Using a single-use, disposable negative pressure wound therapy system in the management of small wounds

KEY WORDS
- Chronic wounds
- Disposable
- Negative pressure therapy system
- Outpatient
- Single-use

A novel, single-use, non-powered, disposable negative pressure wound therapy system (SD-NPWT; Nanova™ Therapy System; KCI) has been developed to manage acute and chronic wounds. It can be used in the outpatient setting and is compact and portable. The system is worn and can be operated by the patient, who can participate in the overall management of his or her wound care. The purpose of this article was to present initial experience using a novel SD-NPWT system to treat small acute and chronic wounds in an outpatient setting at St John's Hospital in the UK. One patient with a chronic, non-healing ulcer and two patients with acute wounds were treated with SD-NPWT on an outpatient basis. All of the patients tolerated the SD-NPWT well. There were no device complications and there was no patient non-compliance. Follow-up time ranged from 3 to 8 weeks. In all patients, periwound skin appearance and wound bed granulation improved. In all three cases, adjunctive use of SD-NPWT positively affected the clinical outcome and helped promote wound bed improvement.

TANYA BRANDON
Plastics Specialist Nurse, St John's Hospital, Howden, Livingston

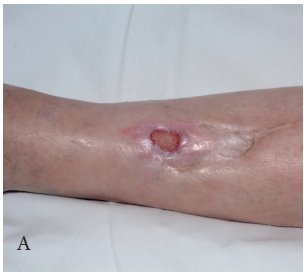
Negative pressure wound therapy (NPWT) has revolutionised the treatment of acute and chronic wounds since it was popularised by Argenta and Morykwas (Argenta and Morykwas, 1997; Morykwas et al, 1997). Powered NPWT systems utilise negative pressure to promote a wound healing environment by removing exudate and infectious material, promoting perfusion, reducing oedema, stimulating granulation tissue formation, and drawing wound edges together (Saxena et al, 2004; McNulty et al, 2007; Blume et al, 2008; McNulty et al, 2009). NPWT usage has increased. Powered NPWT systems to treat acute and chronic wounds often require hospital visits, which may inconvenience the patient and potentially result in higher medical costs. Non-professional caregivers and patients who participate in managing wound care treatment at home may find the experience stressful, and therefore there is a need for innovative and easy-to-use products in order to improve caregiver confidence.

Recently, a novel, single-use, non-powered disposable NPWT system (SD-NPWT; Nanova™ Therapy System; KCI, an Acelity company, San Antonio, Texas, USA) has been developed for use in the outpatient setting. The SD-NPWT system has many beneficial features (*Box 1*) and involves an absorbent dressing combined with a compact, manually-activated, single-patient-use therapy unit. The SD-NPWT system has an expected shelf-life of 30 days, and with the delivery of continuous negative pressure, the dressing absorbs exudate into the internal core to reduce the potential for maceration. The dressing is designed with a

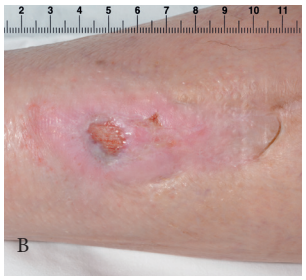
Box 1. SD-NPWT therapy unit features
- Lightweight
- Portable
- Allows for normalised activities
- Silent: no alarms, motor buzz, or other sounds
- No batteries: there is no risk of electrical failure
- Therapy unit is single-patient use
- 1–3 manual pumps, which are enough to generate negative pressure
- Yellow indicator marker indicates when re-priming is necessary
- Therapy unit lasts up to 30 days with multiple dressing changes

Acknowledgements

The author wishes to thank Acelity for providing the SD-NPWT and wound dressings and Gilbert Carrizales (Acelity) for assistance in the preparation and editing of this manuscript.



A



B

Figure 1. Wound appearance at initial presentation (a) and at 8 weeks after starting therapy (b)

silicone wound contact layer to help reduce wound bed adherence. A silicone-acrylic border maintains an effective seal for negative pressure, enabling easy repositioning and removal, which helps minimise trauma to the periwound skin.

The SD-NPWT system is indicated for use on small chronic, acute, traumatic, sub-acute and dehisced wounds, partial thickness burns, ulcers (such as diabetic, venous or pressure), surgically-closed incisions, flaps, and grafts. The SD-NPWT system requires no electricity, and activation of the system involves one to three manual compressions to prime the device. Once activated, the system maintains continuous negative pressure at -125 mmHg.

The purpose of this article was to evaluate our initial clinical experience using the SD-NPWT system to treat small wounds in an outpatient setting.

MATERIAL AND METHODS

Between February and October 2015, three patients received SD-NPWT at Saint John's Hospital, UK, in the outpatient department. All patients provided written consent to access confidential notes and photographs. Wound measurements were recorded before and after treatment, and the degree of slough, periwound skin appearance, and amounts of fluid exudate were observed. Patients attended twice weekly for follow-up visits in the outpatient setting; the length of follow-up ranged from a minimum of 3 weeks to a maximum of 8 weeks.

SD-NPWT was initiated using a sterile, single-use, absorbent silicone wound dressing (Nanova™ dressing; KCI, an Acelity company, San Antonio, Texas, USA) measuring 18 cm × 18 cm with dressing tubing. The tubing was connected to a single-patient-use disposable therapy unit at -125 mmHg. Dressings were changed every 3 days.

RESULTS

After the SD-NPWT was applied, patients were educated on the operation of the SD-NPWT and were discharged home. All patients tolerated the SD-NPWT well; there was no device or dressing failure. In all patients, periwound skin appearance and wound bed granulation improved. Notable reductions in the wound area were measured in these patients. Clinical experience using SD-NPWT on the three patients is described in detail below.

Case study 1

A 66-year-old female with a history of smoking presented with a chronic non-healing ulcer to the lower leg that measured approximately 2.5 cm × 2 cm. The wound appeared static with adherent slough, coupled with a red and excoriated periwound environment (*Figure 1a*). The wound was initially a pre-tibial laceration sustained after a fall. Previous treatments included medical-grade honey, silver-impregnated dressings, alginates, contact castings, compression therapy, skin substitutes, and skin grafting. Patient complications included a high level of pain and exposed tendon.

SD-NPWT and dressing changes were initiated as previously described. By Week 8 post treatment, the patient had experienced a reduction in pain, and the wound displayed improved granulation and improved periwound appearance. There was a reduction in the wound area to approximately 1 cm × 1 cm (*Figure 1b*).

Case study 2

A 50-year-old female with a history of alcohol dependency and malnourishment presented with burn contractures and wound breakdown on the right lateral and posterior areas of the torso. The wound measured approximately 11 cm × 6.5 cm and displayed thick adherent slough with a red and excoriated periwound environment (*Figure 2a*). Previous treatment included skin grafting, but the position of the wound prevented adequate healing.

SD-NPWT and dressing changes were initiated as previously described. By Week 3, the overall size of the wound remained consistent; however, it appeared improved, with decreased slough (*Figure 2b*). On Week 4, the periwound environment showed further improvement. The wound bed displayed increased vascularity and granulation appeared improved (*Figure 2C*). There was a reduction in the wound area to approximately 10 cm × 6 cm.

As the periwound skin and wound bed continued to improve, the patient was

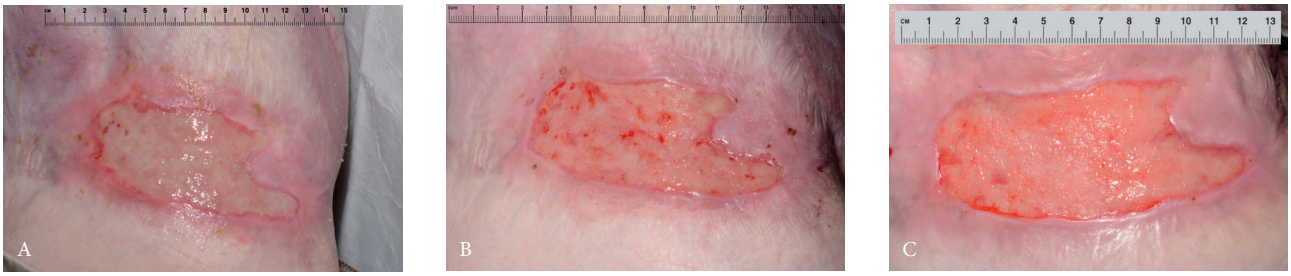


Figure 2. Wound appearance at initial presentation (a), at 3 weeks (b) and 4 weeks (c) after initiating therapy with the Nanova SD-NPWT system

referred to a local plastic surgeon for wound debridement and application of a bilayer matrix wound dressing (INTEGRA™ Bilayer Matrix Wound Dressing, Integra LifeSciences Corporation, Plainsboro, New Jersey, USA) and subsequent split-tissue skin grafting.

Case study 3

A 52-year-old male, with a history of sarcoidosis and a burn injury sustained over 50 years ago, presented with burn contractures with a large number of restricting bands on the right arm extending from under the axilla to the hand. The skin region from the axilla to the elbow displayed tightness, and the arm displayed a withered appearance and appeared smaller in circumference to the bottom of the right arm. Wound breakdown on the right arm had developed as a result of the sarcoidosis and the restricted circulation from the contractures *in situ*. The wound measured approximately 11 cm × 5 cm and displayed approximately 20% slough with moderate levels of exudate. The periwound environment was very red and excoriated, and the presence of a small number of broken areas with potential for further breakdown could be seen (*Figure 3a*). Previous treatments included split-tissue skin grafting and rotational flap surgery.

SD-NPWT and dressing changes were initiated an by Week 4, the levels of fluid exudate from the wound had decreased and slough was no longer present. The periwound skin appeared healthier, and the wound bed displayed improved granulation (*Figure 3b*). There was also a reduction in wound area to approximately 8 cm × 4 cm.

DISCUSSION

In all three cases, adjunctive use of SD-NPWT positively affected the clinical outcome and helped promote wound bed improvement. In one case, SD-NPWT, followed by other advanced wound-healing treatments (bilayer matrix wound dressing and split-tissue skin grafting), was successfully used in wound care management.

In our experience, the disposable SD-NPWT system has optimised our patient care, led to a decreased number of doctor appointments between dressings, and reduced nurse interaction time with the patient. Although the device is currently not indicated for larger, more heavily exudative wounds, the SD-NPWT system is indicated for many types of smaller wounds, including diabetic foot ulcers, venous ulcers, surgical wound dehiscences, pressure ulcers, acute traumatic wounds, and over skin grafts. As the SD-NPWT system is entirely disposable, it eliminates the added administrative and support costs from rental-based systems that are incurred with traditional electrically-powered negative pressure pumps.

Our initial experience suggests that, compared to other traditional NPWT devices, the use of SD-NPWT in the outpatient setting could potentially reduce medical costs; however, further study is warranted. Although larger dressings may be available in the future, the SD-NPWT system was not designed for wounds that exceed the size of the dressing in surface area or have exudate levels greater than the capacity of the dressing. Further research to measure the efficacy of SD-NPWT in the adjunctive management of various wound types is necessary. WUK

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

Blume PA, Walters J, Payne W et al (2008) Comparison of negative pressure wound therapy using vacuum-assisted closure with advanced moist wound therapy in the treatment of diabetic foot ulcers: a multicenter randomized controlled trial. *Diabetes Care* 31(4): 631–6

McNulty AK, Schmidt M, Feeley T, Kieswetter K (2007) Effects of negative pressure wound therapy on fibroblast viability, chemotactic signaling, and proliferation in a provisional wound (fibrin) matrix. *Wound Repair Regen* 15(6):838–46

McNulty AK, Schmidt M, Feeley T et al (2009) Effects of negative pressure wound therapy on cellular energetics in fibroblasts grown in a provisional wound (fibrin) matrix. *Wound Repair Regen* 17(3):192–9

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

Saxena V, Hwang CW, Huang S et al (2004) Vacuum-assisted closure: microdeformations of wounds and cell proliferation. *Plast Reconstr Surg* 114(5):1086–96

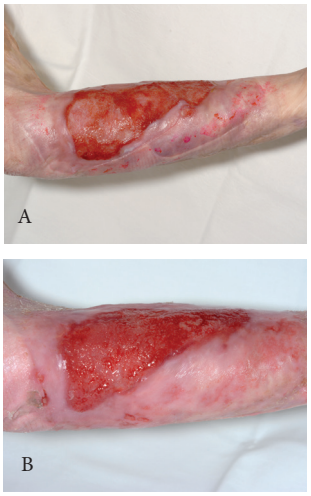


Figure 3. Wound appearance at initial presentation (a) and 3 weeks after starting therapy (b)