

# An In Vivo Evaluation of Bond Failure Rates with Hydrophilic and Self-Etching Primer Systems

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**B**ecause moisture contamination is reportedly the most common reason for bond failure,<sup>1-3</sup> several manufacturers have introduced hydrophilic systems for bonding to wet enamel surfaces. Transbond\* Moisture Insensitive Primer (MIP), which contains a hydrophilic primer solution dissolved in ethanol, is recommended for use on either dry or wet etched enamel. This material is chemically identical to a widely used dentin-bonding agent<sup>4</sup> (Single Bond\*\*).

Transbond Plus\* Self-Etching Primer (SEP), which is mainly a solution of a methacrylated phosphoric acid ester, was developed to combine the etching and priming stages and eliminate the need for rinsing. This not only saves time and improves patient comfort, but also allows better moisture control.<sup>5</sup>

The purpose of the present study was to in-

vestigate the in vivo bond failure rates of brackets bonded with composite resin after the use of either a conventional etchant and Transbond MIP or Transbond Plus SEP alone.

## Materials and Methods

Fifteen consecutive patients at the Department of Orthodontics, School of Dentistry, State University of Rio de Janeiro, Brazil, participated in the study. Patients were eligible for the study if they:

- Required two-arch fixed appliance therapy.
- Had no caries, fillings, or hypoplasia.
- Had no occlusal interferences (to eliminate the influence of trauma on the bond failure rate).
- Gave their consent to the trial.

Extraction patients were included if their extractions were balanced on both sides of the mouth. Sex, age, and racial differences were ignored.

All teeth, except for the molars, were bonded directly with metal standard edgewise brackets.\*\*\* The primers were allocated by the split-mouth method: The mouth of each patient was divided into quadrants, and a contralateral bonding pattern was randomly alternated from patient to patient to assure an equal distribution of enamel treatments between the right and left sides.

In the hydrophilic primer quadrants, the teeth were isolated and dried with oil-free air. A 37% phosphoric acid etchant was applied to the enamel surfaces for 15 seconds, then rinsed with water and dried until the enamel was frosty white. Transbond MIP was applied to the etched enamel, according to the manufacturer's instructions, followed by a gentle burst of air. The bracket bases were coated with Transbond XT adhesive paste, and the brackets were positioned on the teeth with gentle pressure. After excess

\*Trademark of 3M Unitek, 2724 S. Peck Road, Monrovia, CA 91016.

\*\*Trademark of 3M ESPE, St. Paul, MN.

\*\*\*American Orthodontics, 1714 Cambridge Ave., Sheboygan, WI 53082.



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## Bond Failure Rates with Hydrophilic and Self-Etching Primer Systems

**TABLE 1**  
**BOND FAILURE RATES WITH DIFFERENT ENAMEL TREATMENTS**

	No. Brackets	No. Failures	Failure Rate
Hydrophilic primer	118	3	2.54%
Self-etching primer	118	6	5.08%

adhesive was removed, each bracket was cured for 10 seconds per side with a halogen lamp (Ortholux XT\*).

In the self-etching primer quadrants, the teeth were isolated and dried with oil-free air. Following the manufacturer's instructions, the material was rubbed vigorously onto each enamel surface for three seconds and gently air-dried for one second. The brackets were positioned and light-cured as described for the first group.

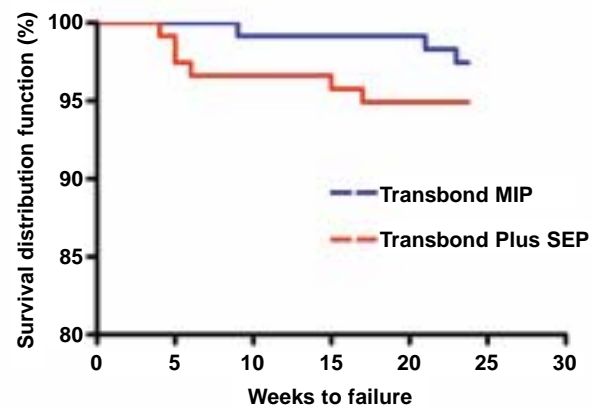
Initial archwires were fitted 15 minutes after bonding. All patients received the same instructions and were treated by Dr. Cal-Neto using a similar preadjusted edgewise technique. Patients were seen at three-to-four-week intervals, but were asked to come in as soon as possible if a bond failure became apparent. The sites and dates of any bond failures during the first six months of treatment were recorded.

### Results

Only nine bond failures were noted during the six-month observation period: three (2.54%) with conventional acid etching and the hydrophilic primer, and six (5.08%) with the self-etching primer (Table 1). The corresponding bracket survival curves were plotted using a Kaplan-Meier product-limit estimate (Fig. 1). There was no significant difference ( $p < .05$ ) in bond failures between the two groups (hazard ratio = .49; 95% confidence interval = .13-1.85; log rank test,  $p = .299$ ).

### Discussion

In another in vivo study under similar conditions, the bond failure rate of Transbond Plus SEP was 10.99%.<sup>5</sup> Although bond failure rates below 10% are generally considered to be clinically



**Fig. 1 Graph of Kaplan-Meier survival plots for brackets bonded with different enamel treatments.**

acceptable, a direct comparison may not be entirely valid because there is no standardized protocol for clinical studies.<sup>6</sup> The Transbond MIP demonstrated a lower bond failure rate in our study, but the difference was not statistically significant.

We limited our data collection to a six-month period because most bond failures occur within the first six months after bracket placement.<sup>7</sup> A 12-to-18-month study might have found more failures for the self-etching primer, which may tend to weaken over time. Still, this clinical trial demonstrates that a self-etching primer can be a viable alternative to conventional adhesives. It can save chairtime and reduce the potential for placement errors and moisture contamination without significantly affecting the bond failure rate.

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