Debridement

The presence of a biofilm in a wound is know to be detrimental to wound healing[1-7] as is the case with the presence of necrosis or slough[8-12]. Thus, the removal of these harmful aspects, debridement, is essential for creating a healing wound environment.

The type of debridement chosen depends on a number of factors, such as suitability to the patient, the type of lesion, its anatomical location, the extent of debridement required, and equipment, techniques, and clinical expertise available in a given setting.

A number of materials and techniques is available for debriding lesions and they may be combined within one patient or used sequentially. The most common and important ones are listed below.

- Surgical debridement is used in many different types of lesions and includes a wide array of materials and devices, from curettes and scalpels to highly specialized knives such as the Humby knife, the Weck dermatome and the cautery knife, which are used for large-area debridement such as excision of full thickness burns[13-16]. Surgical, excisional debridement is quick and safe when done by a surgical but, indeed, requires a high level of expertise[17]. It is also relatively expensive because it typically has to be done in an OR setting. Depending on the technique and size of the excision, blood loss may be significant as well[18].

- Hydrosurgery uses high a thin, high-powered jet of saline combined with a venturi system to avoid aerosol formation, and is used in many different types of lesions[19-21]. It is precise and relatively quick21 but a certain level of expertise is required and the equipment is relatively expensive.

- Non-contact low frequency ultrasound is another way to disrupt biofilm and necrosis. It can be used in many indications although, in practice, its primary use is in skin ulcers[22 23]. It requires a certain level of expertise and is relatively expensive but quick.

- In the USA, two types of enzymes are used for debridement. Collagenase is used by some for the debridement of superficial partial thickness burns[24-26] but its use in skin ulcers is more common[27-29]. The compound is not very expensive and easy to use but debridement is slow with variable results[30] while certain topical side effects have been described[29 31]. Bromelain, an enzyme derived from pineapples, is approved in Europe as an alternative for surgical excision in deep burns[32-34]. It has been used with favorable results. The procedures have to be done in the OR, a learning curve exists and the procedure causes pain for up to 24 hours[32 35 36].

- Biosurgical procedure uses a specific type of maggots. This method is very precise (since the animals only remove dead tissue) and relatively cheap and fast. Frequently, the patient has to overcome a psychological barrier, however [37-40].

- Negative pressure wound therapy (NPWT) uses suction to remove unwanted tissue and debris from a lesion. A tight seal is created around the lesion and an external suction device is connected to the seal via a valve. Is it successfully used for both trauma and ulcers with the most extensive clinical documentation for diabetic foot ulcers [41-43] and venous leg ulcers[44-46].

Although a wide range of NPWT devices exist, equipment is relatively expensive, and the seal may fail relatively frequently on certain anatomical locations.

• Surfactants, organic compounds that contain a hydrophobic and a hydrophilic region arrange themselves in spherical aggregates (micelles) when in an aqueous system. Micelles trap fragments of loose tissue and flushing the wound will remove the tissues within the micelles[47-49]. Surfactants are easy to use, relatively inexpensive but they take a long time for a wound to be cleaned.

• Wet-to-dry debridement uses moist gauze that, when dried out, sticks to the tissues in the wound: upon removal of the gauze the tissue is removed as well. This is one of the oldest techniques for debridement and it is easy and cheap. The major drawback is the that the technique is unspecific[50 51]: necrosis but also viable tissue may be removed and removal of the dressing per se is typically painful[52]. These side effects make for the use of the wet-to-dry technique to be considered sub-standard practice[53]

• Autolytic debridement relies on the bodily systems for cleaning up a wound[54]. The efficacy of this method depends on the wound environment and, thus, is improved by using dressing that create a moist environment, which is shown to allow for better survivability and mobility of cells such as neutrophils and macrophages[55-58]. Autolytic debridement is easily promoted by using the appropriate dressings but the dressings themselves may be relatively expensive and autolysis is slow.

DEBRICHEM debrides in a way that is different from the materials and techniques mentioned above. DEBRICHEM is an active gel containing an acidic species with a potent hygroscopic action59 which, when in contact with microorganisms and necrosis, leads to swift desiccation and carbonization of the proteins in bacteria, yeasts, and viruses, as well as of necrosis and the extracellular matrix of biofilms. The resulting dead materials rapidly slough off, thus removing elements from the wound surface that are detrimental to wound healing and allowing the development of granulation tissue and subsequent reepithelialization.

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