Evaluation of a Novel Incisional NPWT System and Innovative Dressing Utilizing a Light Switchable Adhesive to Minimize Surgical Site Infections and Medical Adhesive-Related Skin Injuries: A Case Series

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Study Objective

Evaluate the first human experience with a novel disposable negative pressure wound therapy (NPWT) device and a post-operative incisional dressing with light-switchable adhesive to ensure surgical site integrity and gentle removal, minimizing the risk of pre-skin injury.

Background

» **Comprehensive reviews with meta-analyses demonstrate that incisional negative pressure wound therapy reduces the risk of surgical site infections (SSI)[1,2,3]**

- Incisional NPWT **reduces** the risk of SSI comparably at -80 and -125 mmHg[1,2,3]
- Incisional NPWT **increases** the risk of skin blistering (6.6% vs. 1.2%), but lower pressure may reduce the risk[1]
  - » 80 mmHg relative risk: 2.24 (95% CI: 1.45 – 3.45)
  - » 125 mmHg relative risk: 16.8 (95% CI: 8.26 – 34.15)
  - » Blistering potentially caused by pressure level or from wrinkled dressing to skin interface

» **A new incisional NPWT (iNPWT) disposable device and post-op dressing may help address skin injury risk**

- Device uses 80 mmHg with a controlled leak[4] at the dome to help ensure consistent pressure at the incision site
- Dressing incorporates an extended contact layer to help ensure smooth dressing skin interface (see figure 1)
- Absorbent component to remove draining exudate
- Light switchable adhesive ensures dressing integrity but gentle removal[5]

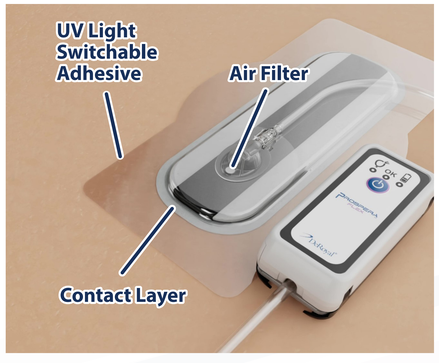

Figure 1: Rendering of the post-surgical dressing and NPWT device.

Methods

» **Seven (7) consecutive patients consented to receive the iNPWT system and dressing to protect surgical site incision following total knee arthroplasty (n=4) or total hip arthroplasty (n=3)**

- All incisions were closed with staples and dressing was applied under sterile conditions
- In accordance with surgeon protocol, at seven days patients used provided near UV-flashlight to switch dressing adhesive, easing dressing removal

» **Patients completed an online survey to assess comfort, ease of use of the device, ease of removal, and presence of skin redness**

Figure 2: Representative dressing placement before dome placement on THA

Clean Incisions, No Skin Irritation

Figure 3: Case 1 Total Knee Anthroplasty

Figure 4: Case 2 Total Hip Anthroplasty

Figure 5: Case 3 Total Hip Anthroplasty

» **Each picture was taken seven days post-surgery by participant at home**

- Case 1: Left total knee arthroscopy, incision line follows previous incision for unrelated knee surgery, Male
- Case 2: Right total hip arthroscopy, Female
- Case 3: Left total hip Arthroscopy, Female

» **Each case exhibited clean incision lines with no reddening, irritation, or blistering from iNPWT or dressing removal**

Patient-Reported Outcomes

» **Six patients completed the online survey and all patients completed seven days of therapy**

- All reported no redness or blistering on peri-wound skin
- During dressing removal with near UV-light, one patient reported no pain, three patients reported minimal pain, and two patients reported some pain on a five-point Likert scale

» **All patients indicated satisfaction with the therapy delivered by the evaluated iNPWT system**

Discussion and Conclusions

» **The novel disposable NPWT device and post-operative dressing with light-switchable adhesive safely delivered iNPWT for seven days**

- The NPWT system with dome-integrated filter ensured consistent delivery of -80 mmHg[4]
- Light switchable adhesive ensured both 7 days of dressing integrity as well as gentle release once switched[5]
- Absorbent component of dressing lifted wound drainage to prevent maceration of the wound site

» **No skin irritation or blistering was reported in the case series despite increased risk associated with iNPWT[1]**

» **Extended contact layer potentially helps protect skin from mechanical forces of pressure that pull skin into dressing wrinkles**

- Use of -80 mmHg associated with a reduced risk of blistering compared to -125 mmHg[1]

» **Patient reported outcomes indicate satisfaction with therapy**

References:

1. Groenen et al. eClinicalMedicine 2023
2. James et al. Am. J. of Surgery 2024
3. John et al. PRS Open 2023
4. Cayce et al. SAWC Fall 2023
5. Cayce et al. SAWC Spring 2023

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