Zetuvit® Plus
Under Compression

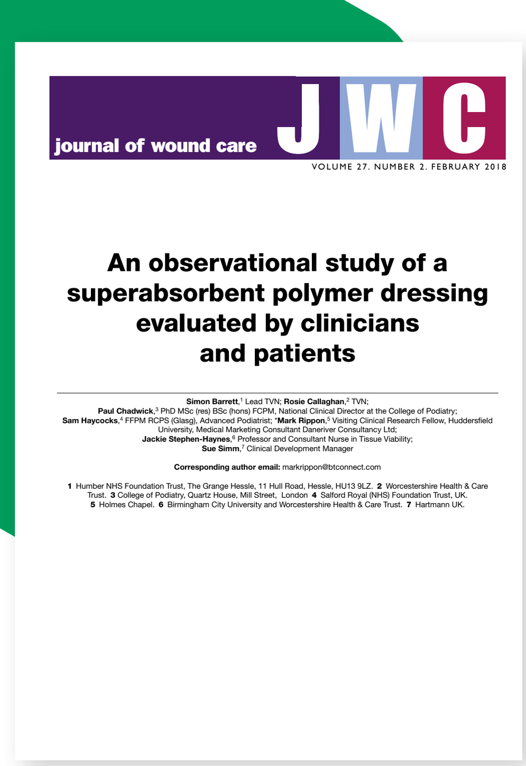
Corporate Statement

CLICK HERE

Zetuvit® Plus under compression

The following publications provide evidence that **Zetuvit® Plus** is suitable to be used under compression therapy

1



journal of wound care JWC

VOLUME 27. NUMBER 2. FEBRUARY 2018

An observational study of a superabsorbent polymer dressing evaluated by clinicians and patients

An observational study of superabsorbent polymer dressing evaluated by clinicians and patients. Journal of Wound Care.

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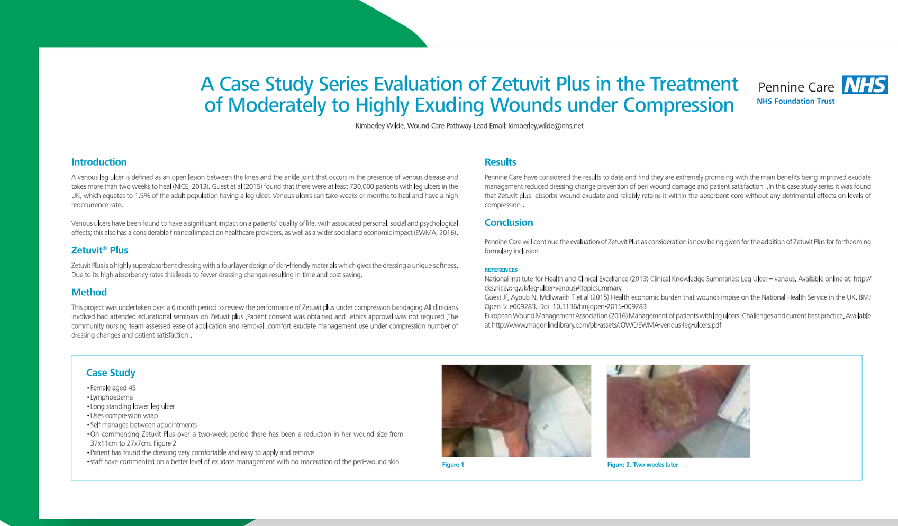

A Case Study Series Evaluation of Zetuvit Plus in the Treatment of Moderately to Highly Exuding Wounds under Compression

Pennine Care NHS Foundation Trust

Case Study: A case study series evaluation of Zetuvit® Plus in the treatment of moderately to highly exuding wounds under compression.

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2

Dealing effectively with heavily exuding wounds. Zetuvit® Plus tested in clinical practice

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5

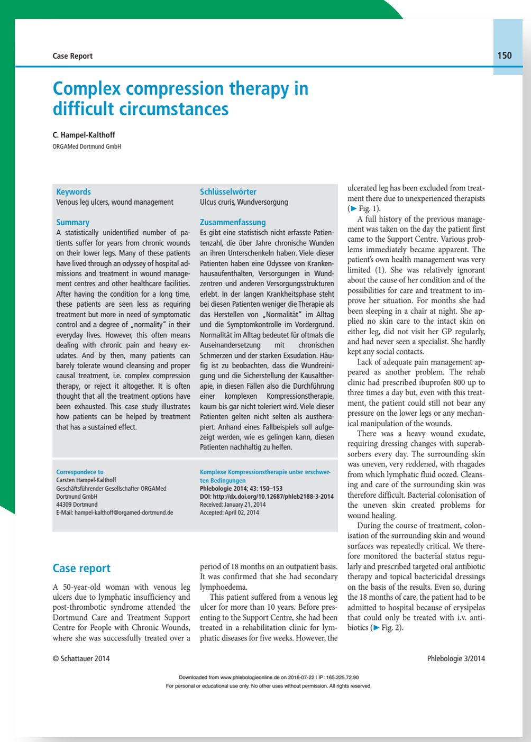
Exudate, infection and patient quality of life

Maureen Benbow, Jane Stevens

Exudate, infection and patient QoL. Stevens 2010

Click here to view

3



Case Report

Complex compression therapy in difficult circumstances

C. Hampel-Kalthoff

Case Study: Complex compression therapy in difficult circumstances.

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SMTL data summary

					Absorbancy		Fluid Retention		Absorbency Under Compression	
Product	Test Nr.	Date	Product size	Pad size	(g)	(g/cm2)	(g)	(g/cm2)	(g)	(g/cm2)
Zetuvit® plus	Report No: 17/5370/1	February 2017	10x10	10x10	189	1.89	128	1.28	87	0.87
Kliniderm® superabsorbent	Report No: 15/4816/1	July 2015	10x10	10x10	80	0.80	62	0.59	30	0.30
KerraMax Care®	Report No: 15/4816/1	July 2015	10x10	10x10	73	0.73	69	0.69	34	0.34
Eclypse®	Report No: 15/4816/1	July 2015	10x10	10x10	51	0.51	40	0.40	30	0.30

Klinderm® superabsorbent is a trademark of h&r healthcare. KerraMax Care® is a trademark of Crawford Healthcare. Eclypse® superabsorbent is a trademark of Advancis.

SMTL data summary

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To whom it may belong

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Zetuvit® Plus under compression

We can confirm that Zetuvit® Plus is a superabsorbent dressing and is suitable for use under compression. This can be seen in an observational study of Zetuvit® Plus in clinical practice (S. Barrett et al. 2018)[1], where 9 out of 50 patients received compression therapy. This study showed that more than 65% of clinicians rated the suitability of Zetuvit® Plus under compression as 'excellent' or 'good'.

Moreover, SMTL test reports show that Zetuvit® Plus absorbs a relatively high amount of fluid under compression when compared with other superabsorbent dressings.

SMTL 'Absorbency under compression' data

- Zetuvit® Plus: 0.87 g/cm2 (Test report 17/5370/1 – mean value)
- KerraMax Care®: 0.34 g/cm2 (Test report 15/4816/1 – mean value)
- Eclypse®: 0.30 g/cm2 (Test report 15/4816/1 – mean value)
- Kliniderm®: 0.30 g/cm2 (Test report 15/4816/1 – mean value)

In addition, published case reports demonstrate the suitability of Zetuvit® Plus under compression, including for use in complex and difficult wound cases (C.Hampel-Kalthoff 2014)[2].

Kind regards

PAUL HARTMANN AG

i.V.

Horst Schmid
Director Global Product Marketing Advanced Wound Care

i.A.

Iris Streit
Senior Manager Global Product Marketing Advanced Wound Care

References:

(1) S.Barrett et al. 2018, 'An observational study of a superabsorbent polymer dressing evaluated by clinicians and patients', JWC, Vol 27, No2

(2) C. Hampel-Kalthoff. 2014, 'Compression therapy in difficult circumstances', Phlebologie, Vol 43, Issue 03, pp150-153

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An observational study of a superabsorbent polymer dressing evaluated by clinicians and patients

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practice

An observational study of a superabsorbent polymer dressing evaluated by clinicians and patients

Objective: This open, non-comparative, multi-centre investigation examines the use of a new superabsorbent polymer (SAP) wound dressing used for exudate management (in medium-to-high exuding wounds) in a patient population with a variety of wound types. The primary objective of this study was to evaluate the fluid management capabilities of the dressing.

Method: Both acute and chronic wounds with moderate-to-high exudate production levels were assessed (over a period of two weeks) as requiring exudate management, with a SAP dressing, Zetuvit Plus*, as part of their normal treatment regimen. Clinicians recorded a subjective assessment of exudate management and its impact on periwound skin conditions. In addition, wound bed preparation, healing trajectory and pain level reduction were monitored to give an insight into the clinical implications of using this dressing. Data was also collected from clinicians and patients on clinical performance of the dressing.

Results: The SAP dressing achieved ratings of 'very good'/'good' (83% and 13%, respectively) in relation to its wound exudate handling properties. The dressing supported improved wound healing, reduced damage to and enhanced the status of the periwound skin. Pain levels were reduced and, as a consequence, patient reported outcomes were improved. Patients commented that the exudate handling capabilities of the dressing, its conformability and comfort allowed them to resume a semblance of normality in their life. All participating clinicians indicated that they would continue to use the SAP dressing. A sub-population cost analysis has highlighted that, when compared to alternative (historical) exudate management treatments, the SAP dressing was less expensive. The cost reduction arises from data that shows product use and frequency of dressing change (that impacts on nurse time) are both reduced. For the 10 patients evaluated, total costs were £2,491 and £1,312 before and during use, respectively; a saving of £1,179.00 (47%).

Conclusion: The SAP dressing was well tolerated and shown to be effective in the management of moderate-to-high exudate. Consequently, the dressing supported improved healing, and reduced damage to periwound skin, leading to lower pain levels. Overall, both the patients and clinicians rated the SAP highly.

Declaration of interest: This study was supported by funding from Hartmann.

chronic wounds • exudate management • superabsorbent wound dressings • Zetuvit Plus

Wound exudate is an important component of the wound healing response, and has implications in both acute and chronic wound healing.[1] In acute wounds, wound exudate is at its highest level during the inflammatory phase and contains many components that aid healing.[2,3] However, in chronic wounds, exudate contains components that are deleterious and which compromise the healing response, such as high levels of matrix metalloproteinase (MMP) which may degrade tisue.[4–8]

Therefore, the management of wound exudate is an important aspect of wound care, particularly chronic wound care (Table 1). Effective wound exudate control is needed to minimise the aspects of a patients' Quality of Life (QoL) negatively affected when this control is inadequate.[9] Some of the negative effects on QoL include periwound skin damage and elevated pain.[10] A number of wound dressings that have been developed to effectively manage wound exudate have been shown to reduce the time-to-healing, frequency of dressing changes and nursing time.[11] Effective fluid handling is an important property of an 'ideal dressing'.[12] An advantage of a dressing with high fluid absorbency and fluid retention is to allow these dressings to remain in place for extended periods of time; this reduces the number of times the patients have to 'suffer' dressing changes.[13]

Superabsorbent polymer wound dressings have been developed with the aim of providing extra fluid-handling capacity compared with standard dressings, such as foam dressings.[14,15] These superabsorbent dressings are designed to be used on wounds of varying aetiologies that produce moderate-to-high volumes of wound exudate.[16] Benefits of effective exudate absorption by superabsorbent dressings include reducing the risk of exudate leakage and skin maceration.[17] In recent years, there has been an increase in the number of wound dressings containing a

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superabsorbent polymer (SAP) in order to take advantage of their superior fluid absorbing capabilities.[14,18] Depending on the physical and chemical design of the polymer, the fluid-handling capacity of SAP can vary substantially and, in combination with other materials (e.g., cellulose), can modify the polymer's characteristics.[14] SAPs have also been shown to have additional properties that enhance wound healing. These properties include reducing wound bioburden,[19–22] and the modulation of protein-degrading enzyme (proteinases) and reactive oxygen species (ROS).[17,20,23] Elevated levels of proteinases and ROS in the ulcer wound environment are potentially damaging to wound and periwound tissues if they are not effectively controlled.[24,25] The removal and sequestering of excessive amounts of wound exudate supports wound healing by preventing tissue damage caused by elevated levels of these tissue-destroying components.[16]

A new superabsorbent polymer (SAP) dressing, Zetuvit Plus* is used on severely exuding wounds. It is a combined absorbent dressing pad which consists of four layers of different materials.

- Soft, non-woven wound contact layer
- Thin cellulose diffusion layer (quickly passes exudate into the absorbent core)
- Superabsorbent core made of cellulose fibres blended with SAP (to quickly absorb and retain wound exudate)
- Green, hydrophobic outer layer, water repellent and air-permeable (to protect clothing and bedding and against contamination).

The dressing can also be applied under compression therapy.

Aim

Our aim was to investigate the ability of a new superabsorbent polymer (SAP) dressing, to manage exudate, in medium-to-high exuding wounds, of various aetiologies.

Methods

Ethics approval

Formal ethical approval was deemed not to be required as the SAP dressing was a CE-marked product being used according to the manufacturer's instructions, and patients were not being treated outside of their normal regimen. The investigation was performed in accordance with the Declaration of Helsinki[26] and applicable regulatory requirements. Patient participation was voluntary, all were provided with patient information and were asked to sign an informed consent form, to allow further use of data in educational or commercial settings. All patients had the right to refuse to enter the study.

Study design

The study was designed as an open, non-comparative, multi-centre investigation. Inpatients and/or out-patients were included.

Table 1. Implications of poor exudate management

Clinical consequence	Subsequent clinical implication on the patient
Wound exudate leakage and staining leading to soiled clothing, furniture, etc	Need for frequent dressing changes and/or having to wash clothes, etc
Malodour from the wound or leaked exudate	Issues leading to potential embarrassment of the patient, carer/family, possibly leading to isolation
Periwound skin damage	Skin maceration or excoriation that may lead to localised infection and other implications outlined in this column
Discomfort/pain resulting from 1–3 above	Quality of life issues for the patient
Excessive levels of chronic wound exudate containing detrimental biological factors such as matrix metalloproteinases (MMPs)	Tissue destruction which may also lead to discomfort/pain and, ultimately, delayed healing

Note: the majority of the above complications relating to poor exudate management will lead to an increase in costs

Table 2. Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Older than 18 years-of-age	Known allergy/hypersensitivity to any of the components in the dressing
Signed consent form	Patients who will have difficulty following the protocol
Patient with any wounds that have moderate-to-high levels of wound exudate in need of management	Severe underlying disease judged by the investigator to interfere with treatment

Study endpoints

The primary objective of this study related to the exudate management capabilities of the SAP dressing and its impact on the periwound skin, in terms of damage that might be caused by wound exudate. Specifically, the study was aimed at wounds with moderate-to-high levels of exudate, in addition, the type and viscosity of the wound exudate varied, covering the wide range of exudate challenges seen in the clinic. Additional objectives included an evaluation of the dressing's ability to promote wound bed preparation and wound progression. Dressing performance when used in the treatment of a range of wounds and conditions was also assessed.

Patients inclusion and exclusion

Inclusion and exclusion criteria are outlined in Table 2. Patients included in the study were selected by the clinical investigator(s) according to whether their wound had moderately-to-highly exudate and in need of an appropriate wound dressing to manage the exudate.

Test procedure and dressing evaluation

Each patient was treated according to the local clinical routine and evaluated during a treatment period of two weeks, or for a minimum of four dressing changes. All dressings were applied according to the manufacturer's instructions and the patients'

*Designated RespoSorb Super in other countries.

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Table 3. Patient population characteristics

	Patient number	Age mean±standard deviation	Wound duration
Male	18	74.71±15.47 years	Between weeks and years
Female	32	78.00±14.78 years	
Total number of separate wound assessments—312			

individual clinical requirements.

Patients were assessed at baseline and again at subsequent dressing changes. At baseline, the following information was collected: patient's characteristics, status of the wound (wound bed, periwound skin condition, exudate levels). Previous wound treatment history, medical and surgical history, concomitant medications (including antibiotics) were also recorded.

At each subsequent dressing change a subjective wound assessment was undertaken and the following variables were evaluated and recorded on designated evaluation forms developed for the study:

- Level of exudate within the wound ('high', 'moderate' or 'low'), exudate description ('clear', 'yellow/green', 'brown/bloody', 'other') and viscosity ('high', 'moderate' or 'low') and the need for its management
- Associated with the exudate management, the reason for any dressing changes ('scheduled change', 'leakage', 'strikethrough', 'reached maximum exudate handling capacity', 'wound observation' or 'failure of fixation')
- The impact of any exudate on the condition of periwound skin ('healthy', 'eczematous', 'excoriated', 'dry', 'inflamed', 'macerated', 'hyper-hydrated')
- Healing parameters related to wound size (length and width) and appearance of wound bed (% re-epithelialisation, % granulation, % necrosis, % slough)
- Level of bacterial contamination of wound ('infected', 'critically colonised')
- Level of pain before and after dressing application, using a visual analogue scale (VAS)
- Adverse events (AE) relating to, for example, the wound ('inflammation', 'infection'), significant deterioration of the surrounding skin ('inflammation', 'infection', 'significant deterioration', 'eczema', 'erysipelas', 'erosion', 'irritation', 'maceration', 'blistering', 'ulceration') or any other deleterious effects that might be harmful to the patient.

At the end of each patient evaluation a summary assessment form was completed by the nurse or senior clinical investigator identifying whether the clinical objectives had been reached, and providing an overall evaluation of dressing performance from both patient and clinician perspectives. Both clinician and patient views were recorded.

Wound healing progression was assessed by calculating the wound area at each assessment point. In order to more easily compare the wound area data from all patients, the data was normalised and the change in wound area was calculated against the patient's own baseline (i.e., the baseline wound area is expressed as '1').

Treatment cost analysis

A sub-population of 10 patients were randomly identified. A retrospective interrogation of patient case notes was undertaken for the identification and recording of treatments over a two week period immediately before and then for a two week period during treatment with the SAP dressing.

Costs were assigned to each treatment using:

- Wound care products: Wound Care Handbook 2017–2018[27] (a guide to product selection)
- Nurse time: via Royal College of nursing NHS Payscales 2017–2018, valid from 1st April[28]
- Pharmaceuticals: Dermatology Handbook 2017–2018.[29]

Calculations were undertaken to show:

- Total cost of treatments per patient
- Difference in cost of treatment
- Total savings over ten patients.

Statistics

Statistical analyses were performed on all subjects who completed the study. Only descriptive statistical analyses were undertaken on the relevant data including mean, standard deviations (SD) or trendlines, using an XL software package, where appropriate.

Duration of study:

The duration of the study, to allow for recruitment of 50 patients, was to be six months (or less if patient enrolment was concluded before this). These evaluations were undertaken in accordance with routine dressing changes on a clinical requirement basis. The patient was to be evaluated over a period of two weeks, or a minimum of four dressing changes.

Results

Epidemiology

We recruited 50 patients/wounds and 312 individual assessments comprised the data. The patient population characteristics are summarised in Table 3. A variety of wounds were evaluated with the majority chronic:

- Venous leg ulcers (VLUs) 29%
- Pressure ulcers (PUs) 22%
- Diabetic foot ulcers (DFUs) 8%.

The levels, type and viscosity of exudate for each wound, at each time point, represent a wide range of exudate types. In particular, a high proportion of the wounds were rated in the 'high' (35%) or 'moderate' (59%) range.

Past treatments

Before inclusion in this study, a wide variety of wound dressings were being used to manage wounds. Foams

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(24%), antimicrobials (21%), alginates (13%) and gels (13%) were the four most common dressing categories used.

Exudate management

Clinicians rated the SAP dressing fluid management capabilities as 'very good' (83%) or 'good' (13%) in managing all the different levels and types of exudate seen. All the clinicians participating in the study recorded that they would continue to use the SAP dressing (Fig 1).

Reasons for dressing changes

Fig 2 shows the total number of dressing-related observations when clinicians performed a dressing change. The main clinical observation noted was 'dressing changes' as part of the scheduled treatment regimen followed by the observation of 'dressing strikethrough' (72.0% and 12.4%, respectively). After further discussion with the investigators it was clarified that, in general, strikethrough was recorded even when only a small amount of exudate was apparent on the surface of the dressing. Generally, this level of strikethrough would have been disregarded as clinically irrelevant but was still captured in this study. Closer examination of the data showed that many assessments had multiple observations. For example, one patient, during a scheduled dressing change, had additional observations of 'wound observation', 'exudate handling' and 'leakage'. Results of an analysis to assess whether a dressing change was scheduled or unscheduled, show that over 95% of changes were scheduled, with only 4.5% being unscheduled. The main reason for an unscheduled dressing change was associated with 'wound observation' (possibly due to clinicians wanting to monitor more frequently than the schedule indicated), followed by issues with 'exudate handling' and 'strikethrough'. Despite this, all of the clinicians indicated that the wear time could have been lengthened as the dressing did not appear to have reached its full absorbance capacity.

The median frequency of dressing change was three days, (range: 1.5–11 days) (Table 4). Dressing change frequencies were highest between 2 and 4 days. The dressing change frequency of previously used treatments was recorded at the start of the study and showed the percentage of patients that had their dressings changed several times a day (6%), twice daily (4%), once daily (47%), every second day (18%) and every third day (20%) (Table 4, note some patients' previous dressing change frequencies were not recorded).

In terms of periwound skin conditions during the course of the evaluation period, there was a significant increase in the number of patients identified with healthy skin (5% rising to 28%). There were also significant decreases in patients exhibiting excoriation (28% to 20%), to 16%) and maceration (26% to 9%) (Fig 3). There were 11% of patients who recorded having

Fig 1. Assessment of clinician's experience with the use of the dressing

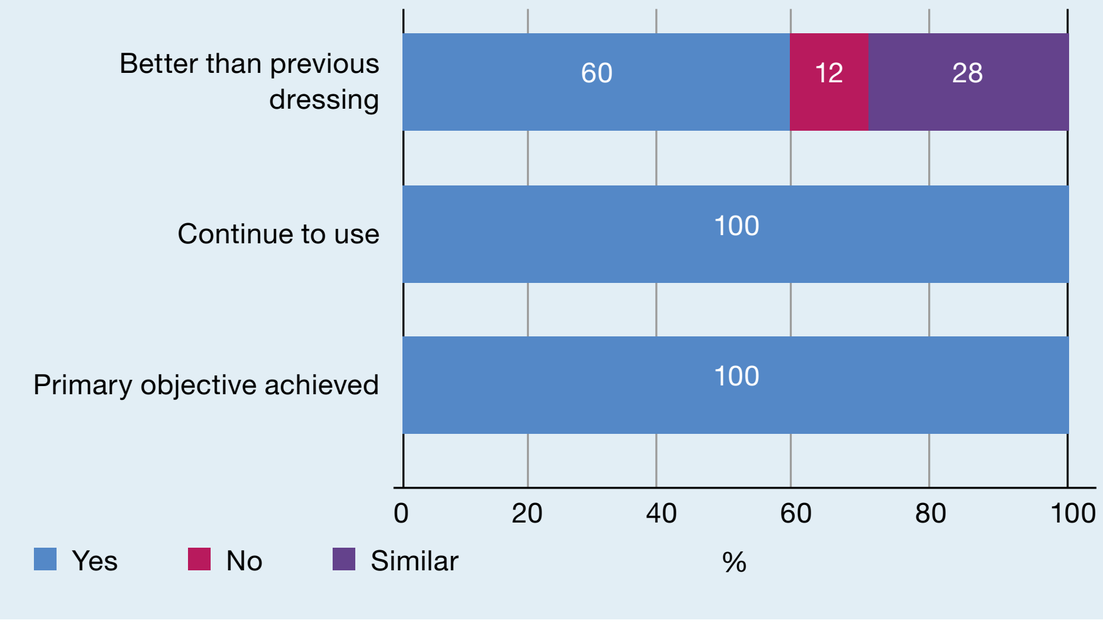

Fig 2. Proportion of dressing-related observations noted at dressing changes during study duration

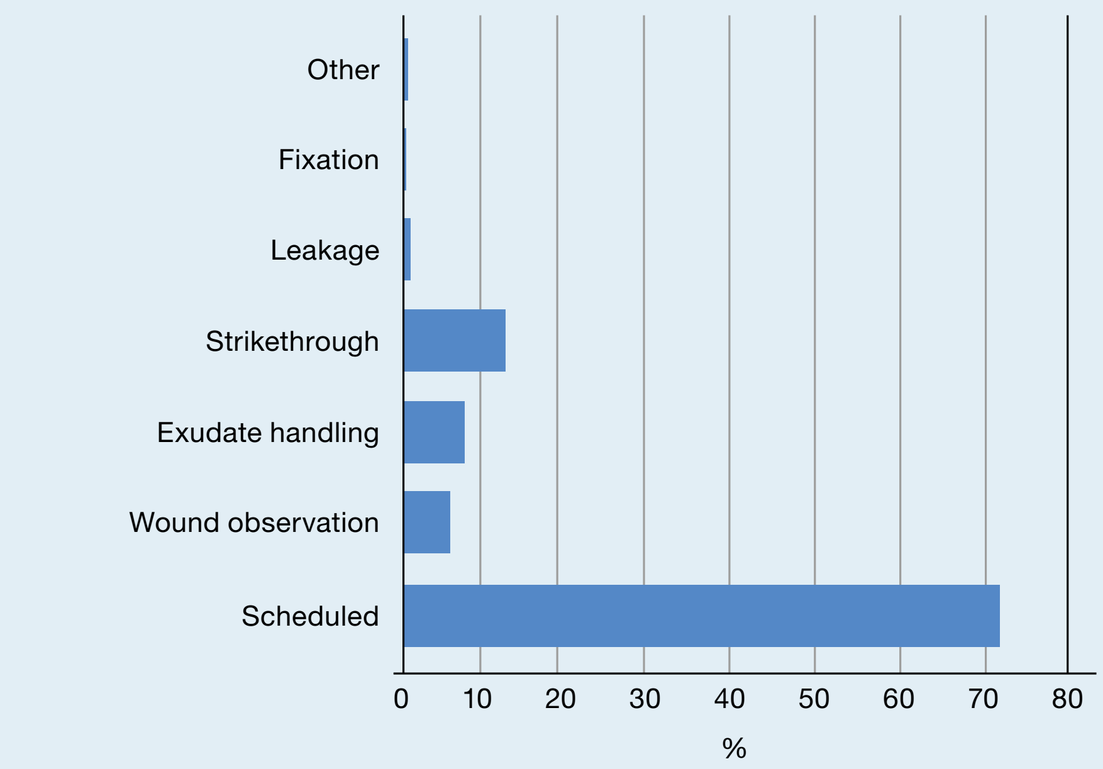

Fig 3. Changes in periwound skin condition

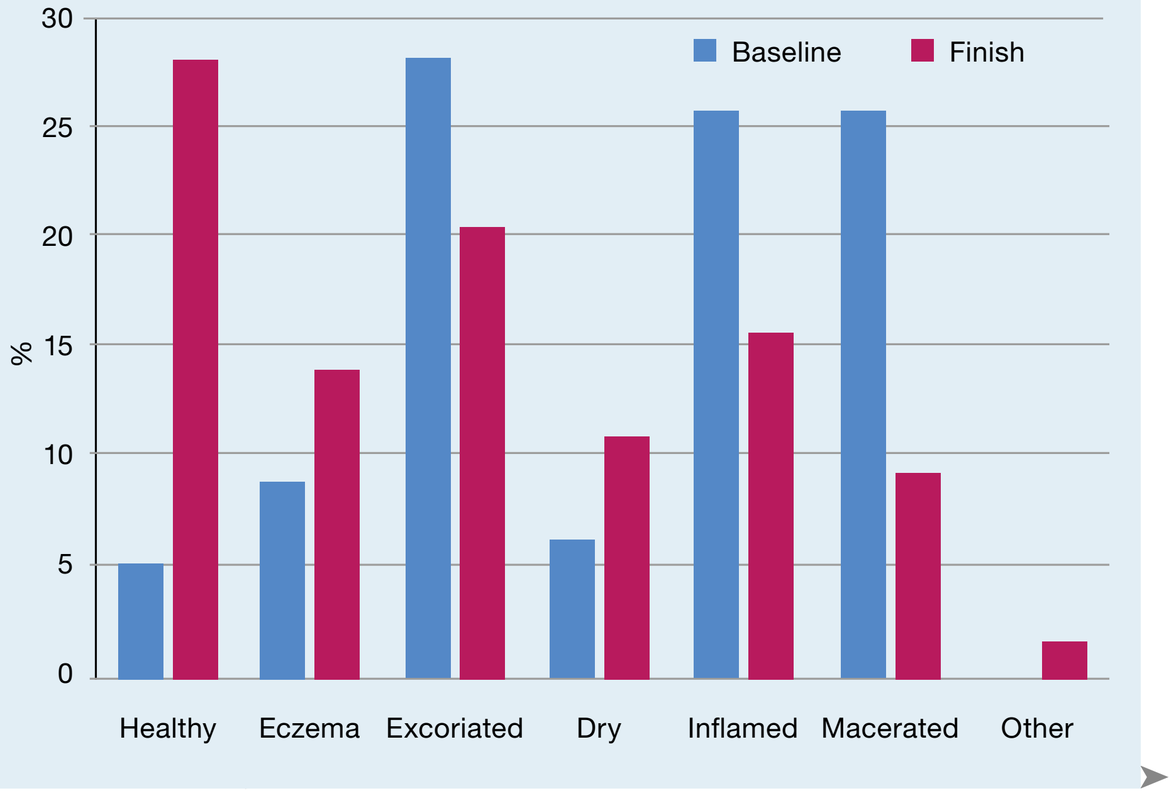

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Table 4. Frequency of dressing change

	Before inclusion* (%)	During study (%)
Several times a day	6	0
Twice a day	4	0
Once a day	48	8
Once a every 2 days	18	36
Once a every 3 days	20	42
Once a every 4 days	0	4
Once a every 5 days	0	4
Weekly	0	2
Other	0	2

*Data not available for two patients before the study

Fig 4. Percentage wound area reduction from baseline to finish of evaluation. Dotted line—trendline. Mean±standard deviation

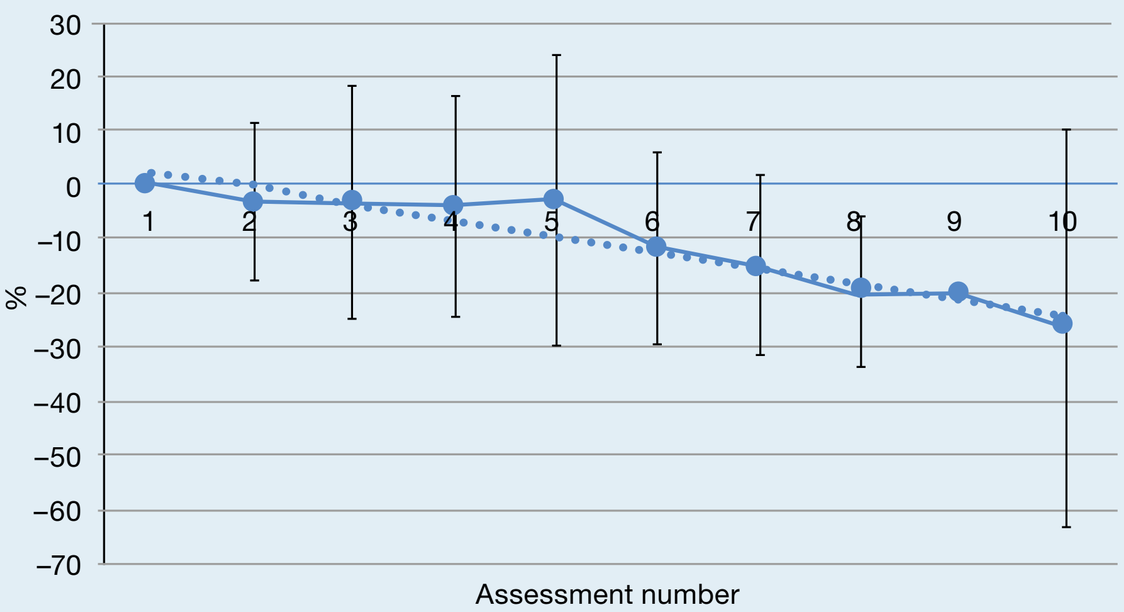
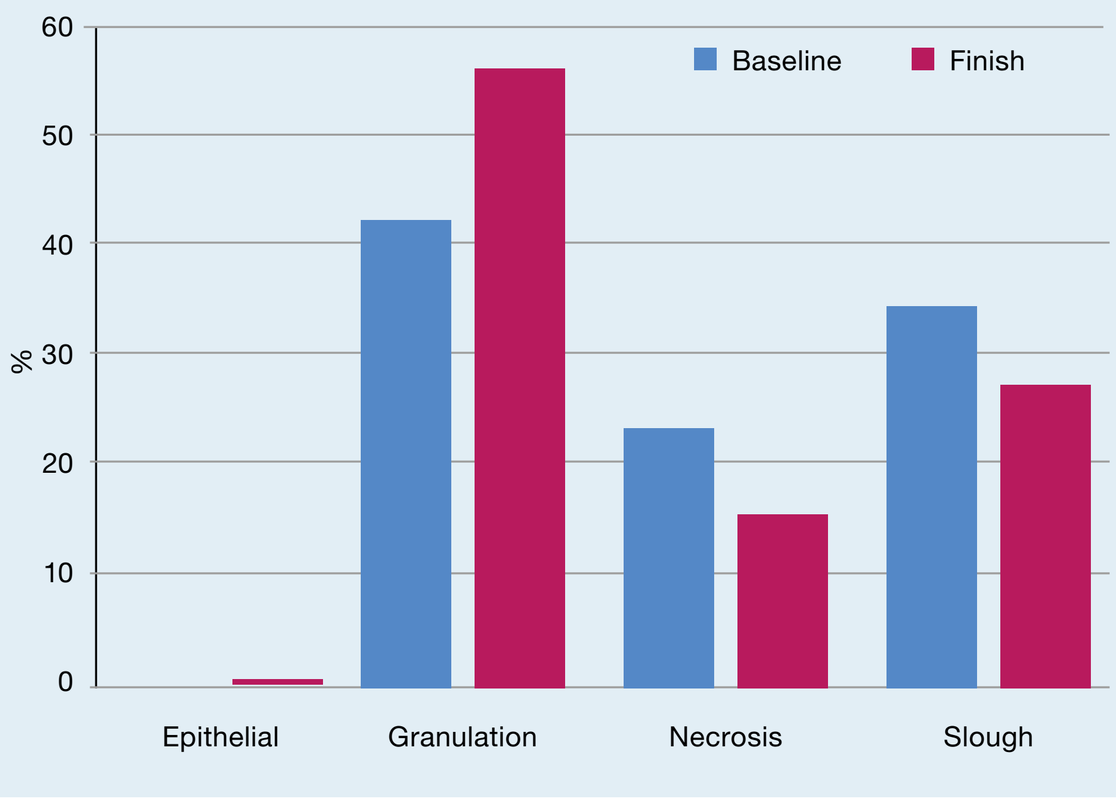


Fig 5. Wound bed changes during evaluation period



'dry' skin at the end of the study compared with 6% at the beginning. This increase in the proportion of patients with dry skin may be attributable to wound progression and/or improved dressing exudate management as the periwound skin dries. Overall, the periwound skin conditions 'improved' in 54% of patients, 'stayed the same' in 42% of patients, and 'deteriorated' in only 4% of patients, over the course of the observation period. At the start of the study 8% of patients had healthy periwound skin and this proportion increased to 36% by the end of the study (Fig 3).

Analysis of the data relating to infection showed that 40.6%, 28.4% and 34.2% of wound assessments noted wound odour, infection or critical colonisation, respectively (assessments evaluated subjectively). Alongside this data, nearly half of the wounds presented with some kind of infection related signs: redness (23.2%) and oedema (14.9%) or friable tissue (10.2%). The high levels of bacterial burden may be responsible for the high levels of exudate seen in many of the wounds. As a consequence of these indications of infection/critical colonisation a variety of topical antimicrobial agents, such as Flamazine, Metrotop, Metronidazole and honey, were used in conjunction with the SAP dressing in attempt to treat these infections. The results show, in the time period evaluated, the infection parameters recorded in majority of the wounds remained the same, but odour and infection parameters were eliminated in 22% and 10% of patients, respectively. Interestingly, laboratory data has indicated that the SAP dressing is effective in absorbing bacteria and chemicals (thiols) associated with producing odour in chronic wounds.[30]

Wound healing progression

Overall, there was a trajectory of healing with a trend towards a reduction in wound size of about 25% (Fig 4).

This wound area reduction correlates with data showing positive changes in the levels of devitalised tissue and healthy granulation tissue in the wound bed. During the evaluation period there is a decrease in the level of necrosis (23.3% to 15.6%) and slough (34.4% to 27.4%) in the wound bed and a corresponding increase in healthy granulation tissue (42.3% to 55.7%) (Fig 5). Closer inspection of the data demonstrated that, in many cases, levels of granulation tissue remained stable (for the period of the study) indicating that the environment provided by the SAP dressing was beneficial for maintenance of the wound bed.

Overall dressing assessment

In the overall dressing assessment summary sheets, the majority of responses, in particular performance with regard to exudate management, rated the SAP dressing as 'excellent' or 'good' in over 95% of respondents. The dressing's performance and the dressing use experience were all rated highly as either 'excellent' or 'good' in all but 2–3 parameters. In these cases, odour control and under compression, only a few assessments were made n=26 and n=9 respectively, however, a significant proportion of respondents (>65%) provided 'excellent' or 'good' ratings. It is noteworthy that the patients' ratings for 'wear comfort' and 'general satisfaction' were both 'excellent'/'good', within the 90–100% range (Fig 6).

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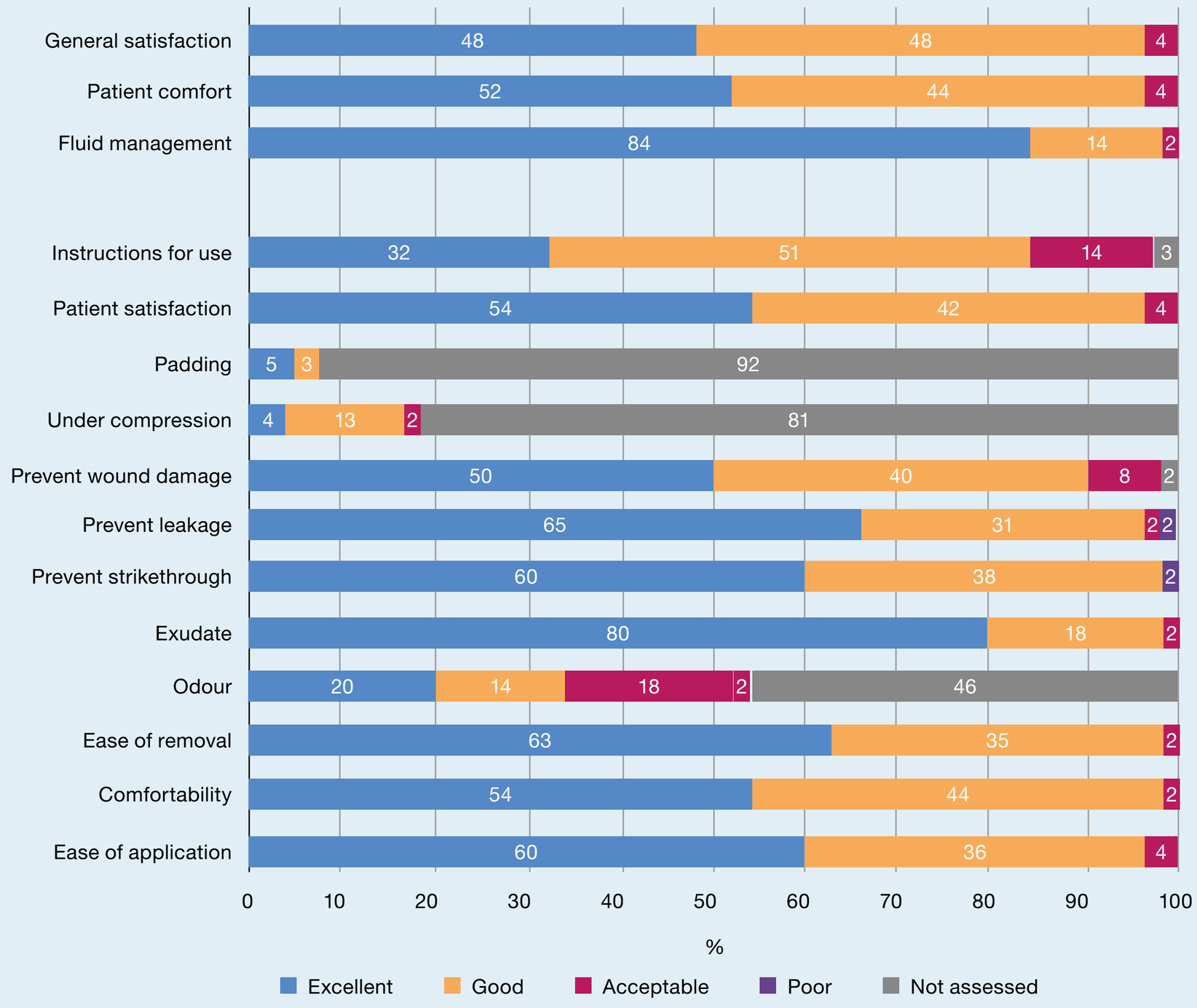
Fig 6. Questionnaire responses on dressing performance and dressing use experiences



SAP dressing use with ancillary products

In several of the patients, the SAP dressing was used successfully with ancillary products that were part of the overall treatment of the patient's wound and other comorbidities. Several wounds showed indications of critical colonisation (34.2%) and/or infection (28.4%), and the SAP dressing was used in conjunction with topical antimicrobial agents to reduce bacterial burden. In addition, some patients were prescribed steroid creams to reduce skin conditions that had a component of local inflammatory response, such as eczema. The SAP dressing was used under compression to treat patients with a VLU, with no adverse effects, or reduction in effectiveness of the compression reported.

Patient benefits

Benefits reported by patients included: exudate management capabilities; the wound area was kept dry; no resultant soiling of clothes or footwear; and less pain during dressing removal (because of no adhesion of the dressing to the surface of the wound).

Wound pain 'at dressing change' and 'between dressing change' was assessed using a validated VAS at the beginning and end of the study. At dressing change, pain levels were reported to be the same or reduced in 56% and 38% of patients, respectively. In two patients (4%) pain at dressing change was noted

Fig 7. Costs before and during treatment with the superabsorbent polymer dressing

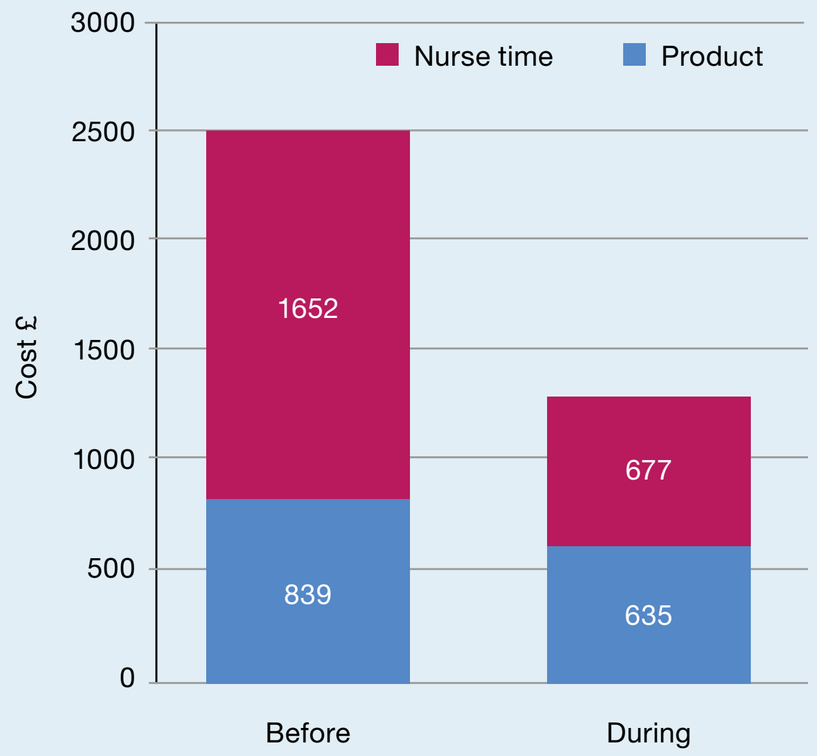


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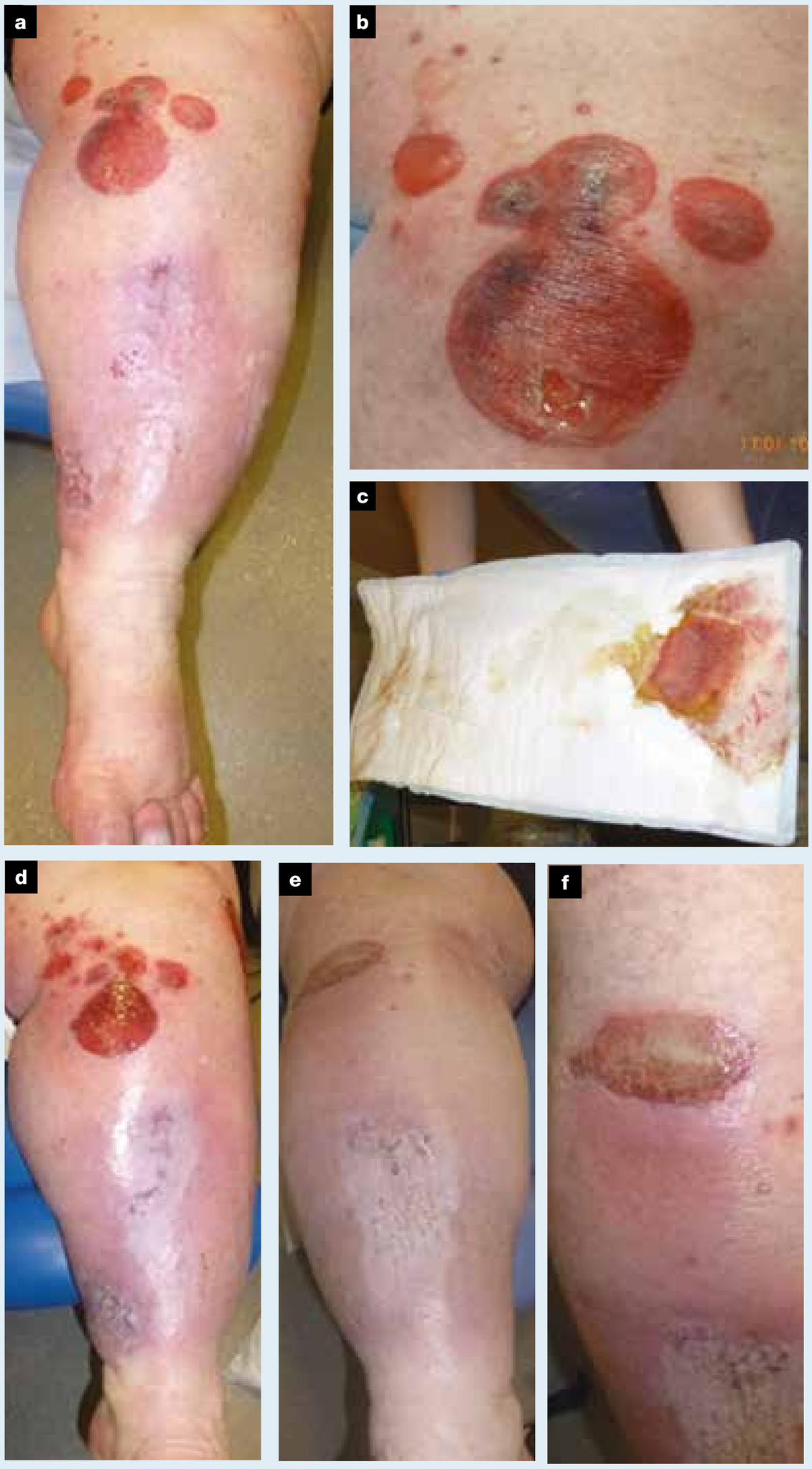
Fig 1. A 62-year-old female with bilateral leg oedema and chronic leg ulceration of 10 months' duration. The status of the left leg wound at presentation (**a** and **b**). The superabsorbent polymer dressing after removal one week before the start of treatment and with exudate absorption and retention within the dressing (**c**). The dressing was retained to the position of the wound (**d**). Healing of the wound on the right leg one week after the start of treatment (**e** and **f**)



to have increased. Between dressing changes, pain levels remained the same or reduced in 60% and 32%, respectively. An increase in wound pain between dressing change was observed in 8% of patients. Generally, patients with high initial pain levels showed a reduction, while those starting with low levels of pain tended to stay the same (data not shown).

Cost comparison analysis

In this sub-population analysis, 10 patients were drawn ad hoc from the study. This cohort included three males and seven females, aged (mean±standard deviation) 77±2.6 and 76±16.0 years, respectively. The wounds were VLU (n=4), PU (n=2), arterial (n=1), chest wound (n=1), 'wet legs' (n=1) and surgical (n=1). Using the patient case notes, data relating to the management of exudate were collected two weeks before and two weeks during the use of SAP dressing. From this, data cost were assigned relating to the products (sources in 1 and 2 of the methods section)[27,29] and nurse time (source in 3 of methods section).[28]

The mean costs per patient were, before enrolment in the study, £84.00±19.40 for products used and £150.20±82.60 for nurse time. The costs during the study were £63.50±33.10 for products used and £67.80±£12.10 for nurse time.

For the 10 patients evaluated, total costs were £2,491 and £1,312 before and during use, respectively, a saving of £1,179.00 (47%) (Fig 7). The greatest saving can be seen in nurse time and this relates, for the most part, to the fact that mean frequency of dressing changes was, before enrolment in the study six times per week which reduced to 2.7 times per week during the study.

Case series

A 62-year-old female, with bilateral leg oedema and chronic leg ulceration of 10 months' duration. The patient also had diabetes and an irregular heartbeat. Fig 1a and 1b show the status of the left leg wound at presentation. The wounds on the right and left leg measured 24cm^2 and 22cm^2 respectively. They had previously been treated with Aquacel, Kliniderm, Actifast under Ksoft, Klite, dressings had been changed daily. Leakage of wound fluid had led to excoriation and skin ulceration. Background and dressing change pain levels were moderately high (each at VAS 5). At this time point the wounds showed a 50:50 granulation tissue slough ratio.

After removal one week before the start of treatment, exudate absorption and retention can be seen within the SAP dressing (Fig 1c). The dressing was retained to the position of the wound (Fig 1d). Figs 1e and 1f demonstrate good healing of the wound on the right leg one week after the start of treatment. Within the periwound area there was reduced maceration/excoriation. Overall, there was excellent exudate absorbency by the dressing and the pain levels were reduced as a VAS of 4 was now reported.

A 79-year-old male, ulceration to medial malleolus of 5 years duration. At enrolment the wound size was 20cm^2 (Fig 2a and b) Previously treated with Silvercel, Kliniderm and Actifast under K1/K2 every second day. The wound was critically colonised, there was high levels of oedema and severe excoriation of periwound

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skin. The background wound pain was moderate (VAS 3) that increased at dressing change (VAS 7). After two weeks the patient's wounds were healing well (Fig 2c and d) and the periwound skin was showing reduced erythema, excoriation and maceration. The dressing had good exudate absorbency and no strikethrough. The pain levels according the VAS remained unchanged.

Patient 3, a 94-year-old with chronic leg ulceration of three years duration. Comorbidities include atrial fibrillation, osteoporosis and inflammatory bowel disease. The wound size at enrolment was 16.5cm^2. It had previously been treated with Urgotul Silver, Kliniderm, Actifast under KSoft, Klite, changed every third day. At presentation, there was 50:50 granulation tissue slough ratio, periwound tissue was eczematous, dry and inflamed with areas of excoriation (Fig 3a). After one week, wound healing was progressing (Fig 3b), the periwound skin maceration and excoriation were reduced and there was a decrease in wound exudate located on the wound bed surface and periwound skin. Figure 3c shows the wound contact side of a SAP dressing; the wound exudate is contained within a small area mirroring the shape of the wound. Figure 3d shows the outer facing side of the dressing with very little indication of exudate strikethrough.

Discussion

In this study, three patients presented with so-called 'wet legs'. This problem occurs if the volume of interstitial fluid in the limb exceeds its capacity to retain it. This may be complicated if there is a breach in skin integrity or an infection, and which can result in gross swelling, blistering and leakage of interstitial fluid onto the skin.[31] The symptoms arising from 'wet legs' can have a significant impact on a patient's QoL; excessive exudate levels that are inadequately managed can lead to problems including malodour, reduced mobility and soiling of clothes, footwear, bedding and furniture.[27] Reduced mobility and the potential embarrassment these symptoms can cause to the patient can lead to social isolation.[31,32] Anecdotal evidence has indicated that some patients have been treated with nappies as there was no alternative treatment for managing the extremely high levels of exudate. For 'wet legs', a dressing needs to absorb and retain exudate, so that fluid does not leak back onto the skin.[33] Therefore, superabsorbent dressings that have a greater absorption capacity than foam dressings should be used on these types of wet wounds.[18] The data from this study shows that the SAP dressing was very effective in managing such wounds.

We observed little effect of the antibacterial measures taken on the signs of wound infection. The limited impact on wound infection in this study is not surprising. Biofilms have been shown to be prevalent in many chronic wounds[34] and are notoriously difficult to eradicate,[35,36] particularly within two weeks.

According to our data, a number of patients were being treated with foams to manage moderate-to-high

Fig 2. A 79-year-old male, ulceration to medial malleolus of five years' duration shows the status at presentation (**a** and **b**). The periwound skin was excoriated and macerated, and the wounds produced significant levels of exudate. After two weeks (**c** and **d**) the wounds are healing well, and the periwound skin is showing reduced erythema, excoriation and maceration

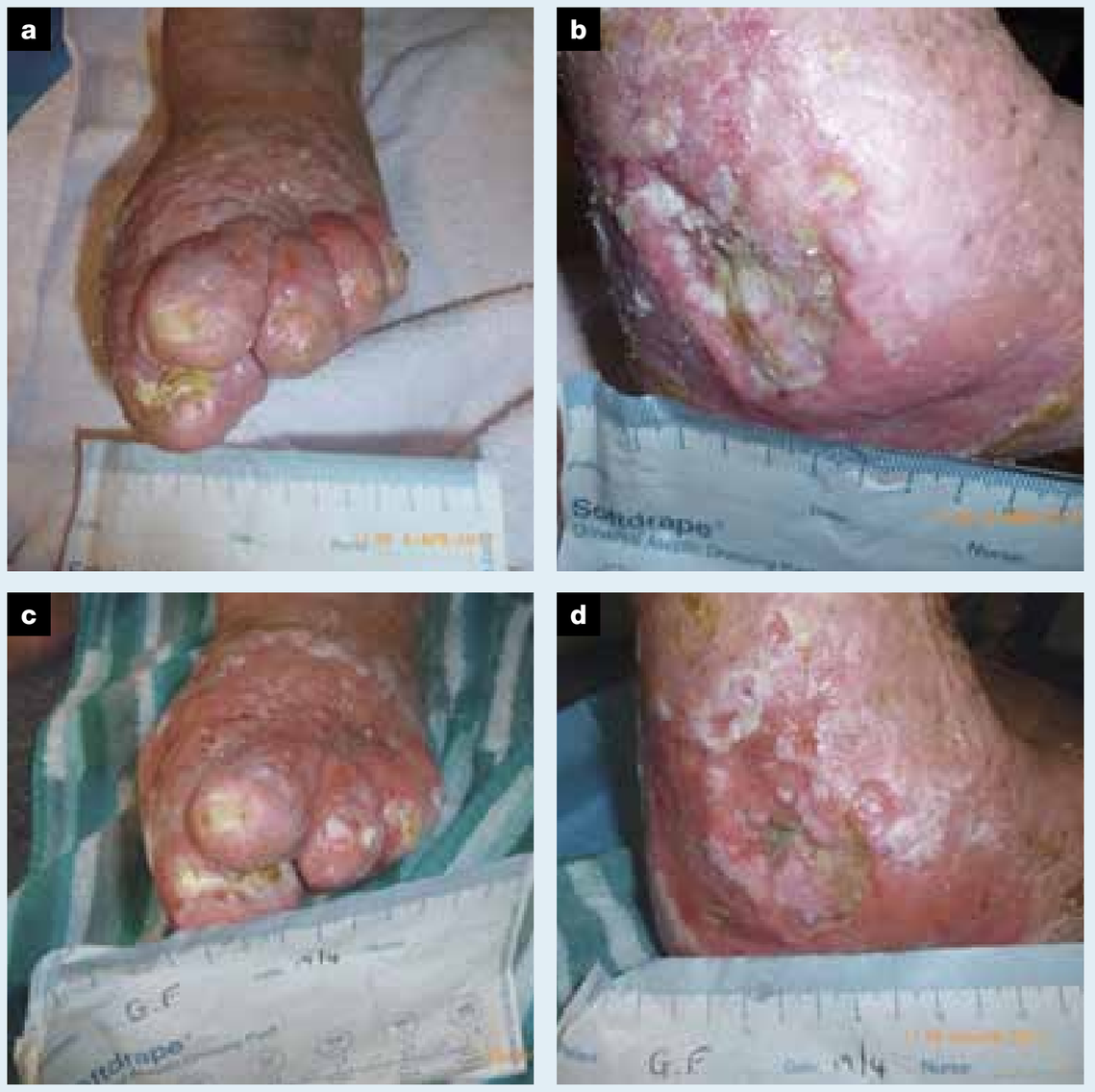
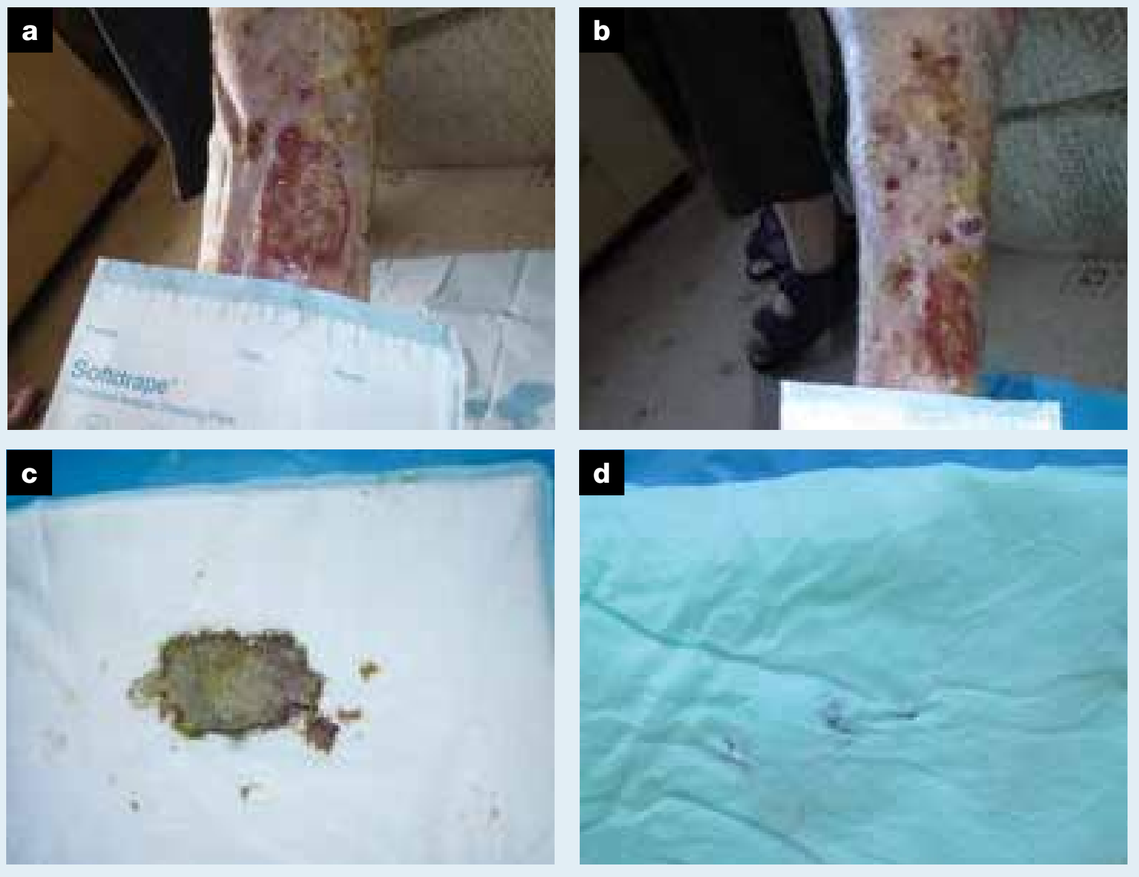


Fig 3. A 94-year-old with chronic leg ulceration of three years' duration. At enrolment, a 50:50 granulation tissue slough ratio, the periwound tissue was eczematous, dry and inflamed with areas of excoriation (**a**). After one week, healing progressed, the periwound skin maceration and excoriation, and wound exudate on the wound bed surface and periwound skin were reduced. The wound contact side of the dressing (**c**) and the outer facing side of the dressing (**d**) show good retention with little exudate strikethrough



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wound exudate. This appears contrary to current recommendations in that a recent best practice statement document, 'Effective Exudate Management'[9] which suggests caution in the use of foam dressings, stating that in a study on moderate-to-heavily exuding VLUs Schulze et al.[33] found maceration at 20% of dressing changes. This has led to their withdrawal from some dressing formularies.[37] Furthermore, the document recommends that a highly exuding wound will require a superabsorbent dressing or NPWT.[9]

It is likely that the beneficial healing environment provided by the SAP dressing was due partly to the removal/sequestration of damaging components, such as MMPs by the dressing. This sequestration has been confirmed by laboratory studies.[38] Overall, the healing response seen with the dressing was comparable to the healing responses seen in other similar studies.[39–41] Our data was also supported by the findings that the dressing achieved its primary objective in 100% of the assessments and that the SAP dressing was better than or similar to previously used dressings.[42]

As regards dressing changes, our data suggests that the frequency of dressing changes, when the wounds were treated with the SAP dressing, was reduced, when compared with dressing change frequency before the study. Furthermore, the calculated wear time is slightly longer than the standard practice relating to the use of SAP-containing wound dressings on moderate-to-high exudate levels.[43]

It is noteworthy that some of the wound exudates were rated as 'high' viscosity. This is often true in terms of infected wounds,[44] of which a high number were included in this study. This SAP wound dressing can absorb wound exudate of varying viscosities, which offers clear clinical benefits. It is also interesting to note that, in one patient, the SAP dressing effectively absorbed post-debridement blood.

At the start of the study, a variety of periwound skin conditions (eczema, excoriation, maceration) were present. These conditions can generally be attributed to the presence and intimate contact of wound exudate with the periwound skin.[45] Chronic wound exudate contains many components, such as MMPs, elastases, and ROS, which are likely to cause damage to the integument.[19,46,47] Our periwound skin data compares favourably with the results of another study which looked at a superabsorbent dressing in a similar patient population.[39] The treatment period in the study reported by Cutting was over four weeks and not two weeks, as here.[39] The improvement of periwound skin seen in this study has implications for wound healing as it has been demonstrated (in VLUs) that the integrity and status of periwound skin is an important determinant towards supporting healing.[48]

Conclusion

The SAP dressing achieved the primary objective relating to wound exudate management in all of the assessments undertaken in this study and underlines the fluid handling capabilities of the dressing. In doing so it supported healing, reduced damage to periwound skin and increased positive patient-reported outcomes. Overall, the dressing was rated highly by clinicians and patients. In particular, many patients commented how comfortable the dressings were to wear, and that they found they were able to resume a semblance of normality in their life.

The sub-population cost analysis has highlighted that, when compared with alternative (historical) exudate management treatments, the SAP dressing was less expensive. The reduction in costs arises from data that shows product use and frequency of dressing change (that impacts on nurse time) are both reduced when using the dressing. **JWC**

Reflective questions

- What specific physiological impacts does a SAP dressing have on wound healing
- Outline two consequences of poor exudate management
- What are the advantages and disadvantages of the different dressing types in managing exudate.

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Dealing effectively with heavily exuding wounds

Zetuvit® Plus tested in clinical practice

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Summary

A clinical application study was conducted to evaluate the wound healing supporting effect, tolerance and application characteristics of the new Zetuvit Plus absorbent dressing pad. A total of 61 patients with chronic ulcers, mainly of venous origin, and non-chronic, predominantly surgical wounds were treated for an average period of 10 days. The wounds were on average 5 months old at the start of treatment.

An overall improvement in the wound status was observed during the course of treatment: wound exudation was markedly reduced and there was an accompanying decrease in the number of infections. There was a steady decrease in the number of patients complaining of wound pain.

Overall, the attending personnel and the patients were very satisfied with the Zetuvit Plus treatment. For more than 90 % of the treated wounds, the attending personnel rated not only the general impression but also the application characteristics and various product properties as “good” or “very good”. The high absorption and binding capacity of the absorbent dressing pad contributed substantially to this result. Treatment with Zetuvit Plus also met with very high acceptance among the patients. More than 90 % of the patients had a “good” or “very good” overall impression of the treatment with Zetuvit Plus. The tolerance and patient comfort were major factors in this respect.

Zetuvit Plus

Zetuvit Plus is a wound dressing particularly suitable for the management of heavily exuding wounds. It binds wound exudate rapidly and reliably retains it within the absorbent core. This exudate removal eliminates inhibitory factors from the wound, thus promoting wound healing. The high absorption and retention capacity reduces the frequency of dressing changes and affords protection against renewed infection. Zetuvit Plus also has a good padding effect ensuring that the wound margins are not irritated.

The combined absorbent dressing pad consists of four layers of different materials. The dressing core is made from soft cellulose fluff blended with fluid-retaining polyacrylate. The absorbent core is enclosed in a thin non-woven fabric that uniformly distributes the fluid. On the side facing away from the wound, the product features a special water repellent non-woven that is permeable to air. The entire product is enclosed in a soft two-layer outer non-woven. The outer surface of the non-woven consists of hydrophobic polyamide fibres which do not absorb fluid, preventing it from sticking to the wound. The inner surface of the non-woven consists of hydrophilic cellulose fibres and has high capillary activity.

Effective wound treatment should be phase-specific (1) and support the physiological healing process by eliminating interfering factors.

An important part of wound healing is the exudation phase, in which the wound is cleaned by the cells migrating into the wound area (2). Problems arise if this phase is prolonged and the exudate which initially promotes healing exerts harmful effects on the peri-wound area and no longer contributes to the healing process. Excessive exudation is observed not only in chronic wounds, but often also in bacterial superinfections of acute wounds. Under these conditions, bacterial constituents stimulate the release of pro-inflammatory mediators by activating specific surface receptors of inflammatory cells (3, 4). Vascular cells respond to this situation with increased permeability, which explains the sometimes marked tendency of these wounds to exudation.

Proper exudate management must therefore ensure that excess exudate is removed from the wound. On the other hand, it is important that dressing changes should not be more frequent than necessary in order to avoid disturbing the wound rest, which in turn could cause renewed bacterial contamination.

The need to satisfy these requirements resulted in the development of the highly absorbent dressing pad Zetuvit Plus, which is particularly suited for the effective removal of bacterially contaminated exudate from heavily exuding wounds.

This study was performed to determine how far the new wound dressing pad meets the requirements of clinical practice.

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Multicentre study with 61 patients

A multicentre study was conducted in 61 patients with wounds of varying etiology to evaluate the wound healing supporting effect, tolerance and application characteristics of Zetuvit Plus. 15 attending personnel documented the course of the study over an average period of 10 days with three dressing changes, and with the final dressing change simultaneously being the concluding examination. At the initial examination, data on the patient's age, gender and general condition, the age of the wound and additional therapeutic measures were recorded. The success of the wound treatment with Zetuvit Plus was assessed on the basis of the exudate management and the incidence of infections. Anomalies in the periwound area and the occurrence of pain were also documented.
After completion of the treatment with Zetuvit Plus, the attending personnel assessed the wound dressing pad on the basis of the course of treatment, its application characteristics and various product properties and also indicated the extent to which the product had fulfilled their expectations. The patients were also asked to state how satisfied they were with the product and also about the tolerability and user comfort during treatment with Zetuvit Plus.

More than 80 % of the patients had moderately or heavily exuding wounds and less than half had infections.

The majority of the patients were suffering from wounds associated with moderate or heavy exudation, including both chronic wounds such as venous ulcers and non-chronic, e.g. surgical wounds.
The 34 female and 27 male patients had an average age of 68 years. In 18 % of cases the general condition of the treated persons were described as “very good”. In more than half of the patients, the state of health was classified as “age-appropriate” and in 26 % as “debilitated”.
67 % of the patients were suffering from a chronic wound, 34 % of the wounds had been diagnosed as venous leg ulcers (ulcus cruris venosum).

Indications

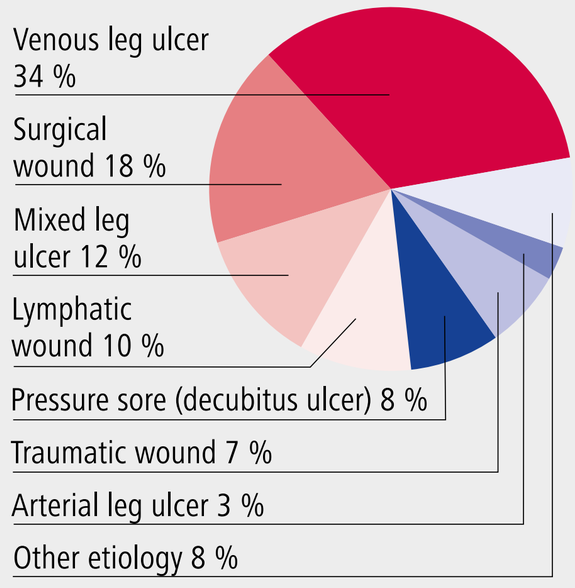

Fig. 1: Etiology of the treated wounds

The other chronic wounds were classified into mixed leg ulcers (12 %), lymphatic wounds (10 %), pressure sores (8 %) and arterial leg ulcers (3 %). Of the non-chronic wounds (25 %), well over one half were consequences of a surgical intervention (total 18 %) and 7 % of the wounds were the result of an injury.

The mean age of the wounds was 5 months. A large portion of the patients (44 %) were enrolled in the study because of the lacking success of prior wound treatment. Other categories comprised initial treatments (29 %) or a change to Zetuvit Plus during treatment with a different wound dressing pad after the wound had entered a different phase of healing (26 %).
28 patients received compression therapy as a causal treatment because their chronic wounds were predominantly of venous origin. In many patients, Zetuvit Plus was combined with another product during the course of treatment. Silver-containing ointment dressings were often used to protect against infections. In some cases, deeper wounds were additionally treated with alginates to ensure better contact with the wound bed.

In combination with the accompanying measures, the much lower microbial contamination resulted in a reduced incidence of wound infections.

Infections

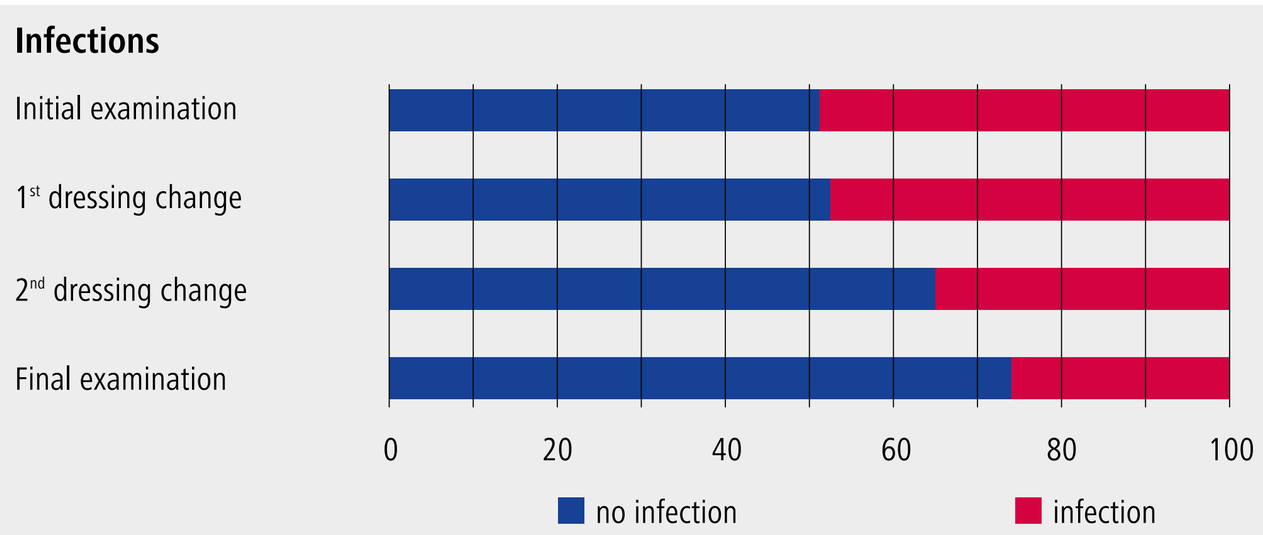

Fig. 2: The number of infections decreased during the course of treatment.

While the attending physicians and nursing personnel initially observed signs of a clinical wound infection in every second patient, at the end of treatment 74 % of the wounds were free from infections.

Exudation

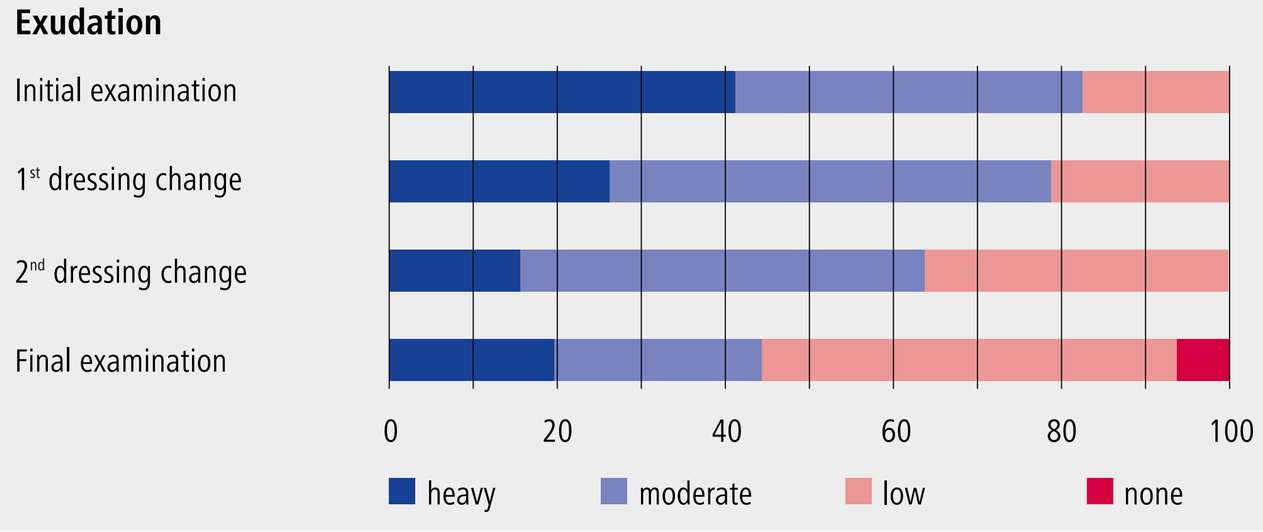

Fig. 3: The proportion of heavily exuding wounds was halved from 41 % at the start of the study to 20 % at the final examination.

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The effective wound management with Zetuvit Plus led to an overall reduction of wound exudation. While at the start of the study 82 % of the wounds were reported to be moderately or heavily exuding, at the final examination only 44 % fell into these categories.
The periwound area was also protected from damage by elimination of the excess exudate. Irritations of the wound margins decreased significantly during the course of treatment, resulting in a doubling of the proportion of periwound areas without irritation from 21 % at the start of the study to 43 % at the final examination.
A decrease in wound odour was also documented. While at the start of the study 61 % of the wounds had a slight to strong odour, at the final examination only 28 % of the wounds were affected by slight or moderate odour production.

Fewer patients complained of wound pain

The removal of tissue damaging exudate and the associated decrease in infections meant that the number of patients complaining of wound pain steadily decreased during the course of treatment. While at the start of treatment 45 % of the patients were still suffering moderate or severe pain, this proportion decreased to 19 % during the course of treatment. At the same time, the proportion of pain-free patients increased from 16 % to 39 % during the course of treatment.

Positive assessment by attending personnel

The physicians and nursing personnel concluded that the state of the wound had significantly improved during the course of treatment with Zetuvit Plus. In 43 % of cases the state of the wound was assessed as improved and in 36 % of cases as markedly improved at the end of the study. In no case an impairment of the wound status was found.
The product properties and the application characteristics of the new Zetuvit Plus were highly valued by the attending personnel.

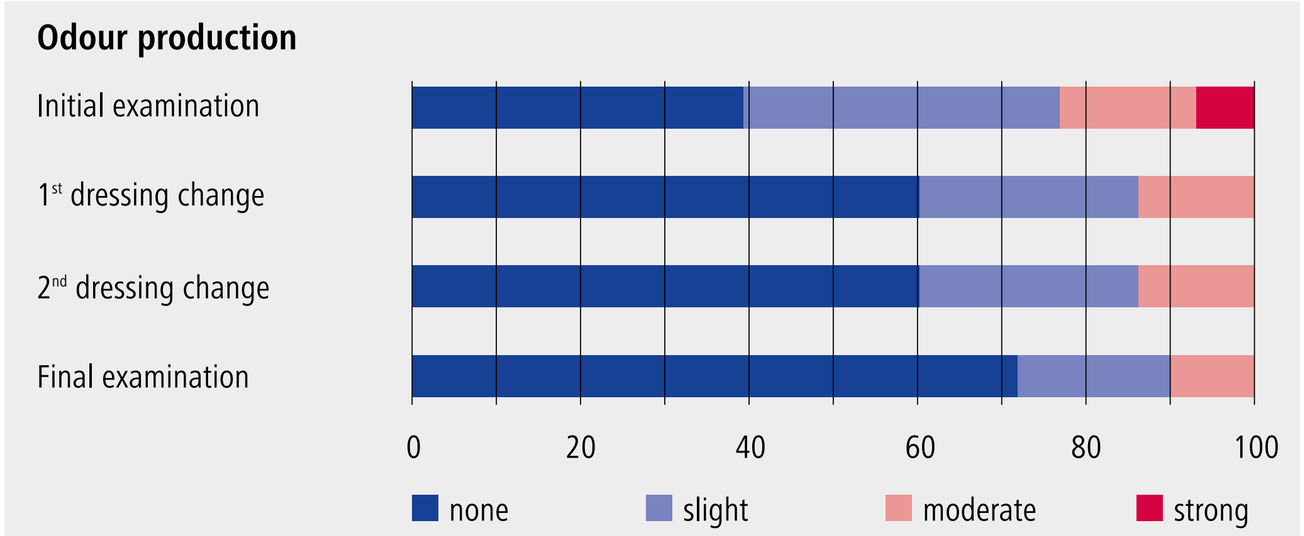

Fig. 4: At the end of the treatment only 28 % of the wounds had a slight or moderate odour.

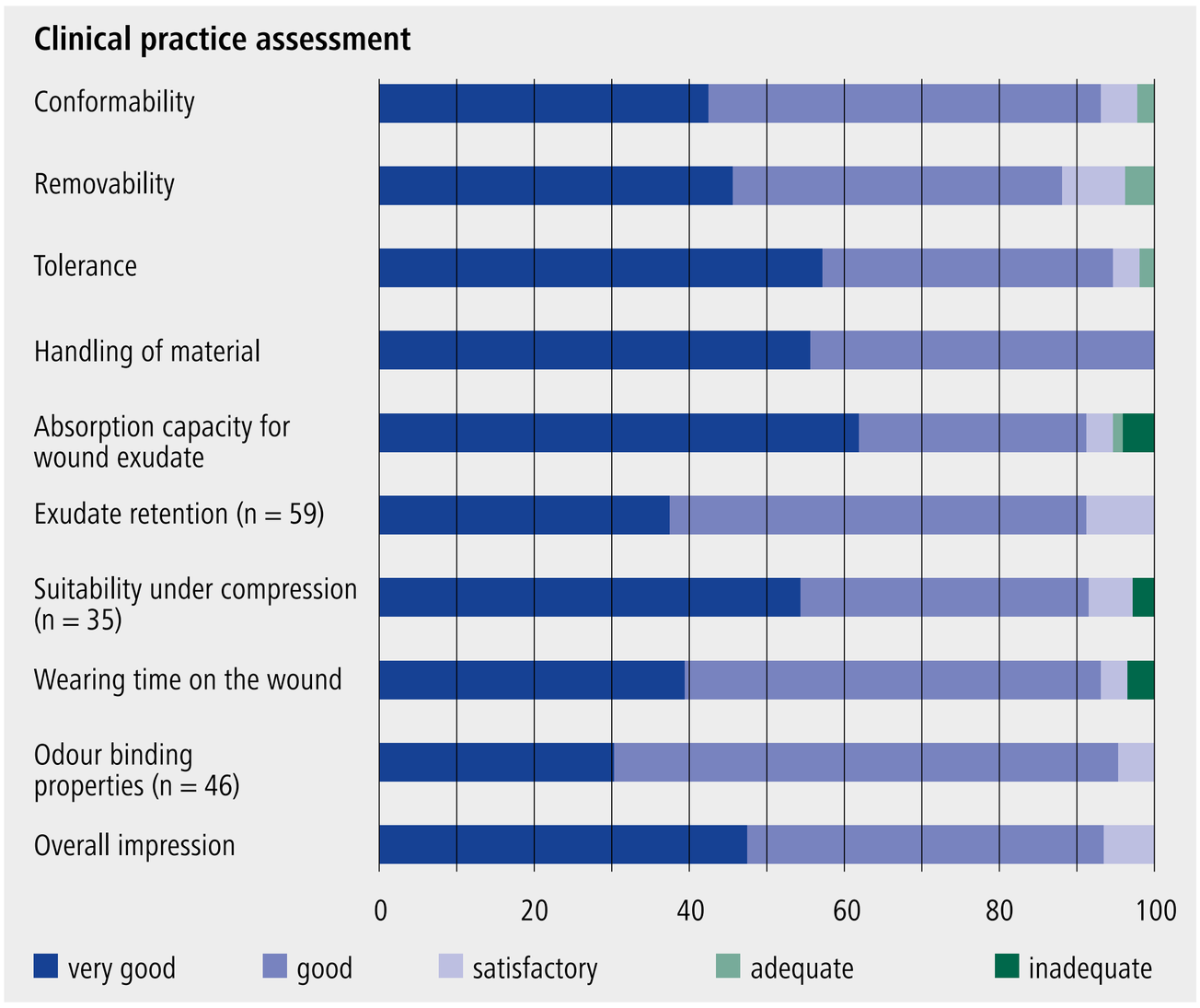

Fig. 5: Almost all the properties of the new Zetuvit Plus were rated as "good" or "very good" for 90 % of the treated wounds.

For more than 90 % of the treated wounds, the persons questioned rated Zetuvit Plus as "good" or "very good" as regards its absorption capacity for wound exudate and its wearing time on the wound. The absorbent wound pad owes this positive assessment to its particularly high absorption and binding capacity. The hydrophobic outer surface made the absorbent pad easier to remove on changing the dressing, with the result that this property was rated by the attending personnel as "good" or "very good" in 88 % of cases. The attending personnel had a "very good" or "good" overall impression of 93 % of the treatments with Zetuvit Plus. In 61 % of these cases, the expectations of those questioned were fulfilled and in 25 % of cases were even exceeded. For 3 % of the treated wounds they considered that their expectations "tended not to have been fulfilled".
After 85 % of the treatments the treating persons stated that they would use Zetuvit Plus again in future for similar wounds.

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High acceptance among patients

Treatment with Zetuvit Plus also met with very high acceptance among the patients. More than 90 % of the patients rated the product as "good" or "very good" with regard to user comfort and tolerance.
This high level of patient satisfaction is attributable to the special properties of the wound dressing pad. Thanks to its combination of materials it is very comfortable in contact with the skin and exerts a good padding effect.
As a result, 95 % of the patients reported having a good or very good overall impression of the treatment with Zetuvit Plus.

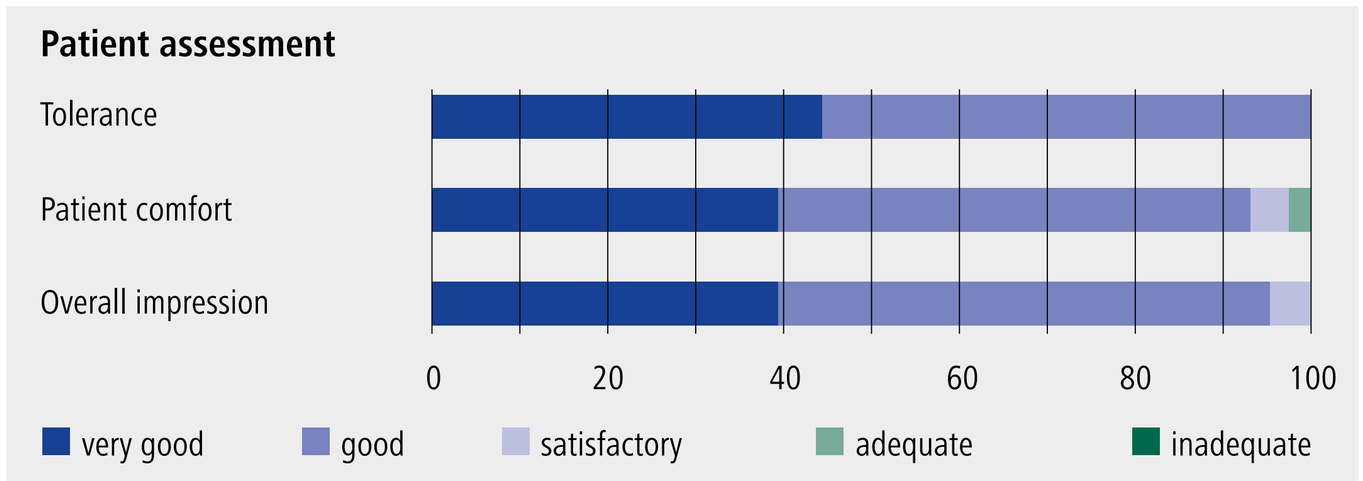

Fig. 6: More than 90 % of the patients rated the product as "good" or "very good" in terms of patient comfort and tolerance.

Conclusion

The results of this clinical application trial confirm in vitro data from laboratory investigations and distinguish Zetuvit Plus as an absorbent dressing pad with high absorption and binding capacity for wound exudate combined with patient comfort. These properties result in:

- effective exudate management
- a low frequency of dressing changes
- protection of the periwound area
- high patient comfort
- cost and time savings

and therefore fulfil the requirements placed on a wound dressing pad in clinical practice (5).
The use of Zetuvit Plus is therefore indicated when excess exudate has to be eliminated effectively and economically from heavily exuding wounds. This was demonstrated in the present study both for heavily exuding, chronic wounds and for heavily exuding surgical wounds.

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Complex compression therapy in difficult circumstances

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Keywords
Venous leg ulcers, wound management

Schlüsselwörter
Ulcus cruris, Wundversorgung

Summary
A statistically unidentified number of patients suffer for years from chronic wounds on their lower legs. Many of these patients have lived through an odyssey of hospital admissions and treatment in wound management centres and other healthcare facilities. After having the condition for a long time, these patients are seen less as requiring treatment but more in need of symptomatic control and a degree of „normality" in their everyday lives. However, this often means dealing with chronic pain and heavy exudates. And by then, many patients can barely tolerate wound cleansing and proper causal treatment, i.e. complex compression therapy, or reject it altogether. It is often thought that all the treatment options have been exhausted. This case study illustrates how patients can be helped by treatment that has a sustained effect.

Zusammenfassung
Es gibt eine statistisch nicht erfasste Patientenzahl, die über Jahre chronische Wunden an ihren Unterschenkeln haben. Viele dieser Patienten haben eine Odyssee von Krankenhausaufenthalten, Versorgungen in Wundzentren und anderen Versorgungsstrukturen erlebt. In der langen Krankheitsphase steht bei diesen Patienten weniger die Therapie als das Herstellen von „Normalität" im Alltag und die Symptomkontrolle im Vordergrund. Normalität im Alltag bedeutet für oftmals die Auseinandersetzung mit chronischen Schmerzen und der starken Exsudation. Häufig ist zu beobachten, dass die Wundreinigung und die Sicherstellung der Kausaltherapie, in diesen Fällen also die Durchführung einer komplexen Kompressionstherapie, kaum bis gar nicht toleriert wird. Viele dieser Patienten gelten nicht selten als austherapiert. Anhand eines Fallbeispiels soll aufgezeigt werden, wie es gelingen kann, diesen Patienten nachhaltig zu helfen.

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Komplexe Kompressionstherapie unter erschwerten Bedingungen
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Case report

A 50-year-old woman with venous leg ulcers due to lymphatic insufficiency and post-thrombotic syndrome attended the Dortmund Care and Treatment Support Centre for People with Chronic Wounds, where she was successfully treated over a period of 18 months on an outpatient basis. It was confirmed that she had secondary lymphoedema.

This patient suffered from a venous leg ulcer for more than 10 years. Before presenting to the Support Centre, she had been treated in a rehabilitation clinic for lymphatic diseases for five weeks. However, the ulcerated leg has been excluded from treatment there due to unexperienced therapists (▶ Fig. 1).

A full history of the previous management was taken on the day the patient first came to the Support Centre. Various problems immediately became apparent. The patient's own health management was very limited (1). She was relatively ignorant about the cause of her condition and of the possibilities for care and treatment to improve her situation. For months she had been sleeping in a chair at night. She applied no skin care to the intact skin on either leg, did not visit her GP regularly, and had never seen a specialist. She hardly kept any social contacts.

Lack of adequate pain management appeared as another problem. The rehab clinic had prescribed ibuprofen 800 up to three times a day but, even with this treatment, the patient could still not bear any pressure on the lower legs or any mechanical manipulation of the wounds.

There was a heavy wound exudate, requiring dressing changes with superabsorbers every day. The surrounding skin was uneven, very reddened, with rhagades from which lymphatic fluid oozed. Cleansing and care of the surrounding skin was therefore difficult. Bacterial colonisation of the uneven skin created problems for wound healing.

During the course of treatment, colonisation of the surrounding skin and wound surfaces was repeatedly critical. We therefore monitored the bacterial status regularly and prescribed targeted oral antibiotic therapy and topical bactericidal dressings on the basis of the results. Even so, during the 18 months of care, the patient had to be admitted to hospital because of erysipelas that could only be treated with i.v. antibiotics (▶ Fig. 2).

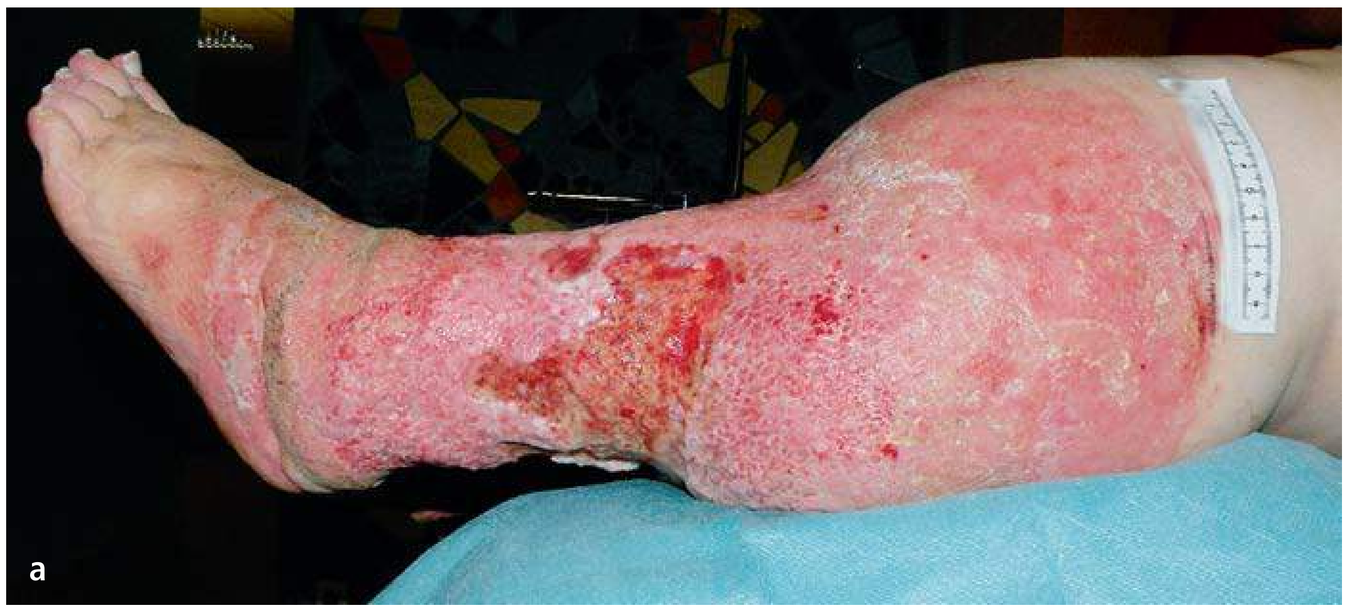

Fig. 1 Findings on the first day at the Care and Treatment Support Centre for People with Chronic Wounds.

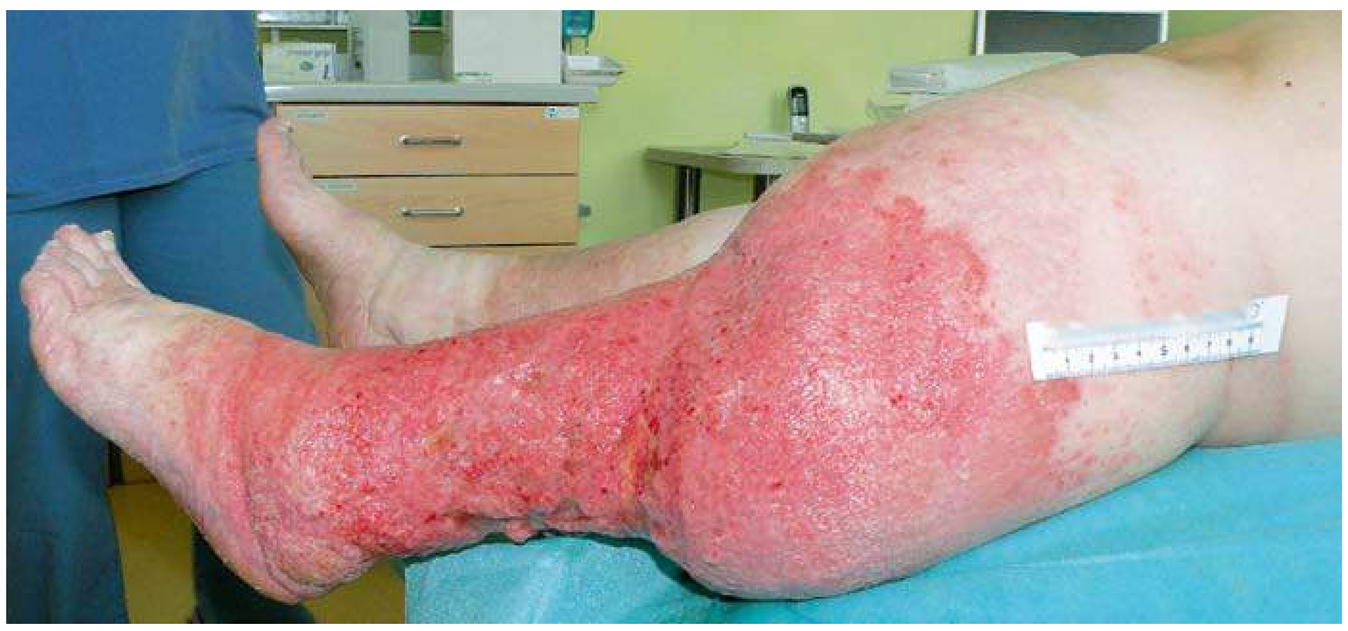

Fig. 2 Erysipelas

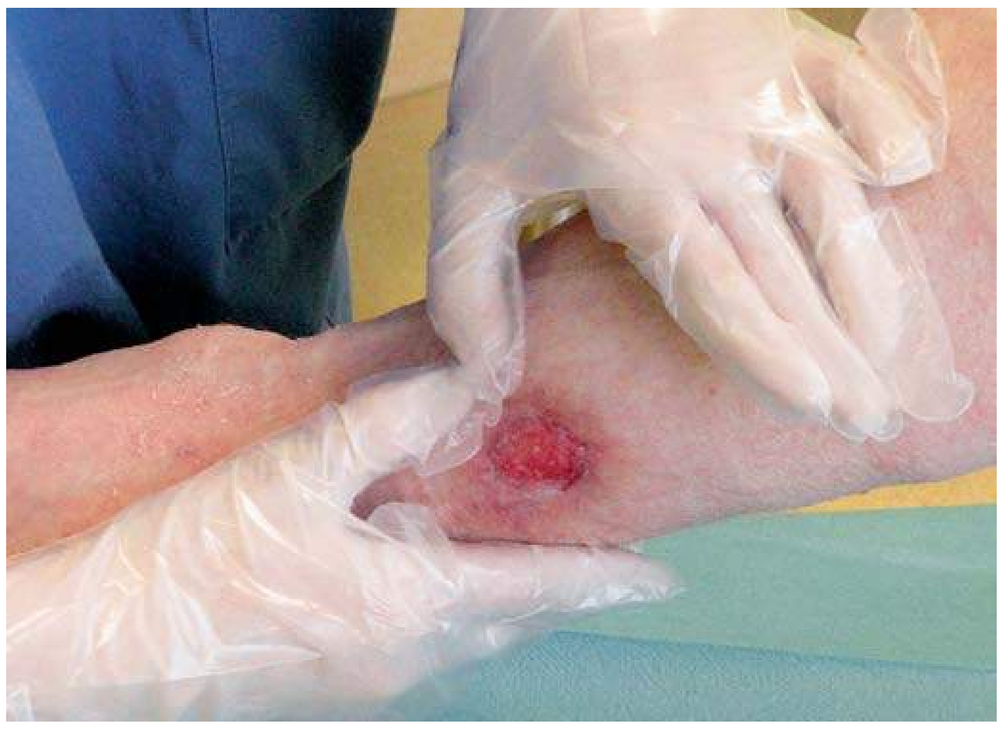

Fig. 3 Lymphatic drainage near the edge of the wound.

At the start of our care, we adjusted the pain therapy to the patient's situation. On the new analgesic regimen, in particular with a rapidly acting opioid (Oxycodon® 5 mg acute) taken as required before dressing changes and lymphatic drainage, she tolerated both wound cleansing and compression therapy. It was important to ask the patient frequently about her sensitivity to pain, to record her responses, and to adjust the medication accordingly. In this way, we were able to reassure her that she would remain free of pain. This in turn increased her trust in the nurses, therapists and doctors, and her confidence that the wound could indeed possibly heal.

In a second step, we intensified the wound cleansing with surgical debridement using curettes, and ultrasound therapy. In addition, we applied dressing materials that painlessly remove any adherent fibrinous coating from the wound (PolyMem®/PolyWic®). We continued to use superabsorbers, initially Curea P1® and later Zetuvit® plus, to cover the wound.

Most important point of treatment was to ensure relief of the complex congestion (2). At the start of care, the patient received 60 minutes of manual lymphatic drainage, including the area immediately around the wound margins, five times a week (▶ Fig. 3).

To ensure that venous flow and lymphatic drainage were sustained long-term, a well-padded lower leg compression dressing using short-stretch bandages was applied at this stage (▶ Fig. 3 and ▶ Fig. 4) (3). Due to the bottleneck anatomy, it was extremely important to obtain an evenly distribution of pressure when applying the padding (4). We used Rosidal® Soft and Softcompress® foam pads cut to size.

The patient's toes were bound because of the positive Stemmer sign and forefoot oedema; the forefoot was compressed more intensely by inserting an inlay. With time, after about four months, the interval between dressing changes could be increased and manual lymphatic drainage given four times a week. And three months later the patient needed to come for treatment only three times a week.

Compression was also optimised regularly. The patient was provided with flat-knit Bermuda shorts combined with lower

leg compression using short-stretch bandages (▶ Fig. 5). We continued to pad the left lower leg and apply short-stretch bandages until the wound had healed (5).

Patient education was also an important aspect of care (6). The patient continuously received information on the cause of her condition. She got advice about measures which she was able to apply by herself to assist the care and prevent new ulceration. We focused on improving her mobility with the associated stimulation of the muscle pump (7) and on skin care. She was informed on the importance to wear appropriate compression hosiery regularly after the end of the wound treatment, as prophylaxis to prevent recurrence or new lesions.

She was also advised to regularly use an intermittent compression device (Lympha mat® 300) for lymphatic drainage (8). From the very beginning, we tried to educate the patient in her own domestic setting, in order to improve venous and lymphatic flow while she was sleeping or sitting. And after several months of unability, she than soon sleept again in her own bed.

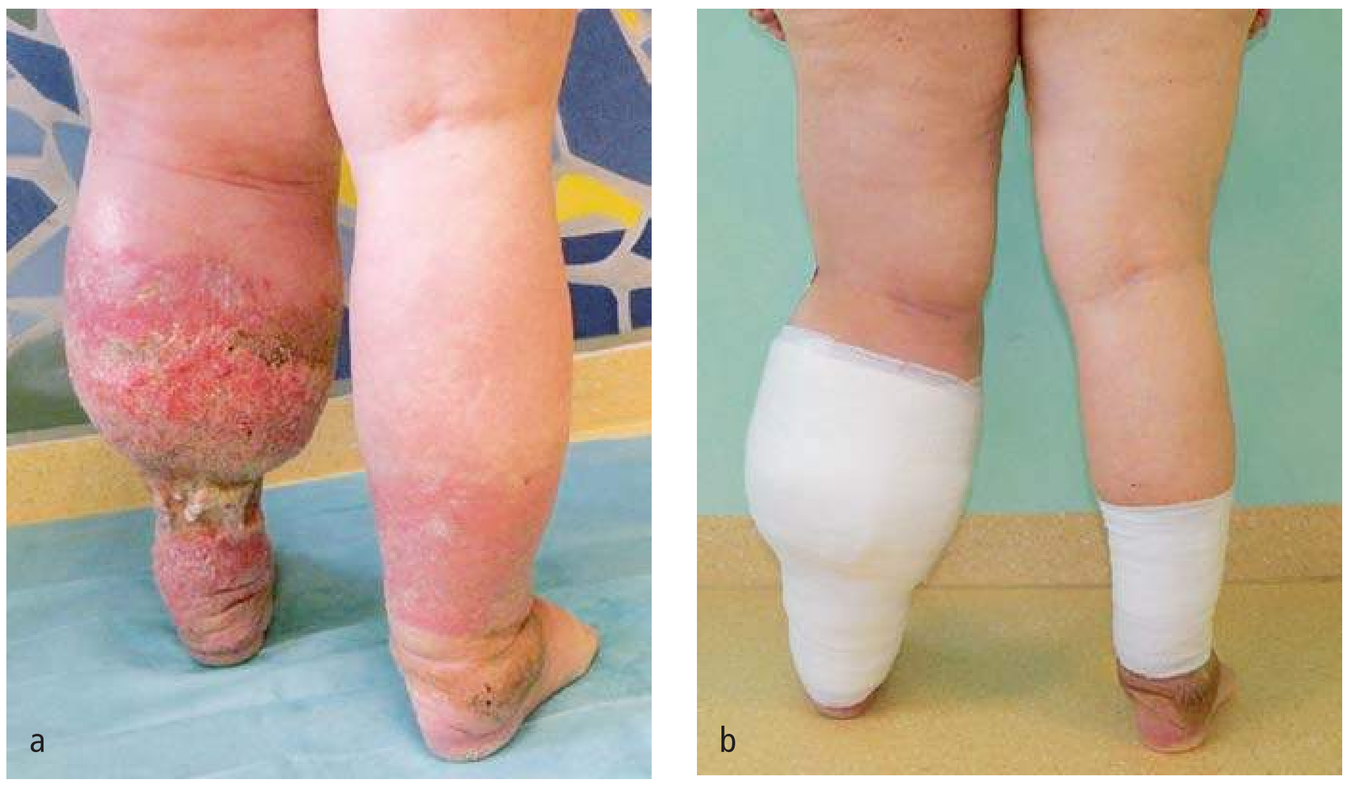

Fig. 4 Padded bottleneck anatomy.

Outcome

Thanks to good interdisciplinary teamwork of various specialities, including physiotherapy, dermatology/phlebology, pain management, surgery and nursing care, the patient's treatment was successfully concluded (▶ Fig. 6). During treatment, we adjusted the compression therapy to the patients needs and reacted swiftly to any complications caused by recurrent critical bacterial colonisation. As key factors for success we identified that experts in wound care coordinated the management (9) and that the patient herself actively supported and shared responsibility for all the measures taken. Ulceration has not recurred since the wound healed (21 months ago) and the patient is now a founder member of a self-help group.

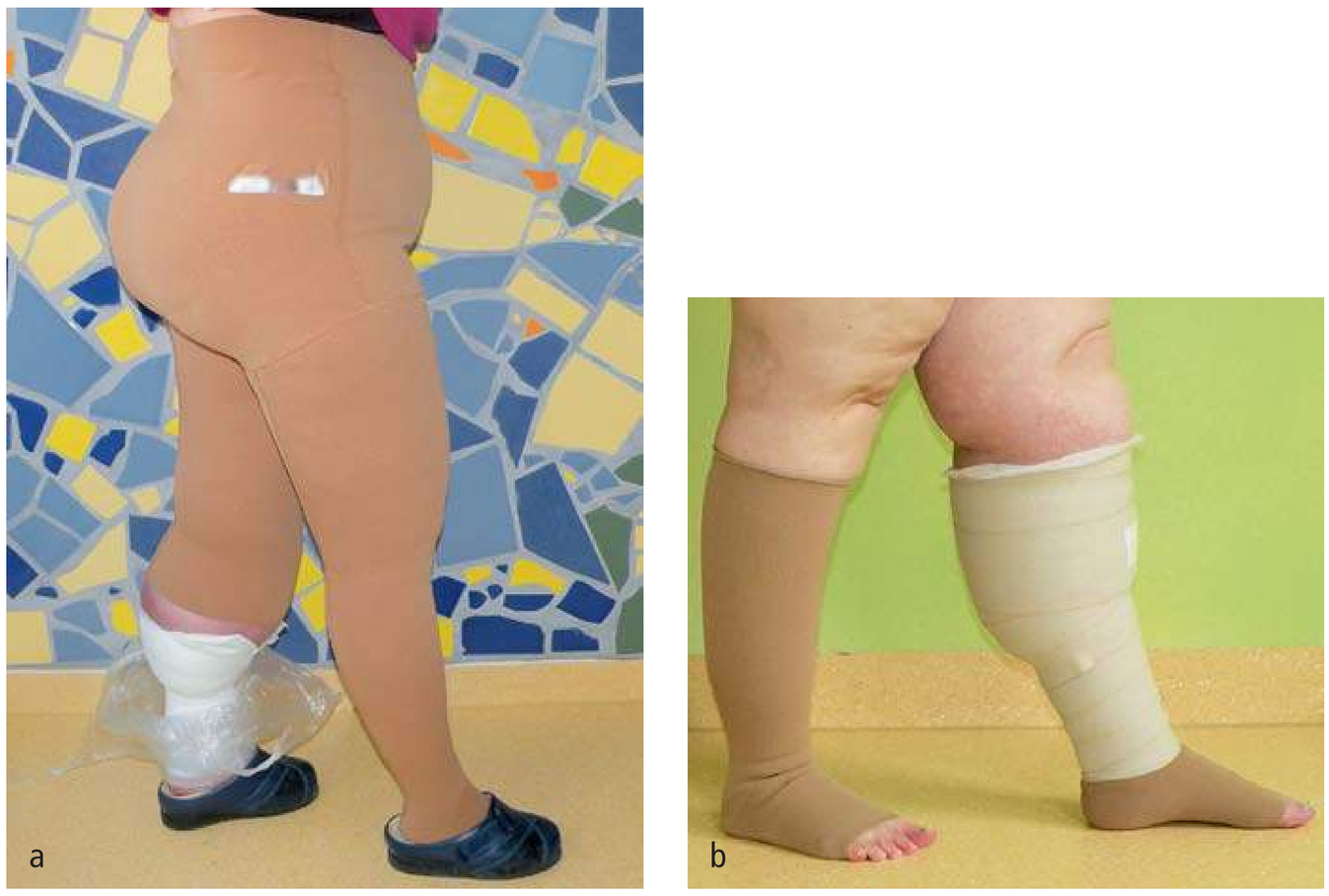

Fig. 5 Compression stockings and tights combined with an underlying padded compression dressing.

Acknowledgements

A further important factor was finance of the treatment. As the result of an exceptional decision, the patient's health insurance, the DAK, agreed to bear the costs of this intensive 18-month ambulant therapy at the Care and Treatment Support Centre for People with Chronic Wounds in Dortmund.
The costs of therapy at this healthcare facility, some €90,000, have to be set against more than €1,000,000 already incurred elsewhere. In the past, various doctors had recommended an amputation as alternative treatment option.

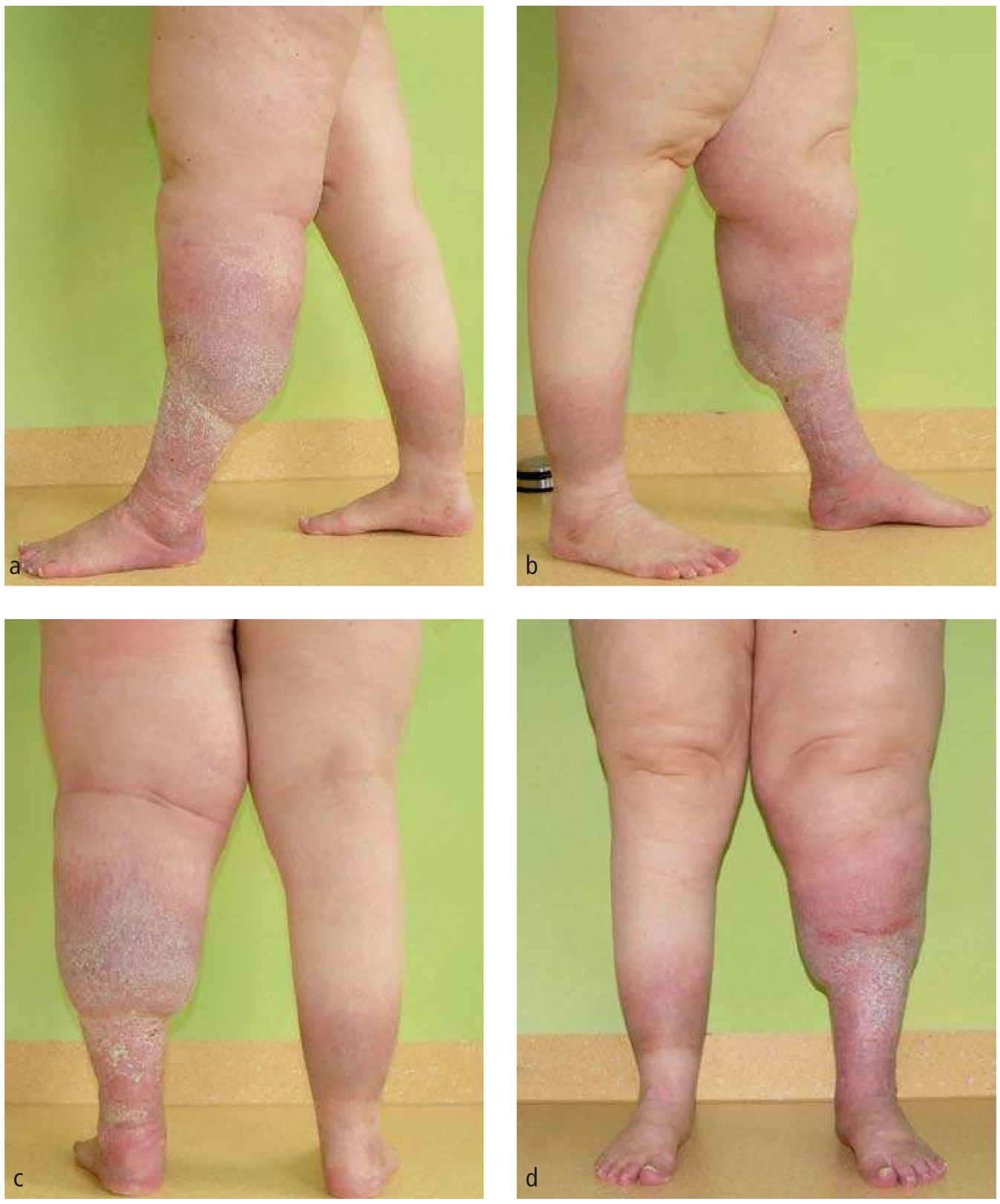

Fig. 6 End of treatment on 29/03/2012.

Ethical guidelines

The author declares no conflict of interest. All data on humans described in this manuscript were carried out in accordance with the national law and the present Helsinki Declaration. Informed consent was obtained from all patients.

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A Case Study Series Evaluation of Zetuvit Plus in the Treatment of Moderately to Highly Exuding Wounds under Compression

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Pennine Care NHS
NHS Foundation Trust

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Introduction

A venous leg ulcer is defined as an open lesion between the knee and the ankle joint that occurs in the presence of venous disease and takes more than two weeks to heal (NICE, 2013). Guest et al (2015) found that there were at least 730,000 patients with leg ulcers in the UK, which equates to 1.5% of the adult population having a leg ulcer. Venous ulcers can take weeks or months to heal and have a high reoccurrence rate.

Venous ulcers have been found to have a significant impact on a patients' quality of life, with associated personal, social and psychological effects; this also has a considerable financial impact on healthcare providers, as well as a wider social and economic impact (EWMA, 2016).

Zetuvit® Plus

Zetuvit Plus is a highly superabsorbent dressing with a four layer design of skin-friendly materials which gives the dressing a unique softness. Due to its high absorbency rates this leads to fewer dressing changes resulting in time and cost saving.

Method

This project was undertaken over a 6 month period to review the performance of Zetuvit plus under compression bandaging All clinicians involved had attended educational seminars on Zetuvit plus .Patient consent was obtained and ethics approval was not required .The community nursing team assessed ease of application and removal ,comfort exudate management use under compression number of dressing changes and patient satisfaction .

Results

Pennine Care have considered the results to date and find they are extremely promising with the main benefits being improved exudate management reduced dressing change prevention of peri wound damage and patient satisfaction .In this case study series it was found that Zetuvit plus absorbs wound exudate and reliably retains it within the absorbent core without any detrimental effects on levels of compression .

Conclusion

Pennine Care will continue the evaluation of Zetuvit Plus as consideration is now being given for the addition of Zetuvit Plus for forthcoming formulary inclusion

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Case Study

- Female aged 45
- Lymphoedema
- Long standing lower leg ulcer
- Uses compression wrap
- Self manages between appointments
- On commencing Zetuvit Plus over a two-week period there has been a reduction in her wound size from 37x11cm to 27x7cm. Figure 2
- Patient has found the dressing very comfortable and easy to apply and remove
- staff have commented on a better level of exudate management with no maceration of the peri-wound skin

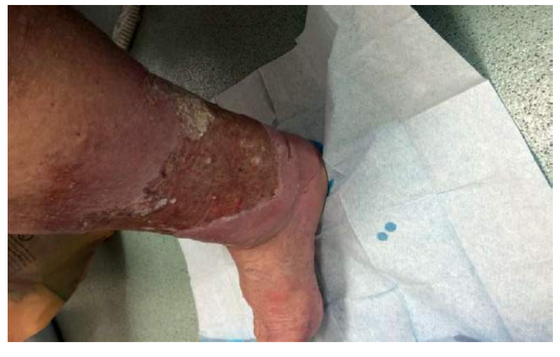

Figure 1

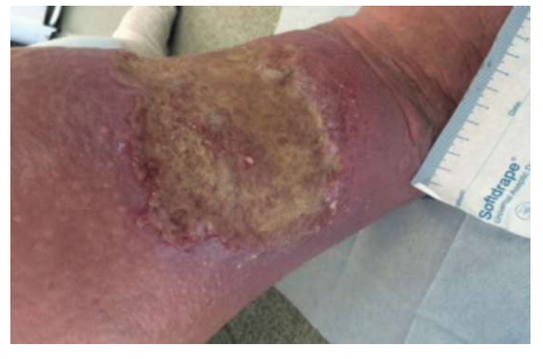

Figure 2. Two weeks later

Exudate, infection and patient quality of life

Maureen Benbow, Jane Stevens

Abstract

Efficient and cost-effective management of excessive wound exudate continues to present unique challenges to nurses. Accurate patient and wound assessment is essential to inform the treatment and selection of suitable dressings. The wide range of modern wound management products should be sufficient to meet the needs of every wound type at all phases of healing, and as circumstances change. However, there are still situations in which nurses are having to change dressings a number of times in 24 hours to prevent maceration (i.e. the softening and whitening of skin that is kept constantly wet), soiling, and the potential for cross-infection. There is no easy solution to the problem, but as nurses become more knowledgeable about identifying and managing the causes of excessive exudate, the available management options, and, as dressing materials become more sophisticated, practice should improve in this area.

Key words: Wound exudate ■ Assessment ■ Management ■ Best practice ■ Zetuvit Plus

One of the most significant challenges faced by nurses is the efficient and cost-effective management of excessive wound exudate, which can cause extreme distress and negatively impact on patients' and carers' quality of life. The practical issues of soiled clothes and bed clothes, and dislodged dressings combined with the increased potential for cross-infection, lead to labour-intensive, frequent redressing of the wound, inconvenience, and social embarrassment. There are a wide range of products and therapies available for managing excess wound exudate, yet many patients continue to suffer the indignities outlined. The key to achieving moisture balance in a wound is careful, regular, and accurate assessment followed by the appropriate choice and use of dressings or therapies (White and Cutting, 2006). The role of exudate in wound management, its significance, nature, methods for management, and associated skin problems will be explored in this article.

Wound exudate

Exudate, also known as wound fluid or wound drainage, is defined as serous fluid derived from plasma that has passed through the walls of a damaged or overextended vein (Collins et al, 2002). It is produced during the initial inflammatory phase (before the proliferative and maturation phases of healing) and combines with extracellular fluid in normal healing. Current understanding of exudate is limited, but its production is thought to be the response to a complicated interaction between wound aetiology, wound healing physiology, wound environment, and compounding pathological processes (World Union of Wound Healing Societies (WUWHS), 2007).

The production of exudate, a desirable and naturally occurring phenomenon at different stages of healing, is a vital component for healing as the blood vessels dilate following haemostasis. As part of the body's normal inflammatory response, it enables white blood cells in particular, and other substances needed for healing, to migrate to the traumatized tissue. Vasodilation and increased capillary permeability is stimulated by histamine and cytokines released by damaged cells to allow the passage of larger molecules than normal, such as phagocytic white blood cells, to work with proteolytic enzymes in order to remove pathogens and devitalized tissue.

Exudate plays an important role in preventing the micro-environment from dehydrating; enables diffusion of immune and growth factors; assists autolysis; and functions as a transport medium for essential nutrients in cell metabolism (WUWHS, 2007). As a result, the blood vessels appear to 'weep', which reflects the Latin origins of the word, *exsudare*, which means to 'ooze out like sweat' (Barnhart, 1988). Exudate is rich in protein and cells, and is an influential factor in wound healing.

Although the production of exudate to support wound healing is both necessary and desirable, problems arise when exudate becomes excessive and difficult to manage. The theory of moist wound healing requires knowledge with regard to the fine balance between being therapeutically moist and not too wet. However, there is no magic formula on which the optimum level of exudate (dryness or wetness) can be calculated and applied in practice. A dry wound will heal more slowly as moisture is needed for cell migration, whereas an excessively wet wound will cause maceration of the wound and surrounding skin, precipitating wound prolongation (Kindlen and Morison, 1999). Both conditions are less than ideal, but it is possible—following accurate assessment of the wound—to add moisture to a dry wound through the application of moisture-donating dressings (e.g. hydrogels) to rehydrate devitalized tissue. Moisture-absorbing dressings can be used for heavily exuding wounds, but all have a limit to the degree of absorbency so, for example, in a heavily-exuding and infected wound, assessment and dressing application may be very frequent until the infection is controlled. It is

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Table 1. Common acute and chronic wounds

Acute wounds
■ Traumatic wounds
■ Surgical wounds
■ Skin abrasions
■ Burns
Chronic wounds
■ Venous leg ulcers
■ Diabetic foot ulcers
■ Pressure ulcers

paramount that the nursing focus is not just on 'mopping up' the exudate, rather than exploring and identifying why the wound is leaking and managing the contributing factor(s). This will create additional resources in terms of nursing time and the cost of dressings; exudate that is not effectively managed can cause skin damage and unnecessary pain.

Acute or chronic?

In general, wound exudate contains growth factors, wound debris, nutrients, electrolytes, glucose, leukocytes, red blood cells, platelets, macrophages, fibrinogen and fibrin, and has a high protein content with a specific gravity greater than 1.02 as a result (Cutting, 2003). The functions of these components range from facilitating clotting, immune defence, maintaining osmotic pressure, and as an energy source to degrading protein.

The constituents of exudate produced in acute and chronic wounds differ (*Table 1*). The exudate of an uncomplicated, acute wound contains a number of endogenous proteases, which positively contribute to cell growth, wound closure, and remodelling. The chronic wound is defined as one that has remained unhealed for more than 6 weeks as a result of multiple complex factors (Collins et al, 2002). Duration, however, is less important than the clinical state of the wound either on wounding or discovery of it, compared with the nature of its aetiology which may preempt its chronic nature from day 1.

The high level of inflammatory cells in chronic wound exudate is significant with regard to delayed healing (Herrick et al, 1992). The normal sequential progress through the phases of healing, as seen in acute wounds, is disrupted in chronic wounds, which results in delayed restoration of function and extended healing time. The most commonly encountered chronic wounds are pressure ulcers, diabetic foot ulcers and chronic venous stasis ulcers, which account for over 70% of chronic wounds in the UK (Hardwicke et al, 2008). High levels of chronic wound exudate may lead to the inability of capillaries to cope, and may therefore hinder healing. Chronic wound exudate is more likely to cause periwound skin irritation or allergic contact dermatitis as it is thought to be more corrosive than acute wound exudate (Cameron and Powell, 1997); hence, the need to protect the skin from leaking exudate through rigorous, regular patient and wound assessment, and appropriate dressing selection.

Exudate in an acute wound presents as clear, thin, pale yellow or straw-coloured in 'modest' amounts (White and Cutting, 2006), but the colour and consistency may alter according to temperature and changes in constituents. The colour can range from red, pink, yellow or brown to amber. Larger wounds usually produce more exudate than small wounds (e.g. extensive, infected chronic venous leg ulceration). More exudate is produced in the early phases of healing, with the exception being with infected, at which time there may be an unexpected increase in the volume of exudate. A number of parameters of exudate should be assessed and documented, including colour, quantity, odour and consistency as these may vary according to whether the wound is (Bates-Jensen, 1997):

- Serous; possible infection, secreting serum
- Bloody; sanguinous, trauma to blood vessels
- Serosanguineous; trauma to blood vessels, consisting of blood and serum
- Purulent and foul purulent; infected, the production of pus.

The longer the inflammatory activity lasts, more fluid will penetrate through the permeable vessels and more exudate will be produced. It may be thick or watery again, according to the phase of healing. In the early phase it may be thick and/or viscous with large numbers of bacterial and damaged cells as a result of autolysis. The volume of exudate will depend on the size of the wound, underlying cardiac disease, peripheral oedema, and the presence of wound infection.

Systemic factors such as concurrent medical conditions and malnutrition, as well as wound infection, the presence of necrotic tissue, and foreign bodies in chronic wounds sustain the activity of inflammatory cytokines, which impede the healing process (Hardwicke et al, 2008). Although understanding is progressing, further insight is needed with regard to the influencing factors and how they impact on the healing processes through further research.

Assessing wound exudate

Careful assessment of the characteristics pertaining to colour and the type of exudate can provide useful information about the current wound state and as it changes. However, the accurate assessment of the volume and viscosity of exudate is elusive and can usually be described and documented as +, ++ or +++, indicating minimum to maximum amounts. However, this only provides a rough, subjective assessment which is often unsatisfactory, particularly when accurately balancing a patient's fluid intake and output, and he/she has a large, heavily exuding wound. A grade 4 pressure ulcer (i.e. a full thickness wound penetrating the subcutaneous tissue, exposing muscle and bone or supporting structures) is estimated to result in the loss of between 90 g and 100 g protein in exudate every day (Breslow, 1991). Dietary monitoring and advice is essential in order to assess the amount and type of fluid loss to calculate the correct replacement regimens. As much as 1 litre per day of gastrointestinal fluid and/or wound exudate may flow from a gastrointestinal fistula (Dealey, 2000). Accurate recording of intake and output is paramount if it is to be replaced reliably. Medications may be prescribed to reduce the production of gastrointestinal secretions, and therefore effluent from fistulae (Black, 1995).

Gray et al (2005) developed an assessment tool, the

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Wound Exudate Continuum, the use of which is said to assist in the accurate assessment of exudate and inform the decision-making process (White and Cutting, 2006). The aim is to calculate a score based on the viscosity and volume of exudate, which can be compared over time. Inspection of the dressing on removal, noting the frequency of dressing change, the presence of periwound maceration and strike-through, will provide information pertinent to exudate production in a wound. Changes in the amount, type and odour of exudate can also be an important indicator of infection. For example, the characteristic odour and fluorescent green staining of the dressing is indicative of *Pseudomonas aeruginosa* infection.

Badly managed exudate may lead to further breakdown, maceration of the wound bed and surrounding skin, skin sensitivities and excoriation, for which the use of skin barrier preparations may, to some degree, alleviate the damage done to periwound skin by corrosive exudate.

Wound infection

Wound infection is caused by pathogenic microorganisms evading the victim's immunological defences, entering and establishing themselves within the host's tissues, and multiplying, causing a host reaction (Collins et al, 2002). Infection may be systemic, causing generalized illness, or local when it only affects the wound bed and surrounding tissues. The classic signs and symptoms of infection have been extended to include more subtle indications (Cutting and Harding, 1994):

- Pain
- Heat
- Erythema
- Cellulitus
- Oedema
- Pyrexia
- Malodour
- Delayed healing
- Wound breakdown
- Fragile granulation tissue
- Excessive exudate
- Presence of pus.

Many patients who are immunocompromised as a result of a number of disease processes do not display these signs as they do not host a traditional immune response, and therefore need to be monitored very closely and carefully for the less obvious signs of infection.

Yellow or brown haemopurulent exudate may result from abscess formation or systemic infection. Malodorous exudate may be directly owing to colonization or infection, or the result of faeces mixed with the output from a fistula originating in the bowel. Local colonization or infection may result in blood-stained exudate owing to degradation of the tissues.

Early removal of necrotic tissue should reduce the risk of contamination and infection; however, desloughing treatments will temporarily increase the volume of exudate, which will require extra vigilance when protecting the periwound skin.

Accurate management will depend on identifying and treating the infecting organism, which may most commonly be *Staphylococcus aureus* and *P. aeruginosa*. Wound infection should be treated with systemic antibiotics and antimicrobial local dressings, such as those containing silver. During the early stages, exudate volume is likely to be high so every effort should be made to contain leakage to prevent both skin damage and cross-infection by undertaking frequent dressing changes and close monitoring of the wound.

The effect of bacterial infection varies from delayed healing, temporary disability, prolonged hospital stay and loss of productive activity to life-threatening septicaemia and death. The most common cause of death in burn patients was found to be wound infection (Evans, 1975). Although knowledge of the mechanisms by which bacteria interfere with normal cell metabolism is unclear, it is thought that it interferes with collagen synthesis (Niinikoski et al, 1972), decreasing the amount of available oxygen (Bullen et al, 1966; Gottrup, 2004) at the wound site, and leading to decreased local metabolism and death of tissue (Irvin, 1981).

Posnett and Franks (2007) estimated the cost of wound care to the NHS to be between £2.3 billion and £3.1 billion per year, which includes hospital costs, interventions, extended healing times, and increased cost and frequency of dressings. This does not take account of factors such as the extra costs associated with time for dressing wounds, and nutritional and general patient support costs, nor the impact an infected wound will have on the patient's quality of life.

Managing wound exudate

Absorbent dressings have traditionally been used to absorb exudate, such as gamgee tissue, cotton/viscose based pads, foams and alginates, and often combine with the establishment of more recently introduced therapies like topical negative pressure therapy and compression therapy (White and Cutting, 2006).

Any proposed clinical interventions must be agreed with and be acceptable to patients and carers. The first step is to identify and understand the wound aetiology, which involves assessing the patient's underlying disease and contributing factors, and their impact on both the development and current presentation of the wound. Therefore, careful patient and wound assessment should always precede the selection of dressings to identify the cause of the wound and the reason for the excessive production of exudate. Where possible, the underlying cause should be treated alongside local wound and exudate management.

Vowden and Vowden (2002) suggest that dealing with exudate comprises the two related phases of direct and indirect management. Direct management includes the use of absorbent dressings, compression/elevation to eliminate fluid from the wound site, and the use of topical negative pressure; while the indirect measures include the control of bacterial infection or bacterial load, control of oedema and the use of immunosuppression or steroids to control inflammatory exudate in particular types of wounds.

The challenge in managing heavily exuding wounds is to maintain a moist wound–dressing interface, while effectively absorbing and retaining excess exudate, keeping exudate away from the skin, performing under compression bandaging, be easy to remove, and cost-effective (White and Cutting, 2006).

With regard to handling exudate, wound dressings may be designed to absorb, gel, retain moisture or allow the transmission of moisture vapour. For example, foam dressings absorb but not all retain fluid, so that when pressure is applied through compression bandaging or the patient putting weight on the

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dressing, the exudate may be expressed (White and Cutting, 2006). Gelling dressings such as alginates require adequate amounts of exudate to function in the process of breaking down devitalized tissue by autolysis. However, unless the dressing is carefully placed within the wound, the periwound skin may become macerated. Hydrofiber dressings, which look similar in appearance to alginate dressings, are able to retain exudate without sideways spread or 'lateral wicking', keeping the exudate clear of the skin and wound base. Moisture–vapour permeability is cited as a way of reducing the amount of exudate held under or within a dressing (Thomas, 1996), such as a film product or foam dressing with a vapour-permeable outer covering, the theory being that a small amount of vapour can escape through microscopic pores in the dressing. However, there is no clinical evidence that this has any direct benefit to exudate management (White and Cutting, 2006).

Zetuvit Plus

Zetuvit Plus is a recently launched four-layer, non-irritant, conformable, air-permeable, highly absorbent pad designed for heavily exuding wounds. It comprises a soft outer non-woven hydrophobic surface that prevents adhesion to the wound surface, and facilitates the rapid passage of fluid into the central hydrophilic cellulose layers. This prevents the accumulation of exudate and as a result reduces the risk of maceration and infection, and the frequency of dressing changes. The central absorbent core of cellulose fluff is responsible for absorbing the exudate and providing soft padding. The manufacturers claim that Zetuvit Plus is capable of absorbing more than double the volume of conventional absorbent dressing pads and of binding, trapping and evenly distributing exudate even under compression bandaging. The outer water-repellent, non-woven, air-permeable layer is marked in green to ensure correct application of the dressing and prevent strike-through. The particular combination of dressing properties makes Zetuvit Plus an efficient, effective, comfortable and cost-effective dressing for heavily exuding wounds.

Case studies

The following case studies represent the problems regularly encountered by patients with heavily exuding wounds, and demonstrate the challenges faced by district nurses managing these types of wounds in the community. All case studies illustrate the importance of an holistic assessment and care-planning in partnership with patients and their carers, necessary to achieve best practice.

Case study 1

Mr P is a 45-year-old gentleman with learning difficulties. He was referred to the tissue viability service on 30 June 2010 by the district nurse who had been providing care for him in his residential home. Mr P had a history of leg ulceration and the current ulcer had been present for 6 months. Mr P had signs of venous disease and his ankle brachial pressure index (ABPI) excluded arterial disease.

The main problem, reported by the district nurse, was exudate management. Despite the dressings and compression bandages being changed daily, there was still strike-through. The district nurse had, at various points, used alginates, polyurethane foams, and a hydrofiber.

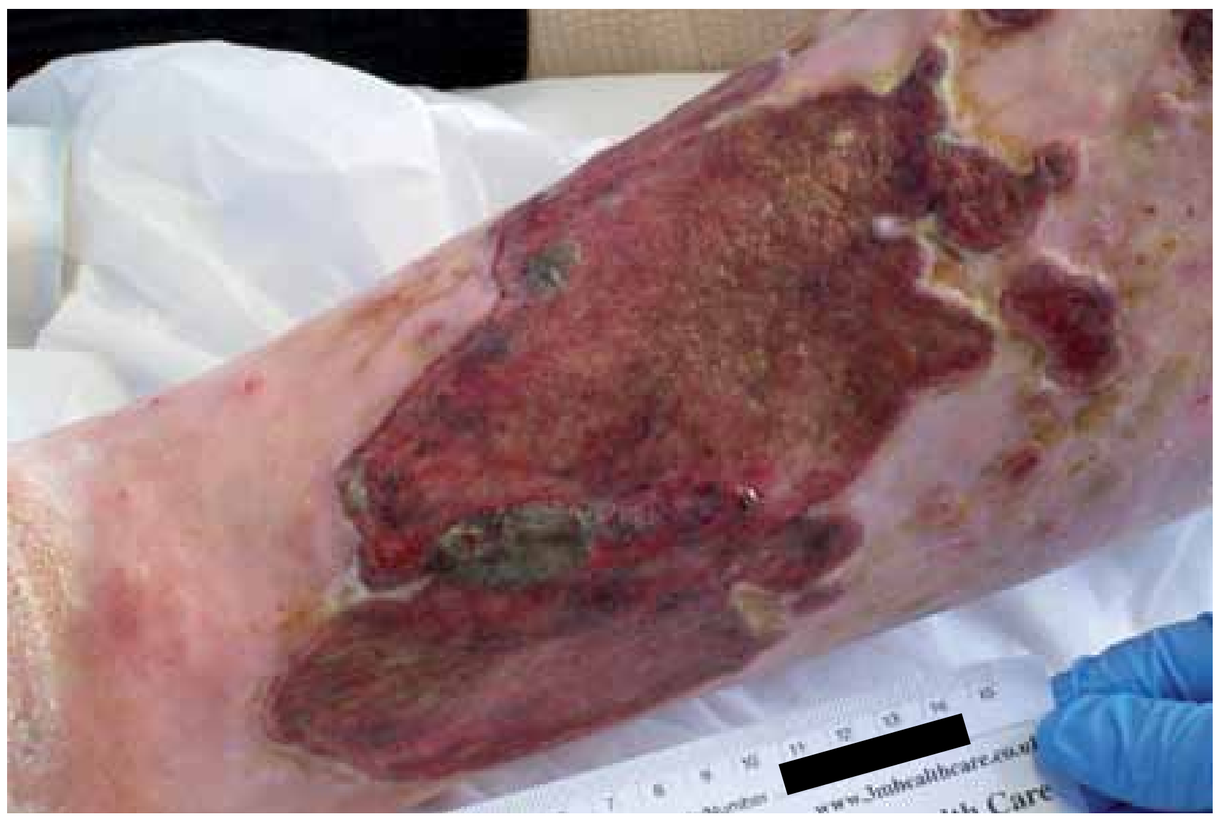

Figure 1. Case study 1. Silver deposits in the wound, with areas of over-granulation

At the time of referral, a silver alginate was being used under four-layer full compression, and changed daily. *Figure 1* shows silver deposits in the wound, with areas of over-granulation tissue. Following assessment, Mr P began using a simple, low-adherent primary dressing, with Zetuvit Plus as a secondary dressing under the existing compression system. Mr P's carers were asked to encourage him to use the recliner chair in the shared lounge.

During the first week, the frequency of dressing changes reduced from daily to alternate days. At week two they were further reduced to every third day; by week three the dressings were being changed twice per week; and by week four dressing changes were reduced to weekly, with no strike-through. Exudate management was reported by the district nurse as very good, with excellent clinical outcome (*Figure 2*). In addition to improved comfort and clinical

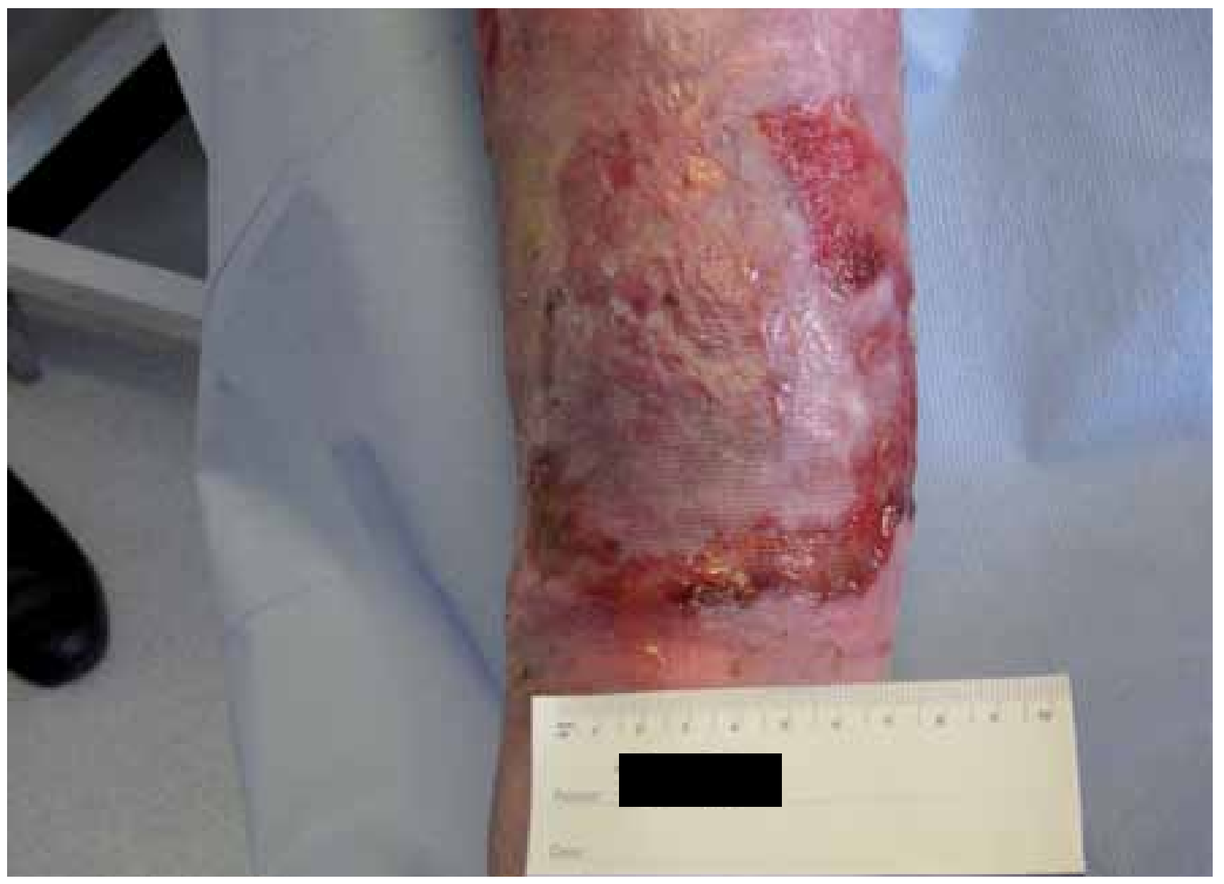

Figure 2. Case study 1. Improvements seen with Zetuvit Plus. Exudate management reported as very good, with excellent clinical outcome

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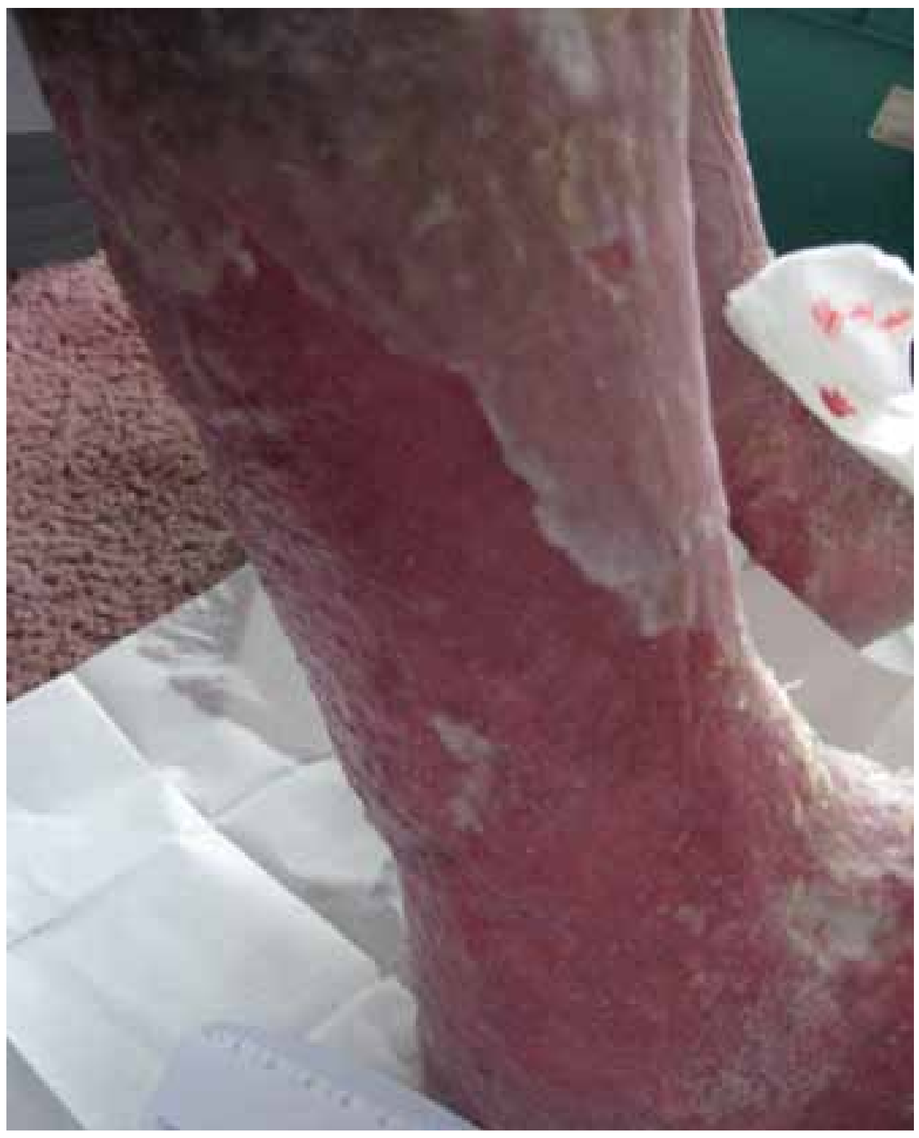

Figure 3. Case study 2. Extensive moisture lesions resulting in copious exudate

outcome for the patient, Zetuvit Plus offered a cost-effective alternative to the trust.

Case study 2

Mr W is a 75-year-old gentleman who has multiple health problems, including chronic heart failure and extensive osteoarthritis. He lives home alone with support from home carers and the district nursing service.

He was referred by the district nurse to the tissue viability service for exudate management. Mr W had extensive moisture lesions (*Figure 2*) resulting from copious exudate, secondary to cardiac oedema and from sleeping in a chair with his legs dependant 24 hours every day. Owing to poor cardiac function, Mr W was not suitable for compression therapy. He expressed his depression at always having wet, sore and stinging legs.

The district nurse had used a variety of dressings to manage the exudate, including viscopaste PB7, foams, alginates, basic wound pads, and a hydofiber. These were covered with a layer of orthopaedic wool bandage and secured with a cotton crepe bandage. Although dressings were being changed twice daily, there was still strike-through. Mr W had also been treated for recurrent infections on a number of occasions.

Mr W began using a simple, low-adherent primary dressing and Zetuvit Plus was used as the secondary dressing, secured with a cotton crepe bandage. During the first week, dressing frequency was reduced to daily, and in week two reduced further to alternate days. The district nurse reported that there was no strike-through on this regimen, and that Mr. W had stated that he felt more comfortable and his legs did not sting so much. The district nurses reported that the condition of Mr W's skin had greatly improved. Mr W was also pleased that he did not need to have the dressings changed twice every day, and had some time to himself.

Unfortunately, prior to the planned review visit from the tissue viability service, Mr W was admitted to hospital were he sadly died.

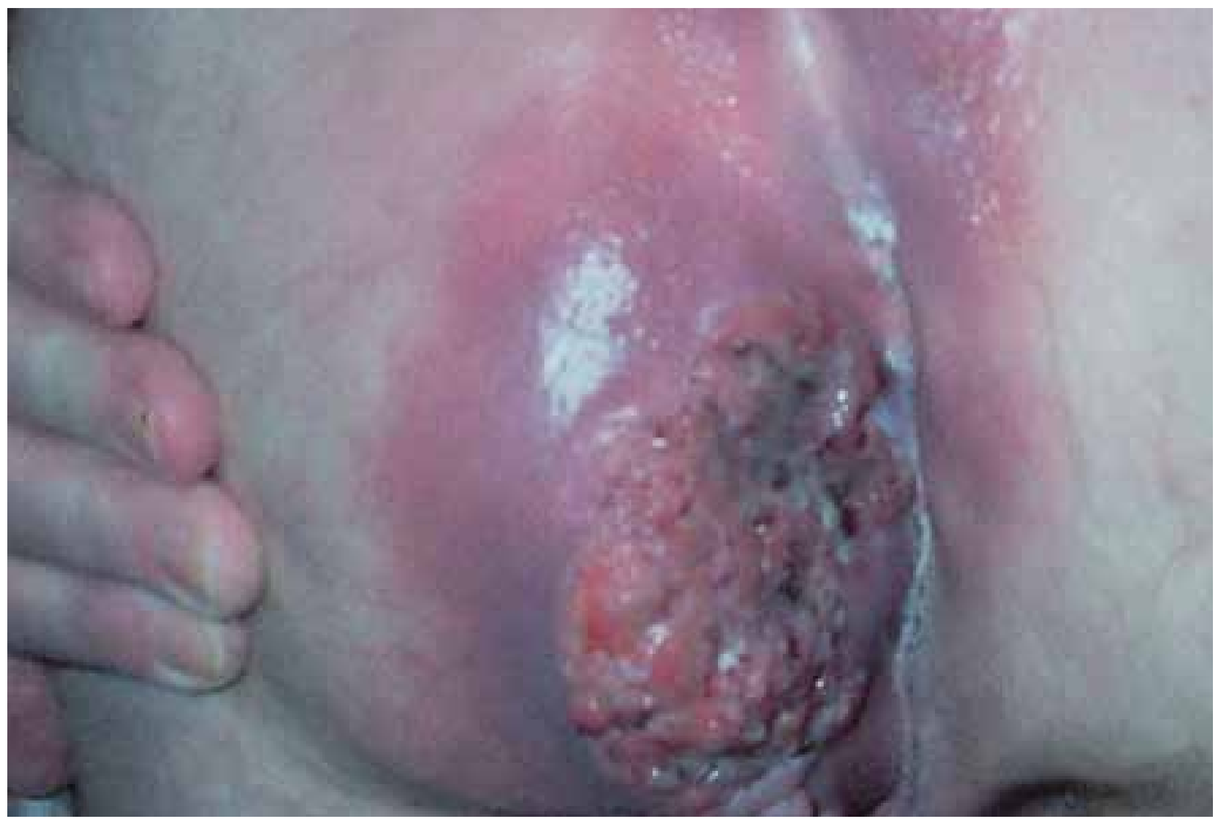

Figure 4. Case study 3. Fungating wound secondary to rectal carcinoma

Case study 3

Mr T is a 72-year-old gentleman with a fungating wound (*Figure 4*) secondary to rectal carcinoma referred by the district nurse. Mr T expressed to the author (JS) at assessment that all he wanted was 'a comfortable pad that would soak up all the muck that was causing his poor wife so much extra washing, and not a sticky one as it was uncomfortable'.

The district nurse had tried two different silicone adhesive dressings with the aim of containing the exudates and reducing the potential for pain at dressing changes. Dressings were changed daily, but did not manage the exudate, resulting in soiled clothes and bedding. The district nurse also reported that the dressing had often lifted prior to the visit, but Mr T had declined twice-daily visits. The district nurse added standard wound pads over the top of the primary dressing, which Mr T found very uncomfortable and still did not prevent the soiling of his clothes.

Following discussion with Mr T, it became clear that he wanted a large pad that could be held in place by underwear, as he had found the different adhesive dressings used in hospital and in the community particularly uncomfortable. Therefore, a plan was agreed to use a soft silicone primary dressing covered with a large Zetuvit Plus pad, secured with elastic net-type continence pants to be changed daily. It was agreed that the district nurse would visit Mr T at a set time to allow him to shower before his/her visit for wound care and administration of medication

On review 1 week later, Mr T had requested after 4 days that the original primary dressing was stopped and expressed his preference to have the Zetuvit Plus dressing placed directly on the wound. Mr T stated that he found the dressing comfortable and it had stopped the leaking.

While Zetuvit Plus may not necessarily have been the initial dressing of choice by health professionals, it met the expressed

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Table 2. Costing and sizing comparisons of wound dressings

Kerramax		Drymax Extra		Sorbion Sachet S		Eclypse		Flivasorb		Cutisorb Ultra		Zetuvit Plus	
Size	**Price (p)**	**Size**	**Price (p)**	**Size**	**Price (p)**	**Size**	**Price (p)**	**Size**	**Price (p)**	**Size**	**Price (p)**	**Size**	**Price (p)**
10cm x 10cm	90	10cm x 10cm	199	10cm x 10cm	225			10cm x 10cm	212	10cm x 10cm	199	10cm x 10cm	60
10cm x 22cm	119	10cm x 20cm	328	20cm x 10cm	373			10cm x 20cm	355	10cm x 20cm	333	10cm x 20cm	83
				12cm x 5cm	189	15cm x 15cm	97					15cm x 20cm	95
20cm x 22cm	210	20cm x 20cm	616	20cm x 20cm	700			20cm x 20cm	668	20cm x 20cm	625	20cm x 25cm	130
				30cm x 10cm	537								
30cm x 20cm	240	20cm x 30cm	886	30cm x 20cm	1007	20cm x 30cm	214	20cm x 30cm	945	20cm 30cm	942	20cm x 40cm	200
						60cm x 40cm	815						
						Eclypse Boot							
						60cm x 70cm	1354						

Prices as per Drug Tariff, October 2010

requirements of Mr T, demonstrating how important it is to listen to patients.

Evidence of effectiveness

Zetuvit Plus offers a cost-effective alternative (*Table 2*) to other high absorbency dressings available in the drug tariff. Zetuvit Plus met the requirements in the case studies for exudate management to the satisfaction of the patients and the district nurse. The patients reported that they found it soft and comfortable.

Conclusions

The management of patients with exuding wounds places unique demands on the nurses who care for them and nurses, in turn, demand high standards in terms of dressing products that do what is required and meet their professional responsibilities. This article has explored the issue of wound exudate, what it is, and the problems associated with patient and wound management. Exudate is not 'bad', nor does it always relate to infection; rather, it is a necessary component for healing. Regular, ongoing patient and wound assessment, and appropriate interventions to correct or alleviate medical conditions that increase exudate production, and managing exudate correctly can prevent many of the uncomfortable, undignified and inconvenient complications that patients experience. BJN

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KEY POINTS

- Exudate is a necessary part of the healing process
- An understanding and knowledge of exudate production will help the nurse to provide effective management
- A number of dressings and therapies are designed to cope with exudate
- Excess exudate can cause inconvenience, loss of dignity, extended healing and embarrassment, as well as increased costs to the NHS if not managed effectively

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SMTL data summary

					Absorbency		Fluid Retention		Absorbency Under Compression	
Product	Test Nr.	Date	Product size	Pad size	(g)	(g/cm^2)	(g)	(g/cm^2)	(g)	(g/cm^2)
Zetuvit® Plus	Report No: 17/5370/1	February 2017	10x10	10x10	189	1.89	128	1.28	87	0.87
Kliniderm® superabsorbent	Report No: 15/4816/1	July 2015	10x10	10x10	80	0.80	62	0.59	30	0.30
KerraMax Care®	Report No: 15/4816/1	July 2015	10x10	10x10	73	0.73	69	0.69	34	0.34
Eclypse®	Report No: 15/4816/1	July 2015	10x10	10x10	51	0.51	40	0.40	30	0.30

Kliniderm® is a trademark of H&R Healthcare Ltd. KerraMax Care® is a trademark of Systagenix Wound Management. Eclypse® is a trademark of Advancis Medical UK.

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Zetuvit® Plus

Superabsorbent Wound Dressing

Size (cm)	Pack contents	HARTMANN Code	PIP Code	NPC Code
10 x 10	10	413710	356 7351	EME046
10 x 20	10	413711	356 7385	EME047
15 x 20	10	413712	356 7369	EME048
20 x 25	10	413713	356 7393	EME049
20 x 40	10	413715	356 7377	EME128

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