# Dentin/enamel adhesives in pediatric dentistry

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## Abstract

The improvements in adhesives and composite technology have made resin-based composite resins and polyacid-modified resin-based composites (compomers) very popular as materials to restore primary and permanent anterior and posterior teeth. More conservative preparations can be performed maintaining more tooth structure due to the adhesive properties of the adhesives used with composites and compomers. Meticulous care in the placement of adhesives and, subsequently, resin-based composites and compomers is necessary to produce long-term satisfactory results.(*Pediatr Dent*. 2002;24:462-464)

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Enamel/dentin adhesives have been considerably improved over the years. Adhesives can be mainly used in pediatric dentistry to bond resin-based composites and compomers to primary and permanent teeth. Because of the improved adhesives, resin-based composites and polyacid-modified resin-based composites (compomers) have become very popular for the restoration of primary anterior and posterior teeth.

## Adhesives

It is difficult to evaluate the clinical performance of adhesives without evaluating the composite also. Most clinical studies evaluating adhesives and composites have done so in permanent teeth.[1]

These results could probably be extrapolated to the permanent teeth of pediatric patients. Other studies have evaluated adhesives and resins in primary teeth,[2-11] but not many report results over 2 years. The literature review shows the consistent void of adequate clinical studies in primary teeth. From the literature search, several factors have been associated with the longevity of restorations. Proper handling and light curing of the materials are perhaps the most significant steps to obtain the maximum potential of the materials' mechanical properties.

Most studies evaluating adhesives and resins in primary and permanent teeth have been conducted in vitro. These in vitro studies show that bond strength and micromorphological adaptation to enamel and dentin is basically similar for primary and permanent teeth.[12-19] Several studies showed that bond strength to primary tooth dentin is similar to permanent tooth dentin.[12,13,20] Others reported that etching primary tooth dentin for a shorter time produced a hybrid layer as thick as those produced in permanent tooth dentin etched for a longer time.[21] However, in vitro studies are no substitute of clinical evidence.

## Enamel and dentin conditioning for resin-based composites and compomers

Either gel or liquid agents are available for etching the enamel. The gel etchant is more convenient because it is clearly seen during placement and after rinsing, producing similar etching effects of the liquids.[22,23] The etchant should be applied for 20 to 30 seconds to both the enamel and dentin. There is no statistically significant difference between the bond strengths of resin placed to enamel etched for 20 or 60 seconds.[24,25] The cavity preparation should be thoroughly rinsed with an air-water spray for 1 to 15 seconds. Rinsing for as brief as 1 second does not impair the bond strength nor affect the microleakage at the enamel site.[26] The enamel may be thoroughly dried or left moist if a hydrophilic adhesive is used to obtain an adequate resin-dentin adaptation.

The dentin must remain moist and should not be dehydrated. Ideally, the enamel should be thoroughly dried, but the dentin must remain moist. A frost-white appearance of the enamel is a clinical indication of adequate enamel etching. If this frost-white appearance is not observed, perhaps reetching for another 20 to 30 seconds is necessary. If

dehydration of the dentin occurs during this step, the dentin can be remoistened with a moist cotton pellet or with AquaPrep (Bisco), a diluted HEMA solution.

## Adhesives used with compomers

According to most manufacturers, enamel etching is not required before placing compomers. Compomers have shown relatively adequate adhesion to unetched enamel and dentin.[20,27-30] However, several laboratory studies have shown a higher bond strength and more intimate marginal adaptation of compomers when the enamel was acid-etched.[29,30] This may be because bonding of compomers to tooth structure is primarily mediated by micromechanical retention (resin tags and resin-dentin interdiffusion zone or "hybrid layer"). Although the indication for acid etching the enamel has been discussed mainly from in vitro studies, the clinical relevance of acid etching the enamel before placing compomers has not been clearly demonstrated.

A glass-ionomer base may be used as a "dentin replacement" or lining material,[31] and the composite or compomer is then placed in increments as an "enamel replacement" material. Each increment is cured separately. If a glass-ionomer is used, it should be placed before placing the primer/adhesive.

The effect of a total-etch technique, when used in primary and permanent teeth in the pediatric population, should be thoroughly assessed to obtain reliable evidence-based data prior to implementation of the technique.

## Primer/adhesive placement

A primer/adhesive may be applied over the entire cavity preparation as it improves the retention of the occlusal restoration (ie, Scotchbond Multi-Purpose, Single Bond, OptiBond Solo Plus, PQ1, Tenure Quik F, Excite, SE Bond, Prompt L-Pop).[32-34] If the adhesive contains acetone (ie, One-Step, All-Bond 2), the enamel should remain moist, and it is not necessary to overdry it.

## Rebonding the restoration

After polymerization of the composite or compomer, a filled adhesive (ie, Fortify, OptiGuard, PermaSeal) may be used as a rebonding agent to extend the lifetime of the restoration, including preventing its discoloration.[2,35]

Other sealants/flowable composites (eg, Ultraseal XT) may be used for these purposes and should be added and placed in any remaining susceptible pits and fissures.

## Summary

Resin-based composite resins and polyacid-modified resin-based composites (compomers) have become very popular for the restoration of primary anterior and posterior teeth. The available clinical studies support their use in pediatric dentistry. Based on the clinical success of resin and adhesives in primary and permanent teeth, more conservative preparations can be performed when using resin-based composites to maintain more tooth structure. As new adhesive technologies develop, further clinical studies should evaluate them in both primary and permanent teeth in the pediatric population.

## Recommendations

The dental literature supports the use of tooth bonding adhesives, when used according to the manufacturer's instructions unique for each product, as being effective in primary and permanent teeth in enhancing retention, minimizing microleakage, and reducing sensitivity.

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