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Effect of different adhesive application approaches on bond strength in over-etched dentin

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Aim

- **To investigate the effect of over-etching and subsequent use of different adhesive application approaches on dentin bond strength**

Methods

- Over-etching of dentin for 30 s (groups 1–5) (n = 10 per group):
  - Group 1 (negative control group): Application of a two-step etch-and-rinse adhesive (Prime & Bond XP; Dentsply Sirona) for 20 s (according to manufacturer‘s information)
  - Group 2 (active application): Adhesive actively rubbed into dentin surface for 20 s
  - Group 3 (double application): Double adhesive application and light-curing in between
  - Group 4 (preheated to 68°C): Adhesive heated to 68°C prior to application
  - Group 5 (ultrasonic-assisted application: Adhesive vibrated into dentin surface (Piezon Master 400, EMS; 27–30 Hz, 20 s)
- Dentin etching for 15 s (according to manufacturer‘s information; group 6):
  - Group 6 (positive control group): Adhesive application for 20 s (according to manufacturer‘s information)
- Photo-polymerization and composite build-up (Ceram.x Spectra ST (HV); Dentsply Sirona)
- Determination of microtensile bond strength (MPa) and failure type analysis
- Statistical analysis: Kruskal-Wallis rank test, post-hoc pairwise comparisons (Conover), p-value adjustment (Holm), α = 0.05

Results

- No significant differences in dentin bond strength after active double, preheated, or ultrasonic-assisted adhesive application compared to control groups (**Figure 1**)
- Mainly adhesive failures in all groups (**Figure 2**)

Conclusion

- **A modification of adhesive application by using active, double, preheated, or ultrasonic application does not improve bonding to accidentally over-etched dentin.**

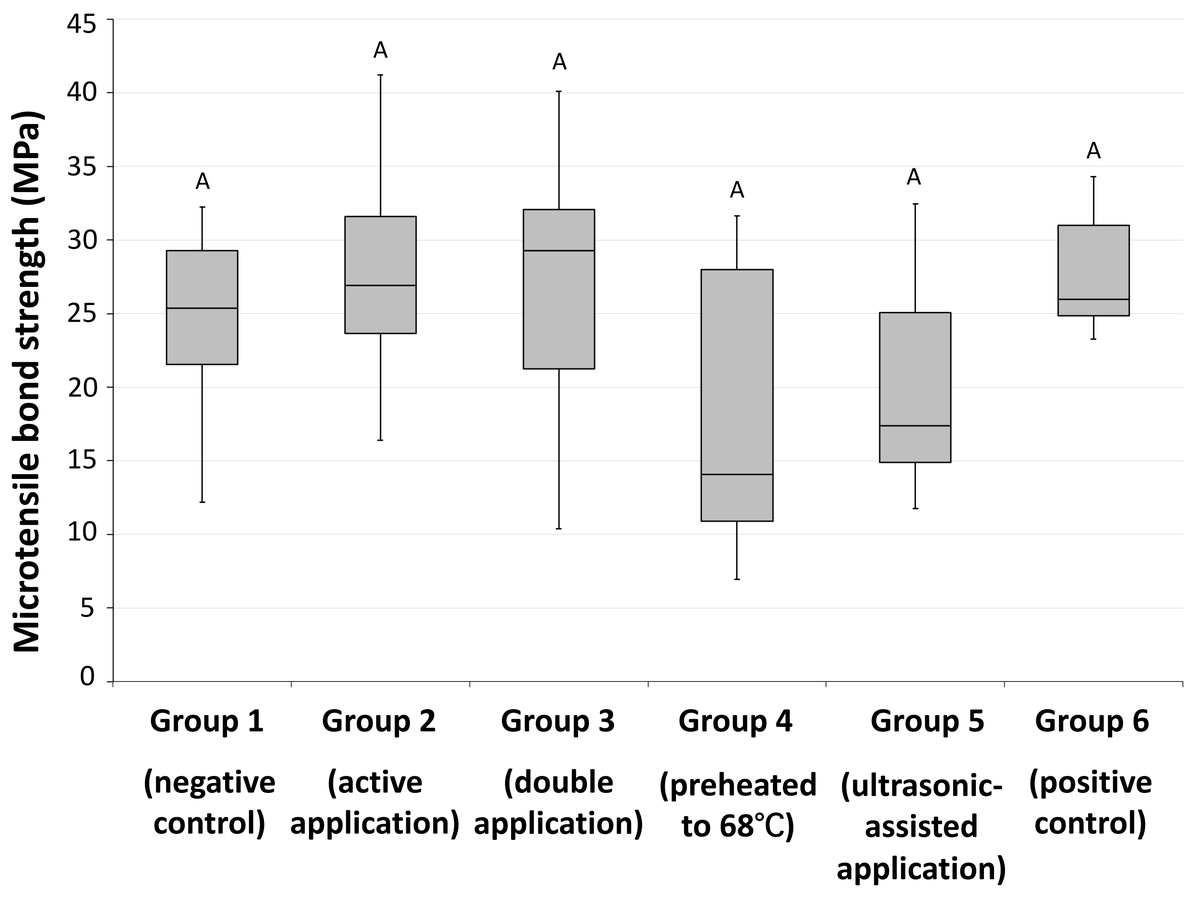

Figure 1: Microtensile bond strength (MPa) of dentin–composite interfaces after treatment with different adhesive application approaches. Groups marked with the same letter are not significantly different from each other ($p \geq 0.05$). The boxplots show the medians (black lines) with 25% and 75% quartiles (boxes); the whiskers represent 1.5 × interquartile range (IQR), or minima and maxima of the distribution if below 1.5 × IQR.

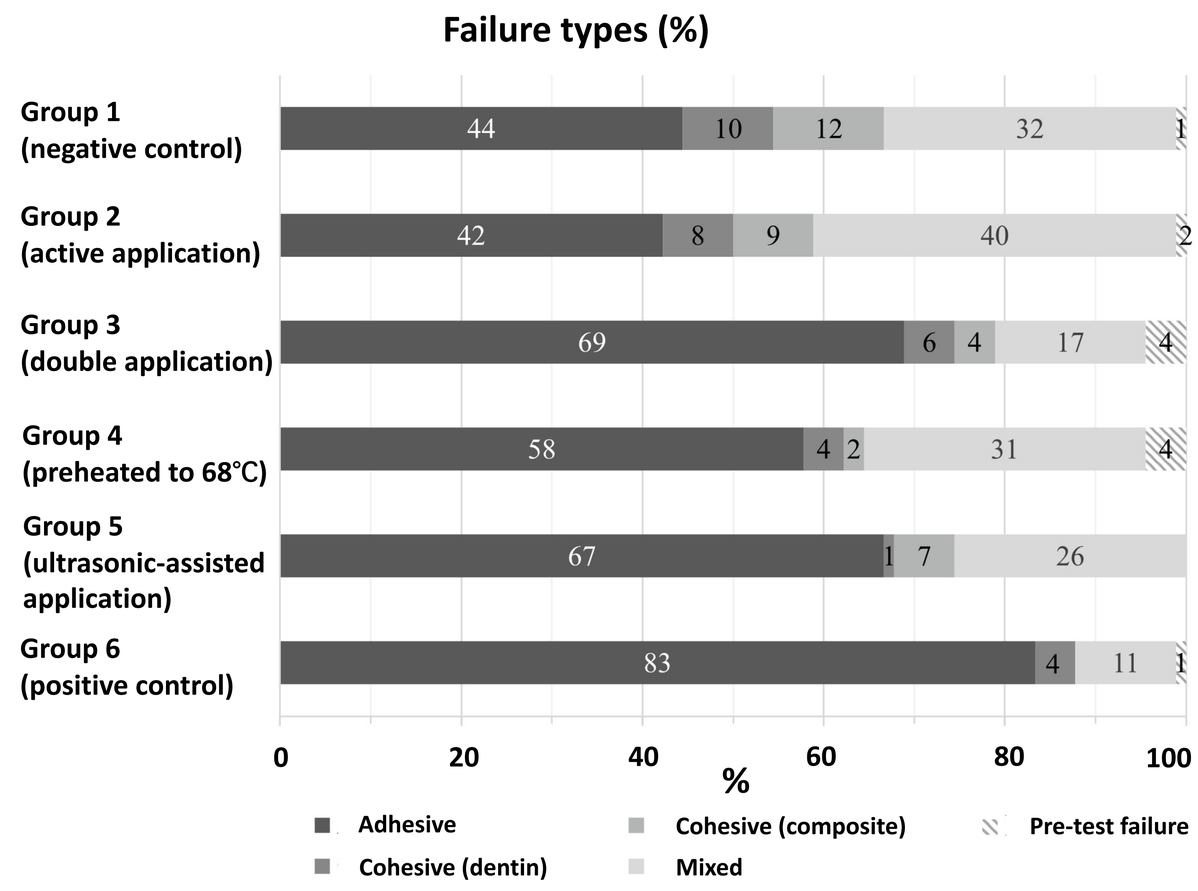

Figure 2: Distribution of failure types of all groups in percentage.

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