Universal adhesives allow etching, priming and bonding in one step. The main ingredients of these adhesives are acidic functional monomers, crosslinking monomers, photoinitiators, solvent and water. The water is added to the adhesive liquid to activate the acidic functions of the monomers for the demineralisation and bonding to the tooth mineral. Monomers are hydrophobic and slightly soluble in water. That leads to the fact, that water droplets occur (sign for phase separation) in some adhesives after placement on a surface some seconds before. This is also the case for iBOND® Universal.

There is a long controversial discussion in the literature if this phase separation is beneficial or a disadvantage. Phase separation needs to be avoided during adhesive application. This can be done easily by active application (rubbing in) of these adhesives during their entire dwell time. On the other hand, a phase separation during air-drying is beneficial: The formation of water droplets above the adhesive layer helps together with a strong air-blast to remove the water from the adhesive. This is really important as remaining water within the adhesive leads to incomplete polymerisation and degradation of the adhesive layer over time, which jeopardises the full restoration.

The following study result confirms that the phase separation of iBOND® Universal has no influence on its bond strength and marginal integrity when compared to an universal adhesive showing no phase separation.
Objective

To compare two universal adhesives possessing different phase separation characteristics regarding their marginal integrity and shear bond strength on dentine and enamel.

Materials & Methods

Marginal Integrity

24 class II-cavities (depth 4 mm, enamel margins) were prepared in caries-free human molars. Half of the specimens were applied in self-etch mode, the other half of the cavities were phosphoric acid etched. iBOND® Universal and PBA were applied on the cavity surfaces in a self-etch or total-etch mode according to their instructions for use. Composite (Venus® Pearl, A2, Kulzer) was placed incrementally and light cured. The margins were evaluated after 24 h water storage (Keyence VHX-1000, 50 x magnifications). Then, the teeth were immersed in 2 % methylene blue for 10 sec and sectioned longitudinally in a bucco-lingual direction. The sections of all the groups were examined under a stereomicroscope for micro-leakage. Statistics were done using ANOVA followed by LSD (p<0.05).

Shear Bond Strength

Shear bond strength (SBS): 32 flat surfaces each of bovine enamel and dentine were prepared (320 SiC-paper). iBOND® Universal (Kulzer) and Prime&Bond active™ (Dentsply) were applied according to their instructions for use in a self-etch mode. After light-curing the adhesive, a composite cylinder (Venus® Diamond, A2, Kulzer) was placed using the Ultradent mold. Composite was light cured. Specimens were stored either for 24 h in water or were thermocycled (TC: 5°C/55°C, 10 k). SBS was measured according to ISO 29022. Statistics were done using ANOVA followed by LSD for enamel and Kruskal-Wallis for dentine (p<0.05).

Results

<table>
<thead>
<tr>
<th>Phase separation does not have an influence on marginal integrity</th>
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<tr>
<td><strong>Mean % of gap-free margins in class II cavities after 24h water storage</strong></td>
</tr>
<tr>
<td>iBOND® Universal Self-Etch</td>
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<td>10</td>
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</table>

No statistical significant difference was found between groups.
Conclusion

Within the limitations of this study, it seems that phase separation does not affect sealing and bonding. Furthermore, iBOND® Universal showed superior results on enamel bond strength in self-etch mode.

Comment

The phase separation of iBOND® Universal has no effect on the bond strength and the sealing ability. It helps together with the solvent (acetone) to remove the water from the hybrid layer which is a pre-condition for long-lasting restorations.

Source


The study was abbreviated, summarised and commented and all diagrams and titles have been established by Kulzer.
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