

STUDY OBJECTIVE

The study aims to compare a novel light-deactivated adhesive to existing medical-grade adhesives used in drapes for negative pressure wound therapy (NPWT) applications.

BACKGROUND

Negative pressure dressings require a sealed environment to enable therapy

- Current standard exists of thick border of adhesive drape around wound
- Edges of dressing often reinforced to reduce risk of leaks
- Especially critical during instillation therapy to prevent peri-wound maceration

Existing NPWT drapes utilize an aggressive adhesive to prevent lifting and to maintain dressing seal. NPWT Patients benefit from therapy, but suffer a high risk of MARSI and often experience pain during dressing removal¹⁻³

- Dressing changes typically required every three days
- Advanced age of patient population increases risk of MARSI
- Comorbidities, such as diabetes and vascular disease, increase fragility of skin and MARSI

A new light-switchable adhesive provides the strength of acrylic adhesives, but switches to facilitate a peel strength more gentle than that of silicone dressings

METHODS

Study compares the novel light-deactivated adhesive, exposed and unexposed, to three acrylic adhesives (Acrylics A, B, & C) and a hybrid silicone/acrylic adhesive (Hybrid) used in NPWT draping material

- All testing occurred on one healthy volunteer's skin using the left and right ventral forearm, with the hair removed, and isopropyl alcohol was used to clean the skin before sample application
- Test samples consisted of 2" x 1" strips; 16 samples were tested for each of the 6 conditions
- Samples were randomly adhered to a healthy volunteer's skin in groups of six using a sample from each condition
- Samples were pulled at an angle of 180°, and maximum and average peel strength were measured (Figure 1)

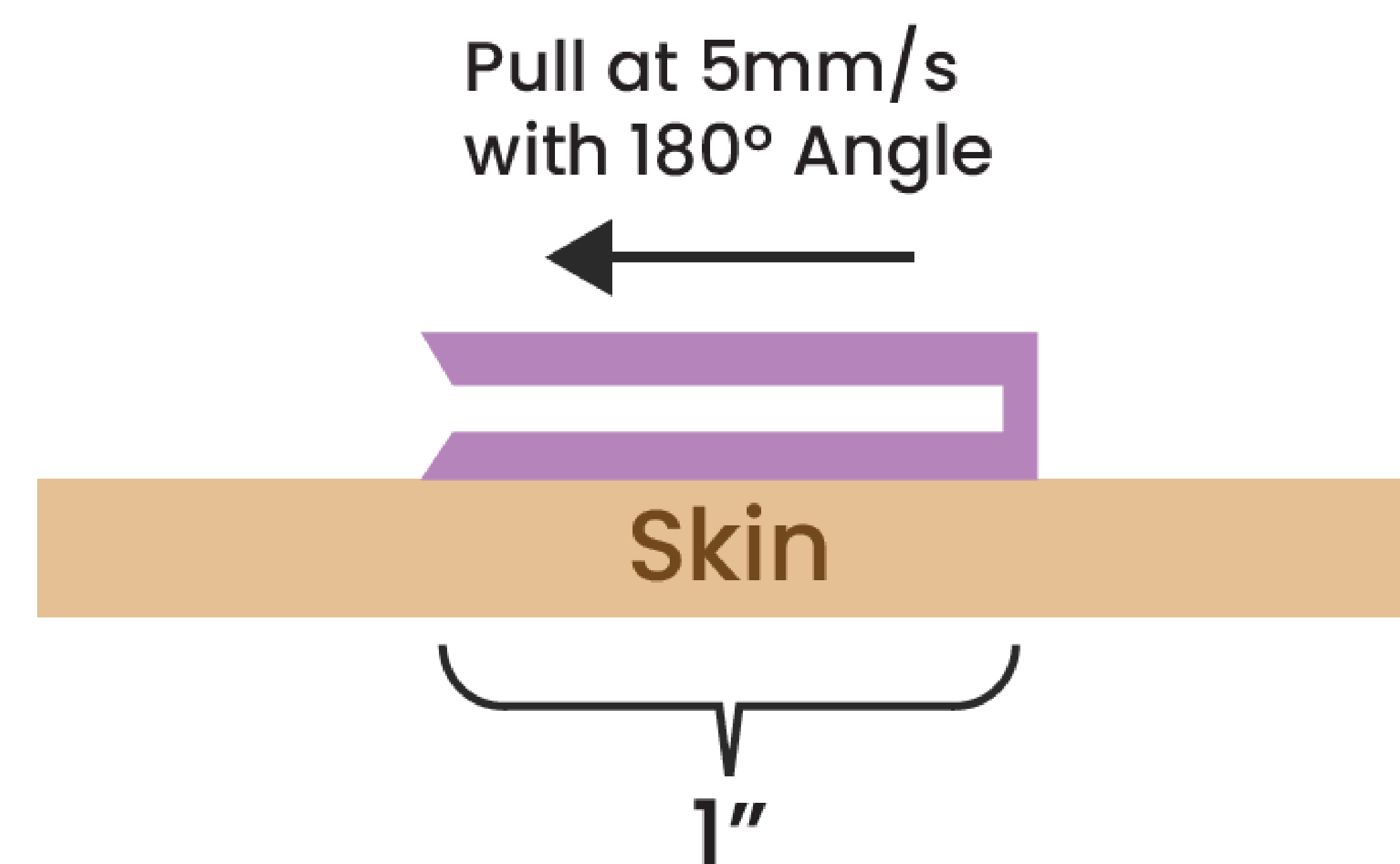


Figure 1: Experimental diagram of peel test

Novel Light-Switchable Adhesive Conditions

- Unswitched condition represents full strength novel drape
- Switched condition represents novel drape deactivated by light exposure

Statistical Analysis

- Peak Peel Strength (top 10 points); Average Peel Strength (plateau phase) (Figure 1)
- One-way analysis of variance
- Pairwise t-test to determine significant differences between conditions
- All p-values corrected for multiple comparisons using Benjamini-Hochberg method
- P < 0.05 indicates a significant difference

RESULTS

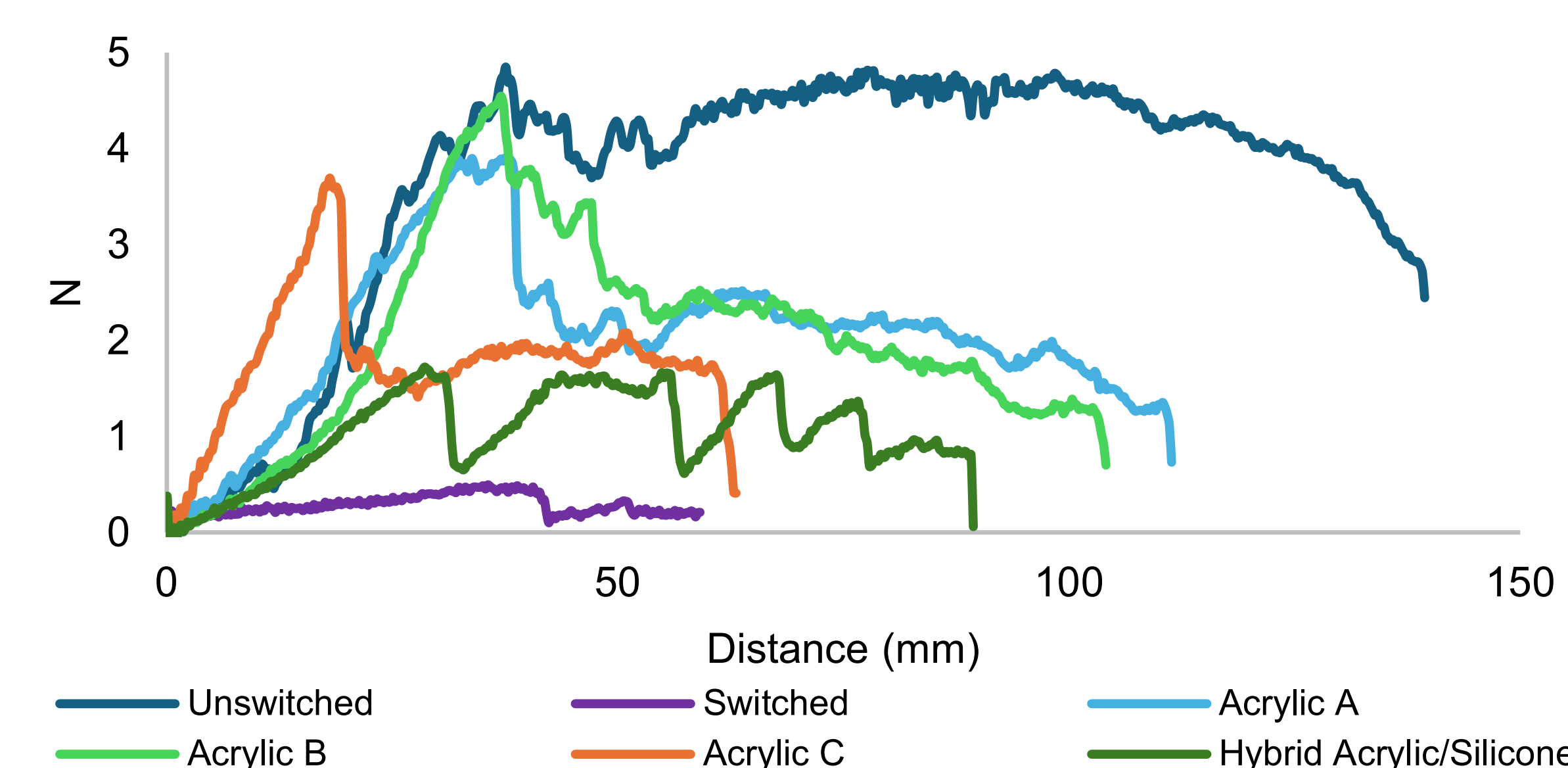


Figure 2: Representative peel test outcome for each condition

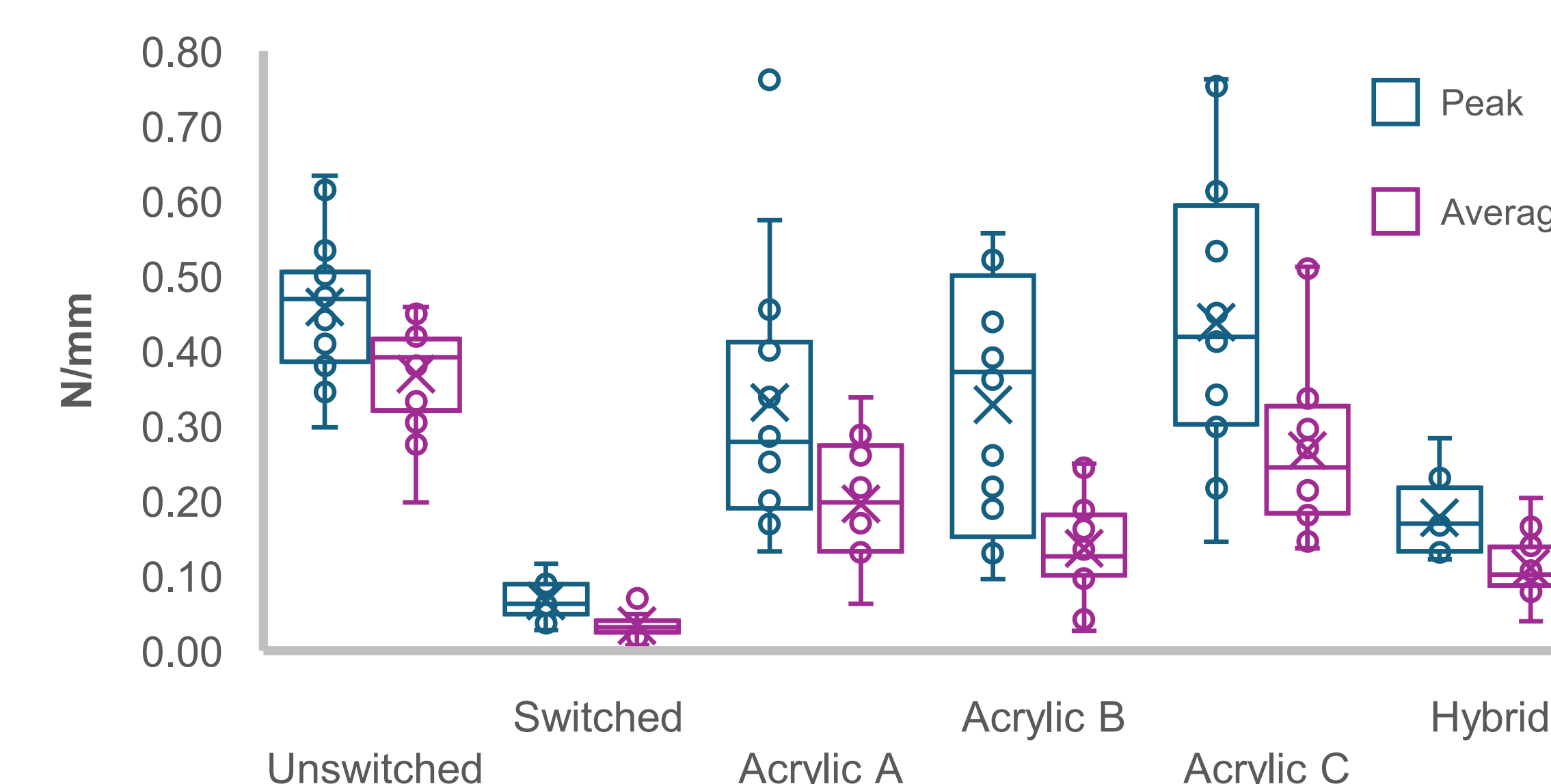


Figure 3: Box and whisker plots for peak and average peel strength

The Unswitched novel adhesive achieves superior or equivalent peel strength compared to Acrylic and Acrylic/Silicone adhesives used in NPWT drapes

- Unswitched novel adhesive performed significantly stronger (p < 0.003) than all conditions except peak peel strength for Acrylic C (p=0.30). Acrylic C performed significantly stronger than the average peel strength for Acrylics A & B (p=0.048 & p=0.0012) and Hybrid conditions (p<0.00015). Acrylic A performed significantly stronger than average peel strength for Acrylic B (p=0.02). Acrylic B peak peel strength performed stronger than the hybrid condition for peak peel strength (p =0.0023), but not average peel strength

Exposed light-deactivated novel adhesive peel strength is significantly lower compared to all other conditions (p < 0.000027)

DISCUSSION

The novel light-switchable adhesive demonstrates the necessary peel strength to maintain dressing integrity in the Unswitched state

- Sustained peel force (average) significantly stronger than other NPWT drapes tested
- Improved peel force helps to ensure dressing integrity during use
- These findings support the use of novel light-deactivated adhesive drape for constructing NPWT dressings

The Switched state of the light-switchable adhesive peels more gently than other conditions tested (p<0.000027)

- Minimizes pain experienced by the patient
- Minimizes risk of MARSI
- Simplifies dressing removal and potentially saves time for clinicians
- Improved experience by the patient and the clinician

CONCLUSION

This study demonstrates the novel light switchable adhesive achieves stronger peel strength in the Unswitched state compared to adhesives used in marketed NPWT drapes. In the Switched state, the dressing releases from skin more gently than other drapes tested, minimizing risk of MARSI and pain.

References:

- Holm et al. J WCON 2024;51(55):S9-S12
- Fidalgo de Faria et al. Int J of Nursing Studies Advances 2022; 4:100078
- Fernandex et al. Int Wound J 2020; 17(6):1829-1834

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