

Increment thickness versus dentin bond strength of bulk fill flowables

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Objectives

The aim was to investigate the influence of increment thickness on shear bond strength (SBS) to dentin of a conventional and two bulk fill flowable composites.

Methods

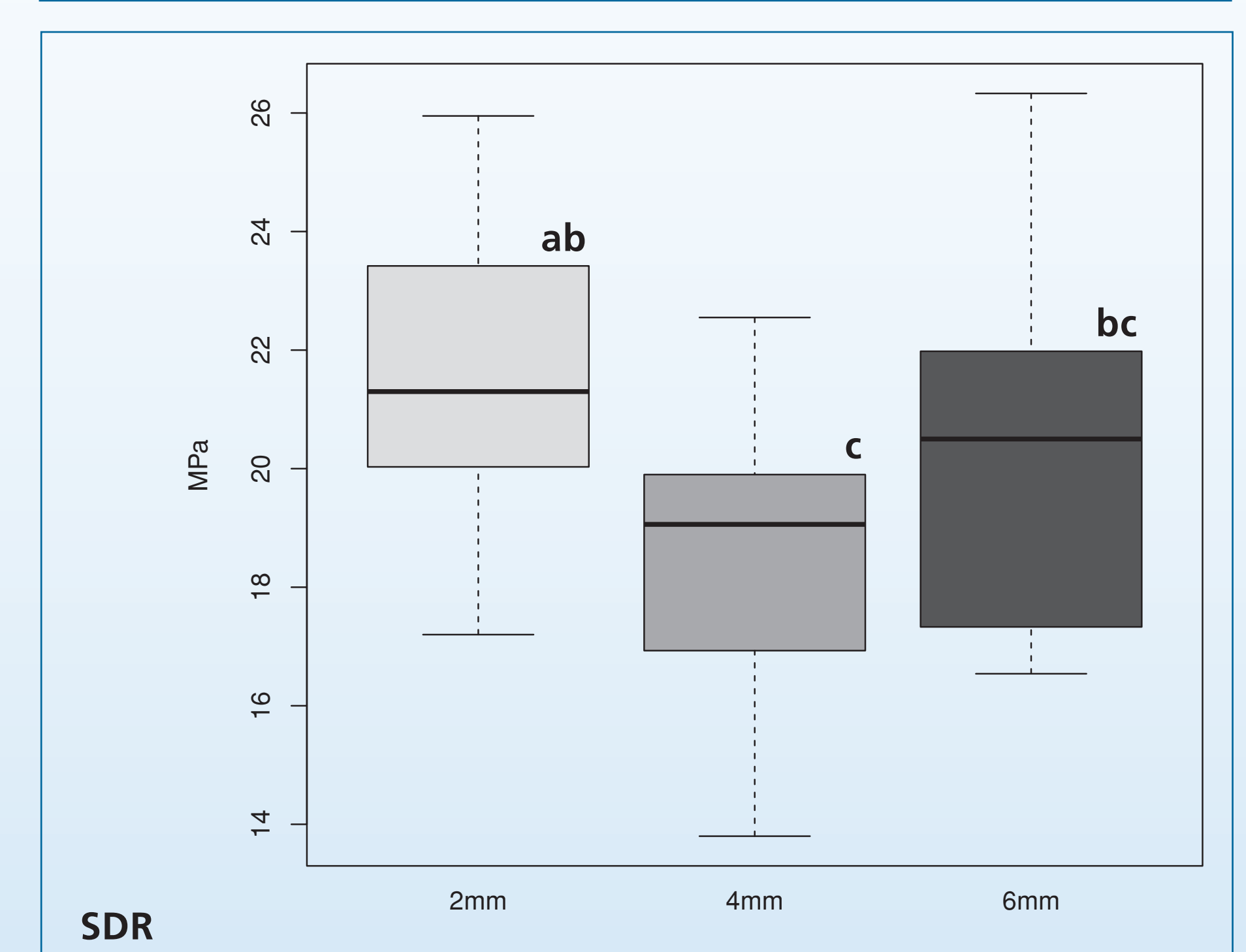
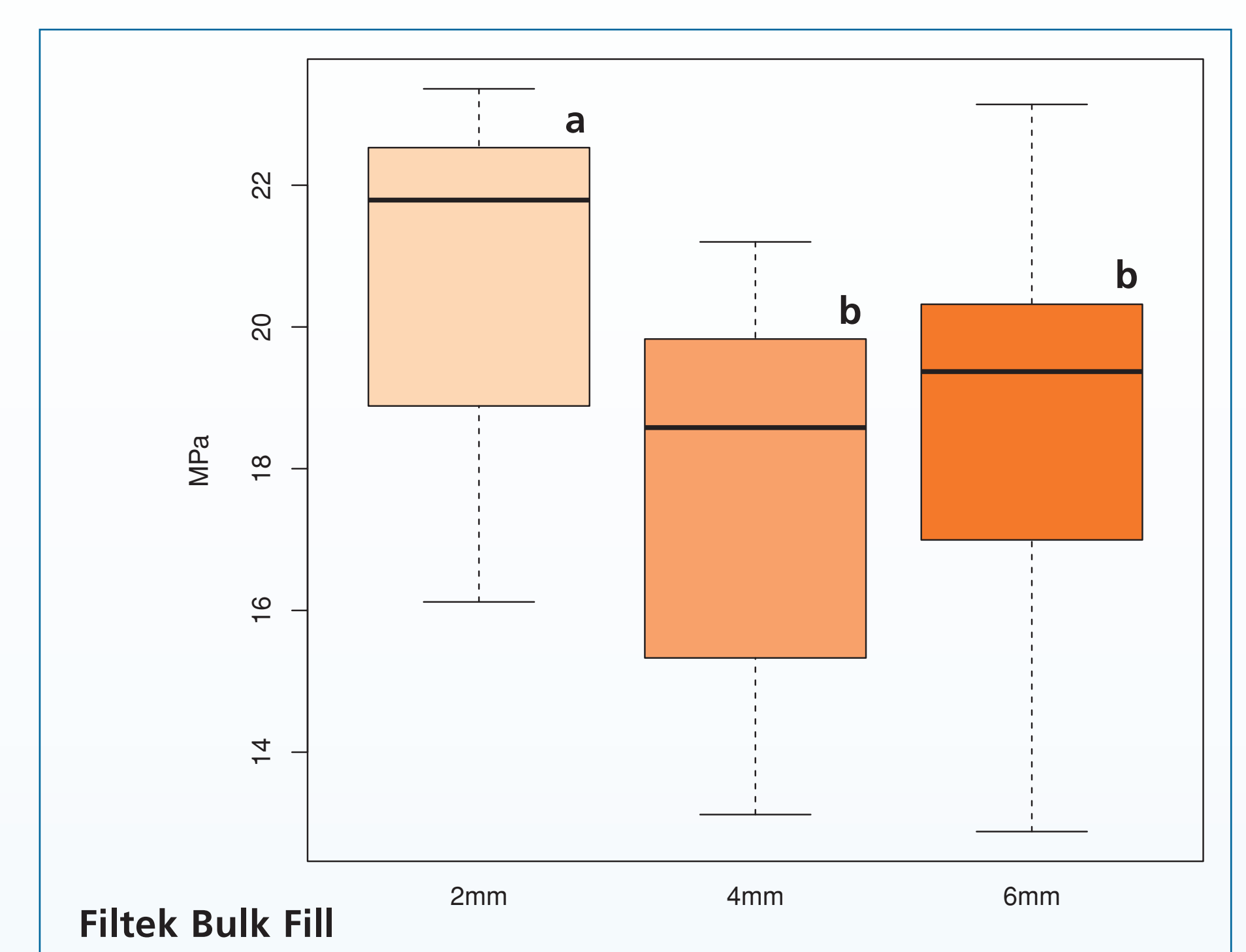
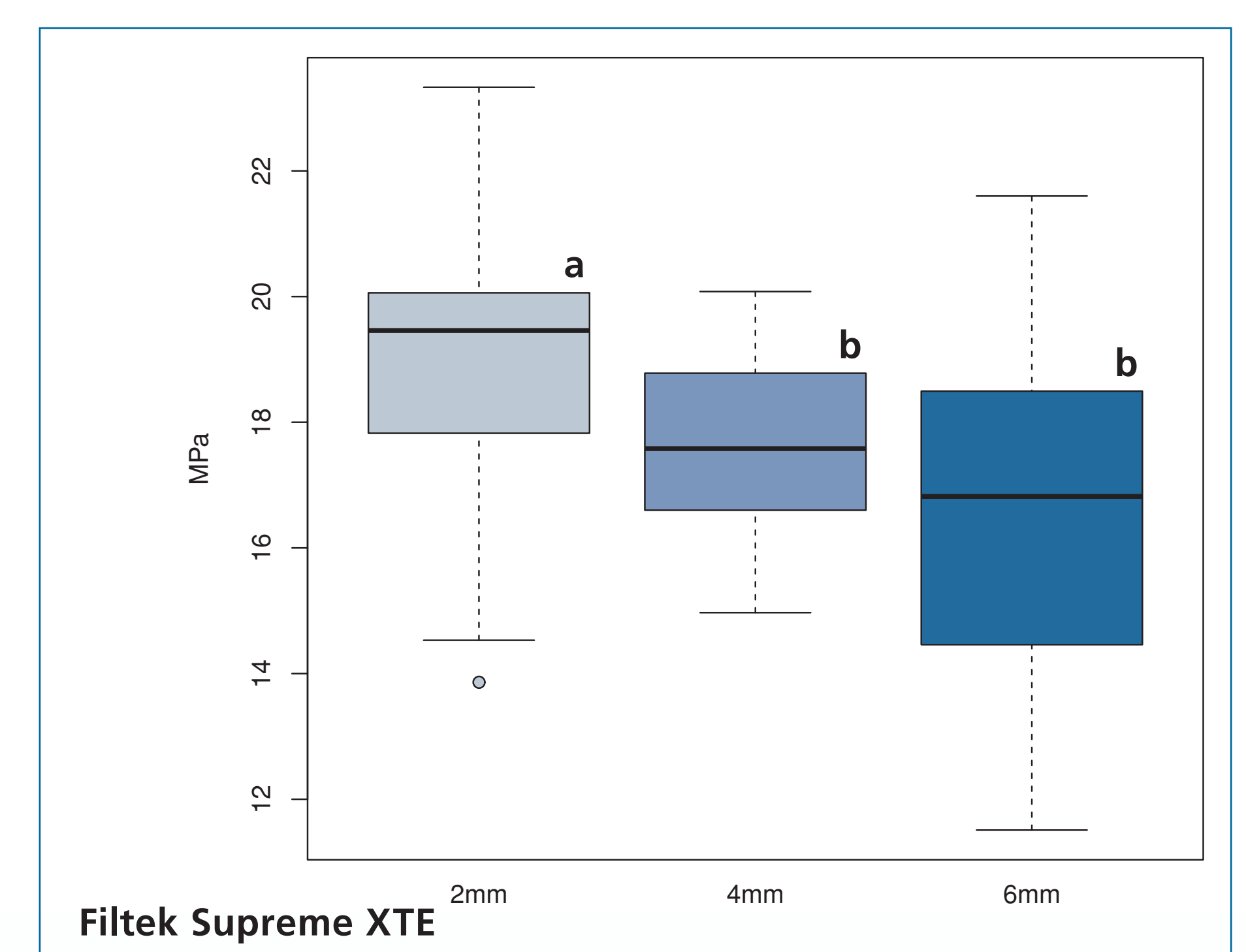
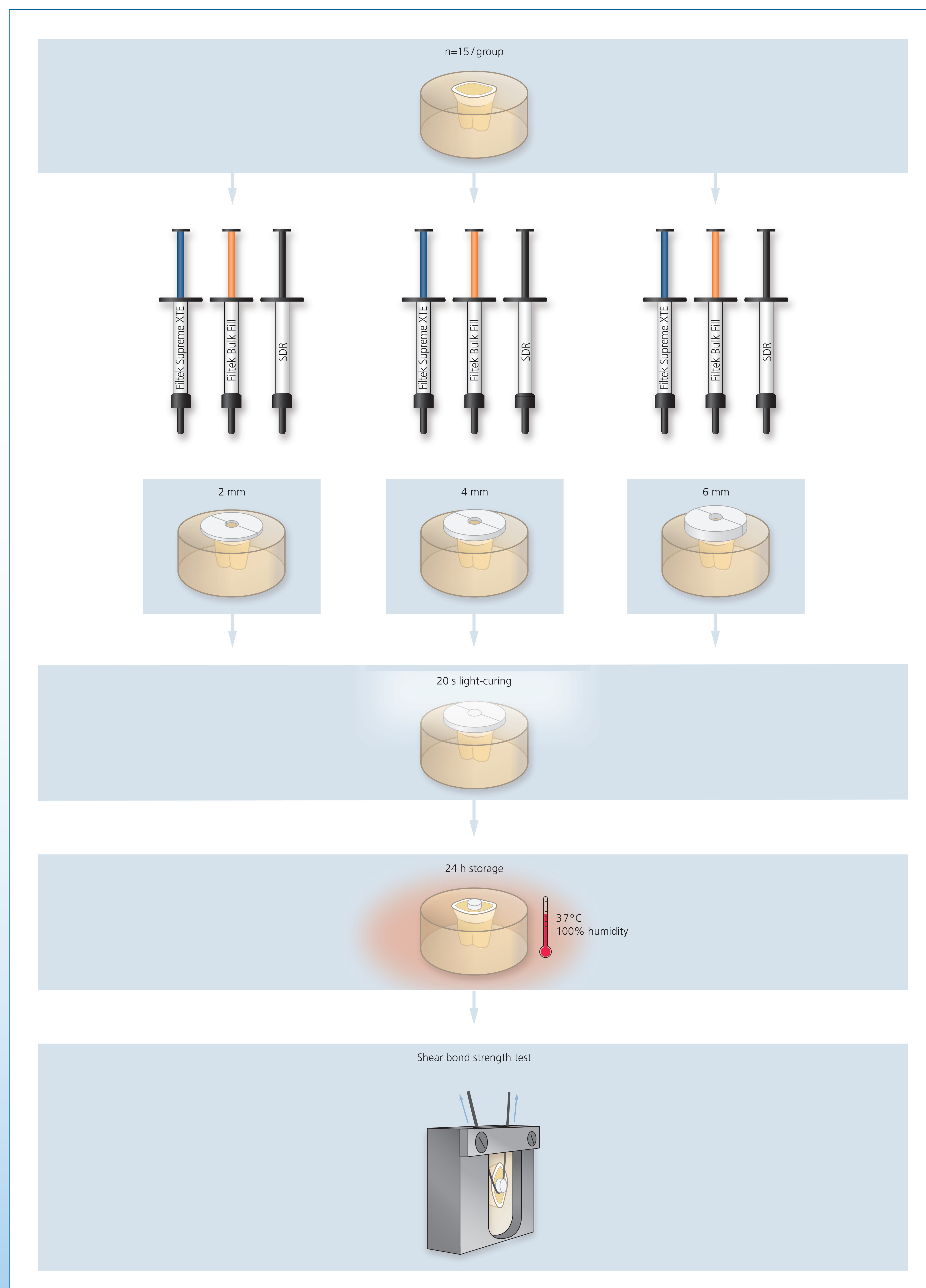
A total of 135 specimens of ground human dentin were produced (n=15/group; 3 increment thicknesses; 3 flowable composites) and the dentin surfaces were treated with the adhesive system OptiBond FL (Kerr) according to manufacturer's instructions. Split Teflon molds (inner diameter: 3.6 mm) of 2 mm, 4 mm, or 6 mm height allowing three increment thicknesses

were clamped on the dentin surfaces and filled with either the conventional flowable Filtek Supreme XTE ((XTE); 3M ESPE) or the bulk fill flowables Filtek Bulk Fill ((FBF); 3M ESPE) or SDR ((SDR); DENTSPLY Caulk). The flowable composites were light-cured for 20 s (Demi LED; Kerr) and the specimens stored for 24 h (37°C, 100% humidity). Specimens were then subjected to a SBS-test in a universal testing machine at a cross-head speed of 1 mm/min (Zwick Z010; Zwick GmbH & Co.). SBS-values were statistically analysed with a nonparametrical ANOVA followed by exact Wilcoxon rank sum tests ($\alpha=0.05$). Failure mode of the specimens was determined under a stereomicroscope at 25x magnification.

Results

SBS-values (MPa) at 2 mm/4 mm/6 mm increment thicknesses (mean value [standard deviation]) were for XTE: 18.8 [2.6]/17.6 [1.6]/16.7 [3.1], for FBF: 20.6 [2.7]/17.8 [2.7]/18.7 [2.9], and for SDR: 21.7 [2.6]/18.5 [2.6]/20.3 [3.0].

For all three flowable composites, 2 mm increments yielded the highest SBS-values whereas for increments of 4 mm and 6 mm no differences were detected. All specimens presented failure modes involving cohesive failure in dentin.



Shear bond strength values at 2 mm/4 mm/6 mm increment thickness. For each flowable composite, identical letters indicate no statistically significant differences between increment thicknesses.

Conclusion

The influence of increment thickness on dentin SBS was less pronounced than expected. However, the high number of cohesive failures in dentin, reflecting the efficiency of the adhesive system, suggests a limited discriminatory power of the SBS-test.