

# Managing wound exudate in the diabetic foot ulcer

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## Introduction

**A key aspect in the management of diabetic foot ulcers is maintaining a wound environment that optimises healing. Wound exudate is crucial to the healing process. This article discusses the factors involved in choosing dressings, including exudate-absorption and adherence properties. Dressing choice is also influenced by the practitioner's approach to wound management, which is based on clinical evidence as well as clinical judgement. Two types of dressing, alginates and hydrocolloids, are considered in more detail.**

**W**ound exudate is 'a generic term given to liquid produced from wounds, fistulae and other more acute injuries once haemostasis has been achieved' (Thomas, 1997). Exudate keeps the wound moist, supplies nutrients, and provides the medium for migration and mitosis of epithelial cells. This, in turn, keeps the wound supplied with leucocytes, helping to control bacteria (Quick, 1994).

White cells play a major role in wound healing by cleaning the wound, removing potentially pathogenic micro-organisms and producing collagen, the building block of new tissue (Thomas, 1997). However, the optimum moisture content in a wound has not been established — excessive exudate can cause maceration and excoriation of the surrounding skin possibly resulting in more pain and trauma which, in turn, increase the size of the original ulcer and prolong the healing process (Neilson, 1999).

Effective wound management aims to produce a balance, i.e. a moist environment to promote healing but not so wet as to cause maceration and excoriation (Thomas, 1997). It is often difficult to select a dressing that is effective in healing, removes excess exudate and causes no trauma while also remaining in situ.

## Choosing dressings

A critical factor in choosing the most appropriate dressing for successful wound management is to make a comprehensive assessment of the patient. The main factors

used in dressing selection are listed in *Tables 1 and 2*.

Even experienced practitioners are unable to accurately gauge the level of exudate production by a wound (Thomas, 1997). This can lead to inappropriate dressing selection or an appropriate type of dressing being applied inappropriately, either singly or in combination (Dealey, 1999).

Another consideration is to avoid causing pain or trauma to the wound bed and periwound area on removal of the dressing (Collier and Hollinworth, 2000). In the neuropathic diabetic foot, pain tends to be less of a problem but may be experienced if the ulcer is infected (Sharman and Kerr, 2000). Although practitioners want to choose a dressing that prevents pain and trauma, in reality this often does not happen due to the confusion surrounding the properties of available dressings (Collier and Hollinworth, 2000).

For the diabetic foot, dressings should be non-adherent, able to absorb exudate, not too bulky and able to withstand pressure if the patient is ambulatory (Foster et al, 1994). There are many products currently available, and each has its own claims for beneficial properties. Practitioners are advised to keep up-to-date with developments in wound care and to be conversant with the research that supports or refutes the claims made by manufacturers (Moody, 2000). This is even more important in the light of clinical governance. The practitioner should be certain that the care they give

## ARTICLE POINTS

**1** For the diabetic foot, dressings should be non-adherent and able to absorb exudate.

**2** Wound exudate is critical to the wound healing process.

**3** Choice of wound dressing is governed by several factors.

**4** Alginates can be used for moderately to heavily exuding wounds.

**5** Hydrocolloids are appropriate when daily inspection is not desired.

## KEY WORDS

- Wound management
- Exudate
- Alginates
- Hydrocolloids

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**PAGE POINTS**

- 1 Clinicians need to ensure that the care they provide is clinically effective and evidence-based.
- 2 Use of gauze as a primary dressing should be discouraged.
- 3 Low- to non-adherent dressings allow for regular inspection of low-exudate wounds.
- 4 Foam dressings are commonly used in multidisciplinary diabetic foot clinics.
- 5 Alginates are able to absorb large amounts of exudate.

is clinically effective and evidence based (Cullum, 1998).

There is some debate as to the best way to manage diabetic foot ulceration (Pudner, 1997). There are many practitioners who believe that dry dressings, e.g. gauze, should be used to remove exudate and to prevent excess moisture which would provide an environment for bacterial growth and in turn cause the ulcer to become infected. However, trauma caused by dried out dressings can lead to surrounding skin damage and reduce healing (Collier and Hollinworth, 2000). The use of gauze as a primary dressing should therefore be discouraged and modern alternatives used (Thomas, 1990).

**Low/non-adherent dressings**

Paraffin-impregnated tulle dressings are still used to provide a non-adherent dressing. In practice, in the author's experience, these dressings sometimes adhere to the wound. This type of dressing has no absorption properties; fluid from the wound can drain through the dressing into an overlying dry dressing. This may then produce strike-through with increased risk of infection.

Other low- to non-adherent dressings include N-A Ultra, Tricotex and Mepital. All are unable to absorb exudate and are purely primary dressings through which the exudate can pass to another dressing. In wounds with low levels of exudate, the use of these primary dressings permits regular inspection of the wound since any associated secondary dressing can be removed without

disturbing the wound bed. In addition, as they are non-adherent, there is no trauma on removal. In heavily exudating wounds, other dressings should be used.

**Foam dressings**

Polyurethane foam sheet dressings, e.g. Lyofoam Extra, Allevyn and Tielle, have become a popular choice of dressings (Foster et al, 1994). Banks et al (1997) compared Lyofoam Extra with Allevyn and found that both products performed well in the management of moderately to heavily exudating wounds, while maintaining the viability of the surrounding skin. Foam dressings are among the most common dressing products used in specialist multidisciplinary diabetic foot clinics.

**Alginates**

Alginates, e.g. Sorbsan, Kaltostat, Tegagen, SeaSorb, and Kaltogel, are all produced from the calcium and sodium salts of alginic acid (a polymer obtained from seaweed comprising manuronic and gluluronic acid residues). The capacity to absorb large amounts of exudate is a major advantage of alginates (Jones, 1999). However, the variable properties of the different alginate dressings have implications for their use. Kaltogel and Sorbsan are soluble in 0.9% sodium chloride and are therefore easy to remove from the wound bed. Tegagen and Kaltostat are less soluble which means that they are removed from the wound bed intact. In position, they are comfortable, painless and do not cause trauma on removal if they are soaked off (Morgan, 1996).

However, alginates should not be used on wounds with low or no exudate as they can stick to the wound and dry it out (Williams, 1999). A study by Dmochowska et al (1999) comparing a polyurethane foam dressing with an alginate dressing found that absorption of exudate was similar but the foam was associated with fewer instances of sticking to the wound.

The practitioner therefore needs to be certain that there

**Table 1. Factors to consider when choosing a dressing**

- Characteristics of the wound bed and the peri-wound area
- Wound products available
- Claimed performance rates for the products
- How and when the product should be used
- Duration of use
- Normal and abnormal responses of the tissues to the presence of the product.

Moody (2000)

**Table 2. Primary and secondary considerations for dressing selection**

- Primary**
- Optimise wound healing
  - Prevent infection
  - Control exudate
- Secondary**
- Improve quality of life
  - Control odour
- Secondary for therapists (e.g. nursing staff and podiatrists)**
- Minimise staff time/effort
  - Optimise treatment costs.

Fairbrother (1988)

**PAGE POINTS**

**1** Alginate dressings are presented in many sizes and in both sheet and ribbon or rope form for use on flat or cavity wounds.

**2** Clinical opinion varies on how often wounds should be inspected.

**3** Hydrocolloids work best if undisturbed for a few days.

**4** CombiDERM and Aquacel are recently launched hydrocolloids.

**5** Light retaining dressings should be used instead of circumferential tape for securing dressings.

is sufficient exudate present in the wound to maintain the hydration of the alginate. This prevents sticking and stops the alginate from hardening into a plug, which would concentrate pressure on the ulcer and block the egress of exudate.

Alginate dressings are presented in many sizes and in both sheet and ribbon or rope form for use on flat or cavity wounds (Quick, 1994). The application of these dressings varies; some (e.g. Kaltostat) have to be cut to the shape of the wound in order to prevent maceration of the surrounding area. If uncut, these dressings absorb exudate and a wick effect spreads it across the dressing causing extensive lateral strike-through, which could cause maceration of the surrounding skin (Morgan, 1996).

Rope products (e.g. Sorbsan ribbon) are designed for use on cavity wounds and are therefore especially useful for the diabetic foot; these should be cut to match the size of the cavity and be loosely packed to avoid plugging.

**Hydrocolloids**

The use of adhesive hydrocolloids (e.g. Granuflex, DuoDERM Extra Thin, Comfeel) in the treatment of diabetic foot ulcers has provoked much debate. In general, practitioners fall into one of two camps: those who believe that the wound

dressing should allow inspection on a daily basis in order to quickly identify any signs of infection (Foster et al, 1994) and those who believe that less frequent inspection is allowable (Knowles et al, 1993; Hansson, 1997; Jones and Gill, 1998). Hydrocolloids work best if undisturbed for a few days and therefore are inappropriate for daily inspection. This must be one of the primary considerations in choosing whether or not to use a hydrocolloid.

In terms of exudate control, it has been shown that hydrocolloids form an airtight seal over the surface of the wound, reducing exudate production by up to 50% (Thomas, 1996). It is suggested that the dressing forms a chamber over the wound surface which becomes filled with exudate under pressure. This in turn exerts pressure back on the capillaries, inhibiting the further production of fluid. However, maceration can be a problem in cases of extremely high exudate.

CombiDERM is a thin adhesive hydrocolloid dressing with an island padding of absorbent material. McInnes (1997) found that it was potentially useful in wounds with moderate exudate. However, further evidence would be useful on this product. CombiDerm N, a non-adhesive version of CombiDERM, is also now available for low to moderate exuding wounds.

Aquacel, known as a Hydrofibre®

**Diabetic foot ulcers vary in terms of level of exudate produced; presence of infection or necrosis; size, depth and shape of wound:**



*Severe infected diabetic ulcer demonstrating necrosis and maceration. A high absorbent dressing would be necessary.*



*Diabetic ulcer with medium exudate. The practitioner's view as to whether or not daily inspection is necessary will influence dressing choice.*



*Small diabetic ulcer of 'punched out' appearance with moderate exudate. Wound depth would help to determine choice of dressing.*

category product, is presented in a different format. It is a non-woven hydrocolloid fibrous sheet dressing that transforms into a soft coherent gel when wet. There is minimal to no wicking across the dressing and so maceration of the surrounding skin is reduced. This dressing, although new, is growing in popularity in diabetic foot clinics. According to McInnes (1998), Aquacel displays good control of moderate to heavily exuding wounds, maintains a moist wound environment interface and remains in place – an important advantage in the management of plantar wounds.

### Additional factors

Tape is often used to secure dressings in place. Patients frequently pick the edges of tape, or develop reactions to the adhesive, damaging the previously healthy tissue around an ulcer. Circumferential tape around toes and tight bandages, which are often used, particularly by community nurses, seriously compromises the blood supply of the diabetic foot. In the author's experience, the use of a light retainer dressing, e.g. Tubifast, is superior because it does not impair the local blood supply and does not cause damage to the surrounding skin when removed.

### Conclusion

Managing a wound and its exudate, especially those that are heavily exuding, can be very difficult. Practitioners should, however, choose the most appropriate dressing for their patients to improve quality of wound care (Collier and Hollinworth, 2000). Such a choice should always be made in the light of researched evidence. It should be remembered, however, that much research is carried out by or for the manufacturers developing and marketing the product. Laboratory testing does not reflect what happens in the real wound and controlled clinical trials of wound products are very difficult because of the large number of variables involved, causing problems in interpreting the results (Casey, 2000).

Ultimately, the practitioner is reliant upon their own clinical judgement and experience, and that of the local specialists in wound care, either a diabetic foot clinic

or tissue viability service. Such services are usually happy to assist with assessing and suggesting treatment for patients with diabetic foot ulceration and should be called upon whenever there is doubt. ■

- Banks V, Bale S, Harding K, Harding E (1997) Evaluation of a new polyurethane foam dressing. *Journal of Wound Care* 6(7): 322–4
- Casey (2000) Three steps to effective wound care. *Nursing Standard* 14(40): 58–61
- Collier M, Hollinworth H (2000) Pain and trauma during dressing change. *Nursing Standard* 14(40): 70–3
- Cullum N (1998) Clinical effectiveness in nursing. *Nursing Times Research* 3(1): 15–18
- Dealey C (1999) *The Care of Wounds: A Guide for Nurses*, 2nd edn. Blackwell Science, Oxford
- Dmochowska M, Prokop J, Bielecka S, Urańska K, Krolicki A, Nagaj E, Petov L (1999) A randomised controlled parallel group clinical trial of a polyurethane foam dressing versus a calcium alginate dressing in the treatment of moderately to heavily exuding venous leg ulcers. *Wounds* 11: 21–8
- Fairbrother JE (1988) Beyond occlusion and back again. In: Ryan T (ed) 'Beyond Occlusion' wound conference proceedings, *International Congress Symposium Series* 136. Royal Society of Medicine, London
- Foster A, Greenhill M, Edmonds M (1994) Comparing two dressings in the treatment of diabetic foot ulcers. *Journal of Wound Care* 3(5): 224–8
- Hansson C (1997) Interactive wound dressings. A practical guide to their use in older patients. *Drugs and Aging* 11: 271–84
- Jones V and Gill D (1998) Hydrocolloid dressings and diabetic foot lesions. *The Diabetic Foot* 1(4): 127–34
- Jones V (1999) Diabetic foot, growth factors and tissue engineering. *The Diabetic Foot* 2(3): 89–93
- Knowles A, Westwood B, Young MJ, Boulton AJM (1993) A retrospective study to assess the outcome of diabetic ulcers that have been dressed with Granuflex and other dressings. *Proceedings of the Joint Meeting of the Wound Healing Society and the European Tissue Repair Society, Amsterdam*: 68
- McInnes A (1997) The Treatment of Diabetic Foot Ulceration with a Hydrosorbative Wound Dressing. *Poster presentation at the Annual Conference of the Society of Tissue Viability*. 1997, London
- McInnes A (1998) Aquacel in the Management of the Diabetic Foot. In: Krieg T, Harding KG (eds) *Proceedings of the Satellite Symposium of the European Academy of Dermatology and Venereology 'The Next Step in Wound Care Dressing'*. Churchill Communications, London
- Moody M (2000) Principles of wound management. *Nursing and Residential Care* 1(4): 229–32
- Morgan D (1996) Alginate dressings. *Journal of Tissue Viability* 7(1): 4–14
- Pudner R (1997) Choosing an appropriate wound dressing. *Journal of Community Wound Care* 12(7)
- Quick A (1994) Dressing choices. *Nursing Times* 90(45): 71–2
- Sharman D, Kerr D (2000) Practical management of neuropathic diabetic foot ulcers. *The Diabetic Foot* 3(2): 49–54
- Thomas S (1990) *Wound Management and Dressings*. Pharmaceutical Press, London
- Thomas S (1996) In vitro investigations of a new hydrogel dressing. *Journal of Wound Care* 5(3): 130–1
- Thomas S (1997) Assessment and management of wound exudate. *Journal of Wound Care* 6(7): 327–30
- Williams C (1999) Alginate cavity dressings for the diabetic foot. *The Diabetic Foot* 2(4): 139–40