Preventing or minimizing MARSI (Medical adhesive-related skin injury) with new technology - Mechanical evaluation of light-switchable adhesive film dressings used as a skin protectant under aggressive medical adhesive dressings

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STUDY OBJECTIVE

The study aims to evaluate the feasibility of using a Light-Switchable Adhesive Film Dressing (LSAFD) as a barrier for protecting skin under aggressive medical adhesives.

BACKGROUND

Aggressive medical adhesives remain a necessity in clinical care, aiming to protect against complications [1].

- Ostomy wafer must remain in place to contain output and protect skin
- Negative pressure wound therapy (NPWT) dressings must maintain seals for 3 days or longer
- Tubing must remain secured to prevent dislodgement and support pressure injury prevention

Use of aggressive medical adhesives increases risk of MARSI.

- The risk of MARSI ranges between 16 to 77% [2,3]
- Treatment cost of MARSI averages $88.50 per incidence[2]
- Repetitive use increases MARSI risk

Skin barriers and adhesive removers add expense and consume time.

Previous research demonstrates high adhesive strength and gentle dressing removal of LSAFD[4-6].

Can the LSAFD act as a skin barrier worn under aggressive medical adhesives, and be switched for gentle removal?

METHODS

Study evaluates unswitched and switched LSAFD placed on a healthy volunteer's skin under medical dressings used for acrylic NPWT drapes and hydrocolloid colostomy securement strips (CSS) compared to the drape and CSS placed on skin directly

- All testing occurred on one healthy volunteer's skin, using the left and right ventral forearm with the hair removed
- Isopropyl alcohol was used to clean the skin before sample application.
- Test samples consisted of 2"x1" strips of the drape or hydrocolloid, and 1"x1" strips of LSAFD
- Samples were randomly adhered to a healthy volunteer's skin in sets of 4, using a sample from each condition.
- Pulled at 180° angle. Measured maximum and average peel strength (Figure 1)

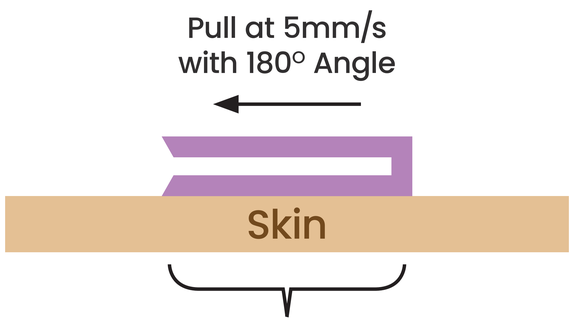


Figure 1: Experimental diagram of peel test

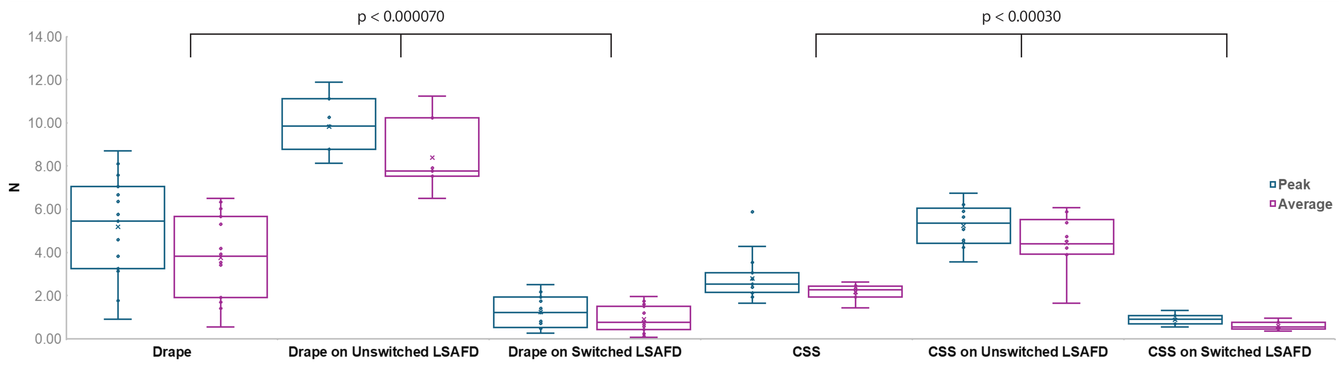
Conditions tested

- Medical adhesive on skin
- Medical adhesive over unswitched and switched LSAFD

Statistical Analysis

- Peak Peel Strength and Average Peel Strength
- 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



NPWT Drape and CSS over Unswitched LSAFD on skin exhibited stronger adhesion than direct adhesion to skin

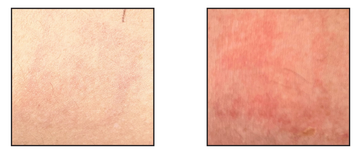
- NPWT Drape on LSAFD peak and average peel strength increased by 86% and 54%
- CSS on LSAFD peak and average peel strength increased by 87% and 106%

NPWT Drape and CSS over Switched LSAFD on skin exhibited significantly weaker adhesion than all other groups

- Switched LSAFD under NPWT drape and opaque CSS strip significantly reduces peak and average peel strength compared to both direct skin adhesion and to adhesion on unswitched LSAFD
- NPWT Drape on switched LSAFD peak and average peel strength versus skin decreased by 76% and 76%
- CSS on switched LSAFD peak and average peel strength versus skin decreased by 68% and 73%

RESULTS CONTINUED

- Skin reddening observed following peel testing of NPWT Drape and CSS



CSS on Skin | Drape on Skin

- Additional light exposure time needed to switch LSAFD under Drape and CSS

DISCUSSION

- Results demonstrate ability to switch the LSAFD under other medical adhesive dressings, identifying a potential use for skin protection
- LSAFD placed on skin and covered by other medical adhesive dressing may increase securement during wear, and decrease risk of MARSI at removal (when switched)

CONCLUSION

This study demonstrates the feasibility of using the LSAFD as a skin protectant under other adhesive medical dressings. In the unswitched state, the dressing stays secured, and when switched removes gently to minimize risk of MARSI.

References:

1. Holm et al. J WCON 2024;51(5S):S9-S12
2. Wang et al. J. Tiss. Viability 2025 33(4) 960-967
3. Maene Wounds UK 2013 9(1), 46-50
4. Cayce et al SAWC Spring 2025
5. Cayce et al. SAWC Fall 2024
6. Cayce et al. SAWC Spring 2023

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