

# A clinical case-series evaluation of a superabsorbent dressing on exuding wounds

- **Objective:** To evaluate the capacity of a superabsorbent dressing (DryMax Extra; Absorbest AB) to manage excessive exudate, thereby protecting peri-wound skin and facilitating wound healing.
- **Method:** Patients with acute and chronic wounds of various aetiology were assessed, and treatment of their wounds with the superabsorbent dressing was evaluated. The starting point for this study was the needs of individual patients and, therefore, the study includes patients with exuding wounds of various aetiologies, which were not progressing towards healing with their previous treatment.
- **Results:** Thirty patients, aged 23–94 years, were included in this case series, between December 2008 and September 2009. Dressings were changed from daily to once a week, based on the clinician's judgment and the needs of the individual patient. In many patients, frequent dressing changes were needed initially but, after a while, the exudate levels decreased and the dressing could be changed at longer intervals. Inspection of the saturation was possible without removing the dressing. The absorbing efficiency of the dressing was considered to be very good by the investigating clinician, even under compression, and blood, stool and urine was seen to be absorbed by the dressing. Prior to using the superabsorbent, many patients suffered from painful wounds and maceration, irritation, eczema and itching in the surrounding skin, caused by the wound exudate. As the exudate levels decreased and the wounds started healing, the patients felt less pain and less itching in the surrounding skin.
- **Conclusion:** This case series suggests that the superabsorbent dressing promoted wound healing in patients with highly exuding wounds, where previous therapy had failed. More research and evaluation comparing the capacities of various superabsorbent dressings *in vitro* and *in vivo* and the clinical implications of their special properties is needed.
- **Declaration of interest:** These studies were sponsored by Absorbest AB, manufacturers of DryMax Extra. A. Hindhede is an independent consultant who received a fee for her contribution. F. Meuleneire completed a clinical case-series in agreement with the sponsor and received funding for conduct of the study. The sponsors had no role in study design, or collection or analysis of the data.

exudate management; exuding wounds; peri-wound skin; superabsorbent dressing; patient outcomes

**W**ound exudate plays an essential role in wound healing, by facilitating the diffusion of vital healing factors and the migration of cells across the wound bed.<sup>1</sup> In a healing wound the amount of exudate decreases with time; an increase in the amount of exudate may be a sign of inflammation, bacterial contamination, limb dependency or other factors.<sup>1</sup> If the wound does not heal, the composition of the exudate changes, which may impede healing.<sup>1</sup>

When too much wound exudate is produced, or it is of the wrong composition, a multitude of problems can follow, causing delayed healing, and impacting on the quality of life of patients and carers, including:

- Leakage and soiling
- Peri-wound skin changes (maceration, skin stripping or erosion)

- Odour
- Discomfort, pain
- Infection
- Protein loss, fluid and electrolyte imbalance
- Psychosocial problems associated with exudate.<sup>1</sup>

When too much exudate is produced, it is important to accurately determine the underlying factors, only then can effective treatment be initiated. Specialist referral may be necessary. Vascularisation needs to be assessed and possibly improved, necrotic tissue and slough removed, oedema and infection treated, nutrition enhanced, and psychosocial support ensured. Successful exudate management can reduce healing time, prevent exudate-related problems, increase patients' quality of life and improve treatment efficacy.<sup>1</sup>

The choice of method for exudate control should be based on the characteristics of the wound and the requirements of the patient. Available methods include physical therapies, such as

**A. Hindhede,<sup>1</sup> RN, BSc,** Specialist in Wound Healing and Dermatology;  
**F. Meuleneire,<sup>2</sup> Tissue Viability Nurse Specialist;** 1 Örebro, Sweden; 2 St Elisabeth Woundcare Centre, Zottegem, Belgium.  
 Email: anne.hindhede@swipnet.se

**Table 1. Baseline wound characteristics, and treatment outcomes**

Wound aetiology	No. of wounds	Age (years)	Treatment (days)	Outcome
Arterial leg ulcer	3	80 (57–94)	70 (67–94)	Less maceration (n=2), healing (n=1)
Haematoma ulcer	3	60 (23–84)	49 (42–154)	Healing (n=1), almost healed (n=1), fully healed (n=1)
Lymphatic leak caused by traumatic leg wound	1	76	56	Fully healed
Lymphatic ulcer	1	87	56	Fully healed
Mixed aetiology leg ulcer	1	70	84	Healing
Postoperative wound	4	55 (30–78)	60 (56–63)	Healing (n=1), almost healed (n=2), fully healed (n=1)
Posttraumatic wound /venous hypertension	1	78	42	Almost healed
Pressure ulcer	3	85 (78–85)	177 (18–196)	Healing (n=2), almost healed (n=1)
Skin tear†	2	71 (70–72)	30 (25–35)	Almost healed (n=1), fully healed (n=1)
Ulcer caused by herpes zoster	1	83	84	Healing
Venous leg ulcer	10	67 (48–83)	77 (28–112)	Healing (n=2), almost healed (n=7), fully healed (1)
<b>Total</b>	<b>30</b>	<b>71 (23–94)</b>	<b>56 (18–196)</b>	<b>Less maceration (n=2), healing (n=9), almost healed (n=13), fully healed (n=6)</b>

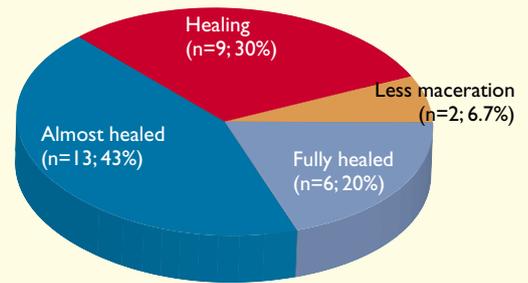
Unless otherwise stated, results presented as median (range); † Results presented as mean (range)

limb elevation,<sup>2</sup> exercise,<sup>3</sup> compression therapy,<sup>4</sup> and negative pressure wound therapy (NPWT).<sup>5</sup> However, for many patients, these methods are unsuitable.<sup>6–8</sup> Accurate use of modern, advanced dressings is a key consideration for managing exudate at wound level.<sup>1</sup>

**Fluid retention and sequestration of exudate**

A dressing’s efficiency in managing wound exudate should not just be viewed in terms of the volume absorbed, but also in terms of its ability to retain the exudate within the dressing, even when external pressure is applied. Wound dressings that only absorb low volumes and have little or no

**Fig 1. Patient outcomes at end of study\***



\* All wounds showed a decrease in maceration; however, some did not progress toward healing

capacity to retain wound exudate are more likely to cause maceration and/or excoriation of the peri-wound skin.<sup>9</sup> Consequently, dressings that absorb relatively large quantities of exudate, but lack the capacity to sequester the exudate and remain wet on the surface, may be less efficient in the management of exuding wounds than dressings that absorb less but retain the exudate inside the dressing.<sup>9,10</sup>

Use of creams or ointments in the wound area may interfere with absorbency and sequestering function of products.<sup>11</sup> Dressings that bind proteases are not suitable for dry wounds or wounds with a leathery eschar.

**Absorbent wound dressings**

Simple absorptive dressings, such as cotton, foams, viscose or polyester textiles, hold fluid within spaces in their structure, similar to a sponge. When these materials are placed under pressure, fluid is released from the spaces and may leak from the dressing. Many absorbent dressings also allow moisture to evaporate from the surface of the dressing. This characteristic is quantified as the moisture vapour transmission rate (MVTR).<sup>12</sup>

In recent years, several companies have introduced wound dressings that contain so-called superabsorbents,<sup>13</sup> which have considerably higher absorption capacities than that of other absorbent dressings.<sup>14–21</sup> One such dressing is DryMax Extra (Absorbest AB). The dressing has a core of cellulose and superabsorbent polymers contained within a polypropylene cover. Wound exudate is drawn vertically into the dressing, where it alters the core to a gel consistency. Fluid is bound within the gel, to prevent peri-wound maceration and retain a humid surface environment, to facilitate tissue repair. The manufacturers state that the dressing also absorbs during pressure and the fluid is retained inside the dressing, even under compression. The product is categorised as a protease modulator and has been evaluated in a few documented observation studies.<sup>18–21</sup>

This article describes a case series of patients with acute and chronic wounds of various aetiologies, to evaluate the capacity of DryMax Extra to manage excessive exudate.



**Fig 2. Case 6, venous leg ulcer on presentation (a), and after 12 weeks of treatment with the superabsorbent dressing (b)**



**Fig 3. Case 17, haematoma on the leg, caused by trauma (a), and after 5 months of treatment with the superabsorbent dressing (b)**

### Method

Patients presenting at St Elisabeth Woundcare Centre, a specialist wound clinic in Belgium, between December 2008 and September 2009, were included in this case series if their wounds were moderate to highly exudative and the treating clinician considered that progression towards healing was stalled due to leakage, maceration, strikethrough or total dressing saturation.

All patients were treated by the same nurse practitioner (FM). No standard protocol was applied to patients included in the study. The underlying cause of the wound was treated before and during the study and patients with venous leg ulcers continued to have the same compression treatment. The dressings previously used included alginates, foams, Hydrofiber and antibacterial dressings.

Dressing changes were scheduled based on the clinician's individual clinical judgment. At dressing change, the clinician recorded the absorbing efficacy of the dressing and the condition of the wound bed and the surrounding skin.

Assessments regarding absorbency were made by inspection of the saturation of the dressing, without removing the dressing, and by comparing the need for dressing change with that of the previous treatment. The retention of blood, stool and urine, as well as odour, pain, maceration, irritation and itch, was also assessed based on the clinician's and the patient's previous experience. Reduction of bacteria was determined by the clinical signs of the wound healing process, such as decreasing exudate levels, less pain and odour, appearance of granulation tissue and, in many cases, epithelialisation. Comfort

was also evaluated and pain level was evaluated by using the visual analogue scale (VAS).

Treatment with the superabsorbent dressing continued until the clinician considered that the condition of the wound no longer warranted its use.

### Results

Overall, 30 patients, of mean age  $69 \pm 16.2$  years (range 23–94 years), with acute and chronic wounds of various aetiologies, were assessed (Table 1), and treatment of their wounds with a superabsorbent dressing was evaluated.

Eighteen of the patients had severely exuding wounds, nine had fairly large amounts of exudate and three had moderately exuding wounds. Dressings were changed from a daily to once a week basis, based on the clinician's judgment and the needs of the individual patient. In over a third of the patients, frequent dressing changes were needed initially but, after a while, the exudate levels decreased and the dressing could remain *in situ* for longer intervals. Inspection of the saturation was possible without removal of the dressing. The absorbing efficiency of the dressing was considered to be very good, even under compression, and blood, stool and urine were absorbed into the dressing and did not stay in contact with the wound.

Before treatment with the superabsorbent dressing, many patients ( $n=21$ ) suffered from painful wounds and maceration, irritation, eczema and itching in the surrounding skin, caused by the wound exudate. Eleven patients reported wound-related pain. Four of these cases concern venous leg ulcers (36%), one a mixed arterial-venous ulcer (9.1%), two arterial ulcers (18%), two skin tears (18%), one lymphatic ulcer (9.2%) and one herpes zoster wound (9.2%). As the exudate levels decreased and the wounds started healing, patients reported less pain and less itching in the surrounding skin. After the superabsorbent was introduced, only one patient required skin protection (Case 6).

One patient reported pain due to the superabsorbent on removal, where the dressing would sometimes stick to the wound; however, this could be prevented by moistening the dressing with a saline solution on removal.

The superabsorbent was continued until the clinician considered that the wound had no further use for treatment with it. In four patients (13%), other dressings were used in direct contact with the wounds at the same time as the superabsorbent. The clinician concluded that the superabsorbent could be combined with an alginate or Hydrofiber to ensure that there is no cavity in the depth of a wound. The relatively poor absorbing qualities of alginates and Hydrofibers are supplemented by the superabsorbent dressing, which absorbs the superfluous wound exudate.

The end results from the study are shown in Table 1 and Fig 1. A selection of five patients are presented below. These patients were chosen to represent a variety of wounds with different aetiologies and photographs that would illustrate the effects of the dressing.

#### Case 6

A 48-year-old man with chronic venous insufficiency and a painful, severely exuding leg ulcer, which had been treated with alginates, foams and several ointments/creams, as well as compression therapy with long stretch bandages (Fig 2a).

Before starting treatment with the superabsorbent dressing, ointment remains, crusts and debris were removed and the leg was washed with povidone-iodine soap. The dressing was fixed with short stretch bandages. Initially, the dressing was changed every other day; after 5 weeks, the exudation had decreased, granulation and re-epithelialisation was noted and the dressing could be changed every 3 days. After 7 weeks, the wound continued to heal, skin protection spray or wound edge protection could be discontinued and the patient no longer experienced nightly pain. After 12 weeks, the chronic ulcer was in the final stage of healing and compression therapy was continued by use of an elastic stocking (Fig 2b).

#### Case study 17

An 84-year-old female presented with a large haematoma on her leg, caused by impact with the edge of the bed. Initially, the skin did not break; however, an incision was made to drain the haematoma, after 2 weeks (Fig 3a). The wound was washed with a polyhexanide (PHMB) solution and the superabsorbent dressing was placed in the wound cavity to absorb the remaining haematoma. After 2 weeks, necrotic skin was clearly demarcated from the vital skin and sharp debridement was possible. A skin transplant was considered in order to close the defect quickly, but the patient's age and overall condition did not allow this surgical procedure.

At the start of treatment, the dressing was changed every second day; however, from week 16, the dressing could stay unchanged for a week. Even when the amount of wound fluid decreased, the treatment was continued. The changing interval was extended and the dressing could easily be removed, after being moisturised with a saline solution. The wound healed slowly, but without any complications (Fig 3b).

#### Case study 18

An 85-year-old woman with a pressure ulcer on her heel, which developed while in hospital for a hip fracture. The foam dressing originally used was

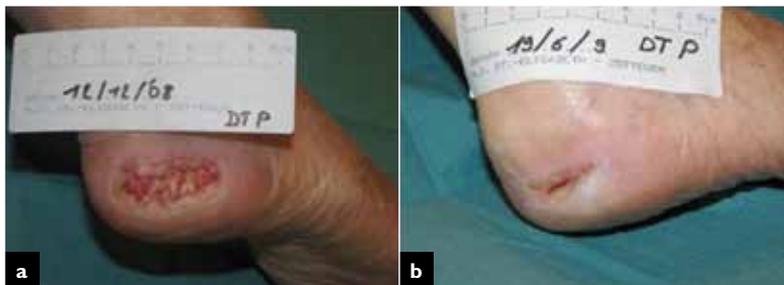


Fig 4. Case 18, hospital-acquired pressure ulcer on heel (a), and after 6 months of treatment with the superabsorbent dressing (b)



Fig 5. Case 23, wound after open ankle fracture (a), and after 6 weeks of treatment with the superabsorbent dressing (b)



Fig 6. Case 24, ulcer with combined arterial-venous aetiology (a), and after 10 weeks of treatment with the superabsorbent dressing (b)

oversaturated every day and wound culture showed resistant *Pseudomonas aeruginosa* (Fig 4a). After 8 weeks of treatment with the superabsorbent, the wound surface was much smaller. The wound bed lay deeper than the wound edges, with the dressing no longer in direct contact with the wound bed. As there was still a large amount of exudate, an alginate dressing was used to fill the wound cavity and the superabsorbent dressing placed on top. To avoid pressure, the patient's heel was offloaded with a heel protector at night. Thin layers of fibrin were curetted during wound care and a PHMB solution was used to preserve the bacterial balance. After 6 months of treatment with no complications, re-epithelialisation was almost complete (Fig 4b).

The clinical signs of wound healing progression and absence of signs of infection suggested that bacteria, toxins and MMPs were removed and did not affect the wound. The superabsorbent dressing is

categorised as a protease modulator, and toxins and MMPs are thought to be removed through its ability to absorb, retain and sequester exudate containing bacteria, including *P. aeruginosa*.

#### Case study 23

A 78-year-old female with a wound on the right lower external shin following an open ankle fracture. There were no clinical signs of infection, with clearly-marked wound edges and a stagnating healing process (Fig 5a).

Initially, the superabsorbent dressing was changed every 4 days. At the very first dressing change, wound bed granulation and flatter wound edges were noted. After 2 weeks, the wound edges were even flatter and epithelialising. Within 6 weeks, the wound was less than a third of its' original size and in the last phase of healing (Fig 5b).

#### Case study 24

An 80-year-old male with an infected and inoperable chronic combined arterial-venous ulcer on the inside of his right ankle (Fig 6a). The patient was a heavy smoker and not willing to stop. The severely exuding ulcer had a foul odour. Local and systemic antibiotics have had little effect on the wound problem.

Initially, the superabsorbent dressing was changed daily. The production of wound exudate decreased only slowly, but after 3 weeks there was far less odour, the wound surface was reduced and the patient suffered less pain. After 5 weeks of treatment, there was much less maceration and the wound was well under control, with visible improvement in the surrounding skin. Progress slowly continued and the last picture was taken after 10 weeks of treatment with the superabsorbent (Fig 6b).

#### Discussion

Management of wound exudate is a key factor in the wound-healing process. To prevent a wound from a prolonged inflammatory process, absorption of excessive wound fluid containing toxins and MMPs is crucial. The challenge is to find a wound dressing that satisfies these needs in a cost-efficient manner, compared to other forms of treatment. According to clinical results, superabsorbent dressings support the healing process in patients with highly exuding acute and chronic wounds. While absorbing excess wound exudate, they keep the wound surface moist and protect the peri-lesional skin from pathological changes. Intervals between dressing changes can be prolonged, reducing wound pain, leaving the wound undisturbed, facilitating granulation tissue formation and epithelialisation, resulting in fast improvement.

The patients enrolled in this prospective clinical study were representative of patients in a daily prac-

tice setting. The mean age of the patients in the study was  $69 \pm 16.2$  years and 27% (n=8) were over 80 years old. Many had comorbidities, such as rheumatic arthritis, circulatory diseases or diabetes and some were treated with cortisone or anti-coagulation medicine, which may compromise wound healing.

The results of this study suggest that the superabsorbent dressing promoted wound healing in patients with highly exuding wounds in which previous therapy had failed. The dressing was well tolerated by the patients and, according to the investigators' evaluations, easy to apply and remove. The superabsorbent could be combined with a hydrophobic dressing to treat wound infection, or an alginate or Hydrofiber to ensure that there is no cavity in the depth of the wound. The poor absorbing qualities of these primary dressings were supplemented by the superabsorbent, which absorbed the superfluous wound exudate.

In this study, the peri-lesional skin was observed to improve, suggesting that the superabsorbent was effective in protecting the wound borders from maceration, oedema and erythema.

#### Limitations

In this study, no rigid standard protocol was applied. As a case series, no inclusion and exclusion criteria were imposed. Furthermore, specific data on healing times and concomitant treatments were not collected in a systematic manner. Undeniably, this entails certain methodological limitations compared with a randomised controlled trial (RCT), where inclusion and exclusion criteria aim to create more homogenous study populations, random allocation to treatment minimises allocation bias and the exact same follow-up of treatment groups ensures the validity of the evidence. However, RCTs commonly exclude patients with wounds resulting from, or complicated by, a variety of concomitant factors, although these wounds may pose significant therapeutic problems, which need to be addressed in daily practice.<sup>22,23</sup> The starting-point for this study was the needs of individual patients and, therefore, the study includes all kinds of patients with exuding wounds who were not helped by the previous treatment.

#### Conclusion

Although superabsorbents have existed for almost half a century, their applications in wound dressings have only just begun. This case series suggests that the superabsorbent dressing promoted wound healing in patients with highly exuding wounds, where previous therapy had failed. More research and evaluation comparing the capacities of various superabsorbent dressings *in vitro* and *in vivo* and the clinical implications of their special properties is needed. ■

## References

- 1** Romanelli, M., Vowden, K., Weir, D. Exudate management made easy. *Wounds International*. 2009; Available from: <http://tinyurl.com/4zt3nqh> (Accessed Oct 2012).
- 2** Abu-Own, A., Scurr, J.H., Coleridge Smith, P.D. Effect of leg elevation on the skin microcirculation in chronic venous insufficiency. *J Vasc Surg*. 1994; 20: 5, 705–710.
- 3** Goddard, A.A., Pierce, C.S., McLeod, K.J. Reversal of lower limb edema by calf muscle pump stimulation. *J Cardiopulm Rehabil Prev*. 2008; 28: 3, 174–179.
- 4** O'Meara, S., Cullum, N.A., Nelson, E.A. Compression for venous ulcers. *Cochrane Database Syst Rev*. 2009; 21: 1, CD000265.
- 5** Borgquist, O., Ingemansson, R., Malmsjö, M. Individualizing the use of negative pressure wound therapy for optimal wound healing: a focused review of the literature. *Ostomy Wound Manage*. 2011; 57: 4, 44–54.
- 6** World Union of Wound Healing Societies (WUWHS) Principles of best practice: compression in venous leg ulcers. A consensus document. MEP Ltd, 2008.
- 7** Collinge, C., Reddix, R. The incidence of wound complications related to negative pressure wound therapy power outage and interruption of treatment in orthopaedic trauma patients. *J Orthop Trauma*. 2011; 25: 2, 96–100.
- 8** Ho, C.H., Powell, H.L., Collins, J.F. et al. Poor nutrition is a relative contraindication to negative pressure wound therapy for pressure ulcers: preliminary observations in patients with spinal cord injury. *Adv Skin Wound Care*. 2010; 23: 11, 508–516.
- 9** Bishop, S.M., Walker, M., Rogers, A.A., Chen, W.Y.J. Importance of moisture balance at the wound-dressing interface. *J Wound Care*. 2003; 12: 4, 125–128.
- 10** Cutting, K.F., White, R.J. Maceration of the skin and wound bed I: its nature and causes. *J Wound Care*. 2002; 11: 7, 275–278.
- 11** Ljungh, A., Yanagisawa, N., Wadström, T. Using the principle of hydrophobic interaction to bind and remove wound bacteria. *J Wound Care*. 2006; 15: 4, 175–180.
- 12** Folestad, A., Gilchrist, B., Harding, K. et al. Wound exudate and the role of dressings. A consensus document. *Int Wound J*. 2008; 5: (Suppl. 1), iii–12.
- 13** Buchholz, F., Graham, A.T. (eds.). *Modern Superabsorbent Polymer Technology*. Wiley-VCH, 1997.
- 14** Bruggisser, R. Bacterial and fungal absorption properties of a hydrogel dressing with a superabsorbent polymer core. *J Wound Care*. 2005; 14: 9, 438–442.
- 15** Tadej, M. The use of Flivasorb in highly exuding wounds. *Br J Nurs*. 2009; 18: 15, S38–S42.
- 16** Godar, S., Guy, H. Managing highly exuding wounds with Eclipse dressings. *Br J Nurs*. 2010; 19: 6, S24–S29.
- 17** Cutting, K.F. Managing wound exudate using a super-absorbent polymer dressing: a 53-patient clinical evaluation. *J Wound Care*. 2009; 18: 5, 200–205.
- 18** Bain, G. Case report on a non-healing venous ulcer utilizing a cellulose/super polymer dressing for exudates control. *Wound Practice Res*. 2008; 16: 4, 186–191.
- 19** Stephen-Haynes, J. Managing exudate and the key requirements of absorbent dressings. *Br J Comm Nurs*. 2011; 16: 3, 44–49.
- 20** Allymamod, A. Evaluation of a 16-patient study using DryMax Extra in four leg ulcer clinics. *Wounds UK*. 2011; 7: 4, 57–61.
- 21** Stephen-Haynes, J., Stephens, C. Evaluation of a superabsorbent dressing in a primary care organization. *Br J Comm Nurs*. 2012; 17: 3, S38–S41.
- 22** Leaper, D. Evidence-based wound care in the UK. *Int Wound J*. 2009; 6: 2, 89–91.
- 23** Grey, L.E., Leaper, D., Harding, K. How to measure success in treating chronic leg ulcers. *BMJ*. 2009; 338: b1434.