Debridement of necrotic tissue and eschar using a capillary dressing and semi-permeable film dressing

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When managing wounds it is essential that a holistic approach to patient management be adopted that takes into account intrinsic and extrinsic factors that may prevent wound healing. Once the ‘healability’ of the wound has been established, appropriate management of the patient may proceed (Krasner, 2001).

Wound healing environment

A variety of underlying factors can inhibit wound healing. Once these are addressed, the selection of local treatment to the wound bed can be made, which will be determined by the clinical presentation of the wound and the management aims.

The commonest factors that affect the healing potential of a wound are: slough, necrosis, eschar and devitalised tissue; oedema; high bacterial load; infection; and excessive exudate (Thomas, 1997; Bembow, 1998; Bowler, 1999; Flanagan, 1999; Tong, 2000).

The terms slough, necrosis, eschar and devitalised tissue describe the results of the process of cell and tissues losing their blood supplies (becoming ischaemic) and dying (Cutting, 1996; Tong, 2000) (Table 1). This dead tissue can take several forms depending on the the tissue affected and the moisture level of the wound.

Necrosis describes the death of areas of skin tissue. It may be hard or spongy, depending on moisture level in the tissue, and is often black or grey in colour. In its dry state, it is called eschar.

Slough forms on open wounds, and is composed of a mixture of dead cell components, exudate and pus. It may be moist or dry, and vary in appearance from yellow, soft and viscous to black/brown, tough and leathery, depending on the moisture level in the wound.

Wound debridement

The removal of slough and necrotic tissue – the process of debridement (Table 2) – will enhance wound healing, reduce the potential for infection, and reduce odour and exudate (Tong, 2000). Falanga (2000) identified two phases of debridement: the initial phase is the removal of slough and necrotic tissue and the reduction of excess exudate; the maintenance phase is to keep the wound bed free of necrotic burden by the use of dressings or enzymatic products.

No single debridement technique is ideally suited to every clinical situation and in some instances, the best result might be achieved by using two or more methods sequentially (Thomas and Jones, 2001). The two case studies described here will show how hard leathery necrotic eschar was debrided using autolytic and mechanical (sharp) debridement techniques. (Mechanical debridement is a potentially risky procedure that should only be carried out by an appropriately experienced practitioner).

The two case studies are of patients with a history of pressure ulcer damage, and a haematoma secondary to a fall and pressure.

Case studies

Mrs S

Mrs S is an 84-year-old lady, with a history of arthritis, cerebral vascular accident (CVA) and multi-infarct dementia. Due to her deteriorating medical condition she is unable to initiate independent activities of living and relies on care staff in the nursing home to provide all care. She is nursed on a dynamic air mattress to prevent tissue damage.

MRS S AND MRS H

Mrs S presented with necrotic pressure damage to her right heel following hospitalization for cardiovascular accident. Mrs H, who had a history of dementia and self-neglect, was found to have a necrotic haematoma on her sacrum. Both presented with leathery necrotic eschar that did not respond to hydrogel or hydrocolloid dressings. Using Vacutex capillary dressing and Tegaderm vapour-permeable film as a secondary dressing, the wound margins showed signs of demarcation within a few days, and within one week I was able to sharp debride the wound, which prepared the wound for healing.
In April 2002 Mrs S had an extension of her CVA, resulting in admission to secondary care. On her return to the nursing home in May 2002 it was reported that there was tissue damage to her right heel as a result of pressure.

I was asked to assess the tissue damage. The clinical presentation was a hard leathery, black necrotic eschar, which measured 5 cm by 5 cm. It was difficult to define the grade of tissue damage (Box 1), but there was erythema surrounding the area of necrosis and heat indicating underlying tissue damage. The nursing report indicated that the wound had been treated with a hydrogel dressing and hydrocolloid dressing, neither of which had penetrated the necrotic tissue (Figure 1). An assessment of the lower limb indicated some arterial insufficiency and Doppler assessment of the ankle brachial pressure index (ABPI) of 0.7 supported the clinical findings.

Mrs H

Mrs H is a 78-year-old lady, with a history of dementia with associated agitation and self-neglect. She was admitted to a secondary care setting for assessment of her mental abilities. On admission it was noted that Mrs H falls on a regular basis. It was recorded that she had an haematoma on her sacrum, and within days this had become necrotic.

I was asked to assess the tissue damage. The clinical presentation was a hard leathery necrotic wound measuring 10 cm by 10 cm (Mrs H initially refused to be photographed). There was no evidence of any autolytic debridement, no odour or exudate. Mrs H did complain of pain, but was not able to describe how painful the wound was. She appeared pale, her skin showed signs of dehydration and she appeared to have lost weight (although she would not consent to being weighed). Routine blood test showed haemoglobin (Hb) 9 g/dl, iron 7.1 μmol/l and albumin 30 g/l, all indicating malnourishment (normal values are 12–15 g/dl, 10.7–32.2 μmol/l and 40–50 g/l respectively). Dehydration and malnutrition may have contributed to Mrs H's dementia. She was prescribed folic acid, ferrous sulphate and supplements foods, and was referred to the dietitian. To reduce the risk of further tissue damage she was nursed on a dynamic air mattress when in bed and when out of bed she was encouraged to walk around the ward and not sit on her sacrum.

**Box 1**

EPUAP pressure ulcer classification

| Grade 1 | Non-blanching erythema of intact skin. Discolouration of the skin, warmth, oedema, induration or hardness may also be used as indicators, particularly on individuals with darker skin. |
| Grade 2 | Partial thickness skin loss involving epidermis, dermis, or both. The ulcer is superficial and presents clinically as an abrasion or blister. |
| Grade 3 | Full thickness skin loss involving damage to or necrosis of subcutaneous tissue that may extend down to, but not through underlying fascia. |
| Grade 4 | Extensive destruction, tissue necrosis, or damage to muscle, bone, or supporting structures with or without full thickness skin loss |

Source: EPUAP, 1998

**Table 1**

<table>
<thead>
<tr>
<th>Definition</th>
<th>Presentation</th>
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<tr>
<td>Necrosis</td>
<td>Local death of tissue</td>
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<td>Slough</td>
<td>Dead cells, pus and serous fluid</td>
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<tr>
<td>Eschar</td>
<td>Dehydrated necrotic tissue</td>
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**Table 2**

**Principal methods of debridement**

| Surgical | Removal of slough, necrotic tissue and some healthy tissue by a surgeon under anaesthetic |
| Mechanical | Removal of slough, necrotic tissue by a competent practitioner (scissors, scalpel) |
| Biosurgical/enzymatic | Removal of slough by larval therapy (maggots), enzymes in a solution |
| Autolytic | Rehydration of the tissues using wound management products |
In both cases, application of hydrogels and hydrocolloids had failed to rehydrate the necrotic tissue, and an alternative was needed. Vacutex (Protex Capillary Dressings Ltd, Hampshire) is a non-woven, low adherent, occlusive capillary dressing, consisting of two outer polyester layers sandwiching a polyester cotton core (Figure 1). It works by capillary action, drawing exudate away from the wound site into the cotton core, thereby creating a clean wound environment and reducing potential maceration. Vacutex is a non-interactive, non-impregnated and suitable for most acute and chronic wounds (Deeth and Pain, 2001), although because of its capillary action, it is contra-indicated in arterial bleeds, vascular fungating and heavily bleeding wounds. The manufacturers of Vacutex recommend it for the treatment of necrotic tissue. It can be used in isolation on exuding wounds, but both the wounds discussed here required a moist environment to rehydrate the necrotic tissue. Covering the Vacutex with a semi-permeable film dressing would control moisture loss from the wound, while the Vacutex would prevent maceration of undamaged skin.

The film dressing chosen was Tegaderm (3M Healthcare, Loughborough), which is a vapour-permeable polyurethane film dressing coated with hypoallergenic acrylic adhesive (Morgan, 2000). Vapour-permeable film dressings differ in relation to thickness, weight, extensibility, moisture vapour transmission rate, and gaseous permeability (Thomas et al, 1998). Tegaderm was chosen for its ease of application.

**Case treatments**

**Mrs S**

With Mrs S, the dressings were applied daily for the first week. On the second day of application of the dressings, a visual demarcation line had begun to develop at the edges of the necrotic tissue. By the fifth day of application, I was able to mechanically debride the necrotic tissue. I was now able to define the depth of tissue damage, which was grade 4 on the EPUAP scale.

Following debridement, I continued to apply the same dressings, and after the first week the dressing regimen was reduced to 48 hr dressing changes. The wound continued to debride and contract. At 5 weeks the wound measured 2 cm by 1.5 cm, it was now grade 2 on the NPUAP (Figure 3). Dressings are now changed twice weekly, and the wound continues to heal.

**Mrs H**

Vacutex and Tegaderm were used in combination on a daily basis for the first week. After the third application there was a clear demarcation line surrounding the necrotic tissue. Following the sixth application I was able to mechanically debride the wound, leaving a layer of 100% sloughy tissue. The wound was defined as full thickness as it extended to the bone.

Dressings were applied daily and as there was an increase in exudate production, the film dressing was replaced with an adhesive foam dressing (Allevyn® Adhesive, Smith & Nephew Healthcare, Hull). On the 14th day the wound had debrided to the extent of having 95% granulation tissue with only 5% slough (Figure 4). The dressing regime continued with Vacutex and foam dressing every third day. At 4 weeks the wound...
measured 6cm by 2cm with 100% granulation tissue, and at 8 weeks the wound measured 2cm by 1.5cm with 50% granulation tissue and 50% epithelialising tissue, and is a partial thickness wound (Figure 5). With the help of the dietician, Mrs H’s nutritional status has improved, her mental health is improving, and she is now able to state she does not have any pain in her bottom, and is able to sit in comfort on a pressure-reducing cushion.

**Conclusion**
The use of Vacutex capillary dressing in conjunction with Tegaderm vapour-permeable film dressing was effective in the rehydration and debridement of leathery necrotic eschar in both these wounds. This enabled the mechanical debridement, which prepared the wound beds for healing.

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**KEY POINTS**
- Thorough assessment will assist with diagnosis and treatment interventions.
- Once the ‘healability’ of a wound is defined, management strategies should be led by the treatment objectives.
- There are two phases of wound debridement, removal of necrotic tissue and excessive exudate and the maintenance phase is keeping the wound free from the necrotic burden.
- To achieve wound debridement you may need to use two or more methods sequentially.
- Vacutex and Tegaderm in combination did prepare the wound bed for sharp debridement and for continued management.

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European Pressure Ulcer Advisory Panel (1998) Pressure Ulcer Treatment Guidelines. EPUAP, Oxford