Combined debridement in chronic wounds: A literature review

Wan-Lin Liu a, Yun-Lan Jiang b,*, Yan-Qiao Wang b, Ying-Xin Li a, Yi-Xian Liu a

a Nursing Department, Chengdu University of Traditional Chinese Medicine, Chengdu, Sichuan 611137, China
b Teaching Hospital, Chengdu University of Traditional Chinese Medicine, Chengdu, Sichuan 610072, China

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ABSTRACT

Wounds debridement is important for healing of chronic wounds. Combined debridement is a new technique to deal with the complex chronic wounds. This review introduces several topical methods of combined debridement according to the various color classifications. Methods include combined sharp and hydrogel debridement, combined ultrasonic and enzymatic debridement, ultrasonic debridement combined with surgical debridement and vacuum aspiration on debridement, and other types of debridement. This article also explores why each combined debridement mentioned above can achieve a good effect.

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1. Introduction

Chronic wounds are wounds that cannot heal within 2 weeks because of the influence of such factors as infection and foreign objects. Diabetic foot ulcers, pressure ulcers, arterial ulcers, venous ulcers and fungus-infected wounds are the primary types of the chronic ulcers. Chronic wounds represent a large health care burden. The reasons for chronic wounds are complex. Chronic disease, vascular insufficiency, diabetes, neurologic defects, nutritional deficiency, advanced age, and local factors such as pressure, infection, and edema can all impair healing. The characteristics of chronic wounds are complex too. Unlike acute necrotic wounds that are covered with a fresh moist eschar where the denatured collagen still maintains its structure, chronic wounds are often covered with dry, leather-like, thick plaques. The characteristics of the eschars are different even within one wound, therefore choosing more than one type of debridement method when dealing with a chronic wound is necessary.

Debridement is removal of necrotic tissue and foreign objects from the wound to expose the underlying viable tissue in an effort to promote and expedite wound healing. It is a major component of the overall management of the wound and the patient. Many types of traditional debridement methods are available such as autolytic, enzymatic, biodebridement, mechanical, conservative sharp and surgical. In recent decades, many new types of debridement were invented such as a Versajet—kinds of fluid jet technology, ultrasound debridement therapy, hydrosurgery debridement and Monofilament polyester fiber pad debridement.

Combined debridement is a concept brought forward in 2006 and is developing quickly. The primary purpose of combined debridement is to use more than one type of debridement method in chronic wounds in order to find the best way of dealing with different parts of eschars and their different pathological tissues. Combined debridement can take advantages of more than one type of debridement method when dealing with a complex wound.

The purpose of this article is to review different types of combined debridement in dealing with different types of chronic wounds.

2. Description of chronic wounds

An accurate description of the tissue is important. The wound healing continuum and it is seen as a practical way of guiding chronic wounds assessment and intervention. The three-color concept is used to describe the wounds (Fig. 1). Those three colors are red, yellow and black. Red wounds indicate healthy granulation tissue. The yellow signifies the inflammatory exudate and damaged tissue and black wounds are characterized by necrotic tissue. However, sometimes this is brown. In recent years, the colors pink and white have been
added to this theory in order to describe wounds better. As debridement mainly addresses black and yellow wounds, this review focuses on these wounds.

3. Search strategy

A systematic search of two electronic databases, PubMed and CNKI, was undertaken on Dec, 2015. PubMed was searched using the MeSH search terms: combined OR hybrid AND debridement AND chronic AND wound; CNKI database was also searched using these search terms. In addition, references of all relevant papers identified from these databases were examined for any related publications.

4. Specific methods and reasons

4.1. The black wounds

4.1.1. Specific methods for black wounds

See Table 1.

4.1.2. Reason analysis

4.1.2.1. The reason for effectiveness of combination of sharp and autolytic debridement. A black wound indicates the presence of necrotic tissue which may be hardened and is known as “eschar”. For black and hard crusting wounds, using conservative sharp debridement first combined with autolytic hydrogel debridement has a good effect. The key of this combined debridement lies in “dissolve while pruning”. This method not only prevents damage to the normal tissue but also will not cause bleeding and pain while accelerating the process of debridement. Hydrogel has unique gel particles. It can increase the activity of organization, thus generate the phenomenon of both debridement and growth at the same time. Due to the removal of necrotic tissue timely, the inflammatory reaction is controlled which can help the healing of wounds.

4.1.2.2. The reason for effectiveness of combination of ultrasound and enzymatic debridement. Demir et al concluded that ultrasound improves wound healing, probably due to its mechanical effects. The effects of the ultrasound include heat generation, a promotion of cell proliferation, improvement of local circulation and oxygenation, wound cleansing, and inhibition of bacterial growth, all of which contribute to improved wound healing. Ultrasound induces the formation of pinpoint depressions or micro channels in the tissue through which the enzymatic debridement is forced into the eschar, so this combination has better effects.

4.2. Both yellow and black color in one wound

4.2.1. Specific methods for both yellow and black color in one wound

See Table 2.

4.2.2. Result reasons analysis

4.2.2.1. The reason for effectiveness of combination of hydrogel and sharp debridement. This type of wound also contains necrotic tissue in the form of slough. This may range in color from white to yellow to black. Hydrogel debridement method belongs to the category of autolytic debridement. Autolytic debridement is the gentle separation of slough and necrotic tissue from the wound bed, which

<table>
<thead>
<tr>
<th>Authors</th>
<th>Wound etiology</th>
<th>Wound characteristics</th>
<th>Debridement methods</th>
<th>Debridement steps</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mei Hong Chen</td>
<td>Chronic pressure ulcers</td>
<td>Dry hard black crusting</td>
<td>Sharp debridement and autolytic hydrogel debridement</td>
<td>Chose conservative sharp debridement with an eye vascular clamp to separate hard necrotic tissue from the wound bed and cut it down with sterile scissors first. Then used autolytic hydrogel debridement. Smeared hydrogel approximately 5 mm thick. First applied anesthetic gel (lornacetane 2%). Then, used combined ultrasonic and enzymatic debridement in flap perforation within 2–5 min.</td>
<td>The wounds all healed</td>
</tr>
<tr>
<td>Reuwen Gurfinkel</td>
<td>Burn eschars</td>
<td>Both black dry and liquefied necrotic eschars</td>
<td>Combined ultrasonic and enzymatic debridement therapy</td>
<td></td>
<td>This therapy is more rapid and effective than either method alone</td>
</tr>
</tbody>
</table>
occurs slowly in a moist wound environment. Hydrogel wound dressings promote autolytic debridement by rehydrating desiccated and devitalized tissue, aiding its separation from healthy tissue. It is not suitable for doctors to choose autolytic debridement when only dealing with black tissue because it will take a long time to finish. Yellow tissue is suitable because it is softer than black tissue. A shorter debridement period is mainly caused by the “dissolve while pruning” method. For yellow wounds, this method not only has the effect of removing scab shell but also removes bacterial biofilms, reducing inflammation and controlling infection. Autolytic debridement is more suitable for shallow damaged tissue, such as pressure ulcer degree II and degree III, so surgical debridement combined with autolytic debridement in the wounds works well.

4.2.2.2. The reason for effectiveness of combination of ultrasonic, surgical debridement and vacuum aspiration debridement. The theory of ultrasonic debridement is based on transmitting a certain dose of ultrasonic waves to human tissue, creating a biological effect, and changing the organization status and functions of its components, resulting in treatment of the disease. Surgical debridement is the fastest and usually most thorough method available. Pressure suction can remove the damaged tissue as well as wound exudate timely and thoroughly. It also has the effect of reducing the number of bacteria, destroying the bacterial survival environment and preventing bacteria from invading deep tissue. The combined use of the two debridement methods has a better effect on wound healing and pain relief.

4.3. For other types of chronic wounds

If the wound edges have rolled and become quiescent, the patient should be taken to the operating room for surgical wound edge debridement and a topical negative pressure (or vacuum-assisted closure) dressing subsequently applied. Regarding fungus-infected wounds, palliative treatment is another choice beside curative treatment. Debridement has the effect of reducing the stench and pain.22

5. Conclusions

At present the choice of debridement method largely rests on each clinician’s experience24; therefore, an acknowledgment of the best way of dealing with different types of chronic wounds is needed. Although this review introduced the different types of combined debridement according to the different color of the wounds, debridement still requires a full assessment of both the wound and the patient by a holistic framework, identifying wound etiology and other factors that may be hindering healing, such as pain, nutrition, and anemia.25 The color of the wounds is a basic frame of reference for choosing the method of debridement in addition to the importance of the overall assessment of the patient.

Conflict of interest

All contributing authors declare no conflicts of interest.

References


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