

APPLICATION PROTOCOLS OF SIMPLIFIED DENTAL ADHESIVES

F.Chasqueira, S.S.A.Oliveira, J.Portugal

Biomaterials Department, School of Dentistry, University of Lisbon, Portugal



Introduction

Adhesive techniques have been improved during the last years. However, adhesion to dentin has been harder to achieve and sustain, because of its heterogeneous composition, hydrophilicity and the presence of smear-layer.

The two-steps etch-and-rinse and one-step self-etching adhesives have a great amount of hydrophilic monomers and present no hybrid layer covered by a hydrophobic resin. These facts lead to a hybrid layer that works as a semi-permeable membrane, allowing the movement of water through the interface, even after the polymerization.

Some authors have suggested changes to the application protocols of two-steps etch-and-rinse and one-step self-etching adhesives, in order to enhance the durability and integrity of the hybrid layer and the bond strength values.

Objective

To evaluate the 24 h shear bond strength (SBS) between a composite resin and dentin, promoted by two dental adhesive systems (an etch-and-rinse and a self-etching) with alternative application protocols:

- 1) different number of adhesive layers;
- 2) application of an hydrophobic resin over the adhesive layer;
- 3) pre-etching treatment of the dentin, in the self-etching group.

Materials and Methods

- Fifty-three caries-free human molars used
- Two dental adhesive systems tested (Figure 1):
 - Easy Bond (3M ESPE)
 - Scotchbond 1XT (3M ESPE)
- Two dentin specimens per tooth (Figure 2a), randomly assigned to the experimental groups (n=15) (Table1)
- Restorative resin: Filtek Z250 (3M ESPE)
- Specimens mounted in the Watanabe device with an adhesion area of 3mm diameter (Figure 2b, 2c, 3)
- LED lamp used (Figure 2d)
- Shear bond test conducted in an universal testing machine (Instron 4502) with a load cell of 1KN and a crosshead speed of 5 mm/min (Figure 4)



Figure 1 – Adhesive systems used

PROTOCOLS	ADHESIVE SYSTEMS	
	Easy Bond	Scotchbond 1XT
Manufacturer's instructions	E1	S1
Two adhesive layers	E2	S2
Three adhesive layers	E3	S3
Four adhesive layers	E4	S4
Five adhesive layers	E5	S5
Manufacturer's instructions + hydrophobic adhesive layer	EH	SH
Pre-etching treatment	EP	-

Table 1 – Experimental groups

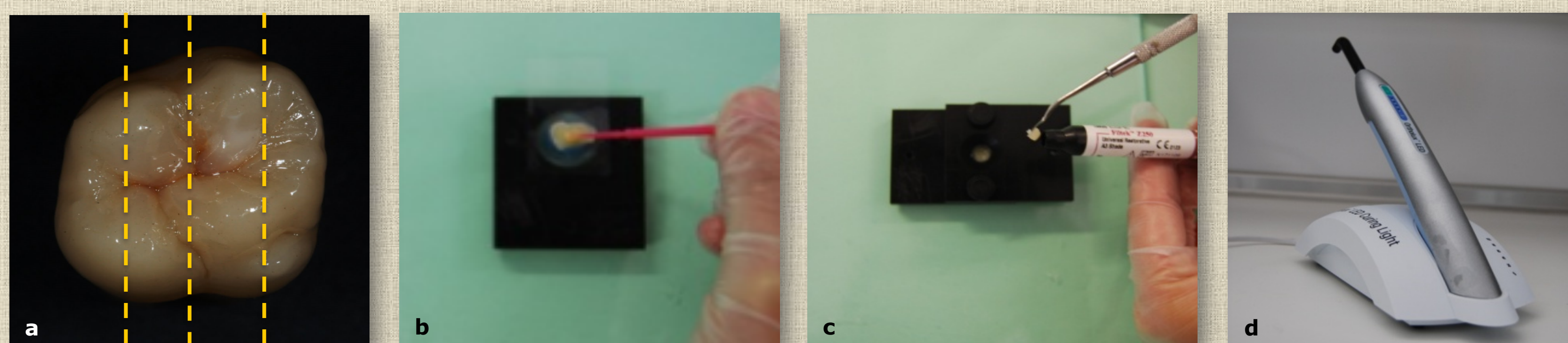


Figure 2 – Experimental procedures



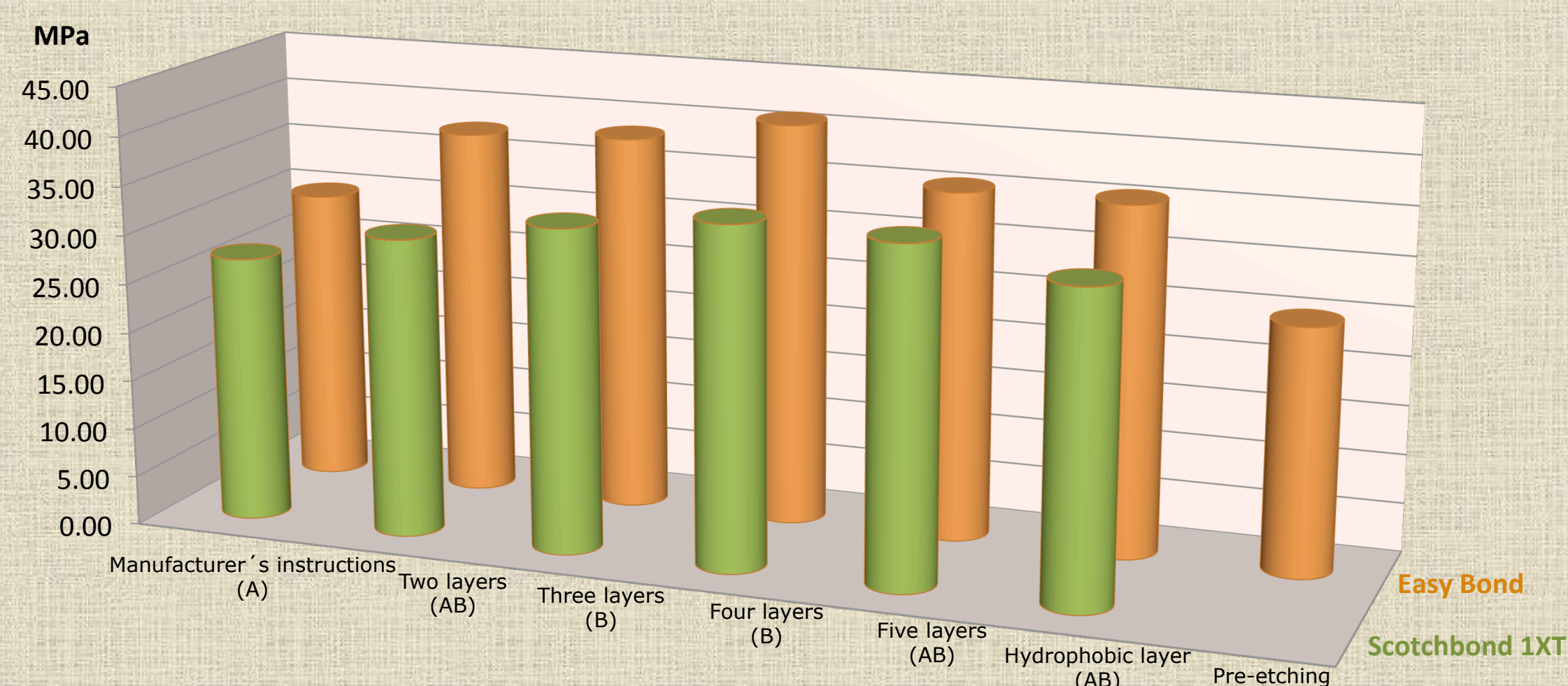
Figure 3 – Watanabe device



Figure 4 – INSTRON 4502

Results

- Data were analysed with ANOVA and Student-Newman-Keuls tests.
- SBS means are presented in Graphic 1.
- ANOVA did not show a statistical interaction between technique and adhesive groups.
- The SBS values increased with the number of adhesive layers, till the fourth.
- Separate data analysis for Easy Bond group, revealed that PE group yielded similar results to the E1 and E5 ($p>0.05$).



Graphic 1 – SBS mean values for Easy Bond and Scotchbond 1XT. Same letters indicate statistically similar groups.

Conclusions

According to the results of this 24 h *in vitro* study:

- At least two adhesive layers should be used when bonding with Schotcbond and Easy Bond adhesives;
 - An hydrophobic layer could be used instead of the several adhesive layers to improve SBS
 - Pre-etching of dentin before adhesion with Easy Bond does not yield higher SBS results.