The assessment and management of cavity wounds
To reference this document: The assessment and management of cavity wounds. Wounds UK 4(2) Supplement: 1–20
A holistic approach is required when managing a patient with a cavity wound

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For cavity wounds, as with all other wound types, careful and thorough assessment forms the basis of good wound management. Assessment should take into consideration the needs of the patient beyond the wound, including the social and environmental issues which may influence wound healing outcomes. Once a complete clinical history is taken and aetiology of the wound is established, the wound assessment should be thorough, with particular attention being paid to the presence of undermining and cavity depth. Tissue type, exudate, infection and pain assessment are all part of the process and will help to direct the management of the wound and the patient.

Thorough wound assessment is necessary as it provides a baseline against which the success of management strategies can be measured, permits differential diagnosis, facilitates timely referral to other healthcare providers and provides the basis for a treatment plan.

Management strategies employed should also be holistic and take into account the wound bed and local and systemic barriers to healing, as well as the patients’ thoughts and concerns about their wound. Emphasis should be placed upon the management of the distressing symptoms which patients with cavity wounds may present with, since for many these are the most problematic aspect of having a wound. For example, cavity wounds can produce a large volume of exudate and appropriate management of this can alleviate the embarrassment of having soiled clothes and bedding and will reduce the impact of the wound on the patient’s daily life. Healing is of course a desirable outcome but for many patients, may not be achievable and symptom control may be the key aim of treatment.

There are currently a number of wound management products available that are suitable for the management of cavity wounds. All can be used to provide an environment in which healing can proceed at the optimum rate. However, if they are to be used successfully, they must be applied to the right wound at the right stage of the healing process. The effectiveness of healing depends on wound assessment and constant re-evaluation of the management strategy adopted.

Capillary action dressings have been used on infected, moderate to heavily exuding wounds, cavity wounds (Russell and Evans 1999; Deeth and Pain 2001), leg ulcers (Goldman et al 2003), and wound sinuses (Russell and Evans, 1999; Deeth and Pain, 2001) and have a role in cavity wound management.

Advadraw Spiral and Advadraw (Advancis Medical, Nottingham) are unique capillary action dressings that give the wound care practitioner an effective alternative to the commonly used capillary action and alginate dressings. They control exudate well, and are comfortable because of their pliability and low adherent properties (Oldfield and Burton, 2007).

This supplement describes the holistic assessment and management of the patient with a cavity wound, and explains how the Advadraw range of dressings can be successfully used as part of an overall management plan.

References


How to systematically assess a patient with a cavity wound

A cavity wound is often only part of a complex clinical picture with which the patient presents. In order to deliver optimal care, a systematic, holistic approach to assessment must be taken. Comprehensive assessment is critical to care since it establishes a baseline for subsequent comparison, permits differential diagnosis, provides the basis for a treatment plan and facilitates timely referral to other healthcare providers. A wound should always be assessed in the context of the patient's overall medical status and history so that underlying aetiology is determined and treatment is optimal for the individual (Harding, 2007).

The term cavity wound refers to any wound that extends beneath the layers of the dermis. It is impossible to classify all cavity wounds as one entity as for each individual wound there is a different underlying aetiology, depth, size and anatomical position, and all of these factors will have a direct impact on the outcome of treatment. For example, a cavity wound may be a dehisced abdominal surgical wound, a pilonidal sinus in a young, mobile patient or as is more often the case, a grade 3 or 4 pressure ulcer in an older person.

All cavity wounds regardless of cause, however, provide a number of challenges to the clinician, mainly as a result of the amount of tissue lost and the increased risk of infection:

- Cavity wounds may require extensive debridement due to the presence of necrotic tissue which can act as a focus for infection and a barrier to healing.
- Cavity wounds may produce moderate to heavy amounts of exudate depending on the wound site and tissue types present. This can result in several problems including maceration and malodour.
- Tunnelling and undermining if present can be difficult to assess and if not recognised as such can be a source of future infection and/or wound breakdown.
- The presence of a cavity wound is distressing for patients and relatives. The length of healing time is often prolonged and the risk of infection increased due to the volume of tissue loss. These factors along with high exudate levels and malodour can have a negative impact on the psychological wellbeing of the patient.

For cavity wounds, as with all other wound types, careful and thorough assessment is the basis of good wound management (Bale, 1998). When carrying out assessment, it is all too easy for the process to focus upon the wound itself, to the detriment of wider issues (Morison, 2004). Therefore, it is important to take a holistic approach, ensuring that the general health of the patient, as well as social and environmental factors are also considered.

This article will describe the types of cavity wounds encountered in clinical practice, and will explain how to carry out an accurate, holistic assessment of the patient, their wound and environment, highlighting when further investigations may be necessary.

Types of cavity wounds
Identificaiton of the factors contributing to the development of a cavity wound will greatly assist in the assessment process as well as providing insight into the likely depth and degree of tissue damage that may be present. The key categories of cavity wounds seen in clinical practice are:

- Surgical
- Dehisced
- Traumatic
- Chronic.

Surgical
Surgical cavity wounds are created where there is a risk of infection if the wound is closed using primary closure techniques. Such wounds include pilonidal sinuses and abscesses. Surgically created cavity wounds are generally uniform in dimension and should be boat-shaped or saucer-shaped, with evenly sloping sides. This allows free drainage of wound
secretions and enables easy dressing of the wound (Bale and Jones, 2006). It also promotes healing from the wound bed upwards (Figure 1).

Dehisced
Dehiscence occurs when the wound has failed to develop sufficient strength to withstand the forces placed upon it (Bale and Jones, 2006). Dehiscence usually takes place 6–10 days post-operatively and the risk of its occurrence is increased by localised wound infection. When high levels of bacteria are present in the wound, the generation of toxins result in the breakdown of wound tissue. Once this happens, the wound edges begin to separate and primary closure may be compromised, at which point it may be necessary to remove the sutures or clips to allow the wound to drain freely. The result is a cavity wound that may be allowed to heal by secondary intention or which may be closed surgically at a later date once the infection has been treated.

Traumatic wounds
In traumatic injury, the mechanism of tissue damage may result in the loss of large volumes of tissue, for example, in friction injuries resulting from industrial machinery or from road traffic accidents. Large areas of tissue may be lost, which results in the formation of a cavity wound. As traumatic wounds generally contain debris, treatment usually includes cleansing and debridement, often under anaesthetic, after which a dressing will be applied, with a decision to use primary closure taken at a later date unless skin grafting is required. Topical negative pressure may also be used to reduce wound size before primary closure.

Chronic wounds
Chronic wounds commonly present as cavity wounds particularly pressure ulcers, diabetic foot ulcers, and to a lesser extent, leg ulcers.

Grade 3 or 4 pressure ulcers are cavity wounds which may extend down to but not beyond the underlying fascia or which may result in extensive destruction, tissue necrosis or damage to muscle, bone or supporting structures with or without full thickness skin loss, respectively (EPUAP, 2001).

The physical forces involved in pressure ulcer development are pressure, shearing and friction. McClemont (1984) described the pressure damage sustained due to pressure and shear as causing a ‘cone’ of pressure damage. The skin surface is the top of the cone, and under the least amount of pressure, graduating to a greater degree of pressure and larger area of damage at deeper tissue levels. Following pressure injury, the skin may remain intact, however, deeper tissue damage will be exposed over time (Bader, 1990).

In diabetic foot ulceration, the scale of the cavity may be much smaller than that of a sacral pressure ulcer; however, due to the proximity of bone to the skin surface the actual damage may be proportionally greater, with the potential for damage to quickly encroach on essential structures. This can be seen in the diabetic foot ulcer where infection and osteomyelitis is problematic (Edmonds et al, 2004).

Leg ulcers are on the whole less likely to present as a cavity wound. In cases of venous ulceration the wounds are usually large, relatively shallow and heavily exuding (Franks and Moffatt, 1998). In patients with arterial ulcers and mixed aetiology ulcers, the presentation is sometimes that of a cavity, being more regular in size and shape than that of a purely venous ulcer.

Assessment of a patient with a cavity wound
Comprehensive assessment is critical to care since it establishes a baseline for subsequent comparison, permits differential diagnosis, provides the basis for a treatment plan and facilitates timely referral to other healthcare providers.

A wound should always be assessed in the context of the patient’s overall medical status and history; taking into account the presenting symptoms, the results of any investigations, as well as the indicators for the success or failure of treatment. Focusing on the whole patient and not just the ‘hole’ in the patient is essential to ensure that the underlying aetiology of the wound is known, and that the subsequent treatment plan is optimal for each individual (Harding, 2007).

It is helpful to have a structured approach to the assessment, diagnosis and treatment of a cavity wound. Table 1. HEIDI provides an example of an approach to the assessment and treatment of a cavity wound.

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Figure 1. A pilonidal sinus which has been incised, drained and laid open to allow drainage of exudate.
and management of any type of wound. HEIDI is an acronym for a holistic framework that represents the five most important aspects of assessing and managing the patient (Harding, 2007; Table 1). This article will now focus upon the history, examination and investigation of a patient with a cavity wound.

History
Patient history
The assessment of any patient with any wound or condition should begin with a full medical and nursing history. This allows a complete picture of the patient’s health to be created and any factors contributing to the cavity wound to be identified, documented and addressed (Table 2).

Wound history
It is important to determine how long the wound has been present, and to consider any factors that may have contributed to the cavity wound’s development, e.g. surgery, trauma, poor seating, inadequate pressure care, infection or general poor health.

Wound assessment
Location
The anatomical site of the wound should be noted as this will provide clues as to how the wound formed. A good knowledge of underlying anatomy is also helpful when considering the depth of the wound, the impact the wound may have upon the patient and on time to healing. For example, when cavity wounds are present over joints, there is a likelihood that synovial fluid may leak out in addition to wound exudate. Cavity wounds of the foot although shallow in appearance, will quickly reach bone due to the thinner layer of tissue present, resulting in bone involvement in a shorter period of time than in other wound sites. Abdominal wounds may present with areas of exposed bowel or fascia that has to be protected from infection; in such wounds early closure is a priority. Furthermore, wound location may also dictate treatment choice since some products are contraindicated on certain body sites.

Physical examination
An examination of the patient’s skin should be performed before focusing on the wound. In elderly and at-risk patients there is a possibility of pressure damage existing in other sites. In addition, general skin assessment will allow other conclusions to be drawn about general health, hygiene and skin condition. Next a visual and physical examination of the wound should be performed. The following should be systematically assessed:

- Tissue types present
- Exudate levels
- Signs of infection
- Peri-wound condition
- Wound size, shape and depth.

Tissue types present
The tissue types present in the wound bed should be recorded and documented as a baseline against which the success of future treatments can be compared. A systematic approach to assessment is recommended using a wound assessment tool such as TIME (Sibbald et al, 2003) or Applied Wound Management (Gray ey al, 2005). The Wound Healing Continuum component of AWM uses a simple colour scale to classify tissue types (black = necrosis, yellow = slough, red = granulation tissue and pink =...
epithelial tissue). Using this tool it is possible to quantify in percentage terms the amount of each tissue type visible in the wound bed (Figure 2). As the percentages change, the wound’s progress or deterioration can be tracked over time.

In some newly presenting pressure ulcers, there may be an area of black necrosis covering the wound, which once removed will reveal the true extent of tissue damage. Yellow slough will often be present in the base of a cavity and may contribute to the malodour that is a common characteristic of cavity wounds. Necrotic tissue delays or prevents healing because not only is it a physical barrier to granulation, contraction and resurfacing, but it is also a medium that promotes pathogenic bacterial growth (Robson, 1997). A newly created surgical cavity often appears red and raw and has adipose tissue or muscle at the base of the wound. This appearance is normal during the first two weeks of healing before granulation. Healthy granulation tissue is pale pink and has a bumpy appearance – it is firm, painless and does not bleed easily. Dark granulation that bleeds easily is indicative of infection.

**Exudate levels**

Exudate production starts in the inflammatory phase of wound healing, but continues until complete epithelialisation has occurred. Exudate has a high protein content and contains essential nutrients as well as providing a moist environment for wound healing (Cutting, 2004). Exudate in chronic wounds has been shown to contain an imbalance of substances such as proteases. These proteases can cause breakdown of the extracellular matrix which can result in prolonged healing (Falanga, 2000).

Cavities vary enormously in the amount of exudate that they produce. In the immediate post-operative period, surgically created cavities can generate large amounts of wound exudate. Also, generally, the larger the wound, the more fluid it will produce (Bale and Jones, 2006). Exceptions include sinuses and fistulae, which may have copious leakage from relatively small apertures.

Excess exudate production may also be due to the presence of bacteria within the wound. This usually results in the thickness or viscosity of the exudate increasing. As a result, in addition to exudate volume, the consistency of the fluid should also be monitored as thick, purulent fluid can indicate infection. Large volumes of serous exudate can also indicate the presence of a sinus or fistula.

**Infection**

Infection can become problematic when treating patients with cavity wounds. The cavity is often moist, contains sloughy tissue and may have undermined areas which can contain debris that can act as a focus for infection. The presence of old dressing material, which may have been left behind in the wound can also act as a focus for infection. This can occur when the dressing is too tightly packed into the wound, if the dressing breaks down in situ or if the wound is not cleaned well enough at dressing change (Pudner, 2001). Good documentation is essential to ensure that what goes into the cavity is fully removed before redressing.

Key indicators of infection within a cavity include odour; increased exudate levels, a change in the consistency of the exudate and changes to the colour of the tissue (Figure 3).

For example, the colour of granulation tissue may change from pale pink to deep red and the wound may show a tendency to bleed easily on light contact and become

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Figure 3a. A pressure ulcer in an elderly female patient. Necrosis and slough are present in the base of the wound, but healthy red/pink granulation tissue can be seen, indicating progress towards healing.

Figure 3b. The wound began to display signs of infection coinciding with a deterioration in the patient’s overall condition. The granulation tissue in the wound has changed colour becoming darker and almost grey in places. The wound appears less vascular and the immediate surrounding skin has a degree of cellulitis. There is an increase in the amount of sloughy tissue present and the edges of the wound are red, showing signs of inflammation. On the upper aspect of the wound an area of undermining has developed.
uncomfortable or painful (Figure 3; Table 3). Superficial bridging (Figure 4) may also occur. The infected wound may become more sloughy and new tissue may be broken down by bacterial toxins within the wound (White et al, 2006) with cellulitis of the surrounding skin occurring along with localized heat and oedema. The patient may also be experiencing pain from the wound that will increase in severity in the presence of infection (Young and Barrett, 2005). Swabbing can be carried out and local protocol should be followed, however, if infection is suspected, awaiting a swab result may take time and treatment should be initiated as soon as possible.

If left unchecked, localised wound infection can lead to deep-seated and more severe infection that in some cases may be life-threatening (Gardener and Frantz, 2004). Therefore the at-risk patient may require more urgent care and local protocol should be followed when life-threatening infection is suspected (Livesley and Chow, 2002).

Wound size, shape and depth
In order to assess the effectiveness of a particular treatment, it is necessary to monitor changes in the size of the wound. The wound can be measured by using a tape measure to easily determine its length and breadth. Wound volume is more difficult to assess and does not really offer any advantage over the measurement of linear dimensions.

Chronic wounds such as pressure ulcers are often more difficult to measure as the wound may extend under the skin edge (Bale, 2006), and may have an undulating wound base. This makes wound depth hard to establish. If undermining is suspected, the wound should be palpated for induration, which would suggest hardening of the soft tissue due to inflammation. The extent of undermining should then be established using a probe (Figure 5). The use of examination techniques such as digital swab examination can greatly aide wound cavity assessment while swab probing of sinuses can also aide clinical decision making (Cooper, 2006).

There are a number of devices available to assist with the assessment, such as sterile plastic or metal probes. These methods have been known to cause discomfort, pain and trauma to the patient and the wound bed as they are rigid in nature with no protective soft cover to prevent wound trauma.

Instead, if the wound opening is big enough, it can be probed with a cotton swab or wound swab (Baronski and Ayello, 2004). The cotton bud tip and long handle will allow the wound to be probed around the edges, without causing any trauma or pain to the individual (Cooper, 2006).

If the wound opening is not big enough for a wound swab to pass through, but there is concern that the wound is undermining, a venflon cannula (with the needle removed) can be used to probe the wound (Figure 6). When the cannula comes into contact with tissue it will not go any further as it is too flexible and will bend on contact, unlike a finger or metal probe, and this will not cause trauma to the wound or pain to the patient (Cooper, 2006).

Care should always be taken when undertaking probing to ensure the patient is not at risk from injury or trauma due to the location of the wound or ongoing disease.

If there is necrotic tissue present, this should be removed where possible to allow more accurate assessment of the cavity size. This can be done using sharp debridement, larval therapy, or assisted autolysis; these methods are discussed in more detail on p.12.

Occasionally a cavity wound may develop as a sinus that will have a small aperture but may travel down to a focal point, such as a joint capsule or a site...
which could be a focus for infection, such as a suture sinus (Figure 7).

In some cases there is a risk that the undermining may be too deep to be probed or that the sinus may reach a joint capsule. In such cases, the patient should be referred for X-ray examination, MRI or sinogram to examine the extent of the cavity.

The shape of the wound can be traced using an acetate wound tracing grid system, which allows the surface area to be calculated. However, wound volume can be difficult to assess using this method due to the potential inaccuracy in measuring undermining. There are now digital systems that can assist in the accurate measurement of wound size and volume, allowing improvements to be tracked over time. Digital photography may also be a useful addition to normal wound measurement, and can help to support clinical decision making.

Further investigations
In some cases the assessment strategies outlined above will not be enough and further investigation will be required. Sinuses, fistulae, excessive pain, an unexplained increase in exudate volume, bleeding and failure of a wound to heal could indicate a complication such as osteomyelitis (Livesley et al, 2002). If osteomyelitis is suspected it will be necessary to refer the patient to medical staff, X-ray or MRI and relevant blood tests may be indicated. MRI scanning to investigate the depth and type of tissue damage is recommended in cases of suspected deep tissue injury (Bader, 1990).

Peri-wound assessment
The skin surrounding the wound should be assessed as regularly as the wound itself. The peri-wound skin can give indications of the state of the wound and exudate levels. Excess exudate can lead to maceration of the surrounding skin causing it to turn white or excoriated due to the impact of enzymes contained in the exudate. Cellulitis is an indication of infection of the wound and often this may be visible on the surrounding skin before there are any definite indications in the wound bed. Oedema of the peri-wound area may indicate infection in the deeper tissues and the skin should be palpated with a gloved hand to assess the state of the tissue underneath. Changes in colour of the peri-wound skin may also indicate pressure damage, which may occur if pressure reducing equipment is not utilised.
Pain
As with all wounds, there is the potential for the patient to experience pain in a cavity wound. All patients with wounds should be assessed on an individual basis by using a recognised pain assessment tool. It is believed that deep cavity wounds will not be as painful due to the absence of nerve endings; however, Bliss (2000) suggests that this is more likely to be due to the patient not being able to sense pain as a result of illness or other relevant conditions (Bliss, 2000). The presence of necrotic tissue and bacteria have the potential to increase pain due to the inflammatory response and accompanying oedema so pain levels must be monitored and acted upon.

Conclusion
Cavity wounds are often only a part of a complex clinical picture with which the patient presents. Whether the result of failed primary surgical closure due to infection or due to the deep tissue injury of pressure ulcers, cavity wounds present a number of management challenges. In order to deliver optimal care to the patient, a thorough systematic approach to assessment must be taken. Once a complete clinical history is taken and aetiology of the wound is established, wound assessment should be thorough, with particular attention being paid to the presence of undermining and depth of the cavity. Tissue type, exudate, infection and pain assessment are all part of the process and will help to direct the management of the wound and the patient.

There is a risk that cavity wounds can lead to systemic infection due to their depth and their suitability for bacterial proliferation, and therefore patients may need referral for intensive antibiotic therapy should infection arise. Finally, some cavity wounds will require further investigation using radiological techniques such as ultrasound, sinogram, MRI and plain X-ray.

References
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The management of a patient with a cavity wound

The successful management of a patient with a cavity wound is dependent on a number of factors, the most important of which is the overall wellbeing of the patient. Concurrent illness and other factors that may impact upon wound healing must primarily be addressed. The local wound environment, tissue types and exudate levels will influence the management product used in the wound. For cavity wounds, the ideal dressing must be suitable to place into a cavity, not adhere to the wound bed and be able to handle exudate while maintaining its integrity when wet.

Factors such as where the patient is treated and his or her social support systems must also be considered when deciding on a management plan. For example, the availability or absence of support in the home setting may influence certain product selections or regimens for elderly and debilitated patients (Ovington and Eisenbud, 2004). Furthermore, local policy and formulary may influence what products and therapies are available for use by the clinician.

Patient partnership
It is essential to gain the trust and respect of the patient, to share information and to include the patient in treatment decisions where possible. For example, if the patient is concerned about the odour and exudate from a cavity wound they will be keen to put in place a therapy which can help to reduce the impact of these distressing symptoms. Education of the patient and/or carer regarding cause of the wound and its treatment are vital for optimal healing, health maintenance and the prevention of recurrence. Explaining to patients and their family and/or carers what procedures and dressings are to be used and why can reduce their anxiety and encourage compliance or concordance. Involvement in decision making can help to establish trust between family members and healthcare professionals and this is a good basis from which to make treatment decisions.

Cavity wound management
The outcomes of patient and wound assessment should drive the management plan. The status of the exposed tissues and structures, condition of the surrounding skin, level and nature of exudate, and the microbial status all influence decisions related to topical management (Ovington and Eisenbud, 2004).

The tissue types present within the cavity will often be the determining factor as to which treatment regimen is commenced. Many cavities will have a variety of tissue types present and this can make dressing selection difficult. In addition, the tissue types may have a bearing on the levels of bacteria present within the wound, with sloughy wounds often harbouring a large number of bacteria (White et al, 2006). It is also likely that the volume of exudate produced may be problematic depending on the level of tissue damage and the wound bioburden.

John Timmons, Kristine Dugid, Gail Pirie, Fiona Russell, David Gray
Dressing is not packed too tightly into cavity wounds is to ensure that the key considerations when dressing (Oldfield and Burton, 2007). One of preparing dressings to fit into a cavity cross-contamination when cutting and delayed healing. There is also a risk of the wound bed, which may result in patient. Cutting the dressing may also be appropriate for the wound size cut to an irregular shape may not be fitting, however, this has a number of risks. Dressings that need to be selected a dressing that has a strong wet strength and maintains its integrity on adherent, with an ability to absorb large volumes of exudate. It is important to select a dressing that has a strong wound, the tissue may be debrided upon assessment if the cavity is: Necrotic and dry Necrotic and exuding Sloughy and heavily exuding Sloughy and low to moderate exuding Granulating and heavily exuding Granulating and low to moderately exuding. Wounds with necrotic and dry/low exuding wounds Necrotic tissue can have a variety of appearances from loosely adherent yellow slough to tightly adherent, leathery black eschar. The presence of necrotic or sloughy tissue in a cavity wound can prevent accurate assessment (Figure 1), is a physical barrier to healing and provides an environment for bacteria to multiply. Thus, where possible it should be debrided (Kirshen et al, 2006).

Debridement can be achieved by a variety of methods depending on the amount of tissue to be removed and the patient’s overall condition. The most commonly used methods are: Sharp debridement. This is the fastest method of removing devitalised tissue. This method is highly selective and the rapid results ensure that the risk of infection is minimised (Kirshen et al, 2006). The procedure should be relatively pain free as the tissue removed is dead, however, some patients may experience pain, which should be dealt with using analgesics before, during, and after the procedure. Sound knowledge of anatomy is essential to avoid damage to underlying structures, and the practitioner must be able to distinguish between healthy and devitalised tissue. For this reason, sharp debridement must be undertaken by a skilled clinician. Bleeding may be caused by the sharp debridement process and this can be stopped using alginate or silver nitrate topically; caution should be exercised when treating patients on anticoagulant therapy (Kirshen et al, 2006). New hydrosurgery techniques are now more established and these could revolutionise wound debridement and replace sharp debridement as it stands.

Larval therapy. The use of blowfly larvae (Lucilia sericata) is a useful technique for debridement of necrotic or sloughy tissue in cavity wounds. The larvae secrete proteolytic enzymes which breakdown necrotic tissue which is then ingested by the maggot, resulting in a clean wound bed. There is also evidence to suggest that larval therapy can reduce the bacterial load of the wound as the maggots excrete effluent which is antimicrobial (Thomas, 2001). This therapy is normally painless, although pain levels should be routinely monitored as part of the care plan.

Autolytic debridement. This is the method by which the body uses endogenous enzymes to cleave necrotic tissue – the process can be assisted by using dressings that support moist wound healing. Autolytic debridement may take more time than other debridement methods; however, it is generally viewed as a safe, less invasive technique that is more acceptable to patients (Kirshen et al, 2006).

When exudate levels are low and there is necrotic tissue present in the wound, the tissue may be debrided using a hydrogel, which will donate moisture to the tissue. If infection is
Necrotic wounds with high exudate levels
Necrotic tissue coupled with high exudate levels may be the result of an increased bioburden in the wound. This is not uncommon in cavity wounds and so treatment may involve a combination of dressings that can address all three issues, e.g. an antimicrobial primary dressing may be used with a highly absorbent, adherent secondary foam dressing to cover the wound. It is difficult to focus on one particular issue as a priority, however, it should be noted that the presence of sloughy tissue may be supporting the increased bioburden in the wound which may in turn result in increased exudate levels (White et al, 2006).

In necrotic cavity wounds with high exudate levels (Figure 2), hydrofibre or alginate dressings and topical negative pressure (TNP) systems can be used to absorb exudate and assist in debridement. Alginites and hydrofibre dressings work by forming a gel when in contact with exudate (Pudner, 2001). Both types of dressing are able to absorb exudate and, in ribbon form, can be easily inserted into the cavity and fit the contours of the wound bed. These dressings can also be cut to fit the shape of the wound but should not be used to completely fill the cavity as they will expand when moist. Partially filling the cavity by approximately 50% will allow room for expansion without damage to the wound bed. Care should be taken as some alginate products may leave fibres behind, or may adhere to the wound bed causing trauma on removal. This is more likely to occur when the wound is not moist enough or if the cavity is packed too tightly.

Capillary action dressings are multi-layered absorbent dressings that are covered with a low adherent wound contact layer. Their ability to draw or wick exudate and therefore bacteria out of the wound and retain it in the dressing make them particularly useful in heavily exuding cavity wounds. Advadraw Spiral (Advancis Medical, Nottingham) is a rapid capillary action dressing. It is an absorbent, non-adherent primary wound contact layer that can wick exudate, which is rapidly absorbed into the dressing via capillary action. Each side of the dressing is backed with a perforated permeable wound contact layer.

Advadraw Spiral is supplied in a pre-cut ribbon shape. This allows the product to be cut to size to suit the wound in which it is placed without changing the shape of the dressing (Oldfield and Burton, 2007; Figure 3). The unique spiral ribbon formation fits the contours of the wound and does not swell in the same way an alginate might.

If local infection or critical colonisation is suspected then silver alginate or hydrofibre with silver can be used; these dressings confer the properties mentioned earlier; but have added silver which has antimicrobial action. The use of these dressings should address the bacterial balance in the wound while maintaining a moist wound healing environment to aid autolysis.

Granulating wounds
The aim of intervention for cavity wounds lined with granulation tissue is to maintain an environment conducive to healing – this means protecting the tissue and preventing trauma.

Granulating wound with high exudate levels
Clean, granulating cavities may continue to produce large amounts of exudate. This type of cavity will require a dressing that can protect granulation, be non-adherent and also absorb or wick fluid away from the wound bed (Case report 1). If exudate is not controlled, leakage may occur, which soils and stains clothes and bedding, causing discomfort and embarrassment.

Excessive exudate as produced by deep cavities can also lead to maceration of the wound bed and surrounding skin. Exudate can be controlled through the use of absorbent dressings, hydrofibre and alginates. The wicking effect of...
Case report 1

A 47-year-old female presented with four abdominal wounds of 24-hours duration. The patient had undergone a total abdominal hysterectomy four weeks previously for uterine fibroids and had a history of ovarian cysts and hypertension.

Initial assessment revealed a 13cm long healing surgical incision which had dehisced in four separate places.

Wound one measured 1.75cm x 1.75cm, probing to 5.5cm in a central direction; Wound 2 measured 1.50cm x 1.0cm with a depth of 2mm; Wounds 3 and 4 both measured 0.25cm x 0.25cm. The patient found probing of the wound very painful (Figure 1).

Examination revealed evidence of spreading infection. The peri-wound skin was hot and there was red tracking to 10cm in circumference. The wound bed of wound one could not be seen due to a high volume of malodorous exudate with thick viscosity. Wounds 2 and 4 consisted of red granulation tissue.

The patient was commenced on IV antibiotics. The wounds were swabbed for culture and sensitivity, irrigated with saline and were gently packed with Advadraw Spiral (Advancis Medical, Nottingham). The wounds were then covered with foam adhesive (Alione, Coloplast). Dressings were changed daily.

On review four days later, the dimensions of wound one had reduced to 1.7cm x 1.0cm probing to 5cm in depth. Wound 2’s dimensions had reduced to 1.0cm x 0.7cm, wound 3 had healed, while wound 4 measured 0.3cm x 0.2cm (Figure 2).

The surrounding skin no longer felt hot and the red tracking was now less than 1cm. The patient reported experiencing less pain on probing. The volume and viscosity of the exudate had reduced significantly, and the wound was no longer malodorous. As a result of the resolving infection, the patient was switched to oral antibiotics.

On day 8 of treatment, the dimensions of wound one had reduced to 1.0cm x 2.0cm and measured 3.5cm depth. Wounds 2 and 4 remained static (Figure 3). The patient was no longer experiencing any pain and all the signs of infection had resolved.

Due to a further decrease in exudate volume, Advadraw Spiral was changed on alternative days. The secondary dressing was reduced in size and absorbency to foam adhesive (Allevyn, Smith and Nephew Healthcare, Hull).

By day 16 of treatment, wound one was reduced to 1.0cm x 1.0cm x 3.75cm deep. The wound bed consisted of granulation tissue. Wound 2 had reduced to 0.5cm x 0.7cm, while wound 4 had healed.

On day 30 of treatment, wound one had decreased in size to measure 0.5cm x 0.5cm x 0.5cm deep. Wound 2 had healed (Figure 4).

On day 44 of treatment, wound one had a slight reduction in wound depth from 0.5cm to 0.4cm deep, but there were still no signs of infection, such as pain or malodour. A small volume of serous exudate was being produced (Figure 5).

On day 58 there was no change to the wound dimensions, however, the wound bed appeared dull and was bleeding slightly. As the wound seemed to be critically colonised or stagnant, the patient was advised to irrigate the wound in the shower and instill Iodosorb into the wound. The dressing was secured with foam adhesive and changed every 3 days. The patient did not reattend the clinic but telephoned to say the wounds had completely healed.

Figure 1. The wound on initial assessment.
Figure 2. The wound on Day 4.
Figure 3. The wound on Day 8.
Figure 4. The wound on day 30.
Figure 5. The wound on day 44.
Wounds which have low to moderate levels of exudate require dressings that are able to support the formation of granulation tissue and are not likely to adhere to the wound bed on removal. Gel-based dressings can be of use in this type of wound as they are able to donate fluid when required. Advadraw Spiral can be used in this patient group; however, the dressing should be left in situ for longer periods; this will benefit the patient by reducing the number of dressing changes required (Case reports 2 and 3).

**Low to moderate exudate**

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**Negative Pressure Wound Therapy**

For large cavities that have exudate levels which cannot be managed with traditional dressings, there may be a role for TNP at least until exudate levels subside (Baxandall, 1996). Negative pressure therapy is associated with fast wound closure, reduced risk of infection and excellent exudate management. For patients with infected wounds, some TNP systems now incorporate silver; which is impregnated into the wound contact layer.

**Controlling odour**

Malodour is one of the main issues for patients with a wound (White et al, 2006). Odour is often associated with the presence of sloughy or necrotic tissue. The smell from a wound which is colonised or infected with bacteria and large amounts of sloughy tissue will be problematic for the patient and their relatives. In order to address odour, antimicrobial products containing silver, iodine, or honey can help to reduce the bacterial levels within the wound. In addition, removal of sloughy tissue is vital to reduce the areas where bacteria are likely to multiply (White et al, 2006).

Selection of a product that can handle exudate well will also avoid the wound becoming over moist, and prevents bacterial growth. Foam dressings which are occlusive can help to absorb exudate but will also prevent the ‘escape’ of odour between dressing changes. Dressings containing charcoal may also be used to help filter the odour from the wound, but should only be used in highly exuding wounds.

**Secondary dressings**

Secondary dressings that are compatible with the primary dressing layer should be chosen. For example, if the cavity is dry and a hydrogel is being used to rehydrate the wound, a secondary dressing that absorbs exudate quickly may result in the primary dressing drying out over time. Similarly, when using absorbent dressings in the cavity, such as alginates, these need to be kept moist – in this case a foam secondary dressing may be able to support an optimal moist environment.

When wounds are highly exuding, the use of an adhesive foam dressing will help to absorb exudate as well as being retained on the wound. Advadraw Spiral can absorb large amounts of exudate and if Advadraw Spiral is used as the secondary dressing the exudate is quickly wicked away due to the rapid capillary action of these products. This method of exudate management is particularly effective in preventing damage to the surrounding skin.

**Managing infection**

When a cavity wound becomes infected, accurate and prompt diagnosis is a central part of the treatment.Clinicians should look out for the signs of local infection (listed on p.8) at each dressing change and any indication of a systemic infective response such as pyrexia or malaise should potentially be viewed as stemming from a wound infection. The risk of local infection is high due to the condition of the wound, tissue type, depth and exudate levels. Sepsis, which stems from pressure ulceration, is relatively common and is a major cause of death in patients with deep tissue injury – it is therefore crucial that clinicians are aware of the signs of infection (Redelings et al, 2005).

Due to the serious implications of spreading cavity wound infection, patients will require prompt treatment with systemic antibiotics and topical antimicrobials should be applied to the wound (Mackenzie and Lever, 2007). Referral to secondary care may be necessary if the patient’s condition fails to improve and close monitoring is important during this time. For some patients, the infection may progress to systemic sepsis – if this is the case they should be moved to a secondary care facility for more intensive treatment (Mackenzie and Lever, 2007).

**Reducing pain and trauma to the surrounding skin**

The skin surrounding a cavity wound is at risk due to the frequency of dressing changes required and the exudate levels which may leak onto the skin.

Dressing adhesives have been associated with skin stripping, which causes pain and allows the skin to be exposed to further damage (White, 2006). In order to reduce the likelihood of skin stripping, secondary dressings that have softer adhesive technology and are atraumatic should be used. The high exudate levels, if in contact with the skin, can cause irritation and pain for the patient.

In order to reduce this, dressings must be used which can cope with large volumes of exudate. In addition barrier films/creams should be used between dressing changes to protect the peri-wound area.

In order to deal with patient pain, it is beneficial to assess and document...
Case report 2

A 55-year-old man with long standing and advanced multiple sclerosis was reviewed and found to have two grade 3 pressure ulcers on the right and left ischium. The patient was unable to move his limbs without assistance and also required assisted feeding. The ulcers had been present for over 12 months and had consistently failed to respond to a variety of therapies. The wounds had been treated for the previous four weeks using a silver impregnated alginate.

On presentation the wound on the left ischium measured 4cm x 3cm, probing to 6cm at its deepest point (Figure 1). The wound on the right ischium measured 3cm x 3cm probing to 5cm deep (Figure 2). Both wound beds consisted of 100% granulation tissue, and were producing a low volume of exudate with a low viscosity. The patient did not find the wounds painful due to his condition.

Advadraw Spiral (Advancis Medical, Nottingham) was gently placed into the cavities, and the wounds covered with Allevyn Adhesive (Smith and Nephew Healthcare, Hull). These dressings were changed every 3 days. Additional care relating to pressure ulcer prevention and management complied with the Best Practice Statement in Pressure Ulcer Treatment and Management (QIS, 2005; www.nhshealthquality.org).

Following 6 days of treatment, the wound on the left ischium had reduced in size to measure 4cm x 2cm and 5.5cm at deepest point (Figure 3). The right ischium had reduced to 2.5cm x 2.5cm, measuring 4cm at its deepest point (Figure 4).

Following 21 days of treatment, the wound on the left ischium had reduced in size to 4cm x 2cm x 3cm deep. The wound on the right ischium measured 2cm x 1.5cm x 2cm deep. On day 32 of treatment, the left ischium wound measured 4 cm x 2 cm x 2cm deep (Figure 5), and the right wound 2cm x 1.5 cm x 1.5cm deep (Figure 6). Throughout this period the wound bed consisted of 100% granulation tissue and produced a small quantity of exudate.

Conclusion

In these two wounds which had been present for over 12 months, Advadraw Spiral appeared to reduce the depth of the wound consistently over a 34-day period. The depth of the left ischium wound had reduced in depth from 6cm to 2cm and in area from 12cm² to 8cm². The depth of the right ischium wound reduced from 5cm to 1.5cm and the area size from 9cm² to 3cm². This patient had co-morbidity factors that made healing a challenge. In the controlled environment of the hospital these wounds are continuing to improve.

Figure 1. Left ischium on day 1 of treatment.

Figure 2. Right ischium on day 1 of treatment.

Figure 3. Left ischium on day 6.

Figure 4. Right ischium on day 6.

Figure 5. Left ischium on day 32.

Figure 6. Right ischium on day 32.
Case report 3

A 96-year-old gentleman was admitted for hyperbaric treatment to an ENT ward for longstanding cancer of the mandible. The patient had been involved in a road traffic accident 18 years ago and due to crushing chest injuries had to have 3 ribs removed. Approximately 2 years ago the patient started experiencing an itch over the old surgical scar site. This developed into a sinus and for 18 months the district nurses had tried to promote healing by utilising various wound products.

On first review by the TVN the wound measured 0.5cm x 0.5cm and on probing measured 1.5cm at its deepest point (Figure 1). The wound bed was made up of granulation tissue and was producing a low volume of exudate. Advadraw Spiral was inserted into the sinus and covered with a secondary adhesive foam dressing. The dressing was changed every 2–3 days. After 7 days the wound reduced in size to measure 0.5cm x 0.5cm probing to 1.0cm at the deepest point (Figure 2).

Conclusion

Although the wound surface had not reduced in size, the sinus tract had reduced in length from 1.5cm to 1cm. The peri-wound skin had remained excoriated but appeared less dehydrated and the patient was experiencing less itching.
pain levels regularly and provide analgesia before dressing changes (Young and Barrett, 2006).

**Adequate nutrition and fluid intake**

Clinicians should encourage adequate nutrition and fluid intake, particularly if the wound is producing copious amounts of exudate. The role of nutrition in wound healing and in general patient well-being is well-documented. Despite this, studies show that many patients in both community and hospital settings remain in an under-nourished state (Sitton-Kent and Gilchrist, 1993). These studies highlight a clear correlation between slow wound healing and sub-clincial malnutrition. The wound healing process is complex and requires a number of nutritional factors to be present in order to meet the excessive demands that wound healing requires.

**Monitoring the wound**

All wounds will require regular review in order to ensure the treatment is optimal for the condition of the wound. If the sloughy tissue remains in the wound bed despite the application of a dressing, the treatment may need to be reviewed. For some patients, the cavity wound may be a symptom of underlying disease and in such cases, dressing changes may not have any effect on wound healing. For these patients, elimination or minimisation of complicating factors is the most critical aspect of care.

If the granulation tissue becomes dark in colour instead of red/pink, and breaks down easily, this is a sign that there may be infection present and an antimicrobial dressing could be necessary. An increase in exudate levels is also indicative of an increase in the bioburden and an antimicrobial product may be required as well as the use of an absorbent dressing.

Wounds that fail to progress may be exhibiting the signs of critical colonisation, which indicates an increase in the wound bioburden. The use of a topical antimicrobial product may help to reduce the bacterial levels in the wound and restart the healing process.

Infection of the wound itself may present as changes in the colour of the wound bed – the surrounding skin may also appear cellullitic. When there is infection present in the wound, the patient may experience unexplained pain in the wound and may feel generally unwell. In some cases, systemic antibiotics may be required and topical antimicrobial products will assist in reducing the bioburden in the wound bed.

**Conclusion**

Cavity wounds provide a number of management challenges. Central to dealing with the wound effectively is the need to ensure that any concurrent illnesses are being monitored and treated accordingly. A thorough patient and wound assessment as well as clinician and patient goals for treatment form the basis of the individual management plan. Tissue types and exudate levels will often determine which wound management product is selected. The challenge of a large, sloughy, malodourous, heavily exuding cavity is one that requires thought and planning and the selection of the appropriate management strategy.

**References**


**Key Points**

- When treating a patient with a cavity wound, management decisions must be based on the findings of thorough and holistic patient assessment.

- Concurrent illness and other factors which could influence wound healing must be addressed.

- Tissue types, exudate levels, and the local wound environment can all influence the management product selected.

- Advadraw Spiral is a capillary action dressing that is of great value in controlling the exudate produced by cavity wounds and promoting the healing process.
Ultimate pulling power

Advadraw dressings will rapidly absorb exudate, with a wicking action that quickly distributes absorbed fluid throughout the dressing achieving a balanced moist wound healing environment.

Advadraw
Capillary action dressing

Advadraw Spiral
Capillary action ribbon

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