbrush applicator to place the sealant, covering all pits and fissures and extending onto the cusp ridges. The final sealant thickness upon application should be at least 0.3 mm.

7. After application, light-cure the sealant for 10 seconds, holding the light-curing probe at right angles to the occlusal surface as close as possible using a high-intensity LED curing light. In this case an Allegro (Den-Mat, Santa Maria, CA) light was used (Figure 7).

8. Evaluate the sealant for retention, seal of the occlusal surfaces, and occlusion (Figure 8).

Although the most common practice is to apply the pit-and-fissure sealant directly to the etched enamel, various studies have evaluated the efficacy of using an inter-
were glass ionomers. The mechanism in time, the only moisture-tolerant sealants for successful retention. Up to this point is necessary to ensure the optimal chance of adhesion is ionic bonding, not micro-
difficult. A moisture-tolerant resin sealant can lead to success in preventing pit-and-fissure caries with sealants.

DISCUSSION
Clinically, a moisture-tolerant sealant makes sense. Unless a clinician is using a dental dam, the oral cavity is 100% humidity with a temperature that mimics the Amazon jungle. Typically when a clinician places a dental mirror in a patient’s mouth, it fogs up because of the humidity within this closed system. This atmospheric moisture ensures that even the driest tooth surfaces contain moisture. Also, because the permanent first molars are the teeth at greatest risk, it is desirable to seal them immediately on eruption when isolation is the most difficult. Therefore, it is desirable to seal them immediately on eruption when isolation is the most difficult. A moisture-tolerant resin sealant is necessary to ensure the optimal chance for successful retention. Up to this point in time, the only moisture-tolerant sealants were glass ionomers. Their mechanism of adhesion is ionic bonding, not micro-
mechanical retention to an acid-etched enamel surface. In studies with glass-ionomer sealants it has been reported that the 3-year retention rate is only 31%.

Pardi and coworkers also reported low sealant retention rates with glass ionomers. The information available at the present time suggests that the optimal characteristics for a pit-and-fissure sealant are a resin-based material that is moisture tolerant, light-cured, and lightly filled with color so that sealant detection and evaluation at recall is possible.

In our practice-based study (second author) on Embrace WetBond with recalls of 4 to 6 years, of the patients recalled, 334 sealants were evaluated. Of these, 299 sealants were intact and clinically acceptable (Figure 9A and Figure 9B). Of the remaining teeth, 32 required re-sealing with no evidence of occlusal caries, and only three teeth developed occlusal caries.

The introduction of a moisture-tolerant, resin-based sealant (Embrace WetBond) has eliminated some of the problems seen in the past with traditional resin-based sealants. In a dental practice, pit-and-fissure sealants are best applied to high-risk populations by trained auxiliaries using an etch-and-rinse, moisture-tolerant sealant. The adherence to the described technique can lead to success in preventing pit-and-fissure caries with sealants.

REFERENCES