



Strong performance, low price:

clinical and economic benefits of Advazorb foam



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Foreword

In the past two decades, we have seen exciting developments in advanced wound care products. While the science of wound care focuses on healing, the art of wound care involves having the skill and knowledge to select the most appropriate wound dressing for the patient's needs. Choosing the right dressing for the right wound at the right time is paramount when trying to create an environment that will facilitate healing. However, cost effectiveness and clinical effectiveness now sit side by side, so clinicians are encouraged to explore all elements of a dressing's economic profile when making a product selection.

No single dressing is suitable for every wound type. Therefore, a key element of selection is deciding which dressing promotes the optimal environment for an individual wound. Managing wounds with moderate to high exudate levels often presents considerable challenges, particularly when selecting a dressing on the basis of wear time. Leaving wounds undisturbed and dressings in place for longer has advantages, but if wounds are wet then the adverse effects of moisture against the skin can lead to wound breakdown and an increased risk of infection. Getting the exudate balance right is important if wounds are to progress through the natural phases of healing.

In today's health-care market, dressings are being designed to manage varying exudate levels. An awareness of a dressing's performance, its appropriate usage and its recommended dressing change interval can be important aspects of wound management. Working in partnership with dressing manufacturers, therefore, can have significant benefits in terms of achieving cost-effective products and cost-effective procurement.

However, it must also be remembered that the cause of the exudation needs to be determined and treated. Wound dressings alone will not necessarily be sufficient to achieve the desired outcome. If the increase in wound fluid is due to infection and/or oedema, then no matter how absorbent the dressing, the high volume of fluid may be too much for it to manage. Sometimes our expectations are too high. This underlines the need to understand how a dressing product works and for which clinical situation it is best suited. This will prevent the nurse being disappointed and the patient losing confidence.

Patient acceptability is a key factor in wound management and products that are easy to remove and gentle on the skin are, of course, better

tolerated than those that cause pain and trauma. Using products that have a gentle adhesion and an atraumatic contact layer reduce the likelihood of pain and trauma at removal, although it is equally important that they are able to stay in place for the recommended time frame. Therefore, balancing these different requirements within a wound dressing is a challenge for manufacturers.

As clinicians, our expectations of wound dressings are getting higher as the wound care challenges we face become more complex. Meeting patients' needs, clinicians' expectations and manufacturing standards are all essential elements of the wound management jigsaw. If we can fit these pieces together, then we can achieve both clinical and cost effectiveness.

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Strong performance at a competitive price:



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Advazorb

Advazorb Silfix

Advazorb Silflo

Chronic wounds can have a significant impact on well-being and quality of life. They also pose a challenge for nurses who strive to optimise the conditions required for healing within the boundaries of their knowledge, the limits of patient acceptability and financial parameters. These wounds also place a considerable financial burden on the NHS. Posnett and Franks (2008) state that approximately 200 000 people in the UK live with a chronic wound, costing the NHS £2.3–3.1 billion per annum (or approximately 3% of its budget). In addition, chronic wounds have a significant impact on the individual, with pain, exudation and malodour resulting in frustration, loss of earnings and reduced social interaction (Harding et al, 2002).

It is the responsibility of health-care providers to meet financial targets and achieve good healing outcomes. The aim is to facilitate healing, enhance the patient's quality of life and reduce the economic burden of chronic wounds. Nurses therefore need to be able to identify the factors that cause a wound to become chronic and select dressings that promote an optimum healing environment and are acceptable to the patient.

This supplement examines the causes of chronic wounds and discusses approaches to achieving good patient outcomes. One such approach involves the use of the Advazorb range of foam dressings, which has been developed by Advancis Medical with a strong focus on clinical performance and competitive pricing. Advazorb is a soft, conformable, polyurethane, hydrophilic foam dressing with a breathable film backing that has a high moisture vapour transfer rate and allows exudate vapour to evaporate into the atmosphere. The film backing is waterproof and prevents the ingress of bacteria from the environment onto the wound bed.

The Advazorb range of dressings is designed to control low, moderate and highly levels of exudate, thereby providing the moist conditions required for wound healing, and to protect the peri-wound skin. According to the manufacturer, these products rapidly absorb exudate and hold it within the dressing structure. In my experience, they also have an aesthetic appearance that promotes patient acceptability, and are designed

to provide a cost-effective alternative to other foam dressings. Dressings in the Advazorb range can be used at any stage of the healing process and on chronic wounds where achieving successful healing may be a challenge. Advazorb is contraindicated for arterial bleeds, heavily bleeding wounds and fungating wounds. This supplement explores the clinical value and cost efficacy of Advazorb dressings in promoting healing in wounds with low to moderate exudate levels. It concludes with some clinical case studies demonstrating how they can achieve these outcomes in practice.

The role of exudate in the healing process

Following injury, acute wound healing results in a cascade of events that repair the damaged tissue. This process is classified in four stages:

- Haemostasis
- Inflammation
- Proliferation
- Remodelling.

Each stage is mediated by growth factors, cytokines and other protein molecules secreted by cells in and around the site of injury. Haemostasis is the most rapid stage of healing, lasting only a few hours (Broderick, 2009). It minimises blood loss by facilitating the formation of a fibrin mesh over the wound surface. Platelets aggregate and adhere to the edges of damaged blood vessels, forming a temporary plug over the injury site. They also release growth factors, which stimulate the conversion of fibrinogen, which has been dissolved in blood plasma, into solid strands of fibrin that cover the wound.

clinical and cost benefits of Advazorb foam

Once the risk of bleeding has subsided, the wound becomes inflamed and the blood vessels dilate, allowing plasma and an array of white cells to infiltrate the wound bed. As a result, the wound becomes warm to the touch, oedematous and painful. Inflamed wounds produce exudate containing growth factors and white blood cells; indeed, 'inflammatory' exudate contains more neutrophils than are normally found in the circulation (Cutting, 2004). Neutrophils are soon followed by macrophages, which contribute to the phagocytosis (or ingestion) of bacteria, produce the growth factors required for healing and stimulate the release of matrix metalloproteinases (MMPs), which debride damaged elements of the extracellular matrix (Monaco and Lawrence, 2003). The biochemical components of inflammatory exudate remove debris and bacteria from the wound, thereby reducing these barriers to healing. Nonetheless, this is an 'aggressive' fluid and, if not controlled, will damage granulation tissue.

Towards the end of the inflammatory phase, leucocytes (white blood cells) in the wound decrease in number and the area becomes saturated with fibroblasts, which generate the connective tissue required for wound repair (Monaco and Lawrence, 2003). Buds of endothelium sprout from intact capillaries at the edge of the wound and join to form a vascular network. This matrix gives rise to the appearance of granulation tissue: capillary loops on a network of collagen, glycosaminoglycans and glycoproteins. As the wound fills with granulation tissue, the exudate level gradually reduces. Nevertheless, exudate remains a key component of the healing process as it enables growth factors and cytokines to reach their site of action. Epithelialisation then occurs as new keratinocytes migrate from the wound edges to cover the wound and re-establish the skin's barrier function. Remodelling of underlying tissue then takes place to ensure a strong avascular, acellular scar (Enoch and Price, 2004).

Prior to wound closure, exudate plays a key role, releasing growth factors into the wound. Using occlusive dressings to maintain a moist environment will help ensure these chemicals remain functional in the wound environment (Chen et al, 1992). This results in more rapid formation of granulation tissue and quicker epithelialisation (Jones et al, 2006). In addition, the moist environment promoted by these dressings facilitates the autolysis (removal) of dry eschar, fibrinous slough and soft, non-viable tissues. Failure to remove debris from the wound bed can result in a chronic wound.

Chronic wounds occur when the normal healing process is disrupted and the wound fails to regain functional and anatomical integrity (Telgenhoff and Shroot, 2005). Fletcher (2008) identified factors that alter the molecular balance of the wound, with the end result being failure to heal in an orderly and timely sequence. This molecular imbalance may

stem from systemic variables, such as systemic disease, medication, poor nutritional status and the ageing process, or local factors such as an alkaline wound environment. This results in confused biochemical activity, with reduced levels of growth factors — platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF- β) and epidermal growth factor (EGF) — that help mediate each stage of the wound healing process (Harding et al, 2002). The cellular activity that helps promote granulation tissue formation and epithelialisation is thus impaired.

The changing character of wound exudate

The production of wound exudate is therefore a natural part of the healing process. Yet it can pose a considerable challenge to nurses, who not only need to control its level, thereby protecting the surrounding skin from excoriation and maceration, but must also be able to recognise those changes in its appearance and volume that are associated with delayed healing. The composition of acute wound fluid usually includes water, protein, electrolytes, glucose, cytokines, macrophages and MMPs (Cameron, 2004; White and Cutting 2006; World Union of Wound Healing Societies, 2007). These components provide the conditions required for healing; they support the metabolism, migration and proliferation of cells, assist with autolysis of non-viable tissue and enable growth factors to diffuse across the wound bed, stimulating cellular activity. As exudate moves through the wound, it collects debris and microorganisms, which will then flow away from the wound with the movement of fluid (White and Cutting, 2006). The amount and composition of exudate will change as healing occurs, with a reduction in the amount of fluid production becoming evident as the wound decreases in size (Adderley, 2010).

However, when the wound fails to heal as expected, exudate may not decrease and will change in colour, consistency and content. As the inflammatory response is prolonged, neutrophils continue to enter the wound and produce heparin-binding protein, which can increase exudate production (White and Cutting, 2006). In addition, chronic wound fluid contains high levels of inflammatory markers and MMPs. These degrade elements of the wound bed, producing cloudy, thickened fluid in which strands of connective tissue degraded from the wound bed are evident (White and Cutting, 2006). To function, MMPs require an alkaline environment and access to zinc. In addition, their natural regulators, tissue inhibitors of matrix metalloproteinases (TIMPs), need to be restrained (Toriseva et al, 2007). Therefore, for the wound to heal, there needs to be a critical balance between TIMPs and MMPs. A

number of growth factors are responsible for regulating the availability of TIMPs (Monaco and Lawrence, 2003).

Chronic wound fluid can be corrosive, damaging the wound and surrounding skin (Adderley, 2010). While MMPs require an alkaline environment to function, fibroblasts proliferate within an acidic one. Therefore, the chronic wound environment cannot sustain a healing response, with fibroblasts reducing in number and becoming senescent, unable to perform their normal functions.

Increased exudate levels can damage the peri-wound skin. The skin can become macerated, increasing its friability and risk of tearing (Cameron, 2004), or excoriated as the chronic alkaline fluid comes into contact with the skin's acidic surface (Schneider et al, 2007; Hampton, 2008). This can increase susceptibility to trauma and the breakdown of skin integrity. The wound may increase in size, causing the patient further distress and delayed healing.

Assessment

It is vital that the exudate level in the wound is accurately assessed. This should include assessment of colour, consistency, odour and the amount of exudate present (World Union of Wound Healing Societies, 2007). This will enable nurses to plan care that will ensure wound fluid

is managed well and for any changes in the exudate profile to be quickly identified and addressed. Systemic variables contributing to a high exudate levels, such as heart failure or low albumin, must be considered. Some of the exudate assessment tools available are outlined in *Table 1*. To ensure continuity of care, these need to be implemented across the organisation and in agreement with the tissue viability specialist.

Infection/inflammation

A moist environment is ideal for the growth of bacteria. However, accurate dressing selection plays a role in preventing wound infection (Collier, 2004). Following injury, most wounds quickly become contaminated with bacteria, which then begin to replicate and colonisation occurs. However, if the bacteria do not damage the wound or provoke a host response, the healing process will continue regardless. Therefore, the presence of bacteria in a wound does not always result in infection; the impact of microorganisms depends on their ability to invade a susceptible host and overcome the body's defence mechanisms to erode target tissue (Cooper, 2005). The cellular and biochemically mediated immune response that prevents this activity can be inhibited by variables including systemic illnesses (e.g. diabetes), malnutrition, medication, extremes of age and lifestyle factors. Microorganisms also

Table 1: Exudate assessment tools

Exudate assessment tool	Overview	Benefits	Drawbacks
Wound Exudate Continuum (Gray et al, 2005)	Considers the volume and viscosity of exudate. Scores for the amount and viscosity of fluid present are added together to give a risk status	Excellent visual aid for quick recognition of the wound status: Score 8–10 = red Score 6 = amber Score 2–4 = green	Does not take into account colour and odour associated with exudate
Integrated Exudate Assessment (World Union of Wound Healing Societies, 2007)	Exudate assessment cycle. Takes a holistic approach to assessment of exudate, identifying all of the possible causes and the impact on the patient	Designed to become part of the wound assessment process. Has been adapted and presented in a simpler format by <i>Wounds International</i> (Romanelli et al, 2010)	Appears to be a complex approach to exudate assessment
MOIST Approach to Assessment of Exudate (Trudgian, 2005)	Uses the acronym MOIST to guide assessment: M onitor the amount of exudate O bserve for changes in colour and viscosity I dentify factors within exudate that may delay healing S elect the correct dressing T reat the patient holistically	Considers a range of factors associated with exudate that may influence healing	Not yet developed into an easy-to-use framework

demand specific environmental factors for their survival. Anaerobes, for example, cannot survive in an area rich in oxygen, whereas other bacteria, such as *Staphylococcus aureus*, are oxygen dependent.

The potential for wounds to become critically colonised has recently been discussed as the point at which healing is interrupted by a steady growth in the numbers of bacteria (Patel, 2010). Signs of critical colonisation may be subtle and stem from delayed healing to a change in the level of exudate, odour, colour of the wound bed or pain perception (Calianno, 2006). These can be difficult to identify; nonetheless, they are abnormal responses and can disrupt healing and cause a deterioration in health if not addressed. Recognising changes in the wound bed early and acting to reduce the levels of bacterial may prevent infection and the ensuing deterioration of the wound. A change in the exudate profile may be the first indicator that the level of bacteria in the wound is increasing.

Biofilms pose an additional challenge to nurses. They comprise a colony, consisting of multiple forms of bacteria, that attaches to the surface of a wound and produces an extracellular polymeric microenvironment consisting of polysaccharides, proteins and DNA (Wolcott et al, 2008). Being encased in a biofilm allows the bacteria to communicate with each other by a process called quorum sensing and to develop a parasitic relationship, with the biofilm gaining nutrients from the surrounding capillary network (Wolcott et al, 2008). These colonies of bacteria have a reduced susceptibility to antibiotics, which are unable to penetrate their coating, that also protects them against the host immune response.

While they do not cause overt infection, biofilms can contribute to the development of a chronic wound and delayed healing by stimulating a prolonged inflammatory state (Percival and Bowler, 2004). Bacteria in biofilms appear to gather around the basement membranes of capillaries. This stimulates an inflammatory response and an ensuing influx of white blood cells, although this has little effect on the microorganisms held within the biofilm matrix. Nonetheless, the subsequent inflammatory response and vasodilation allows bacteria to source nutrients from the microcirculation (Wolcott et al, 2008). Prolonged, chronic inflammation occurs, and neutrophils, stimulated by pro-inflammatory cytokines, fail to degenerate in an organised way. This again results in the overexpression of MMPs, an increase in exudate and the wound becoming static.

One method of preventing the risk of infection is to occlude the wound and control the amount of exudate spilling out into the wound environment. Studies demonstrate that foams have greater ability to absorb and retain moderate amounts of exudate than other dressings (Davies and Ripon, 2010). Foam can also be used as an absorbent

secondary dressing to secure antibacterial products in place while controlling the exudate associated with infection.

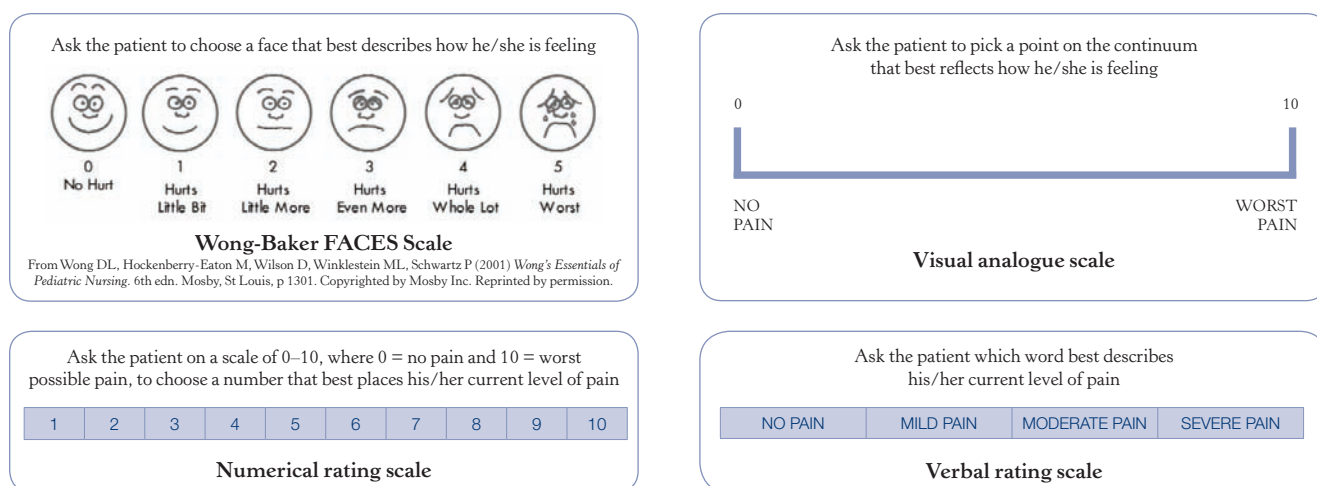
Quality of life

Pain

Pain is, of course, a major influence on quality of life: it can reduce mobility, sleep and appetite (Teare and Barrett, 2002; Moore and Cowman, 2009), and is a constant reminder of the wound. Pain can also cause vasoconstriction and slow the healing process (MacLellan, 2000). Moffatt et al (2002) suggested that patients with wounds experience significantly greater bodily pain than the rest of the population due to alternations in their physiological pain response. Patients may experience both acute pain, which occurs during activity, and chronic pain, which is continuous and can result in stress and delayed wound healing (Soon and Acton, 2006; Upton, 2011). Moffatt et al suggested that practitioners may not always recognise the significance or level of pain the patient is experiencing, a view later supported by Leighton-Bellichach (2006). A more recent evaluation by Lloyd Jones et al (2010) of 246 nurses attending an educational wound-care event found that only 34% (n=82) 'always' documented the level of pain experienced, 42% (103/246) documented the pain if the patient complained and the remainder rarely or never documented it. With only one third of nurses always considering the pain experienced by a patient with a wound, there is clearly still a long way to go before nurses truly appreciate the importance of pain assessment and its possible impact on healing.

Pain can become even more severe when the patient is undergoing a procedure, such as a dressing change. Dressings that dry out or adhere to the wound bed are considered the greatest contributors to procedural pain as they can cause skin stripping and trauma to the wound bed (Benbow, 2010). Moffatt et al (2002) noted that pain reduces when a wound responds to treatment and healing is taking place. This may be due to coverage of exposed nerves by granulation tissue. Therefore, using a dressing that promotes the conditions required for healing is essential. It is vital that the dressing is able to stay in place and does not cause trauma to the wound tissue on removal. Patients should not fear dressing change but rather view it as an opportunity to discuss the wound's progress or any other concerns with the nurse. This can only be achieved if accurate wound and pain assessment is undertaken; the patient must therefore be provided with adequate analgesia if appropriate, and dressing selection

Figure 1: Examples of pain assessment tools



must focus on exudate control, optimum wear time and minimisation of pain. Another consideration is the potential of the dressing material to cause or minimise pain. For example, dressings with a soft silicone contact layer are atraumatic, and thus minimise pain and stress at dressing change.

Activities of daily living

Chronic wounds can also limit the ability to function normally, and patients may become much less mobile, resulting in the use of walking sticks, frames and wheelchairs (Beitz, 2005). Performing activities of daily living may also be problematic and patients may experience a loss of independence. This can be further exacerbated by the use of bulky dressings to control wound fluid (Fleck, 2006). While most individuals do not mind having some short-term assistance, failure to see an improvement in the wound and a return to normal mobility can be frustrating (Beitz, 2005).

Copious amounts of exudate can have a dramatic effect on quality of life. Problems occur when the exudate level exceeds expectations for the wound size, or becomes excessive and difficult to control (Benbow and Stevens, 2010). The patient's life revolves around exudate management, appointment times for dressing changes and the risk of leakage during social interaction. Leakage from dressings onto clothing, bedding and furniture can be distressing (Cameron, 2004). Patients may become embarrassed, lose confidence and isolate themselves from family and friends. Replacing

carpets and bedding etc, if necessary, is expensive. Many authors (Romanelli et al, 2010; Benbow and Stevens, 2010) stress the importance of exudate control to minimise disruption to the patient's lifestyle.

Malodour is frequently associated with heavily exuding wounds and can add to the social stigma associated with a chronic wound. Malodour occurs as tissue dies and becomes necrotic, or anaerobic bacteria release metabolites and end products including putrescine, cadaverine, unstable sulphur compounds and short-chain fatty acids. Other bacilli, including *Pseudomonas* and *Klebsiella*, can produce an unpleasant smell (Fleck, 2006), as can stale exudate present on or around the wound.

Failure to address factors that influence quality of life can, in turn, reduce concordance with treatment. Hallett et al (2000) found that patients who are anxious or poorly informed may not follow the nurse's instructions and become passive in their efforts to heal themselves. Others (Beitz et al, 2005) suggest that patients do not always have sufficient information to develop clear rationales for treatments or recommendations that can be uncomfortable or restricting, such as limb elevation or compression bandaging. In addition, patients may lose confidence in a dressing that they find difficult to cope with, causes pain or trauma at removal, or does not appear to be making any difference to the wound. Adopting a person-centred approach can improve concordance (Widby, 2009). An effective nurse-patient relationship in which the patient feels listened to and is free to discuss all aspects of his or her wound care is essential. Dressing selection needs to be patient

focused and all factors relevant to healing must be considered; these include pain, bulkiness of the dressing and its ability to achieve healing.

When caring for patients with wounds, it is important not to underestimate the impact that quality of life can have on their ability to function normally. In my professional experience, even a small wound can have a dramatic impact on quality of life, even in patients with other complex pathologies. In order to achieve a holistic understanding of the life of an individual with a chronic wound, it is necessary to be aware of the patient's unique interpretation of the experience, including its effect on their work, social status and their psychological response to it. Psychosocial support should be provided when necessary, dealing with issues such as social isolation and depression. Wound assessment, therefore, must encompass environmental factors and the variables that contribute to quality of life including pain, mobility, exudate and odour (Beitz et al, 2005).

Dressings selection

Harding et al (2002) noted the importance of using a dressing to optimise the conditions for healing and reduce the risk of wound chronicity. The type of dressing used is determined by the condition of the presenting wound and the patient's individual needs. In addition, it must be acceptable to the patient, as this will encourage concordance. Dressings, such as hydrogels and hydrocolloids, that help remove debris from the surface of the wound are required for autolysis of slough and necrosis. High bacterial burden is managed through application of an antibacterial, such as silver. High exudate level can be controlled through the use of an alginate or Hydrofiber product. Foam dressings provide the ideal environment for the management of moderate levels of exudate. They can also be used as a secondary dressing. Foams are frequently used in the management of chronic wounds (Bianchi et al, 2011) and are one of the most commonly used dressings in my trust. Their efficacy is measured by their ability to absorb exudate, reduce the risk of skin maceration, promote healing and be acceptable to the patient. They should not cause trauma to the skin or surrounding tissue, and must be acceptable to the patient.

The Advazorb range includes three products that meet patient-specific needs. These are designed to be easy to apply and acceptable to patients, to enhance quality of life and promote the conditions required for healing. The products manage low to moderate amounts of exudate in a variety of wound types. The ability of the Advazorb range to hold exudate away from the wound surface will reduce the risk of maceration and excoriation of the peri-wound skin. As exudate

contains MMPs and is held within the foam matrix of the dressing, it is also possible there will be a reduction in the number of proteases available to inhibit healing.

Advazorb is a non-adhesive foam that can be cut to size and used under compression. It has been developed to control exudate and increase patient concordance through use of a surface that reduces friction against clothes and bandages, and prevents rucking. This may also prevent the dressing loosening and being removed before a dressing change is required.

Advazorb Silfix has a gentle, atraumatic, soft silicone wound contact layer that holds the dressing in place. It is designed to protect friable granulation tissue and delicate, thinning skin.

Advazorb Silflo has the same atraumatic soft silicone wound contact layer as Advazorb Silfix, but with the addition of a silicone border. The border's silicone contact layer enables the dressing to stay in place while at the same time protecting the patient's skin. This, in turn, reduces pain at dressing changes and unnecessary trauma to the wound bed. Large perforations on the surface allow exudate to pass through the dressing into the absorbable foam. Advazorb Silflo can be used in hard-to-dress areas where application of a secondary dressing can be problematic. Each of the dressings in the range is available in 'Lite' and regular thickness to control varying levels of exudate.

As yet, only case studies have been conducted on the Advazorb range, and the preliminary evidence from these is encouraging. Cook (2011) describes two case studies in which Advazorb was associated with good patient outcomes. In the first, full healing was achieved with Advazorb Silfix, used in combination with Activon Tulle and compression bandaging, on a painful 3-month-old superficial venous leg ulcer with 90% dehydrated slough. In the second case study, within 48 hours Advazorb non-adherent foam dressing managed the heavy exudate levels in a painful acute ulcer on the toe of a patient newly diagnosed with type 2 diabetes. The dressing was able to absorb and retain the fluid, and was conformable enough to apply to the toe, with the added advantage that it could be cut to shape. Edwards (2011) described the use of Advazorb Silflo Lite in a patient with a 2-day-old superficial dermal burn on his left foot. Following debridement and the combined use of Advazorb Silflo and Flamazine (Smith & Nephew), the burn healed in 7 days and the patient was able to mobilise without any problems. In a poster presented at the Wounds UK Harrogate conference, Cook (2011) described three cases involving patients with leg ulcer, which showed that Advazorb was effective both under compression bandages and as a secondary dressing, holding Advancis Manuka honey against the wound surface. Finally, a laboratory study compared the absorbency and

Table 2: Approximate cost savings using the Advazorb range as an alternative foam dressing for 12 months

Dressing size	Cost of foam dressings used 2010–2011	Alternative Advazorb dressing	Potential cost for 12 months	Potential cost saving
22.5 x 22.5 cm	£169.80	Advazorb Silflo 20 x 20 cm	£118.08	£51.72
7.5 x 7.5 cm	£12 423.04	Advazorb Silflo 7.5 x 7.5 cm	£8700.64	£3722.04
17.5 x 17.5 cm	£1456.25	Advazorb Silflo 20 x 20 cm	£1476.00	-£19.75
12.5 x 12.5 cm	£14 420.40	Advazorb Silflo 12.5 x 12.5 cm	£13 429.76	£990.64
10 x 10 cm	£1405.92	Advazorb Silflo 10 x 10 cm	£1299.20	£106.72
5 x 5 cm	£3640.00	Advazorb 7.5 x 7.5 cm	£2163.20	£1476.80
10 x 10 cm	£11 296.58	Advazorb 10 x 10 cm	£4719.86	£6576.72
Totals	£44 811.99		£31 906.74	£12 904.89

water retention capacity of four foam dressings using modified versions of the British Pharmacopoeia. The dressings were: Advazorb; Biatain Foam (Coloplast); Mepilex Border Foam (Mölnlycke Health Care); Allevyn Non-Adhesive (Smith & Nephew). The results show that Advazorb performed well against the comparators (*Figure 2*) (Cica Biomedical, 2011).

The Advazorb range is designed to provide clinicians with affordable products that can control exudate, promote healing and are acceptable to the patient. In the current economic climate, trusts must strive to demonstrate procurement based on cost effectiveness, with unit cost being the primary driver for many organisations. Advazorb is less expensive than many other foam dressings. An analysis of spend in the author's trust identifies that a cost saving of approximately £12 000.00 per annum, equivalent to 28.8%, could be achieved if the current foam dressings used were replaced with the equivalent sizes and number of Advazorb dressings over a 12-month period (*Table 2*). This calculation is based solely on unit cost within an acute 900-bed hospital environment and does not consider other resources, such as nursing time and frequency of dressing changes. Additional saving may be made within a community setting if increased wear time and enhanced patient acceptability can be achieved.

Conclusion

Wound healing is a complex process that depends on the diagnosis, assessment and management of holistic variables and use of dressings that promote optimum conditions for healing. The Advazorb range can be used on all patients with low to moderately exuding acute and chronic wounds, while also achieving cost savings and being acceptable to patients.

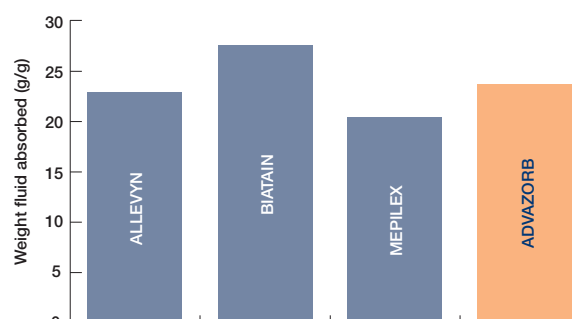


Figure 1. Dressing absorbency per gram dressing dry weight (mean ± SD)

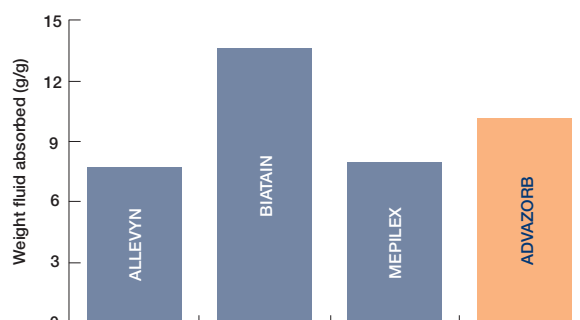


Figure 2. Fluid retention under compression per gram dressing dry weight (mean ± SD)



Case study 1

An 86-year-old woman was seen in her residential nursing home after sustaining an injury, initially thought to be a skin tear, to her right lower leg.

She had had a cerebrovascular accident (CVA) at the age of 42, and had been hemiplegic ever since. She was independently mobile in an electric wheelchair, but required full-body hoisting for transfers. Following admission to the home 4 years previously, she had presented with a leg ulcer of several years' duration; following treatment, full healing was achieved, with no recurrence. Her legs are moisturised daily and she wears compression hosiery. In addition, over the past 4 years she had a history of recurrent cellulitis.

Examination revealed a full-thickness laceration on the front of her leg, and the patient was referred to the local minor injuries clinic. The wound was 7 cm long, with some fresh bleeding, and covered by a full-thickness skin flap (*Figure 1*). The injury was causing her some pain. The surrounding skin was healthy and she received 14 sutures.

Treatment and healing outcome

Advazorb Silfix was selected as the primary dressing, as it is easy to apply; adhesive dressings had not adhered well to her leg, due to the daily moisturising. The patient did not experience any pain on dressing removal, and the dressing did not stick to the wound. Exudate levels were moderate and the dressing was adequate for absorption. The dressing was held in place with an elasticated viscose stockinette, which proved effective and was comfortable to wear. The wound was checked regularly, with dressing changes every third day.

During the course of treatment, the patient developed cellulitis in the leg, requiring antibiotic therapy; however, the laceration healed well and the sutures were removed after 2 weeks (*Figure 2*).

Jola Merrick
Clinical Nurse Manager,
Herons Park Nursing Home, Kidderminster

Case study 2

A 55-year-old male patient with type 2 diabetes was admitted to hospital in December 2011 for intravenous antibiotics for an infection in the hallux on his right foot. An angiogram, angioplasty and stenting procedure was not enough to save his hallux, which was amputated. The patient discharged himself from hospital against medical advice, but was readmitted 2 weeks later after developing gangrene in his second, third and fourth toes, which were amputated shortly afterwards.

On his second assessment after surgery, the wound site appeared to be clinically infected. His foot had an open wound incorporating the first four metatarsals, with only the fifth toe left in place. The surgeons decided the toe was no longer viable and, due to the deterioration in the wound bed, he returned to theatre for further debridement. This resulted in a forefoot amputation.

After surgery the team applied negative pressure wound therapy (NPWT), but this was too painful to tolerate and was stopped after only one application. An in-growth of granulation tissue in the NPWT foam dressing resulted in pain at dressing change, which led to a breakdown in trust between the patient and the ward team. The patient also developed a sharp increase in the ongoing pain in his foot, which was severe enough to stop him sleeping. His aversion to pain at dressing changes was so severe that, at times, he refused to undergo them. The patient was referred to the diabetic foot team. The main objective was to try to understand his pain and work, within the patient's own boundaries, to establish the way forward.

First assessment

The wound was very oedematous, with extremely high levels of exudate (Figure 1). It measured 25 x 25 cm and had a considerable effect on the patient's quality of life: he was unable to look at the wound and was feeling very depressed about it. The management plan was to:

- Try to reduce oedema by using an aircraft pneumatic walker, which gently compresses the foot and offloads pressure
- Use a non-adherent but highly absorbent dressing to manage pain at dressing change



- Swab for bacteria
- Manage his diabetes aggressively
- Build trust.

Advazorb Silfix dressing was selected due its high absorbency and silicone contact layer, which is designed to reduce pain on dressing application and removal.

Follow-up

At the next wound assessment 2 days later, the wound measured approximately 22 x 17 cm and the oedema had reduced by approximately 25% (Figure 2). The quality of the granulation tissue had improved significantly, showing signs of increased capillary growth. No peri-wound maceration was evident, despite the heavy exudate levels. The dressing had not been changed since the first assessment. The wound margins were showing signs of contracture. The swab taken at the first visit grew *Haemolytic streptococcus* group G, which was sensitive to doxycycline. This was therefore prescribed. The patient was able to sleep through the night for the first time in weeks and generally felt that his foot was more comfortable. He said the dressing change was 'easy' and reported no pain at dressing removal or application.

The wound was assessed again 4 days later. It now measured approximately 20 x 13 cm. There was a further reduction (approximately



45%) in oedema and an approximate 10% increase in granulation tissue formation; the percentage of slough remained unchanged. There was still no peri-wound maceration, even though the exudate level remained high. Dressing changes continued to be pain free. There was minor tenderness on the lateral border of his foot but, in general, his foot was comfortable and he was able to sleep well (*Figure 3*). Overall, his appearance, mood and demeanour were much improved and he appeared more optimistic. He also agreed to try NPWT again.

Conclusion

Advazorb Silfix played an integral role in the overall care of an extremely complex and limb-threatening wound. Crucial to the successful treatment of this patient was gaining his trust and the successful management of his wound pain.

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Case study 3

A 22-year-old female with known epilepsy suffered a full-thickness burn to her back after having an epileptic seizure while ironing. Her sister found her after the seizure with the iron on her back (*Figure 1*). The burn covered approximately 1% total body surface area (TBSA). Her only previous medical history was a tonsillectomy, and she was a non-smoker with no known allergies. Full-thickness burns are usually dry, white, black or brown, and may be covered with eschar. As this was just 1% TBSA and on the much thicker skin of the back, the burn was treated conservatively without surgery.

After 2 weeks, it was apparent that this burn was not going to heal in a timely manner and the patient wanted a skin graft to speed up the healing process (*Figure 2*). The pros and cons of this treatment were outlined to her, with the main disadvantage being that she might develop a deeper deformity and would have a donor site scar.

First signs of healing

The patient was initially treated with a tie-over dressing. At first dressing change, at 48 hours, the graft looked stable (*Figure 3*) and the wound was dressed with Advasorb Silfix and a small amount of silver sulphadiazine cream. The patient was then discharged home. Local arrangements were made for dressing change. Four days later she was reviewed in the burns clinic. The dressing initially felt very sticky, but was easy to remove and there was no adherence to the skin graft. The patient had found it comfortable to wear, with no strikethrough and no movement, which could have led to graft shear.

Final outcome

Initially, Advasorb Silfix was used but, as the amount of exudate decreased, we switched to Advasorb Silfix Lite, which was more conformable and still easy to remove and apply. The wound healed fully at day 25 and the patient was advised to massage and cream the area. At first scar check 3 weeks later, the scar was flat, soft and supple, and the patient was happy with the result (*Figure 4*).

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Case study 4



A 44-year-old healthy male presented with a dehiscent groin wound following recent surgery for recurrent abscess formation in his left groin and scrotal area. He had a 10-year history of surgery in the axilla, groin and perineum for hidradenitis suppurativa. The wound measured 2 x 1.5cm (Figure 1). As the sutures were still in place, it was not possible to measure the wound depth. The wound comprised 100% granulation tissue, and the peri-wound skin was healthy. There were no clinical signs of infection. The initial postoperative treatment comprised silver sulphadiazine and an absorbent pad. Following removal of the sutures, the wound cavity was filled with a gelling fibre-filled dressing, and Advazorb Silfix was used as a secondary dressing to absorb any exudate.

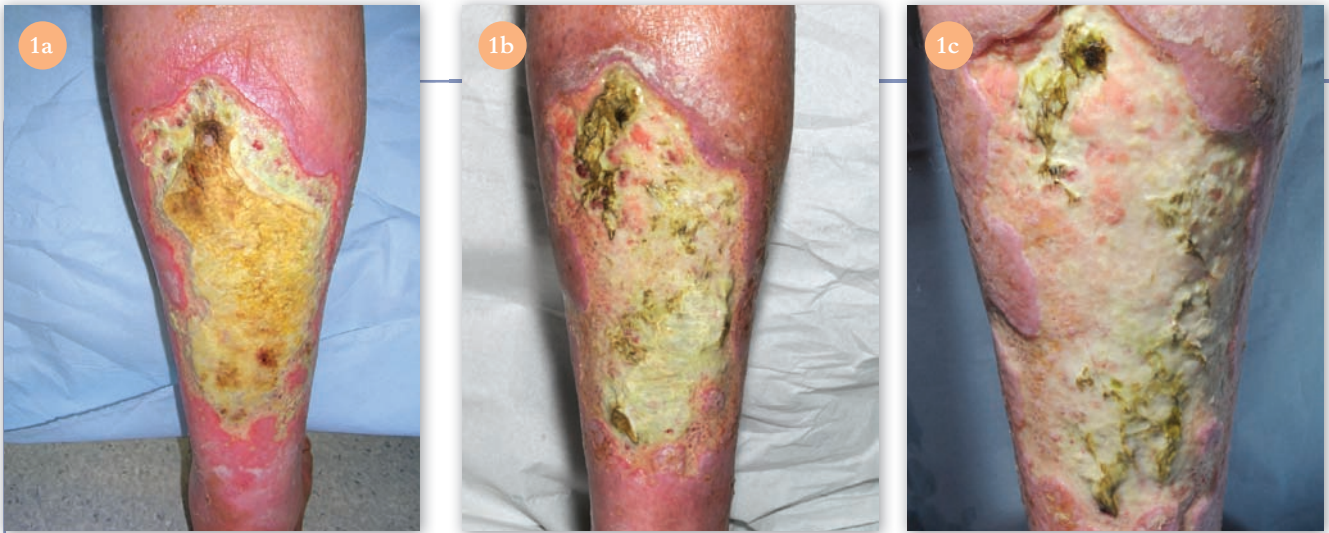
The patient had a known allergy/sensitivity to a number of dressings, particularly adhesive ones. Therefore, adhesives could not be used to affix the dressings, leading to difficulty in keeping the dressing in place for longer than 24 hours. As such, the dressing was reapplied daily. Two weeks later, the scrotal wound had also dehisced, measuring 0.5 x 0.5cm, with a depth of <0.5cm (Figure 2). The gelling fibre-filled dressing was used to fill the cavity, and Advazorb Silfix was used as the secondary dressing.

Follow-up

At the first follow-up assessment, one week later the groin wound had increased in size to 2.2 x 2cm, but still comprised 100% granulation tissue. The scrotal wound was flat but otherwise almost unchanged in size. It was fully granulating and the peri-wound skin was healthy. Advazorb Silfix did not cause any skin irritation or reaction. The dressing was very conformable and stayed in place. It was easy to apply and there was no pain at dressing removal; the patient reported that the dressing was very comfortable and continued to stay in place well.

At the follow-up assessment 2 weeks later, both wounds were progressing well towards healing, with the groin wound measuring 1.4 x 2cm and the scrotal wound 0.6 x 0.5cm (Figure 3). Throughout this treatment period, the dressing remained easy to apply, and the daily dressing removals were pain-free, with no bleeding.

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Case study 5

A 78-year-old woman presented with a painful severe ulcer of several weeks' duration to the posterior aspects of both calves. She had a history of spontaneous ulceration, and was being treated by community nurses, who arranged an urgent referral to the vascular team. Her past medical history included ischaemic heart disease, hypertension and asthma; her medications comprised amlodipine, bendroflumethiazide and aspirin, as well as various inhalers. The ulcer was causing her severe pain, for which her GP had recently prescribed co-codamol 30/500.

On examination, the patient had palpable femoral pulses but absent pulses below this level. She was unable to tolerate measurement of her ankle brachial pressures, but had abnormal monophasic arterial tones in all of her foot arteries. There was extensive ulceration on both legs. Her right leg (*Figure 1a*) had a large ulcer measuring 25 x 14 cm at its widest point. The ulcer was covered with 100% slough, which was thick and drying out in places. It was covered with a Hydrofiber dressing and Surgipad, which was saturated, causing maceration of the skin at the lower half of the ulcer. This resulted in wet footwear, bedding and carpets in the patient's home, causing her much distress.

There were two areas of ulceration on the left leg (*Figure 2a*). One measured 8 x 10 cm, with a 4 x 2 cm central area of thick dehydrated blackened slough, which was surrounded by superficial slough. The smaller ulcer measured 1.5 x 1.5 cm, and was also covered with superficial slough. The ulcer was leaking copious amounts of serous fluid and the dressings (Aquacel and sterile pads filled with

absorbent cotton in a fabric sleeve) were not effectively controlling the exudate, resulting in maceration of the peri-wound skin, especially to the lower half where exudate was dripping down the leg.

Diagnosis and treatment

The ulcers were thought to be a result of peripheral arterial disease with clinically occluded bilateral superficial femoral arteries. The patient was advised to undergo an angiogram and, if possible, an angioplasty, but was reluctant to do this until she had discussed it with her family.

The aim of the dressing usage was to control the exudate levels, preventing any further maceration, and to help debride the sloughy tissue and avoid infection. A honey-impregnated alginate dressing (Algivon, Advancis Medical) was applied to the sloughy tissue to promote debridement and help absorb some of the exudate. This was covered with Advazorb foam to manage the exudate, prevent further maceration and protect the damaged peri-wound skin, allowing it to heal. The dressings were secured with wool and crepe bandages and changed every 1–2 days, depending on extent of strikethrough.

Healing outcome

One week later, the patient was reviewed in clinic. On her right leg, the honey-impregnated alginate dressing was starting to lift the sloughy



tissue (Figure 1b). More importantly, the Advazorb foam was managing the exudate levels effectively. There were no further signs of maceration and the surrounding skin appeared healthy.

On her left leg (Figure 2b), the sloughy tissue was also starting to debride and the dry blackened slough was being rehydrated. The surrounding skin appeared healthy and the previously macerated areas had settled in only one week as the exudate was now being drawn into the Advazorb dressings, which were successfully holding it away from the skin surface.

At this appointment, endovascular intervention was discussed again with the patient, who was still unsure whether she wanted to proceed with an angiogram. She reported that her legs had dramatically improved in only one week as the exudate levels were now being controlled and the burning pain she had been experiencing because of the maceration had completely resolved. She was no longer troubled by wet bandages, which had impaired her quality of life. She wanted to continue with her current treatments.

When she was reviewed again the following week, the ulcer on her right leg (Figure 1c) continued to debride well; the thick sloughy tissue was mostly removed and the true depth of the ulcer was visible. The level of exudate was starting to reduce as the Advazorb dressings continued to successfully manage it, preventing maceration.

The ulcer on her left leg (Figure 2c) was now clear of dehydrated slough, with only a layer of superficial slough remaining. There was no further evidence of maceration and the surrounding skin appeared healthy. At this appointment, 3 weeks after presentation, the patient consented to an angiogram and possible angioplasty. It was hoped this would improve the blood supply to her lower legs, allowing the wounds to heal.

Benefits

The honey-impregnated alginate dressings rapidly debrided the thick sloughy tissue. The Advazorb foam, on the other hand, was able to cope with high amounts of exudate and protect the previously macerated skin, allowing it to heal and preventing strikethrough. All of these improvements gave the patient the time she needed to carefully consider her treatment options in relative comfort.

Leanne Cook

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Case study 6

A 90-year-old woman was admitted to the nursing home with a category IV pressure ulcer on her sacrum, and a skin tear on her left medial shin. Her past medical history comprised dementia, cerebrovascular accident, and urinary and fecal incontinence. The nursing home referred her to the tissue viability service for management advice. Following assessment, the service advised the home to continue using the resident's current pressure-relieving mattress, along with the 30° tilt and regular repositioning, and to document this on a positional change chart. Both wounds were colonised with meticillin-resistant *Staphylococcus aureus*, but were not infected. The pressure ulcer has previously been dressed with a rope alginate dressing and a polyurethane foam.

Wounds at presentation

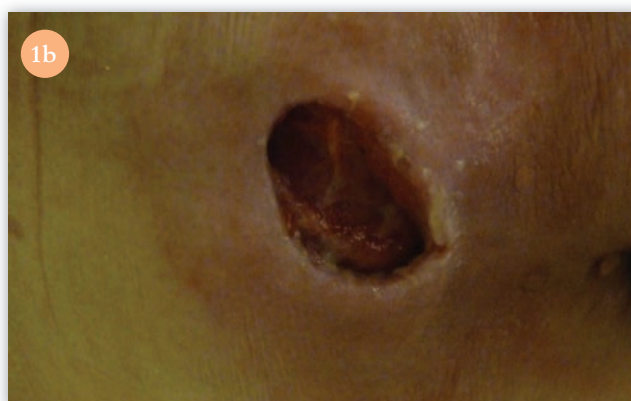
At first assessment, the sacral pressure ulcer measured 20 x 35 mm and was 15 mm deep, with undermining (Figure 1a). The skin tear (Figure 2a) was a horseshoe shape and measured 70 x 10 mm. At presentation, both wounds had 100% granulation tissue at the base, and the surrounding skin was dry and friable. The pressure ulcer and skin tear had high and low exudate levels, respectively. The pressure ulcer was dressed with Advazorb Silflo and the skin tear with Advazorb Silflo Lite.

Tissue viability review

At this review, 2 weeks later, the sacral pressure ulcer area was unchanged, but the depth had reduced to 10 mm and the peri-wound skin was no longer dry and friable (Figure 1b). The exudate levels had reduced; however, the dressing was still being changed daily due to soiling due to episodes of soiling secondary to incontinence. The skin tear had almost healed (Figure 2a) with minimal exudate. The home was advised to leave the dressing on for a further week, and then apply emollients to maintain skin hydration. Staff considered Advazorb Silflo and Silflo Lite easy to apply, conformable and absorbent, and the patient showed no signs of pain at dressing removal.

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Case study 7

A 33-year-old woman with spina bifida, bilateral lymphoedema and limited sensation below the waist presented with a category III pressure ulcer on her left posterior thigh (reference wound), a category III pressure ulcer on the plantar surface of her left heel and a longstanding category IV ulcer on the plantar surface of her right heel. The district nurses were treating the right heel, but the patient did not mention the new ulcers, which she was dressing herself.

On assessment, it was apparent that the ulcer on the thigh was caused by prolonged contact with the cross bar of her wheelchair, and the new ulcer on her left heel had developed as a result of pivoting on this foot during transfer from her bed to a chair. The patient declined referral for orthotic footwear as her limbs and feet had significant lymphoedema. Her right calf measured 63cm. It was not possible to bandage the limb because of the pressure ulcer. Previous dressings used were adhesive polyurethane foam and an absorbent Hydrofiber foam impregnated with ionic silver. Bed rest was instigated on a pressure-relieving mattress and transfers were limited for hygiene reasons only, to reduce shear and friction.

The pressure ulcer at presentation

The category III pressure ulcer (*Figure 1*) measured 50 x 75 x 30 mm (D x L x W). The exudate levels were high as a result of lymphorrhea.



The wound was dressed with Advazorb Silflo to create a moist sealed environment and manage the exudate. Due to moderate to high exudate level, the dressing was changed daily.

Progression towards healing

Assessment one week later showed that the wound volume had reduced, with the wound now measuring 30 x 70 x 20 mm, and the wound bed was covered with 100% granulation tissue. At day 7, the wound measured 30 x 55 x 20 mm, and the exudate level remained unchanged. On day 14 (*Figure 2*), the wound volume had reduced to 20 x 40 x 20mm. The dressing was considered easy to apply, conformable and acceptable to both the patient and clinician. There was no bleeding or discomfort at removal.

Jeanette Milne

Tissue Viability Nurse Specialist,
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Case study 8

A 54-year-old man, with mild learning disabilities and epilepsy, presented to the emergency department having spilt a hot drink on his abdomen and right arm. He had been given first aid in the care home where he lives, consisting of cold water and a cooling dressing.

Referral and diagnosis

He was referred to the burn centre from the emergency department; however, due to staffing difficulties, he was not assessed until 3 days post-injury. The assessment determined that he had approximately 2.5% total body surface area burns (TBSA), with superficial dermal burns to the arm and patches of the abdomen, and a smaller deep-dermal burn to the right flank (Figures 1 and 2).

Superficial dermal burns are usually pink and heal within 7–10 days. Deep dermal burns can have a number of appearances, but often take 21 days or more to heal. Burns over 1% TBSA that are deep dermal are often grafted to accelerate healing. The patient's deep dermal patch was less than 0.5% TBSA, so it was decided to treat this conservatively (Edwards, 2011).

Initial follow-up

All affected areas were dressed with silver sulphadiazine cream and Advazorb Silfix. On day 7, the right arm was healed (Figure 3). The dressing did not adhere and the patient did not complain of any pain. The abdomen was progressing well, but there was an area of fixed slough to the deep-dermal patch on the right flank (Figure 4), which is to be expected as deep-dermal burns often develop a sloughy appearance over 7–10 days.

Healing at week 2

At 14 days most areas were healed (Figure 5) and the slough was starting to lift on the right flank. By 21 days, the slough was lifting and the wound size had decreased considerably and, by day 35, the wound was almost healed (Figure 6). As the size of the wound had reduced, and there were no surrounding wounds, the dressing was changed to silver sulphadiazine and Advazorb Silflo, which improved retention.



There was minimal pain while the Advazorb dressings were in place and during removal. Ease of application was considered excellent, and the dressings were rated highly in terms of conformability, durability and ease of removal. The surrounding skin remained intact at dressing change, there was no trauma on removal and all staff felt confident to use the product and would recommend its use.

Jacky Edwards

Burns Nurse Consultant, University Hospital of South Manchester



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