Using negative pressure therapy in wound healing

Wound healing does not always follow a simple path; some acute wounds fail to heal and some become chronic. Negative pressure wound therapy (NPWT) can be used to aid healing in acute, chronic, closed incisional, closed skin graft and open abdomen wounds. Unlike many other wound treatments and dressings, has a relatively good evidence base to demonstrate its effectiveness. This article considers its application in both primary and acute care.

### Keywords
- Tissue viability
- Negative pressure wound therapy
- Chronic wounds

### In this article...
- Types of wound for which negative pressure wound therapy is suitable
- Considerations for patient selection
- Using negative pressure wound therapy in the community

### 5 key points
1. **Negative pressure wound therapy** has been found to aid healing in many complex wounds
2. The therapy can be used in both acute and community settings
3. Practitioners using NPWT must be trained to use the specific device
4. Patient selection must involve assessing a range of factors in addition to the wound requiring treatment
5. NPWT must be applied carefully to avoid damaging the wound bed or causing pressure damage to the surrounding skin

### Abstract


Negative pressure wound therapy, also referred to as topical negative pressure therapy, is a useful treatment for a variety of acute and chronic wounds and, unlike many other wound treatments and dressings, has a relatively good evidence base to demonstrate its effectiveness. This article considers its application in both primary and acute care.

Wound healing does not always follow a simple path; some acute wounds fail to heal and some become chronic. Negative pressure wound therapy (NPWT) can be used to aid healing in acute, chronic, closed incisional, closed skin graft and open abdomen wounds. Unlike many other wound treatments and dressings, has a relatively good evidence base to demonstrate its effectiveness, but manufacturers list some contraindications and situations requiring caution (Box 1).

Negative pressure (suction) is applied to the wound bed through a foam or gauze contact medium using an electrically, battery or mechanically powered pump; this involves achieving an airtight, vacuum, seal. The benefits of NPWT include:

- Enhanced healing and granulation tissue formation (Othman, 2012; Schintler, 2012; management of highly exuding wounds (Schintler, 2012; Mouès et al, 2011); reduced dressing changes compared with more conventional dressings (Wu and Armstrong, 2008); reduced nurse time (Dowsett et al, 2012); reduced costs (Othman, 2012); and improved quality of life (Othman, 2012).

The treatment is thought to assist healing by providing a moist environment and removing interstitial fluid and exudate (Schintler, 2012; Mouès et al, 2011); and enhancing granulation tissue formation (Schintler, 2012), angiogenesis (Mouès et al, 2011) and tissue perfusion (Schintler, 2012; Mouès et al, 2011). Others have reported fluctuations in blood flow (Borgquist et al, 2011; Malmsjö et al, 2009a), which may be useful in patients with compromised vascularity.

Until recently, funding for NPWT was restricted to the acute sector, but it is increasingly available in the community due to the introduction of competing devices, the availability of consumable dressings on prescription, and the drive to prevent hospital admissions and facilitate early discharge. However, access in community setting is variable (Othman, 2012). Dressings

A range of studies evaluating gauze-based and foam-based NPWT have considered the difference in tissue formation (Malmsjö et al, 2012; Fraccalvieri et al, 2011a) and deformations (Malmsjö et al, 2012), healing rates (Dorafshar et al, 2012); pain at dressing change (Dorafshar et al, 2012; Fraccalvieri et al, 2011b), contraction (Anesäter et al, 2011; Othman, 2012).
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Malmşjo et al, 2009b), scar tissue depth (Fraccalvieri et al, 2011a), and effect on microvascularity (Malmşjo et al, 2009a). Little difference has been demonstrated between the two, although patient-reported pain on dressing change has been consistently significantly lower with gauze (Dorafshar et al, 2012; Fraccalvieri et al, 2011b). The use of gauze also requires fewer dressing changes and, without the need to sculpt the foam, less nursing time at dressing change (Dorafshar et al, 2012).

Patient selection

Patients whose wounds are suitable for NPWT need to be assessed for their ability to live with the device. The following factors should be considered:

- Level of mobility and risk of tripping – drain tubes can create a trip hazard for those with reduced mobility, who may also find the larger pumps too cumbersome;
- Level of cognitive ability and risk of pulling the dressing or tubes off;
- Mental health status and ability and willingness to adhere to the treatment regimen – which involves wearing the pump at all times and having two or three dressing changes a week, and to care for the pump;
- Position of wound or wounds and the ability to obtain and maintain a seal;
- Pain at dressing changes – some patients may need nitrous oxide for pain relief, or if this is ineffective or unavailable (for example in community settings) it may be necessary to discontinue NPWT.

Dressing application

The application of NPWT dressings is not difficult but it requires an understanding of how the therapy works and training in the use of the specific device. Staff undertaking dressing changes should have the appropriate knowledge and training – poor dressing technique can lead to wound complications or breaches in the seal.

The wound is filled with gauze or foam, depending on the device used, then a drain is applied to facilitate the application of negative pressure and remove wound exudate. Drains are either inserted into the wound filler or on top, again depending on the device. Any areas of undermining, tracks or sinuses must be fully explored and filled to ensure negative pressure is achieved at these deepest areas. Practitioners applying NPWT must ensure that:

- Healthy skin is not damaged by contact with foam, gauze or drains;
- Exposed tissues such as tendon or bone are not damaged;
- Dressing materials are not left to embed into granulation tissue;
- Drains do not cause pressure damage;
- Patients and staff are familiar with the functionality of the pump;
- Foam/gauze does not come into contact with intact skin;
- Intact skin is lined with film dressing if foam is used it is important to document foam adhering to the wound bed. The use of a low-adherent liner dressing became standard practice when using foam because it prevents the foam adhering to the wound bed. However, Jones et al (2005) demonstrated that liner dressings can reduce the level of pressure delivered to the wound bed. They are unnecessary unless bowel, tendon or bone is being protected or dressing adherence causes painful dressing changes. Care must be taken to ensure that all liner is removed at dressing change, as there has been a reported case of liner dressing growing into the wound and scar tissue (Tan et al, 2009). Cutting gauze or foam should be carried out away from the wound as this can leave fragments in the wound, which can become embedded in healing granulation tissue.

Carving foam is a skilled procedure as it involves creating a shape that fits into the wound contours. If more than one piece of foam is used it is important to document how many so they can be counted out at dressing change. The wound bed should be thoroughly examined for flecks of foam or threads of gauze at dressing change so that these can be removed.

It is also necessary to secure drains at the exit point of the dressing to help obtain a seal and to prevent skin damage due to pressure at the exit point.

NPWT in community settings

The introduction of NPWT in community settings means patients with chronic and complex wounds can be treated at home, and also facilitates early discharge. The pathway in Fig 2 is an example of a community provider that purchased 18 NPWT devices and uses an online ordering system for the provision of dressings (Knight, 2010). Nine devices are held in locations throughout the organisation across the integrated care team (ICT) bases. These teams include community nurses, community assessment team and community matrons as well as other therapy and liaison nurses based within the local acute hospital. Nine devices are stocked in the tissue viability centre for the initiation of therapy as required in the community.

The pathway was designed to ensure that patients with NPWT initiated in hospital can be discharged home and receive equitable care. However, it is extremely important that any potential risks or hazards are identified for patients.

Fig 1. Stoma paste around wound edge

 BOX 1. CONTRAINDICATIONS AND CAUTIONS

Contraindications

- Wounds involving untreated osteomyelitis
- Wounds exposing blood vessels or organs with an unexplored fistula
- Wounds including open joint capsules
- Skin malignancy and excised skin malignancy – except for palliative care
- Wounds with necrotic tissue

Cautions

- Wounds with visible fistula
- Wounds with exposed bone or tendon
- Clotting disorder (risk of bleeding)
- Compromised micro-vascular blood flow to wound

Source: European Wound Management Association (2007)
The risk of accidents and misuse can be avoided. The device can be plugged into an electricity supply where necessary, without the use of extension leads to avoid causing a trip hazard. Patients are advised to be careful if they have animals or small children as unpredictable behaviour may lead to accidents.

**Conclusion**

NPWT is a useful and effective wound treatment that can be applied in both the community and hospital setting. Collaborative working between acute and primary care can ensure a seamless care pathway for patients who will benefit from this therapy. However, there are risks associated with NPWT, not all of which have been fully explored in this article, that need to be considered before using it. The range of devices available today means NPWT can be accessible to patients in any setting.

**References**


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