Use of a soft silicone-based film dressing in negative pressure wound therapy

Over the past 20 years the use of negative pressure wound therapy (NPWT) has broadened and is now widely used in the management of complex wounds in a range of settings. Trauma and pain caused by the removal and reapplication of NPWT dressings has been identified as a major contributor to wound pain. Film-based dressings with adhesive skin contact layers are used to keep NPWT systems in place and skin stripping may occur because the film can adhere too aggressively to the periwound skin, resulting in trauma and pain on removal. Here, the authors report 10 patients' responses to a questionnaire on the experiences of dressing changes using a traditional acrylic adhesive-based film (Avance® Film; Mölnlycke Health Care) or an advanced silicone adhesive-based film (Avance® Film with Safetac®; Mölnlycke Health Care) during treatment with NPWT. Overall, the patients were satisfied with the silicone adhesive-based film and preferred it to the acrylic adhesive-based film.

KEY WORDS
- Negative pressure therapy
- Silicone-based film
- Skin stripping
- Wound-related pain

Effectively handling patient pain is a fundamental part of ensuring high-quality treatment. While some clinicians are aware of the issues associated with wound pain, others fail to manage pain effectively at dressing change (Hollinworth and Collier, 2000). The World Union of Wound Healing Societies (WUWHS; 2004) consensus document on minimising pain during wound dressing-related procedures recommends that wound-related pain be assessed, and its intensity rated, before, during, and after dressing changes using a recognised pain scale (e.g. Wong et al, 2001).

Pain management is an area of wound care that requires further research and clinician education. Bell and McCarthy (2010) found that, while nurses have a good knowledge of the causes of wound pain during dressing change, they have insufficient knowledge of the use of evidence-based pain assessment and dressing selection that would minimise wound pain at dressing change.

One of the first steps in treating pain during dressing change is to recognise when it occurs and to identify the primary cause, and to this end the WUWHS (2004) consensus document is a valuable resource for clinicians. Clinicians need to actively engage in strategies to minimise trauma and pain in wound care by understanding the impact of the pain of dressing change on patients (Hollinworth and White, 2006).

BACKGROUND

Damage to the wound bed and skin stripping of the periwound skin can occur following the repeated application and removal of dressings incorporating adhesives (Waring et al, 2008), and the level of pain or discomfort associated being unique to each patient (Cooper, 2010). Use of these products can also result in inflammatory skin changes, blistering, and oedema, and impair the skin's ability to act as a barrier to the external environment (Gerristen el al 1994, Dykes and Heggie, 2003; Dykes, 2007). Dykes (2007) suggests that some traditional adhesive dressings are more aggressive than those that employ Safetac® (Mölnlycke Health Care) soft silicone adhesive technology.

Negative pressure wound therapy (NPWT) is widely used in the management of complex wounds in a range of settings (European Wound Management Association [EWMA], 2002). During NPWT, adhesive film dressings are generally used to fix the wound dressing to the site and provide an adequate seal with the periwound skin for negative pressure to be generated. NPWT dressings

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Box 1. Product synopses.

(a) Avance® Film with Safetac®†

This products consists of a film with a Safetac skin contact layer and a vapour-permeable, waterproof backing film. It is intended for use with the Avance negative pressure wound therapy (NPWT) System to fix the wound dressing and provide an adequate seal. The film is designed to minimise pain and prevent trauma at the dressing change. In addition, the Safetac skin contact layer facilitates repositioning of the film dressing. Safetac employs soft silicone technology which adheres readily to intact, dry skin, while also adhering to the surface of the moist wound bed. Dressings coated with Safetac can be applied without causing damage to newly formed tissue in the wound or stripping skin in the periwound area. It also minimises pain at dressing removal (Cutting, 2008). Safetac reduces trauma to wounds and periwound skin, and lessens wound-related pain during and after dressing change (White, 2008). Safetac has been demonstrated to mould to the skin's pores, covering more skin surface and spreading peel forces on removal to prevent skin stripping (Rippon et al, 2007). It seals the wound margins, ensuring exudate does not spread to the surrounding skin and minimises the risk of maceration (White, 2005).

(b) Avance NPWT System

This system is a flexible and easy-to-use treatment for the promotion of wound healing, including drainage and removal of infectious material or other fluids, providing constant or intermittent negative pressure. It incorporates a rechargeable battery so that it can be operated independently of the mains (supporting patient mobility during treatment). Avance offers foam or gauze dressings that can be used in conjunction with the silicone-based wound contact layer, Mepitel®†, to reduce trauma and pain at dressing changes, prevent tissue from growing into the wound dressing and protect delicate deep structures (Chadwick et al, 2010). The Avance NPWT System is the only NPWT system that offers dressing kits that have Avance film with Safetac.

(c) Avance Transparent Film

This product is thin, transparent, breathable polyurethane film coated with a polyacrylic adhesive. The film is intended for use with the Avance NPWT System to fixate the wound dressing and provide an adequate seal.

†All Mölnlycke Health Care.

normally require replacement every 2–4 days and, as a result, skin stripping can occur when films adhere too aggressively to the periwound skin, resulting in trauma and pain.

By employing the principles outlined in the EWMA (2002) document on reducing pain during dressing change, using medical adhesive removal sprays*, and carefully selecting appropriate, atraumatic dressings, pain associate with dressing removal can be reduced.

AIMS

The aim of the case series was to provide evidence for the benefits of the soft silicone-based Avance® Film with Safetac (Mölnlycke Health Care; *Box 1a*) when used in conjunction with the Avance NPWT System (Mölnlycke Health Care; *Box 1b*); namely that it minimises pain at dressing change and reduces the risk of skin stripping when compared with the acrylic adhesive-based Avance Film (Mölnlycke Health Care; *Box 1c*).

This evaluation was registered with the clinical audit department at Burton Hospitals NHS Foundation Trust where the evaluation took place. The objectives were to:

- Record patients' experiences of application and removal of the two films.
- Explore the expectations and perceptions of pain with the application of NPWT dressings among patients.
- Observe patients' skin around the wound for evidence of skin stripping while using the two films.
- Explore the patency of Avance Film with Safetac when used with NPWT dressings, based on clinician observation and patient reports on dressing change.

METHODS

Ten patients were recruited who had received care for a dehisced surgical wound that included Avance NPWT System in conjunction with Avance Film initially, and then had at least four dressing changes with the Avance Film with Safetac. All patients had experienced use of the acrylic adhesive Avance Film initially, and then had ≥4 dressing changes with the Avance Film with Safetac, to enable comparison.

Photographs were taken for evidence of skin stripping during dressing changes. The frequency of dressing changes was maintained in accordance with normal practice (i.e. 2–3 days), depending on whether foam or gauze dressings were being employed in the delivery of NPWT.

Patients were asked to complete a short form questionnaire, which comprised five questions. Using a Likert-type scale based on a modified pain scale tool (Wong et al, 2001) the patients were asked: to rate their pain level upon removal of the acrylic adhesive dressing with topical negative pressure (Wong et al, 2001); if they experienced skin stripping with normal film dressing; how they rated the removal of the Safetac film dressing with topical negative pressure; if they experienced skin stripping with the Safetac dressing; and if the dressing leaked with the Safetac system.

RESULTS

The results of the comparison of the two films is summarised in *Table 1*. For the acrylic adhesive-based Avance Film, the majority (9/10) of patients reported some pain or felt sore at dressing

*Medical adhesive removal sprays are designed to facilitate easy, pain-free, atraumatic removal of adhesive dressings. The siloxanes (silicone-based compounds) have properties that allow exceedingly low surface energy, which permits a change in the chemistry of the skin to disrupt the adhesive link between a dressing and the skin surface (Cutting, 2006).

"With the Avance® Film with Safetac® (Mölnlycke Health Care), seven patients had no pain on dressing removal and three patients had some pain."

removal. One patient found the Avance Film "very comfortable", four found it "comfortable", and three "adequate". Only two patients found it "uncomfortable". Half (5/10) of the patients experienced skin stripping with the Avance Film, and it was observed that all these patients experienced pain on removal of the film. Adhesive spray was required in order to remove the film in the case of five patients; of these, two patients experienced skin stripping.

With the Avance Film with Safetac, seven patients had no pain on dressing removal and three patients had some pain. With regards to the comfort of Avance Film with Safetac, one patient reported that the film was very comfortable, five patients found it comfortable, three described it as being adequately comfortable and one reported it as uncomfortable, but this patient's dressing had fallen off. Nine of the patients had no experience any skin stripping with the Avance Film with Safetac .

Two of the case studies are presented in detail to give the reader an insight into the type of wounds encountered during the evaluation. These cases allow comparison of two patients, one who found Avance Film with Safetac "very comfortable, the other "adequately comfortable".

Case studies

Patient 7

A 39-year-old, obese (BMI 35 kg/m^2) woman was referred to the author following hospital admission for wounds resulting from an accident 6 weeks prior. Her car pinned her against a curb due to hand brake failure, resulting in bilateral leg trauma. The patient went to theatre on the same day for incision and drainage of the wound due to infection.

The right outer lower leg wound was a full-thickness surgical wound measuring 20 cm × 8 cm. The wound bed consisted of 100% pink, well-perfused tissue. On the periwound there was a small amount of necrotic tissue. On her left leg she had a wound that measured 13 cm × 13 cm with an area of necrosis measuring 3 cm × 3 cm at the top right corner of the wound. After consultation with the orthopaedic surgeon, a care regimen was agreed on and NPWT commenced for both leg wounds (*Figure 1a*).

Comfeel® strips (Coloplast) were applied to the periwound to ensure a good seal. The Avance NPWT System was applied using one large Avance Foam dressing and the wound bed was lined with Mepitel® (Mölnlycke Health Care). A flat drain was inserted into the foam and the Avance Film was applied over the top. The Avance Pump was set at –120 mmHg on continuous therapy. Her blood results were haemoglobin 14.1 (130 g/L–180 g/L), white cell count 11.8 (4.0/L–11.0/L), serum albumin 40 (35 g/L–52 g/L), Malnutrition Universal Screening Tool (MUST; 0), and Waterlow Score 5 (no risk).

NPWT was continued for 4 weeks, with twice-weekly dressing changes. Initially, morphine was administered prior to dressing change. The Safetac film dressing was commenced after one week and the patient required morphine on the first Safetac film dressing, but after this time only ibuprofen was required prior to dressing change.

The patient offered feedback on the Avance Film with Safetac, and compared it with the Avance Transparent Film with which she had experienced

Table 1. Results of patient and clinician assessment

		Avance® Film†			Avance® Film with Safetac®†		
Patient	**Site**	**Pain at dressing change**	**Comfort**	**Skin stripping**	**Pain at dressing change**	**Comfort**	**Skin stripping**
1	Breast*	Some pain	Adequate	Yes	No pain	Very comfortable	No
2	Groin*	Some pain	Comfortable	No	Some pain	Adequate	No
3	Breast	No pain	Comfortable	No	No pain	Uncomfortable	No
4	Stump	Some pain	Comfortable	Yes	No pain	Comfortable	No
5	Abdomen*	Some pain	Adequate	No	No pain	Comfortable	No
6	Lower leg	No pain	Very comfortable	No	Some pain	Comfortable	No
7	Lower leg*	A lot of pain	Adequate	Yes	No pain	Comfortable	No
8	Abdomen*	Felt sore	Uncomfortable	No	Some pain	Adequate	No
9	Right ankle	Felt some pain	Comfortable	Yes	No pain	Comfortable	No
10	Abdominal	Felt some pain	Uncomfortable	Yes	No pain	Adequate	Yes

†Mölnlycke Health Care; *Medical adhesive removal spray used to remove the Advance film only. It was not required with the Advance Safetac film.

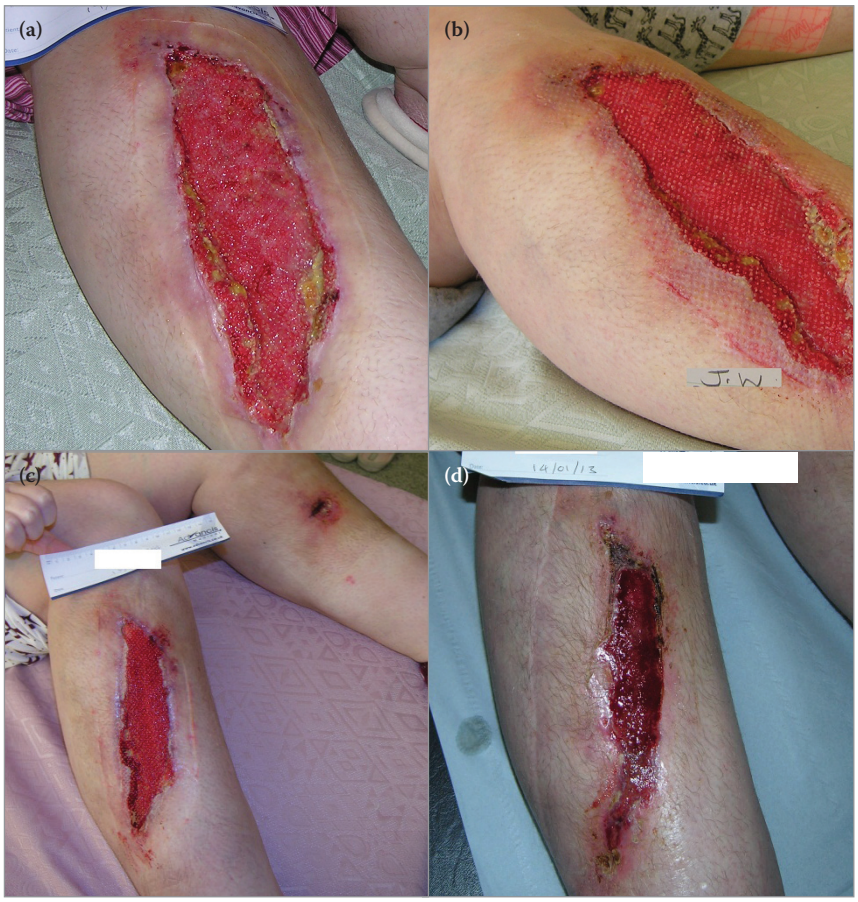
quite a lot of pain on dressing removal, requiring morphine to be administered. The application of the Avance Film with Safetac was comfortable, according to the patient, and she did not experience skin stripping, however, with the Avance Film, she felt pain upon removal of the dressing. The patient was happy with the Avance Film with Safetac and stated that she would recommend this film over the acrylic adhesive film.

After 4 weeks, the right leg outer wound had progressed well and measured 17 cm × 4 cm (*Figure 1b*). The wound was clean, with 100% granulation tissue. The patient was scheduled for a skin graft but, due to delay in transfers, the wound had completely healed by secondary intention in 6 weeks. The surrounding tissue was well perfused, however the leg was swolen, the cause of the swelleing was unknown and she was advised to elevate her legs as high as possible while at home.

The left outer leg wound had reduced to 2 cm × 1.5 cm (*Figure 1c*). The wound bed comprised 20% sloughy tissue and 80% granulating tissue. The patient was told about the importance of resting at home, and taking the correct nutrition for wound healing. A wound swab taken after four weeks of treatment with NPWT showed moderate growth of *Staphylococcus aureus* and moderate growth of *Coliform* spp; the patient completed a course of antibiotics. The author explained that she could expect odour from the wound (especially since she was no longer receiving NPWT) and that she would notice it most when the dressing required changing and that it could be disguised with perfume.

Once NPWT was discontinued, the right leg wound was treated with Aquacel® (ConvaTec) and Biatain® (Coloplast) every 48 hours (*Figure 1d*). The left wound required the full PolyMem® Max® (Ferris Mfg.) every 4 days. She was advised to elevate her lower legs to help reduce the swelling and to promote wound healing. An outpatient review appointment was made for one month later.

Figure 1. The progress of Patient 7's wound at (a) 7, (b) 11, and (c) 30 days after commencement of treatment with negative pressure wound therapy (NPWT), and (c) follow-up visit 1 month after NPWT was discontinued.

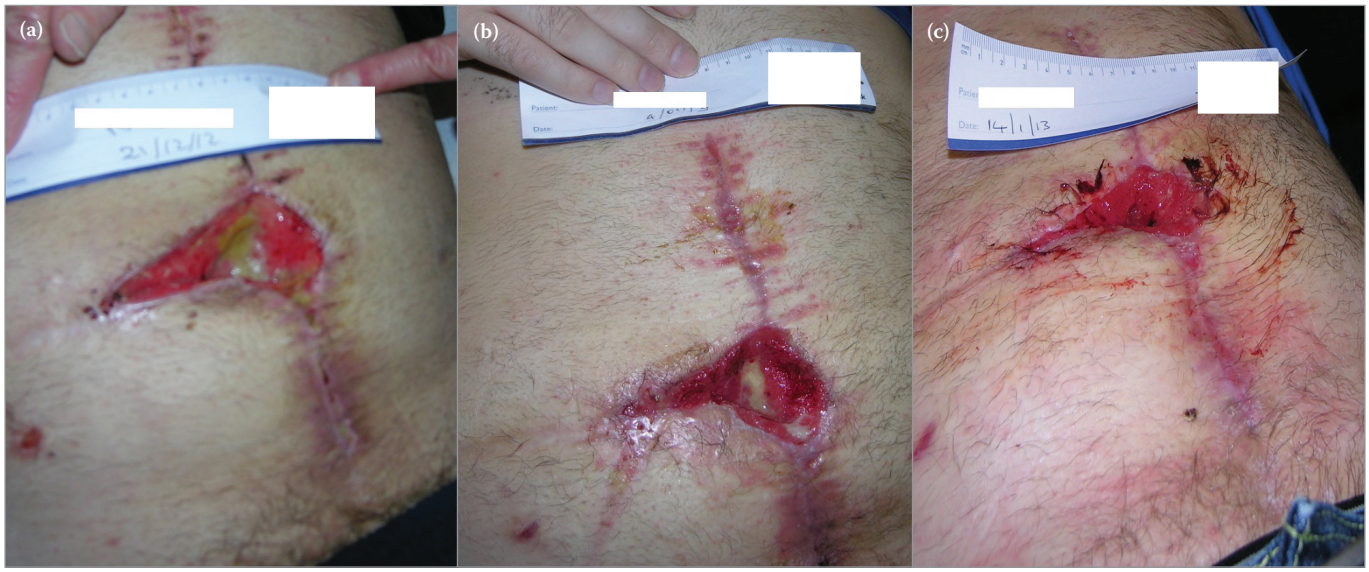


Patient 8

A 33-year-old man was referred to the author with a dehisced abdominal wound following a laparotomy, enterocutaneous fistula and resection of the small bowel. He was diagnosed with Crohn's Disease at the age of 14. His blood results were serum albumin 37 (35–52 g/L, haemoglobin 10 (130 g/L–180 g/L), white cell count 11.2 (4.0/L–11.0/L), MUST 0. His BMI was 27 kg/m^2. A wound swab taken on post-operative day 5 revealed heavy growth of *Coliform* spp and *Pseudomonas* sp and he was treated with 400 mg of metronidazole three times a day. He was eating well and the author discussed with him the importance of a good, high-protein diet in wound healing.

After a consultation with his surgeon, a care regimen was agreed and NPWT was commenced on post-operative day 13 (*Figure 2a*). The wound was 8 cm × 4 cm × 3.5 cm (full thickness) at this time. The wound bed consisted of 30% slough and 70% granulating tissue, there was no inflammation, the moisture level was moderate and the wound edges were well-perfused. Comfeel strips were applied on the periwound skin to ensure a good seal. The author applied the Avance NPWT System using a polyhexamethylene biguanide gauze and a drain was inserted into the gauze and then Avance

Figure 2. The progress of Patient 8's wound at (a) commencement of negative pressure wound therapy (NPWT), and after (b) 14 and (c) 21 days of treatment with NPWT.



Film applied over the top. The Avance Pump was set at –120 mmHg on continuous therapy.

The NPWT dressings were changed twice weekly. The Avance Film was used once and then the Safetac dressing film was used. On all dressing changes, the patient's pain was assessed using the McCaffrey scale (1989). The patient experienced some pain on dressing change (he scored 4 on the McCaffrey scale and took tramadol for the first 2 weeks of his treatment regimen).

The nursing staff were happy with the Avance Film with Safetac, as it stayed in place well and was easy to apply. The patient commented that he had felt sore and tender when the Avance Film was removed. He did not experience skin stripping from the Avance Film but found it to be uncomfortable. He found that the Avance Film with Safetac was associated with some pain on dressing removal but it was tolerable, and he did not experience skin stripping.

After 14 days' treatment with NPWT (*Figure 2b*), the abdominal wound was 7.5 cm × 4 cm × 3 cm. The wound bed comprised 10% slough and 90% granulating tissue. There was no inflammation, the moisture level was moderate and the wound edges were well perfused. During dressing change, the patient's pain score had reduced to 1 on the McCaffrey scale. The patient was discharged at this point, and NPWT was continued for a further week in the community and the patient attended the outpatient clinic twice for dressing changes. On discontinuation of NPWT the following week (*Figure 2c*), treatment was switched to Sorbsan™ Packing Ribbon (Aspen Medical), Aquacel, and Biatain, with dressing change every 48 hours.

DISCUSSION

Tissue trauma caused by the removal of adhesive tapes, films, and dressings can increase the size of wounds, exacerbating pain, delay healing (Hollinworth and White, 2006), or result in skin stripping (Dykes et al, 2001; Dykes and Heggie 2003). The highest levels of pain are generally associated with skin and wound damage that occurs during dressing changes (Gerritsen et al, 1994; EWMA 2002, Tokumura et al, 2005; Dykes, 2007).

Ideal film dressing properties

The ideal properties of film dressings are at odds with one another; the film should adhere without failure, and yet be easily removable at the appropriate time without causing damage to newly formed tissue or to the periwound skin (Rippon et al, 2007). For use with NPWT, the film dressing must hold the NPWT dressing in place without losing the seal, while minimising

the risk of skin maceration. It should allow the dressing to be removed without causing trauma to surrounding skin, be safe (nonirritating and nonsensitising), leave no residue on the skin, have appropriate and suitable adhesion and maintain the secure dressing seal. An appropriate wear time must be achieved in between dressing changes.

Dressings that use Safetac technology have been shown to minimise the risk of trauma and pain associated with dressing changes (White, 2005). The soft-silicone adhesive – a micro-adherent – creates many contact points over the uneven surface of the skin (Rippon et al, 2007). Silicones are inert, nontoxic, and nonsensitising (Thomas, 2003).

With the Avance Film with Safetac technology, some pain was experienced on dressing change (3/10). This warrants further investigation with a larger evaluation group. The majority (nine patients) were comfortable using Avance Film with Safetac. Only one patient experienced skin stripping (Patient 10).

This was only a small evaluation so, therefore, the author could not demonstrate any statistically significant findings.

CONCLUSION

This patient evaluation has demonstrated that the Avance Film with Safetac was more comfortable than the acrylic adhesive-based Avance Film and that the Avance film with Safetac maintained a consistent level of adhesion and dressing security. It has distinct advantages over acrylic film dressings and would be a very valuable addition when used with NPWT dressings as it also helps to reduce patient anxiety at dressing change and minimises skin stripping.

This article highlights a number of important differences between the acrylic film in the Avance NPWT System compared with the Avance Film with Safetac. The Safetac film meets the criteria of an atraumatic dressing that minimises pain on dressing change, while maintaining a seal between the dressing and the skin. Overall, the patients were comfortable with the Avance Film with Safetac and would recommend it over the acrylic film. Avance Film with Safetac may be a useful addition for patients receiving NPWT. WUK

DECLARATION OF INTEREST

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