Chemical debridement for venous leg ulcers

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Question

What is the best available evidence regarding the use of chemical agents for debridement of venous leg ulcers?

Clinical Bottom Line

During the natural healing process the wound is cleared of cellular debris through the phagocytic activity of macrophages and lymphocytes; a process referred to as autolysis. It is believed that the presence of non-viable tissue may delay the healing process by inhibiting the migration of epithelial cells and act as a medium for bacteria [1] (Level IV).

When the granulation process and the subsequent epithelialisation of the wound are inhibited due to the presence of non-viable tissue, a common practice in the management of venous leg ulcers is to debride the wound bed of the non-viable tissue [1,2,3] (Level IV). Debridement is recognised as an important element of wound bed preparation [4] and is defined as 'the removal of foreign matter or devitalized, injured, infected tissue from a wound until the surrounding healthy tissue is exposed' [3] (Level IV).

The term "chemical debridement" is often used interchangeably with the term "enzymatic debridement" and involves the application of chemical / enzymatic agents to the wound bed in order to degrade non-viable tissue without causing harm to newly granulating tissue [8] (Level I). This evidence summary distinguishes chemical debridement from enzymatic debridement on the basis of the chemical agents most commonly associated with each*. In chemical debridement the chemical agents most commonly used are hypochlorite solutions (for example, Edinburgh University Solution of Lime; EUSOL), sodium hypochlorite (bleach) and sodium hypochlorite combined with boric acid (for example, Dakin solution) [5] (Level III). Hydrogen Peroxide is also included as a chemical agent [6] (Level III).

The use of hypochlorite solutions and sodium hypochlorite in debridement of human tissue is associated with cytotoxicity. If chemical agents must be used it is important to minimise adverse effects, careful attention must be given to the strength of the solution in order to determine the dilution required to ensure the viability of fibroblasts [5] (Level III).

Evidence for cytotoxicity is mainly from *cellular in vitro* studies which show damage to fibroblasts and keratinocytes; hydrogen peroxide was found to be highly cytotoxic to fibroblasts and keratinocytes while normal saline was shown to be the least cytotoxic [6] (Level III).

Decisions to use solutions containing hypochlorite or Hydrogen Peroxide as cleansing agents must consider all available information, including the needs of the patient, the environment and local guidelines [7] (Level IV). Due to the high level of cytotoxicity to cells the use of chemical solutions containing hypochlorite or hydrogen peroxide is strongly discouraged by many health professionals; a safer alternative debriding agent is recommended [10] (Level IV).

Risk Factors

- Chemical agents should be used judiciously and only be applied to non-viable tissue within the wound and care taken to avoid contact with normal or healthy skin or tissue surrounding the wound [2] (Level IV).
- In vitro studies report high cytotoxicity associated with the use of hypochlorite solutions and hydrogen peroxide. Careful consideration must be given to the strength of the solution in order to determine the dilution required to ensure the viability of fibroblasts [5,6] (Level III).
- Due to the high level of cytotoxicity to cells the use of chemical solutions containing hypochlorite or hydrogen peroxide is strongly discouraged by many health professionals; a safer alternative debriding agent is recommended [10] (Level IV).

Other Factors for Consideration

- While there is a lack of high quality research evidence demonstrating the benefits of debridement, its importance in wound healing is recognised [2] (Level IV).
- The form of debridement should be selected with the following in mind [3] (Level IV):
  - Wound location
  - Extent of non-viable tissue
  - Presence of infection
  - Exudate volume and viscosity
  - Patient compliance with therapy
  - Patient choice where appropriate

Characteristics of the Evidence

This evidence summary is based on a structured search of the literature and selected evidence-based health care databases. The evidence in this summary is from:

- Two literature reviews summarising the effectiveness of a number of debriding techniques [1,3]
- A review that summarised a number of debriding techniques and reported on a multi-centre, randomised controlled trial [2]
- A review explaining the application of the TIME acronym in the systematic assessment of chronic wounds [4]
- A literature review that summarised the development of wound care practices over time [5]
- A study that evaluated the cytoxicity of 17 cleansers and 3 liquid bath soaps on human infant dermal fibroblasts and epidermal keratinocytes [6]
- An article that reports on the factors that influence clinical decisions in choosing anti-microbial agents [7]
- A systematic review that assessed the efficacy of enzymatic debridement in comparison with autolytic debridement [8]
- A systematic review that assessed 35 studies on debridement and concluded that due to methodological limitations, there was insufficient evidence for choosing one debridement method over another [9]

Best Practice Recommendations

- Chemical debridement should be accompanied by best practice wound care (Grade A).
- A useful framework guiding clinical practice about debridement is the 'TIME' concept. A clinical assessment of the wound **T**issue, **I**nflammation, **M**oisture and **E**dge guides decisions regarding optimal wound bed preparation (Grade B).
- The evidence for the cytotoxicity of chemical debridement is largely from *in vitro* studies; extrapolating these findings to *in vivo* application is difficult (Grade B).
- Decisions to use solutions containing hypochlorite or Hydrogen Peroxide as cleansing agents must consider all available information, including the needs of the patient, the environment and local guidelines (Grade B).
- When using solutions containing hypochlorite or Hydrogen Peroxide as debriding agents careful consideration must be given to the appropriate dilution required to ensure the viability of fibroblasts (Grade A).

References

* Common enzymatic agents used are collagenase or papain-urea (with and without chlorophyllin) [2]. The reader is directed to the Evidence Summary "Enzymatic debridement for venous leg ulcers" for further information.

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10. Wound Healing and Management Node: Expert opinion from Reference Group Members (April 2010).