

Moist vs Over-Dried

FE-SEM/TEM and μ TBS Evaluation of Universal Adhesives.



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Introduction

25 years ago the wet-bonding technique was set as the standard for etch-and-rinse adhesives (Kanca J, 1992). It would be desirable for etch-and-rinse systems not to have such a small **"window of opportunity"**.

Objectives

To evaluate the influence of the moisture degree on dentin **interfacial ultramorphology** and **bond strength** of universal adhesive systems applied on etch-and-rinse mode.

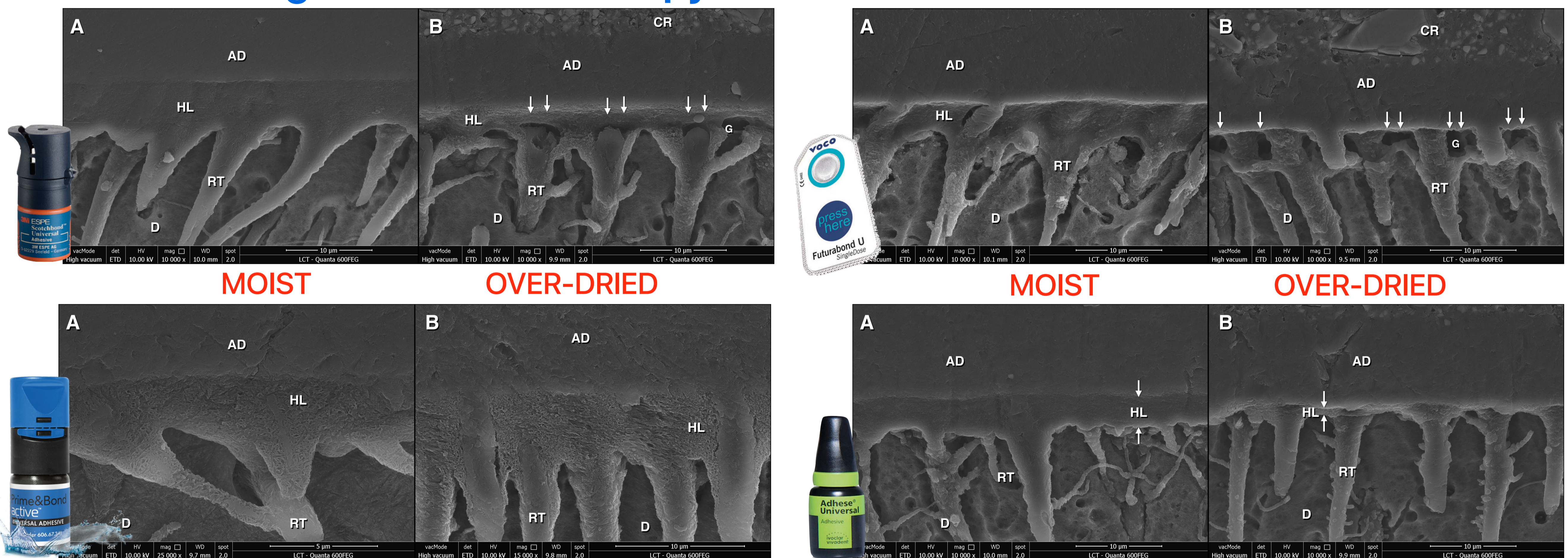
Materials & Methods

Futurabond U (Voco), Scotchbond Universal (3M ESPE), Adhese Universal (Ivoclar Vivadent) and Prime&Bond active (Dentsply Sirona) were used. 64 molars were sectioned in order to obtain flat dentin surfaces, which were wet-polished and etched with 36% phosphoric acid for 15 s and rinsed with water. Two degrees of moisture were tested: moist (as recommended by manufacturers) or **over-dried (air-dried for 10s)**. Teeth were restored with a thin layer of a low-viscosity composite (SDR) for Electron Microscopy evaluation (n=3) and 5 mm-high composite build-ups were made for bond strength evaluation with a conventional composite (n=5). Restored specimens were stored in water at 37°C and sectioned for evaluation 24 hours later. Representative FE-SEM and TEM images were recorded to depict the most frequently observed aspect of resin/dentin interfaces. Microtensile bond strength results were statistically analysed by two-way ANOVA and Tukey test.



Results

FE-Scanning Electron Microscopy



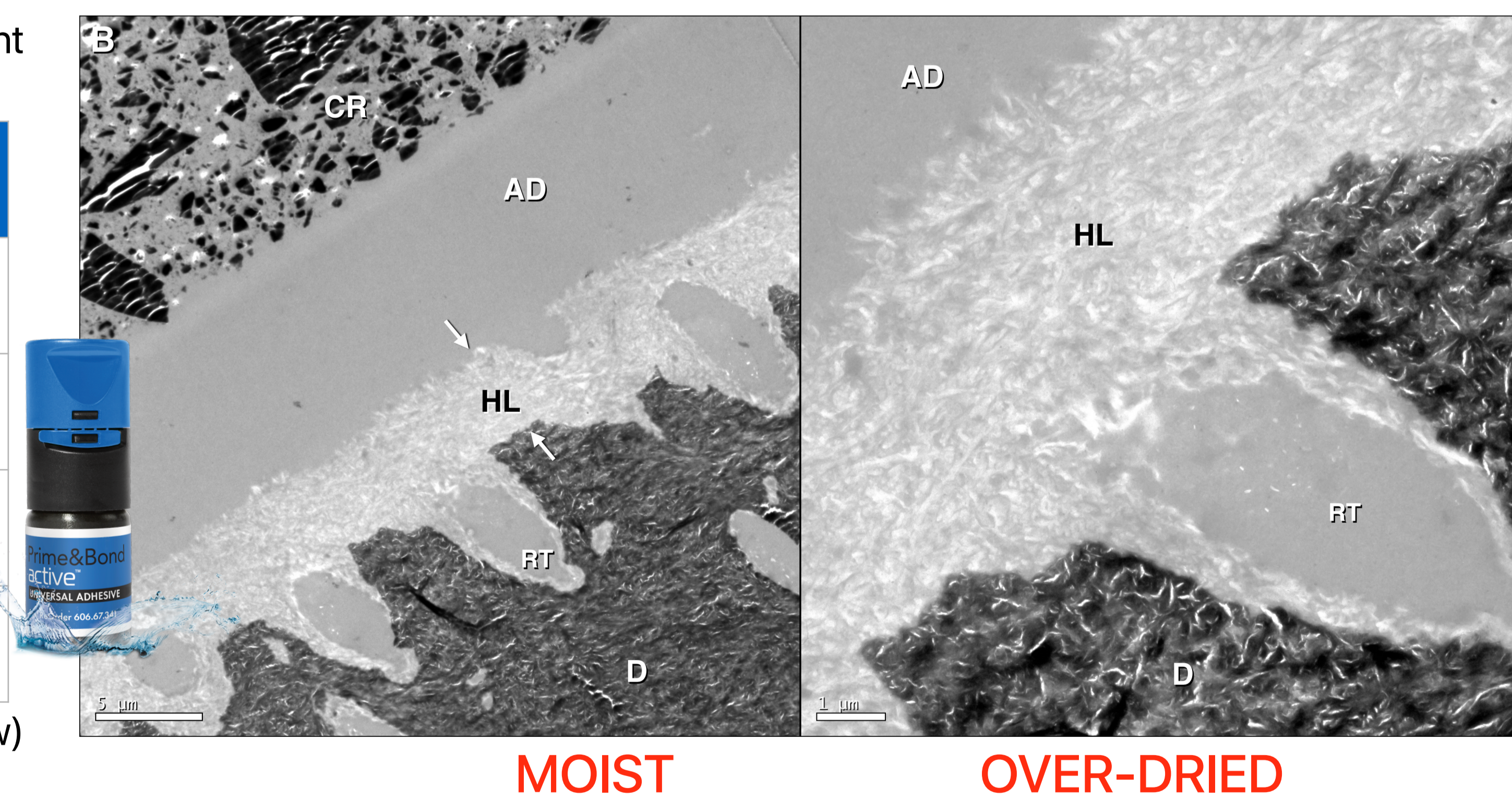
Microtensile Bond Strength

Table 1. Mean bond strength values and standard deviation for the different adhesives applied on etch-and-rinse mode to wet or over-dried dentin.

UNIVERSAL ADHESIVES	WET		OVERDRY 10 s	
Prime&Bond active	74.8 (4.5)	Ab	91.7 (4.6)	Aa
Scotchbond Universal	79.0 (7.9)	Aa	77.3 (14.4)	ABa
Adhese Universal	86.5 (5.7)	Aa	68.2 (9.9)	BCb
Futurabond U	53.2 (9.8)	Ba	54.0 (11.4)	Ca

Means followed by different letters (upper case - column, lower case - row) are significantly different by Tukey test at the 0.05 confidence level.

Transmission Electron Microscopy



Conclusions

Ultramorphological analysis revealed that **Prime&Bond active does not seem to be sensitive to the degree of moisture**, and **presented well-formed hybrid layers when applied to either moist or over-dried dentin**. Even though application to over-dried dentin revealed defects, gaps and reduced hybrid layer thickness for Scotchbond Universal, Adhese Universal and Futurabond U, bond strength analysis only revealed a significant reduction in bond strengths for Adhese Universal.