WOUND CLEANING AND WOUND HEALING – A CONCISE REVIEW

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Background

Three procedures; debridement, irrigation, and cleaning form the basis of standard wound care and are widely held to improve the healing of chronic wounds.

• Debridement describes the mechanical removal of dead tissue;
• Irrigation applies the fluid streams under pressure to the wound; and
• Cleaning (also termed “cleaning”) the more gentle application of any fluid to the wound.

Published literature shows that cleaning improves the wound environment and accelerates healing. Although the cleaning of wounds with antiseptic solutions prevents infection¹ it is not well established that irrigating wounds with a sterility solution enhances wound healing.

Objectives

• The objective of this review is to evaluate the safety and efficacy of currently available wound cleaning agents and their ability to enhance wound healing.

Methods

This review is based on a literature search for studies addressing cleaning of chronic wounds. The search was performed in February 2012 at PubMed using the following terms: Chronic[All Fields] AND (“wounds and injuries”[MeSH Terms] OR “wounds”[All Fields] AND “injuries”[All Fields]) OR “wounds and injuries”[All Fields] OR “wound”[All Fields] AND “cleaning”[All Fields] OR “cleaning”[All Fields] OR “cleaning”[All Fields] OR “washing”[All Fields]) AND “humans”[Medline Terms].

One hundred and sixteen papers were found and 31 were analyzed in detail following a preliminary review. Further relevant papers were cited in these 31 publications, and have been included.

Classification of the evidence of the effect of the cleaning agents was that proposed by the American Association of Chest Physicians Task Force (AACCP).

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Results & Summary

Options for Wound Cleaning

Efficacy in enhancing wound healing is reported for many antiseptics, but positive effects on wound healing are not well defined, and systemic iodine absorption may produce toxic side effects. Comprehensive reviews describe the conflicting results of multiple animal and human studies assessing the potential toxicity and the effect on healing rates associated with iodine preparations.¹¹ One explanation may be that iodine solutions do not inhibit wound healing in vivo, but many clinically available preparations also include detergents, which do delay healing, and the wound must be irrigated with water or saline after use if iodine cleansing solutions with detergent are to be used.¹² No studies have shown a statistically significant benefit from the use of povidone iodine in wounds other than burns although pooled data from two studies in the healing of lacerations suggest that povidone iodine might be superior to saline.

Silver, chlorhexidine and alcohols

Silver, when ionized, is an effective antimicrobial. However, its duration of action may be shortened by binding to proteins or chloride ions, and there is no evidence that it accelerates healing. Chlorhexidine is available both as a dilute (0.05%) solution for wound irrigation, and as a 2% or 4% skin scrub. The latter is sometimes inadequately used for wound care. There is some evidence of toxicity and little evidence of efficacy at either concentration.¹³ Ethanol, isopropyl alcohol and propylene glycol are widely used for surface disinfection and skin antisepsis; antimicrobial activity requires a concentration of > 50% and ideally in the range 60-90%.

Povidone Iodine

Povidone iodine preparations are effective antimicrobial agents, but positive effects on wound healing are not well defined, and systemic iodine absorption may produce toxic side effects. Comprehensive reviews describe the conflicting results of multiple animal and human studies assessing the potential toxicity and the effect on healing rates associated with iodine preparations.¹¹ One explanation may be that iodine solutions do not inhibit wound healing in vivo, but many clinically available preparations also include detergents, which do delay healing, and the wound must be irrigated with water or saline after use if povidone iodine cleansing solutions with detergent are to be used.¹² No studies have shown a statistically significant benefit from the use of povidone iodine in wounds other than burns although pooled data from two studies in the healing of lacerations suggest that povidone iodine might be superior to saline.

Implications for Clinical Practice

The efficacy of the various agents for wound cleansing is summarized in Table 1 together with the strength of evidence classification. While all active agents are effective antimicrobially, efficacy in enhancing wound healing is uncertain. The one exception seems to be povidone iodine / betaine, with several studies indicating efficacy in enhancing wound healing. Water and electrolyte solutions are ineffective.

To summarize, some level of effectiveness regarding wound healing in vivo has only been documented for povidone / betaine and to a lesser degree (2C) for povidone iodine and silver, which is in line with their anti-microbial activity in vitro, while for the remaining compounds no positive clinical effects on wound healing have been demonstrated.

Table 1: Summary of cleaning agents

<table>
<thead>
<tr>
<th>Cleaning Product</th>
<th>Improves Wound Healing</th>
<th>Effective Anti-microbial Agent Against Common Wound Contaminants</th>
<th>Toxicity in vitro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic Acid</td>
<td>Ineffective: 2C¹⁵</td>
<td>Effective: 2B¹⁷</td>
<td>Toxic: 1B¹¹</td>
</tr>
<tr>
<td>Alcohol</td>
<td>Ineffective: 1B¹⁷</td>
<td>Effective: 1B¹⁷</td>
<td>Toxic: 1B¹⁷</td>
</tr>
<tr>
<td>Chlorhexidine</td>
<td>Ineffective: 2C¹⁴,¹⁵</td>
<td>Effective: 2B¹⁷</td>
<td>Toxic: 1B¹⁷</td>
</tr>
<tr>
<td>Hydrogen peroxide</td>
<td>Ineffective: 2C¹⁴</td>
<td>Effective: 2B¹⁷</td>
<td>Toxic: 1B¹⁷</td>
</tr>
<tr>
<td>Polyhexanide / betaine</td>
<td>Effective: 1B¹⁷,¹⁸,¹⁹</td>
<td>Effective: 2B¹⁷,¹⁸,¹⁹</td>
<td>Toxic: 1B¹⁷</td>
</tr>
<tr>
<td>Povidone Iodine</td>
<td>Effective: 1B¹⁷,¹⁸,¹⁹</td>
<td>Effective: 2B¹⁷,¹⁸,¹⁹</td>
<td>Toxic: 1B¹⁷</td>
</tr>
<tr>
<td>Saline</td>
<td>Ineffective: 1A²²</td>
<td>Effective: 1B¹⁷</td>
<td>Toxic: 2C¹⁵</td>
</tr>
<tr>
<td>Silver (ionized)</td>
<td>Effective: 2C,²⁰,²²,²³</td>
<td>Effective: 1B¹⁷</td>
<td>Toxic: 2C¹⁵</td>
</tr>
<tr>
<td>Sodium hypochlorite</td>
<td>Effective: 1B¹⁷,¹⁹</td>
<td>Effective: 1B¹⁷</td>
<td>Toxic: 2C¹⁵</td>
</tr>
<tr>
<td>Water</td>
<td>Ineffective: 1A²³</td>
<td>Effective: 1B¹⁷</td>
<td>Toxic: 2C¹⁵</td>
</tr>
</tbody>
</table>

Key References

15. Additional references are available upon request.