



## ABSTRACT

**Purpose:** To evaluate the influence of 38% silver diamine fluoride (SDF) on shear bond strength of total etch adhesives.

**Methods:** 30 non-carious, permanent, human molars were sectioned mesiodistally using a highspeed handpiece and diamond disc, exposing dentin and giving two test samples per tooth. Samples were mounted into cylindrical molds via acrylic resin with the cut side exposed. Fifteen specimens were then randomly allocated to one of four test groups (n=15): Group 1 Scotchbond Universal Plus, Group 2 SDF + Scotchbond Universal Plus, Group 3 Optibond Solo Plus, Group 4 SDF + Optibond Solo Plus. The same resin, TPH Spectra ST, and curing light were utilized in all groups. After adhesive and resin application, samples were rehydrated at 37°C in Dulbecco's D 8662 PBS solution for 24 hours, then shear bond strength testing was performed. Maximum stress data were statistically analyzed using a two-way ANOVA Holm Sidak post-hoc test, with P<0.05 for significance.

**Results:** The results in MPa were Group 1: 26.5±3.0, Group 2: 25.6±7.2, Group 3: 21.1±5.7, Group 4: 21.7±5.7. Statistically significant differences were only noted between groups 1 and 3 (P=0.01).

**Conclusion:** SDF did not affect shear bond strength to dentin when used in conjunction with Scotchbond Universal Plus or Optibond Solo Plus.

## INTRODUCTION

Traditional operative dentistry is often not easy nor safe to perform in young children with severe disease, behavior difficulties, or in individuals with special healthcare needs. Contrary to "drill and fill" dental treatment options, silver diamine fluoride (SDF) is a non-invasive caries management tool. It is FDA approved for treating tooth sensitivity but is commonly used off-label in dentistry for caries prevention and arrestation. SDF strengthens the tooth structure against bacterial acid byproducts, is bactericidal against multiple species, and decreases the enamel and dentin solubility. Other benefits include that it is affordable, painless, aerosol free, simple to use, and aids in the prevention of secondary caries development.

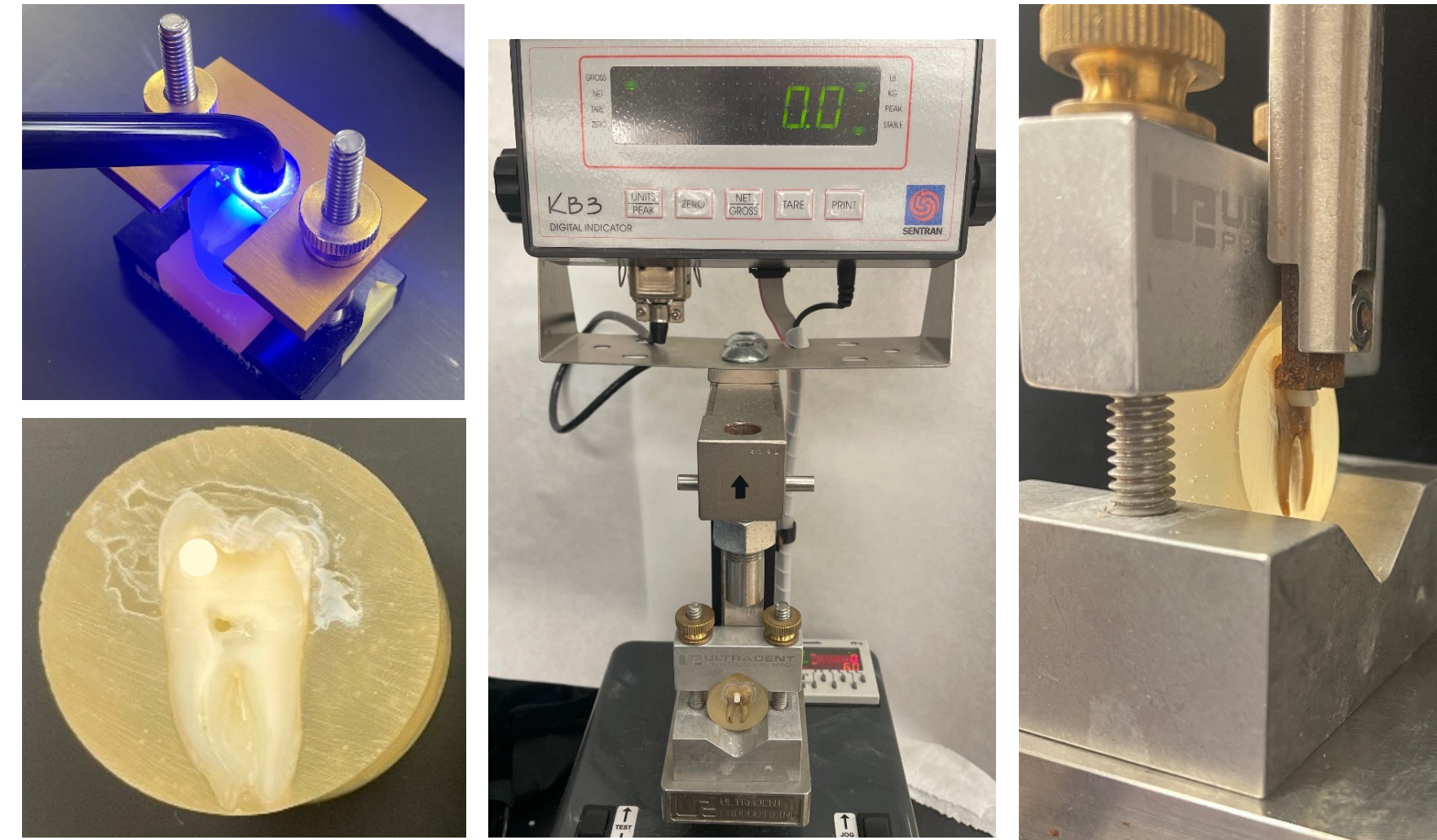
## PURPOSE

For these reasons, SDF is sometimes applied to the exposed dentin of a cavity preparation prior to restoration placement. There is concern, however, that the presence of SDF may negatively impact resin bonding strength to tooth structure, and the results of various studies testing this theory are inconsistent. Some have shown that SDF reduced the bond stability of universal self-etch adhesives, while others have reported that SDF did not affect the bond strength. The objective of this study was to evaluate the effect of SDF on the shear bond strength of total etch adhesives to non-carious dentin.

## MATERIALS



## METHODS



- ❖ **Group 1 Scotchbond Universal Plus Control**
  - Rinsed specimen 5 seconds; etched entire specimen 15 sec with Scotchbond Universal Etchant; rinsed 5 seconds; air dried until damp; Scotchbond Universal Plus applied to entire specimen for 20 seconds with a microbrush; air dried gently for 5 seconds; 10 second cure; A1 TPH spectra applied and cured for 20 seconds.
- ❖ **Group 2 SDF (Advantage Arrest) Intervention + Scotchbond Universal Plus**
  - Rinsed specimen 5 seconds; applied SDF to entire specimen for 1 minute with a microbrush; rinsed 5 seconds; etched entire specimen 15 sec with Scotchbond Universal Etchant; rinsed 5 seconds; air dried until damp; Scotchbond Universal Plus applied to entire specimen for 20 seconds with a microbrush; air dried gently for 5 seconds; 10 second cure; A1 TPH spectra applied and cured for 20 seconds.
- ❖ **Group 3 Optibond Solo Plus Control**
  - Rinsed specimen 5 seconds; etched entire specimen 20 seconds with Select HV Etch (35% Phosphoric Acid); rinsed 5 seconds, air dried until damp; Optibond applied to entire specimen for 15 seconds with a microbrush; air thinned 3 seconds; 20 second cure; A1 TPH spectra applied and cured for 20 seconds.
- ❖ **Group 4 SDF (Advantage Arrest) Intervention + Optibond Solo Plus**
  - Rinsed specimen 5 seconds; SDF applied to entire specimen for 1 minute using a microbrush; rinsed 5 seconds; etched entire specimen 20 seconds with Select HV Etch (35% Phosphoric Acid); rinsed 5 seconds, air dried until damp; Optibond applied to entire specimen for 15 seconds with a microbrush; air thinned 3 seconds; 20 second cure; A1 TPH spectra applied and cured for 20 seconds.

The composite used was identical for all groups: TPH Spectra ST (Shade A1; Dentsply Sirona, Mildford, DE, USA), light cured for 20 seconds with the same curing light used in all groups.

## RESULTS

After adhesive and resin application, specimens were rehydrated at 37°C in Dulbecco's D 8662 PBS solution for 24 hours, then shear bond strength testing was performed on the UltraTester Bond Strength Testing Machine (Ultradent, Provo, UT, USA) at a speed of 1.0 mm/minute.

Maximum stress data were statistically analyzed using a two-way ANOVA Holm-Sidak post-hoc test, with P<0.05 for significance. The test results in MPa, displayed in Figure 1 and Table 1, were: Group 1 26.5±3.0, Group 2 25.6±7.2, Group 3 21.1±5.7, Group 4 21.7±5.7. Statistically significant differences were only noted between Groups 1 and 3 (P= 0.012).

## RESULTS

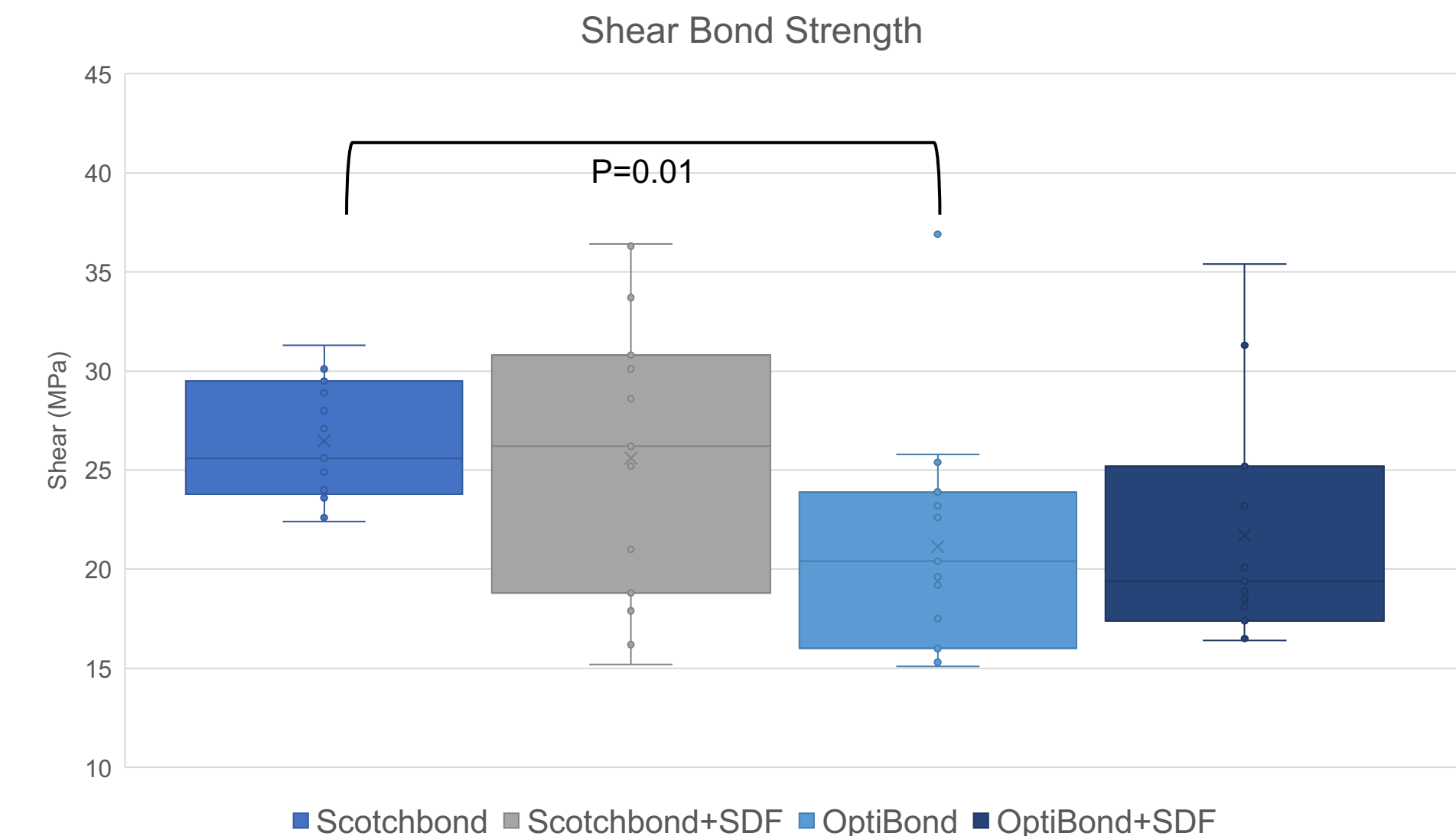


Figure 1: Maximum debonding loads (N; mean ± standard deviation) and nominal debonding stress values (MPa)

	CONTROL	INTERVENTION
Scotchbond	26.5 ± 3.0 <sup>a</sup>	25.6 ± 7.2
OptiBond	21.1 ± 5.7 <sup>a</sup>	21.7 ± 5.7

Table 1: Maximum debonding loads (N; mean ± standard deviation) and nominal debonding stress values (MPa)

\*Two-way ANOVA test found no significant differences in shear bond strength after the application of SDF before composite placement

## CONCLUSION

Within the limitations of this study, the application of 38% Advantage Arrest silver diamine fluoride to non-carious dentin of permanent human molars did not affect shear bond strength of Scotchbond Universal Plus or Optibond Solo Plus, when used in conjunction with TPH Spectra ST Resin Composite.

## MOVING FORWARD

- Investigate SDF's effects on bonding to carious tooth structure
- Analyze SDF effects on bonding to primary teeth
- Explore ways of improving and/or mask SDF's discoloration of tooth structure

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