Wound debridement: doing and teaching

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Abstract

Wound debridement is an important aspect of wound management – removing dead tissue reduces bacterial burden and accelerates healing. Surgical debridement is the quickest and most efficient when compared to other methods of debridement. As described in this paper, the techniques of surgical debridement can be easily taught in the skills laboratory with simulation models prepared at minimum cost.

Introduction

Debridement is the process of removing dead tissue and foreign bodies from the wound to expose viable underlying tissue. At times a wound may be covered by eschar, a hard black crust usually associated with burn wounds, but also occurring in other conditions. Escharectomy is a form of debridement for the removal of eschars [1].

The reasons for wound debridement include:

- The presence of dead or necrotic tissue is deleterious to wound healing and, if the natural process of debridement is accelerated, more rapid healing occurs [2].
- The presence of necrotic tissue increases the bacterial burden on the wound and it is recognised that wound healing is impaired by high bacterial counts [3].
- During debridement an inadequately drained pocket may be unroofed with drainage of pus.
- Infected wounds are usually malodorous and debridement reduces the odour.
- Debridement can initiate the healing process by creating an acute wound milieu [4, 5].
- The trauma of mechanical debridement results in recruitment of platelets and thus initiates the first stage of acute wound healing. Multiple growth factors critical to the wound healing cascade are found in the α-granules of platelets. Two of these growth factors, platelet-derived growth factor (PDGF) and transforming growth factor β, control wound healing during the inflammatory phase.

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Evidence

To date there are no published controlled trials to provide scientific evidence of the benefits of debridement in accelerating the wound healing process. However, indirect evidence supporting debridement is derived from the randomised trial of PDGF [REGRANEX™ Ortho-McNeil Pharmaceutical, Inc Raritan, NJ] conducted at multiple centres. In this trial the best outcome with REGRANEX was achieved at those centres performing the most frequent debridement [6].

Techniques

The techniques of debridement are surgical, mechanical, chemical, autolytic and biological. The key factors in deciding the method of debridement are outlined in Table 1.

Surgical debridement

Surgical debridement is the quickest and most efficient method of debridement. After application of EMLA™ cream on the wound for 15-20 minutes, without inflicting pain, a thin layer of slough over the wound bed can be gently removed with the help of a small curette. Rather than injuring living tissue, it is best to leave some dead tissue behind for later excision. A thick eschar can be excised after infiltrating deep to the eschar with local anaesthetic (Figure 1); this technique is described in detail in the literature [1].

Mechanical debridement

This is also known as wet-to-dry dressing, whereby wet saline gauze is allowed to dry on the wound. When the dressing is removed, the dead tissue is simultaneously pulled away. This method should not be used as it is usually very painful

Figure 1. Simulation model of sloughy wound.

and associated with bleeding. If the wound is covered with a thin layer of loose slough, this can be removed by forceful saline irrigation with a 30ml syringe fitted with an 18-gauge cannula. This will apply a pressure of about 15 psi to the wound [7] and will not damage the delicate granulation tissue.

The VERSAJET™ is a fluidjet powered surgical tool that can be used for debridement whilst sparing healthy tissue [8]. However, it is more suitable for debridement of large wounds in the operating theatre than in the wound clinic. Additionally, ultrasonic vibration at a high frequency [SonicOne™] [9] can be used for debridement with preservation of viable tissue and substructures.

Chemical debridement

Chemical debridement is performed by using certain enzymes and other compounds to dissolve necrotic tissue. A pharmaceutical version of collagenase is available and is highly effective as a debridement agent.

Autolytic debridement

In autolytic debridement the wound is kept very wet with dressings (hydrogels and hydrocolloids in relatively dry wounds; alginates and cellulose in moist wounds) to soften the necrotic tissue, which is removed slowly with repeated dressings. This method takes the longest time to work.

Biological debridement

Maggot therapy is a form of biological debridement. The larvae of *Lucilia sericata* (greenbottle fly) are applied to the wound. These organisms can digest necrotic tissue and bacteria, but leave normal healthy tissue. This method is rapid and selective, but may not be readily available and may not be acceptable to the sensibilities of some patients.

Aftercare

Following surgical debridement, the wound is usually packed with alginate dressings which help to control any bleeding. Moist dressings are usually employed after mechanical, chemical, autolytic and biological debridements.

Contraindications

Contraindications may been seen in terminally ill patients, unless the necrotic tissue is producing unacceptable odour, or in patients receiving anticoagulation, unless appropriate caution is taken. Pyoderma gangrenosum may also occur, as debridement may aggravate the wound (pathergy).

Eschar need not be excised: if it is firmly adherent; if there is no drainage from the wound; if there is no inflammation around the wound; if the peri-wound tissue is not tender; or on an ischaemic foot until there are signs of separation.

Qualifications and training

Medical practitioners and nursing staff involved in wound

Table 1. Key factors in deciding method of debridement (modified [5]).

	Surgical	Mechanical	Chemical	Autolytic	Biological
Speed	1	2	1	4	3
Tissue selectivity	1	3	3	3	1
Painful wound	4	4	1	1	2
Exudate	1	4	3	2	1
Infection	1	3	4	2	1
Cost	1	2	4	4	4

1=most desirable; 4=least desirable

care can perform wound debridements, with the exception of the surgical debridement, which requires the acquisition of specific skills and anatomical knowledge of the skin and underlying tissue. Persons performing surgical debridement must be aware of infection control procedures and the potential complications of surgical debridement and their management.

Surgical debridement can be taught using simulations with minimal cost and equipment, though a more costly training system is described in the literature [10]. A simulated wound covered with thick slough can be created on a pig trotter. An area of skin is then excised and a layer of hydrocolloid paste (e.g. ADAPT™, Hollister) is applied on the denuded area (Figure 1). A layer of toothpaste may then be applied and covered with a piece of GLAD™ Wrap, to simulate the application of EMLA cream. A small curette is then used to debride as in a human patient, after washing away the layer of toothpaste (= topical anaesthetic) (Figure 2).

Figure 2. Curetting slough from simulated wound.

Similarly, one can create an eschar on a pig trotter skin. An area of skin is marked out and then coagulated with diathermy (Figure 3). This simulates eschar seen in human patients (Figure 4). Escharectomy (Figures 5 & 6) is then performed as previously described [1].

The above methods were developed and successfully used by the author for teaching in a surgical skills laboratory.

Figure 3. Simulated eschar.

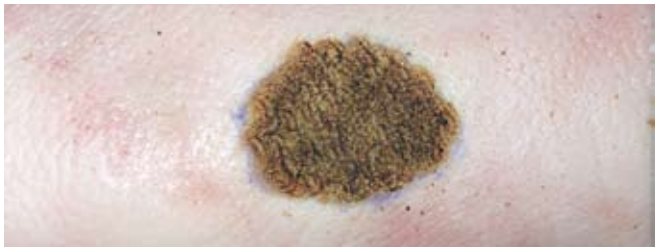

Figure 4. Escharectomy on a patient.

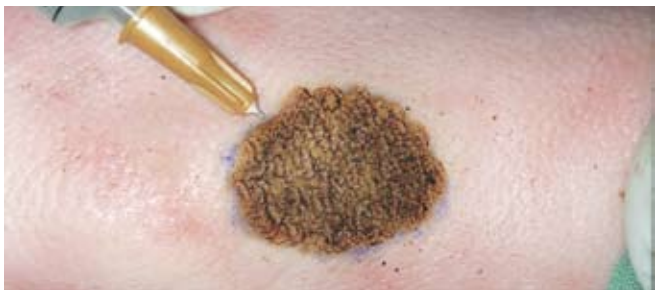

Figure 5. Escharectomy simulation – injecting local anaesthetic.

Figure 6. Escharectomy on simulated model.

Summary

Wound debridement is a useful adjunct in expediting healing. Surgical debridement is the preferred option, as it can be achieved with minimal cost and equipment and can be easily taught to staff involved in chronic wound management.

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