# Using a single-use, canister-free negative pressure wound therapy on recalcitrant wounds: a case report series

Negative pressure wound therapy (NPWT) is a versatile system that helps optimise wound healing by applying negative pressure to reduce inflammatory exudate and promote granulation tissue. Participants in the study were randomly selected. The patients were scheduled for dressing changes twice a week. A sample of seven adult participants with recalcitrant wounds of various sizes and aetiologies was studied at two clinics in Sweden and one in Australia. All patients were treated with a single-use, canisterless negative pressure wound therapy (sNPWT) system, VivereX™ (Sunmedic, Vellinge, Sweden). In these seven patients, the application of sNPWT in wound management resulted in notable improvements in wound healing. The purpose of this study was to determine how effectively sNPWT heals recalcitrant wounds. In conclusion, this study shows that sNPWT is a promising wound-healing modality that offers several benefits compared to conventional wound treatment methods. Further studies are needed to evaluate efficacy, safety and long-term outcomes with the use of VivereX in similar cases.

**Marcus Gerlee**
*Gerlee Plastic and Reconstructive Surgery, Helsingborg, Sweden*

**Christina Håbber**
*Wound consult assistant nurse, Department of Orthopaedic Surgery Skåne University, Ystad, Sweden*

**Key words**
- Diabetic ulcer
- Negative pressure wound therapy
- Pressure ulcer
- Single-use canisterless NPWT

Acute or chronic wounds are a common issue that often result from surgery, trauma, or underlying medical conditions (Wilsonet et al, 2004; Klevens et al, 2007; Spiliotis et al, 2009). Numerous therapeutic approaches can be used to treat these wounds and one such approach is the use of negative pressure wound therapy (NPWT; Stannard et al, 2006, 2012).

NPWT is believed to have a significant impact on wound healing by inducing mechanical deformation on the tissue, which promotes wound contraction and ultimately affects the microvascular blood flow surrounding the wound edges (Argenta and Morykwas, 1997; Morykwas et al, 1997, 2006; Kairinos et al, 2009). This process stimulates the growth of new blood vessels and encourages the formation of granulation tissue (Morykwas et al, 1997; Chen et al, 2005; Greene et al, 2006). Furthermore, NPWT is a therapy that extracts excess fluids from the wound and minimises bacterial colonisation (Mouës et al, 2004; Malmsjö et al, 2014).

Single-use, canisterless NPWT(sNPWT) has gained popularity in recent years, primarily due to its convenience and effectiveness. Unlike traditional NPWT, which relies on canisters that collect wound fluids and debris, the canister-free system enhances the ease of workflow, providing a more hygienic, cost-effective and low-risk way of treating wounds. One of the primary advantages of the sNPWT system is its ability to reduce the risk of wound contamination.

## Patients and methods

An ultraportable NPWT system (VivereX™, Sunmedic, Vellinge, Sweden) was used in all patients. The device is an sNPWT system comprising a disposable dressing with an integrated suction pump. The device is lightweight and therefore is ideally suitable for delivery of NPWT in both hospital and home-care settings.

An informed consent was obtained from all patients prior to their participation in the study. Patients were recruited from two centres in Sweden, an orthopaedic department (Ystad Hospital) and the Gerlee plastic surgery clinic, and one in Australia (Molmike Medical). Study participants were selected by simple random sampling from those who were attending for wound care.

Seven patients were enrolled into the study with various wound sizes and aetiologies, two cases with postoperative wound dehiscence, four cases with pressure ulcers and one case with trauma wound in a diabetic patient. The patients were usually scheduled for dressing changes twice a week.

## Results

In these seven cases, the application of sNPWT

## Case study 1

A 78-year-old woman presented to the emergency room with symptoms indicative of intestinal obstruction. Emergency surgery was conducted. However, she experienced complications with seroma accumulation, which was drained multiple times over a period of 3 months. On presentation for wound assessment, her wound measured 60 mm × 25 mm **[Figure 1a]** and sNPWT therapy was commenced **[Figure 1b]**. After 8 days, the wound had reduced to 35 mm × 10 mm **[Figure 1c]**. The wound was completely closed after 12 days **[Figure 1d]**.

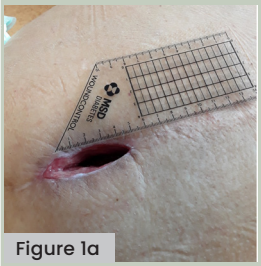
Figure 1a

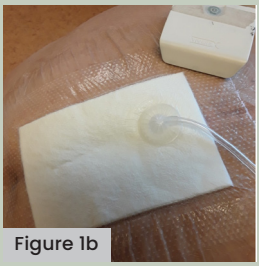
Figure 1b

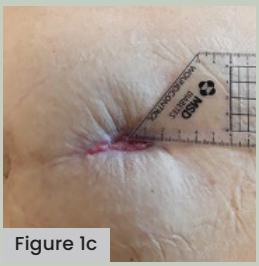
Figure 1c

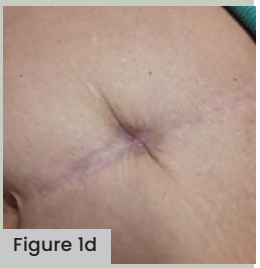
Figure 1d

## Case study 2

A 42-year-old woman who underwent abdominoplasty. Postoperatively, she had wound dehiscence, which did not show any sign of healing by traditional wound treatment and antibiotic therapy. One month after the operation, the wound measured 15 mm × 30 mm **[Figure 2a]** and sNPWT was implemented **[Figure 2b]**. This resulted in a significant reduction in wound size to 2 mm × 10 mm within 5 days **[Figure 2c]**. The patient was treated with sNPWT for 20 days before transitioning to silicone dressing. The wound healed completely 6 weeks after surgery **[Figure 2d]**.

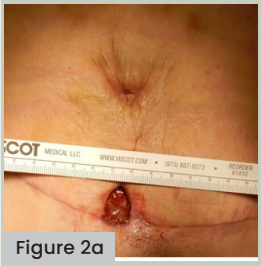
Figure 2a


Figure 2b

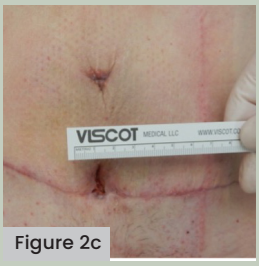

Figure 2c

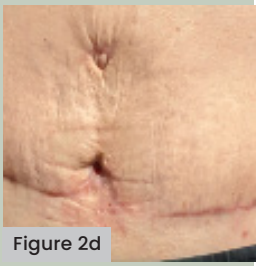
Figure 2d

## Case study 3

A 74-year-old man with diabetes sustained a traumatic leg injury, resulting in a wound measuring 60 mm × 40 mm with a depth of 8mm **[Figure 3a]**. The patient underwent necrotic debridement and subsequently received sNPWT. Within 3 days of application, a reduction in wound size to 50 mm × 40 mm, with a depth of 2–3 mm was observed **[Figure 3b]**. Eight days later, the wound area further decreased to 25 mm × 25 mm with a depth of 1 mm **[Figure 3c]**. The sNPWT was discontinued after 4 weeks of treatment and the wound area was then treated with Prontosan gel, Sorbact and Polymem. Full wound closure was achieved in less than 8 weeks **[Figure 3d]**.

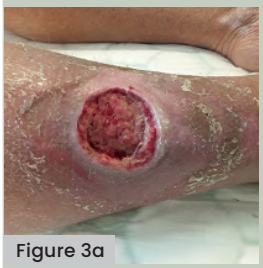
Figure 3a

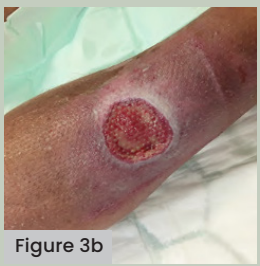
Figure 3b

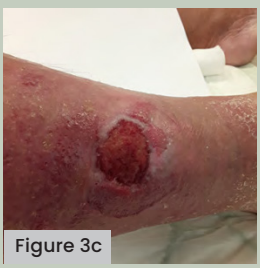
Figure 3c

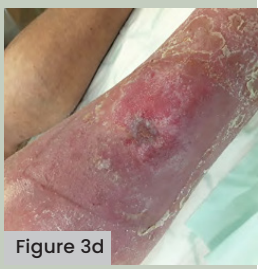
Figure 3d

## Case study 4

A 69-year-old man had undergone a leg amputation 8 years ago, due to a pressure ulcer. The patient subsequently underwent bone revision due to stump overgrowth, with an initial wound measurement of 60 mm × 35 mm **[Figure 4a]**. Treatment by sNPWT system was administered and after 8 days the wound had reduced to 15 mm × 15 mm **[Figure 4b]**. Approximately 2 weeks later, the wound was 10 mm × 10 mm and the surface demonstrated epithelialisation **[Figure 4c]**.

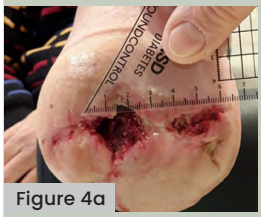

Figure 4a

Figure 4b

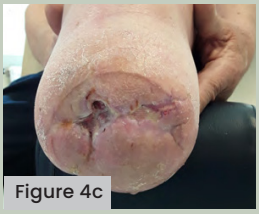
Figure 4c

## Case study 5

A 59-year-old woman underwent abdominoplasty, but her postoperative healing was complicated by wound dehiscence. The wound, measuring 20 mm × 30mm **[Figure 5a]**, was treated with sNPWT. However, due to excessive wound fluid, sNPWT had to be discontinued after 2 days **[Figure 5b]**. One week later, sNPWT was reapplied; the wound was 12 $mm^2$ **[Figure 5c]**. Within 4 days, the wound area decreased to 7 $mm^2$. Subsequently, conventional wound dressing treatment was initiated and after 1 week, the wound had healed **[Figure 5d]**.

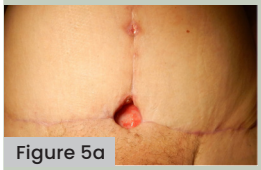
Figure 5a

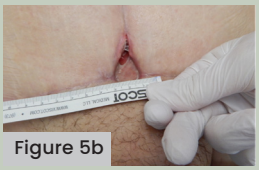
Figure 5b

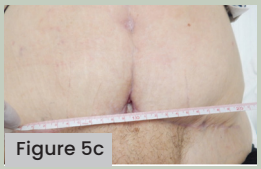
Figure 5c

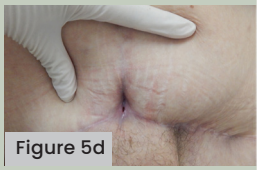
Figure 5d

## Case study 6

A 26-year-old woman presented with pressure ulcer on her left elbow **[Figure 6a]**. Despite being treated with sNPWT option for 220 days, no improvement occurred **[Figure 6b]**. Following this, sNPWT was changed to VivereX. Within 45 days, the wound had fully healed **[Figure 6c]**.

Figure 6a

Figure 6b

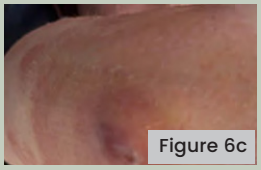
Figure 6c

## Case study 7

A 38-year-old man presented with a lateral malleolus pressure ulcer. The ulcer was 10 mm × 10 mm and was 5 mm deep **[Figure 7a]**. The ulcer was subjected to conventional treatment for 2.5 years. He had been treated sNPWT for 8 weeks, without any notable signs of wound healing, and was then changed to VivereX sNPWT. Complete wound healing was observed after 6 months **[Figure 7b]**.

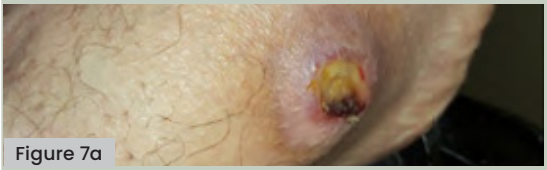
Figure 7a

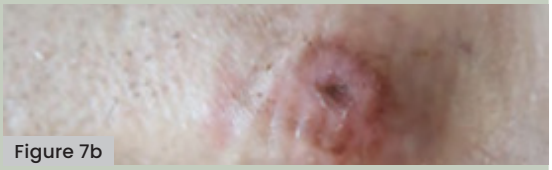
Figure 7b

in wound management resulted in notable improvements in wound healing. In some cases, prior treatments failed to produce any significant results, but sNPWT was able to achieve wound closure within a comparatively short period of time.

## Discussion

The results from these cases provide a promising outcome with the use of sNPWT, which appears to be a safe and effective option for the treatment of different type of hard-to-heal wounds, even when prior treatment had failed.

Case 3 highlighted the successful use of an sNPWT in the treatment of a traumatic wound in a patient with diabetes. The device was effective in reducing the wound size and depth, which led to quicker wound closure. This case emphasises the importance of utilising an evidence-based approach to wound management and underscores the need for proper wound care in diabetic patients to prevent adverse outcomes.

Furthermore, the disposable nature of the sNPWT system minimises the need for device disinfection and reduces the inventory and storage requirements for wound care centres. It is a cost-effective solution that reduces the burden of maintenance, repair and consumable replacement costs associated with traditional NPWT.

## Conclusion

In conclusion, sNPWT is a highly promising wound-healing modality that offers several benefits compared to conventional NPWT. By improving workflow, enhancing hygiene, reducing the risk of complications and providing cost-effective wound care, the system can improve patient outcomes and support the delivery of efficient and cost-effective healthcare. Further studies are needed to evaluate efficacy, safety and long-term outcomes with the use of VivereX in similar cases.

## Conflict of interest

The authors have no conflicts of interest to declare. ●

## References


Argenta LC, Morykwas MJ (1997) Vacuum-assisted closure: a new method for wound control and treatment: clinical experience. *Ann Plast Surg* 38(6): 563–76

Chen SZ, Li J, Li XY, Xu LS (2005) Effects of vacuum-assisted closure on wound microcirculation: an experimental study. *Asian J Surg* 28(3): 211–7

Greene AK, Puder M, Roy R et al (2006) Microdeformational wound therapy: effects on angiogenesis and matrix metalloproteinases in chronic wounds of 3 debilitated patients. *Ann Plast Surg* 56(4): 418–22

Kairinos N, Voogd AM, Botha PH et al (2009) Negative-pressure wound therapy II: negative-pressure wound therapy and increased perfusion. Just an illusion? *Plast Reconstr Surg* 123(2): 601–12

Klevens RM, Edwards JR, Richards CL Jr et al (2007) Estimating health care-associated infections and deaths in U.S. hospitals, 2002. *Public Health Rep* 122(2): 160–6

Malmsjö M, Huddleston E, Martin R (2014) Biological effects of a disposable, canisterless negative pressure wound therapy system. *Eplasty* 14: e15

Morykwas MJ, Argenta LC, Shelton-Brown EI, McGuirt W (1997) Vacuum-assisted closure: a new method for wound control and treatment: animal studies and basic foundation. *Ann Plast Surg* 38(6): 553–62

Morykwas MJ, Simpson J, Punger K et al (2006) Vacuum-assisted closure: state of basic research and physiologic foundation. *Plast Reconstr Surg* 117(7 Suppl): 121s–6

Mouës CM, Vos MC, van den Bemd GJ et al (2004) Bacterial load in relation to vacuum-assisted closure wound therapy: a prospective randomized trial. *Wound Repair Regen* 12(1): 11–7

Spiliotis J, Tsiveriotis K, Datsis AD et al (2009) Wound dehiscence: is still a problem in the 21th century: a retrospective study. *World J Emerg Surg* 4: 12

Stannard JP, Robinson JT, Anderson ER et al (2006) Negative pressure wound therapy to treat hematomas and surgical incisions following high-energy trauma. *J Trauma* 60(6): 1301–6

Stannard JP, Volgas DA, McGwin G III et al (2012) Incisional negative pressure wound therapy after high-risk lower extremity fractures. *J Orthop Trauma* 26(1): 37–42

Wilson JA, Clark JJ (2004) Obesity: impediment to postsurgical wound healing. *Adv Skin Wound Care* 17(8): 426–35