

ORIGINAL ARTICLE

Use of a novel silicone-acrylic drape with negative pressure wound therapy in anatomically challenging wounds

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Abstract

Negative pressure wound therapy (NPWT) utilises a polyurethane drape with acrylic adhesive over foam dressings to create a seal. In anatomically challenging areas, ancillary products are frequently used. Additionally, health care providers are unable to reposition the drape once placed. A novel hybrid drape consisting of polyurethane film with acrylic adhesive and silicone perforated layer has been developed to allow for repositioning after initial placement and easy removal. This six-patient case series evaluates the use of NPWT with hybrid drape over anatomically challenging wounds. Three males and three females were treated. Dressing changes occurred every 2 to 3 days. Drape application, repositioning, and ability to maintain a seal were evaluated. During application, the drape was repositioned 1 to 2 times without periwound skin irritation in 4/6 wounds. Prior to initial application, ancillary products were applied to help create a seal. However, by the second or third application, ancillary products were no longer used in 4/6 wounds. None of the dressing applications resulted in negative pressure seal leaks. In these patients, health care providers could reposition the hybrid drape after initial placement without periwound skin irritation and successfully create a negative pressure seal without ancillary products in anatomically challenging wound locations.

KEYWORDS

negative pressure wound therapy, periwound skin, product testing, wound healing

1 | INTRODUCTION

Periwound skin is often delicate and can easily be affected by the use of medical adhesives associated with wound care products. Application and removal of medical adhesive can result in medical-adhesive-related skin

injury (MARSI), which can be further exacerbated with repeated application and removal of adhesives and dressings from the same periwound skin area.¹ In one acute care setting, the incidence of MARSI was calculated to range from 3.4% to 25.0%.² Balancing wound care while preventing periwound skin injury can be difficult as

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chronic and complex wounds often require the use of advanced wound care modalities for extended periods, increasing the patient's risk of developing MARSJ.³

Negative pressure wound therapy (NPWT), a commonly used advanced wound care modality, utilises a polyurethane drape with an acrylic adhesive over foam dressings to create a seal.⁴⁻⁸ In anatomically challenging areas, it can be difficult to create a seal without the use of ancillary products. Additionally, health care providers are often unable to remove and reposition the drape once it has been placed. A novel hybrid drape (HA-drape) consisting of a polyurethane film with acrylic adhesive and a silicone perforated layer has been developed for use with NPWT to allow for repositioning after initial placement and easy removal. This six-patient case series reports on the initial use of the HA-drape with NPWT over anatomically challenging wounds.

2 | METHODS

All patients provided written informed consent. This study was performed in accordance to the 1975 Declaration of Helsinki and was approved by our institutional review board.

Six patients were treated with NPWT (V.A.C. Therapy, KCI, San Antonio, Texas) using the HA-drape (V.A.C. DERMATAC Drape, KCI). All wounds were assessed and underwent sharp debridement, if necessary. If wounds were found to be infected, intravenous and/or oral antibiotics were administered. The application of NPWT followed the manufacturer's instructions for use. Briefly, the NPWT dressing (V.A.C. GRANUFOAM Dressing, KCI) was cut to size and placed into the wound. The HA-drape was placed over the wound overlapping the periwound skin. A 2.5-cm hole was cut in the HA-drape over the dressing to allow for placement of the sensing pad and tubing. Dressing changes occurred every 2 to 3 days.

Health care providers completed a survey after every dressing change. Drape application, drape repositioning, and ability to maintain a negative pressure seal were evaluated by the health care providers following each dressing change. Descriptive statistics were calculated using Microsoft Excel (Microsoft, Inc., Redmond, Washington) from the survey results.

3 | RESULTS

3.1 | Patient and wound demographics

Three males and three females were treated. Previous patient medical history included diabetes (type 1

Key Messages

- Negative pressure wound therapy (NPWT) utilises a polyurethane drape with an acrylic adhesive over foam dressings to create a seal; however, this drape cannot be repositioned after placement
- A novel hybrid drape has been developed for use with NPWT to allow for repositioning after initial placement and easy removal
- This six-patient case series reports on the initial use of the hybrid drape with NPWT over anatomically challenging wounds
- During application, the hybrid drape was repositioned 1 to 2 times without any periwound skin irritation in 4/6 wounds
- Prior to the initial hybrid drape application, ancillary products were used to help create a seal. However, by the second or third application, health care providers were no longer using ancillary products in 4/6 wounds

and 2), hypertension, peripheral artery disease, obesity, and chronic kidney disease (stage 4) (Table 1). Wound types included trauma, abdominal wall abscess, infected femoral-popliteal bypass graft site, trans metatarsal amputation, and below-the-knee amputation.

TABLE 1 Patient comorbidities

Patient comorbidities	N = 6
Diabetes	4 (66.7%)
Peripheral vascular disease	4 (66.7%)
Chronic kidney disease	2 (33.3%)
Hyperlipidaemia	2 (33.3%)
Coronary artery disease	1 (16.7%)
Hypertension	1 (16.7%)
Klinefelter syndrome	1 (16.7%)
Neuropathy	1 (16.7%)
Obesity	1 (16.7%)
Polysubstance abuse	1 (16.7%)
Previous surgery	1 (16.7%)
Tobacco use	1 (16.7%)

3.2 | NPWT with HA-drape evaluation

During NPWT application, the HA-drape was repositioned 1 to 2 times without any periwound skin irritation in 4/6 wounds. Prior to the initial drape application, ancillary products such as skin prep ointment were applied to help create a seal. However, by the second or third HA-drape application, health care providers were no longer using ancillary products in 4/6 wounds. Additionally, the amount of HA-drape border used in 11/17 dressing applications was less than 3 cm. None of the dressing applications (with or without ancillary products) resulted in NPWT seal leaks.

3.3 | Representative cases

The following three cases are representative of the six patients treated with NPWT using HA-drape. Drape application evaluation was not able to be performed on all dressing changes.

3.3.1 | Case study 1

A male patient presented for care with a traumatic wound measuring $8.5 \times 4 \times 1\text{-cm}^3$ with a 2.5 cm tunnel to the plantar surface of the right foot. Previous medical history included diabetes, hypertension, Klinefelter syndrome, neuropathy, peripheral artery disease, and polysubstance abuse. Sharp debridement was performed, followed by the application of NPWT with HA-drape (Figure 1). During the first dressing application, the HA-drape border was 7 cm. Ancillary products were used to help create a negative pressure seal around the foot wound as the health care provider had used ancillary

products to help create and maintain a seal with the traditional drape applications. Dressing changes occurred every 2 to 3 days. During the second dressing application, ancillary products were used; however, the HA-drape overlap was reduced to 3 cm. No ancillary products were used during the third dressing application, as ancillary products were not needed with the HA-drape. The HA-drape was repositioned twice, resulting in a final drape border of 3 to 5 cm. No patient discomfort was reported during the dressing changes or drape repositioning. The negative pressure seal was maintained without leaks throughout treatment with NPWT using HA-drape. After 5 days, the patient was discharged home with NPWT using traditional drape. The wound was 90% closed at the follow-up visit.

3.3.2 | Case study 2

A female patient presented for care with left lower quadrant pain. Patient examination identified a superficial anterior abdominal wall abscess with a vesiocutaneous fistula. Previous medical history included stage 4 renal disease, urostomy, chronic metabolic acidosis, recurrent pancreatitis, and previous abdominal surgery. The superficial abscess was drained, and NPWT with traditional drape was applied for 10 days. Therapy was transitioned to NPWT with HA-drape, because of patient discomfort with the traditional drape, with dressing changes every 2 to 3 days (Figure 2). The fistula was isolated outside of the drape field, and while the abdominal wound was extensive, exploration showed the superficial abscess did not penetrate the fascia.

At the first application, the HA-drape was repositioned once without patient discomfort reported, and the drape border was 3 to 5 cm. Ancillary products

FIGURE 1 NPWT with HA-drape application to a traumatic foot wound. A, Wound at presentation. B, Application of NPWT with HA-drape (lateral view). C, Application of NPWT with HA-drape (plantar surface view). HA-drape, hybrid drape; NPWT, negative pressure wound therapy

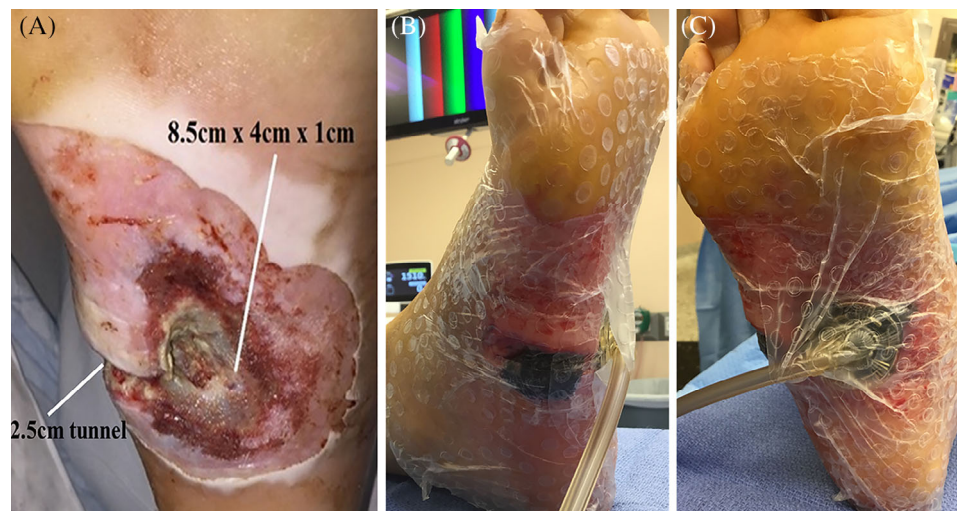




FIGURE 2 NPWT with HA-drape application to an abdominal wound. A, Wound after removal of abdominal abscess. B, Application of NPWT with HA-drape. HA-drape, hybrid drape; NPWT, negative pressure wound therapy

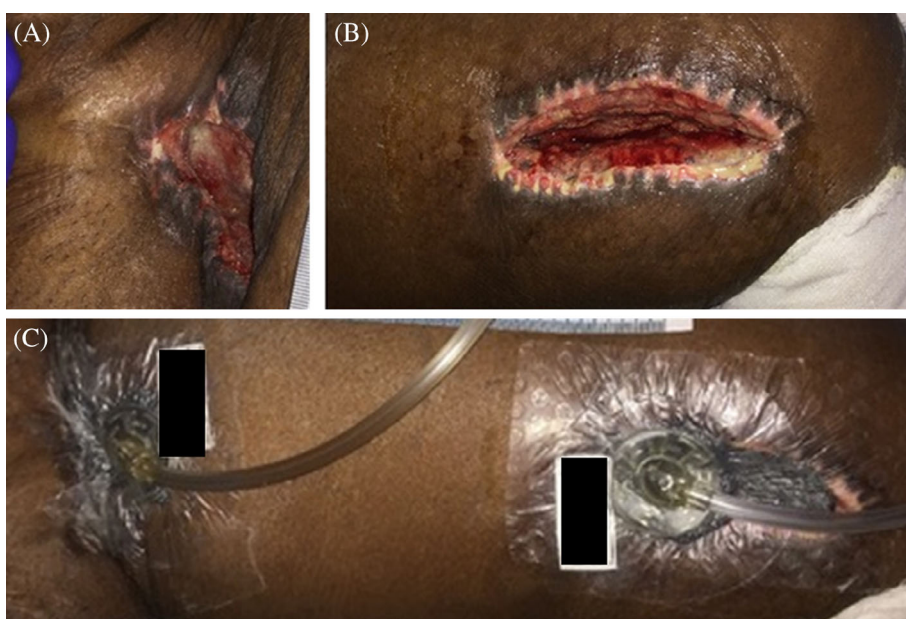


FIGURE 3 NPWT with HA-drape application to an infected femoral-popliteal bypass graft and site. A, Groin wound after sharp debridement. B, Lower left extremity wound after sharp debridement. C, Application of NPWT with HA-drape on both wounds. HA-drape, hybrid drape; NPWT, negative pressure wound therapy

(such as ostomy paste or ostomy ring) were used during this drape application as the health care provider typically needed ancillary products to help create and maintain a seal during the traditional drape application. Negative pressure was maintained without any leaks. After 7 days of NPWT with HA-drape, the patient was discharged home with NPWT and traditional drape. At follow-up, the abdominal wound was fully closed.

3.3.3 | Case study 3

A female patient presented for care with an infected femoral-popliteal bypass graft and site. The groin wound measured $6.5 \times 3.8 \times 4\text{-cm}^3$, and the left lower extremity wound measured $10 \times 3 \times 4.2\text{-cm}^3$. Previous medical history included diabetes, hyperlipidaemia, coronary artery disease, and peripheral vascular disease. Oral antibiotics

were administered, followed by sharp debridement and application of NPWT with HA-drape with dressing changes every 2 to 3 days (Figure 3).

At the first and second HA-drape application, no ancillary products were used as they were not needed to ensure a seal. HA-drape placement utilised a 3 cm border, and drape repositioning was not required during any HA-drape applications. Negative pressure was also maintained without leaks. After 11 days of NPWT with HA-drape, the patient was discharged to a skilled nursing facility with NPWT and traditional drape.

4 | DISCUSSION

Chronic and complex wounds with challenging anatomical locations often require the extended use of advanced wound care modalities, increasing a patient's risk of

developing MARSIs.³ NPWT is commonly used to manage complex wounds and has traditionally required the use of a polyurethane drape with an acrylic adhesive over foam dressings to create a negative pressure seal.⁴⁻⁸ However, this drape is unable to be removed and repositioned once it has been placed, and drape removal during dressing changes can be painful. A new hybrid polyurethane drape with acrylic adhesive and a silicone perforated layer has been developed for use with NPWT.

Our six-patient case series evaluated the use of NPWT with the novel HA-drape. The authors report that the drape was easy to reposition during initial application and maintained a negative pressure seal. No periwound skin irritation with HA-drape use was observed in any of the patients. The authors also found that the HA-drape had similar adhesive capabilities as the standard polyurethane drape system; however, the advantages appear to be the ability to reposition the HA-drape, while retaining adhesion, as well as less discomfort and irritation in the area surrounding the wound, per patient reports. Based on this preliminary experience, the authors have developed some recommendations for HA-drape application in our facility and have identified those patients who would be optimal candidates for use of the HA-drape with NPWT during wound management.

Based on our experience, the periwound skin should be cleaned and prepared per institution protocol or the physician's orders before HA-drape application. A skin protectant may be applied creating an approximately 5 cm border on either side of the wound to assist with dressing seal integrity. The HA-drape should be trimmed to a length larger than the wound size, allowing enough HA-drape to cover the foam dressing as well as an additional 5 to 7 cm border over intact periwound skin. To place, the release liner should be removed, and the HA-drape positioned by using the handling strips. The HA-drape should be placed with the adhesive side face down over the foam and over 5 to 7 cm of intact periwound skin. In order to decrease potential trauma to the periwound skin, the HA-drape should not be pulled or stretched over the foam during drape application. When in the correct position, hold down the edge of the drape at the perforated handling strips should be removed and gently patted down around the wound to ensure an occlusive seal. Wrinkles or creases should be smoothed out to prevent negative pressure leaks. A 2.5 cm hole should be cut through the HA-drape for application of the sensing pad. The sensing pad should be connected to the NPWT therapy unit to initiate the prescribed therapy setting. Negative pressure seal leaks did not occur in any of our six patients, so no additional pieces of HA-drape were needed.

Use of the HA-drape with NPWT may be beneficial for patient populations with complex wounds who are more at risk for developing MARSIs. Typical higher-risk patients for MARSIs include those with chronic skin conditions (eg, eczema, dermatitis, chronic ulcers and epidermolysis bullosa); immunosuppression, patients in the intensive care unit, patients who have recently or are currently undergoing radiation therapy, and patients with malnutrition or dehydration.^{3,9} Patients with peripheral arterial disease, venous insufficiency, cardiac insufficiency, and hypertension are also at risk for developing MARSIs.⁹

Other groups of patients with unique risk factors for developing MARSIs exist. For example, in elderly patients, the aging process can increase the risk of skin injury. These age-related changes include: loss of dermal matrix, loss of subcutaneous tissue, increased epidermal thinning, reduced cohesion between the dermal and epidermal layers, reduced vascularity, elasticity and tensile strength, and loss of skin moisture.⁹ Additionally, skin injuries are frequently seen in orthopaedic surgery patients because of the adhesives used to secure dressings as well as the biomechanical stress caused by joint movement, skin friction and the presence of postoperative or traumatic tissue edema.¹⁰ While skin assessment for MARSIs before application and after removal of medical adhesives is required, selecting the appropriate adhesive product based on patient and wound factors, and appropriate product application and removal technique can help reduce the incidence of MARSIs.⁹ Future studies assessing the potential clinical benefits of NPWT use with HA-drape in these high-risk patient populations is warranted.

Limited published data exist regarding the use of NPWT with the HA-drape. As such, a direct comparison of our data to the published literature was unable to be performed. Additional large-scale studies will need to be conducted to fully assess the clinical and health economic impact of NPWT use with the HA-drape.

In these six patients, health care providers were able to reposition the HA-drape without periwound skin irritation and successfully create a negative pressure seal without the need for ancillary products in anatomically challenging wound locations.

ACKNOWLEDGEMENTS

The authors thank Julie M. Robertson, PhD (3M) for assistance with manuscript preparation and editing.

CONFLICT OF INTEREST

L. G. Fernández and M. R. Matthews are consultants for KCI. KCI provided product samples.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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How to cite this article: Fernández LG, Matthews MR, Benton C, et al. Use of a novel silicone-acrylic drape with negative pressure wound therapy in anatomically challenging wounds. *Int Wound J*. 2020;17:1829–1834. <https://doi.org/10.1111/iwj.13471>