Critical colonisation and local infection – current therapy by use of polihexanide

Th. Eberlein
Private practice, Nürnberg, Germany

The basic problem

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The problem of chronic wounds is rapidly increasing; by now it has in fact developed into an issue of considerable import from the diagnostic, therapeutic, and socio-economic perspective.

All things considered, it would be a safe estimate to assume an overall prevalence of approximately 2% in the total population for each type of (chronic) wounds. At least 2/3 of these occur at the leg level. The risk of chronic wounds increases exponentially with advancing age.

The current situation still has to be regarded as unsatisfactory with regard to diagnostic clarification and adequate management of wound patients. A common problem in wound management is the lack of a causal connection, which has to be made in order to properly acknowledge a wound as a symptom of an often complex medical condition rather than a separate and/or random event.

Also, the issue of chronification of wounds (in terms of an absence of controlled repair processes over a period of at least six months) is not fully understood. In the context of such chronification, the changes in the microbial situation is another immensely important factor in addition to the effects of the underlying conditions that have originally caused the wound.

The microbial situation in the wound

As a general rule, secondarily healing wounds are always affected by microbial contamination. Chronic wounds are almost always colonised. In a “controlled” setting, this does not seem to prevent the progress of wound healing. More often than not, however, this situation gets out of hand — it progresses to the clinically defined intermediate stage of critical colonisation, which then leads to local infection. Depending on the site, type and origin of the wound and the duration of treatment, infections occurring during the treatment of secondarily healing wounds are reported at rates between just under 2% and more than 7%. In some cases up to approx. 10%.

Chronic wounds always have a microbial load. This is a generally acknowledged fact. With regard to the actual microbial load present, and in particular in terms of clinical appearance, chronic wounds at different times during their existence will show different “states of aggregation”. In this context, it is important to distinguish between contamination (the presence of microorganisms without proliferation) and without a host reaction) on one hand and colonisation (limited proliferation, no host reaction) and in particular infectious situations on the other.

The transition from one microbial situation to another is contingent upon various host-specific and/or pathogen-specific factors; moreover, this process is also affected to a significant extent by the overall hygiene conditions of the specific environment.

Table 1: Definitions (according to Kramer, modified)

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition and general recommendation for measures to be taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contamination</td>
<td>Microbial attachment, no proliferation of microorganisms → cleansing, prophylactic antiseptic treatment as required to prevent infection</td>
</tr>
<tr>
<td>Colonisation</td>
<td>Proliferation on the wound at a non-critical level, no clinical host reaction, i.e., no inflammation → no intervention (except in case of MRE)</td>
</tr>
<tr>
<td>Critical colonisation</td>
<td>Chronic wounds: no invasive infection, but release of toxins causes a delay in wound healing without manifest signs of inflammation → inhibition of reparative processes, wound healing may stagnate → “mild” local antimicrobial measures</td>
</tr>
<tr>
<td>Infection</td>
<td>Local and/or systemic host reaction (infectious disease; sepsis) with inhibition or even stagnation of wound healing → antiseptic therapy</td>
</tr>
</tbody>
</table>

Table 1 shows a synopsis and definition of these different conditions.
### Symptoms and signs

<table>
<thead>
<tr>
<th></th>
<th>Contamination</th>
<th>Colonisation</th>
<th>Critical colonisation</th>
<th>Local infection</th>
<th>General infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tendency</td>
<td>Improving</td>
<td>Improving</td>
<td>Stagnating</td>
<td>Deteriorated</td>
<td>Deteriorated</td>
</tr>
<tr>
<td>Temperature</td>
<td>NAD</td>
<td>NAD</td>
<td>NAD</td>
<td>+/−</td>
<td>+</td>
</tr>
<tr>
<td>Lab parameter inflammation</td>
<td>NAD</td>
<td>NAD</td>
<td>NAD</td>
<td>+/−</td>
<td>++</td>
</tr>
<tr>
<td>Signs of inflammation</td>
<td>None</td>
<td>None</td>
<td>None laxate</td>
<td>at wound edges</td>
<td>Erysipelas, Streptococcal, lymphangitis/adenitis</td>
</tr>
<tr>
<td>Degree of exudation</td>
<td>O -O0</td>
<td>O -O0</td>
<td>↑</td>
<td>↑ (O0 -O0)</td>
<td>↑ (O0 -O0)</td>
</tr>
<tr>
<td>Wound odour</td>
<td>NAD</td>
<td>NAD</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Discoloration</td>
<td>NAD</td>
<td>NAD</td>
<td>+/−</td>
<td>++/−</td>
<td>++/−</td>
</tr>
<tr>
<td>Purulence</td>
<td>NAD</td>
<td>NAD</td>
<td>+/−</td>
<td>++/−</td>
<td>++/−</td>
</tr>
<tr>
<td>Biofilm</td>
<td>+/−</td>
<td>+/−</td>
<td>+++/−</td>
<td>+++/−</td>
<td>+++/−</td>
</tr>
<tr>
<td>Granulation</td>
<td>NAD</td>
<td>NAD</td>
<td>pale gray, reddish brown, pale, oedematous, easily vulnerable; propensity for bleeding: often no new growth</td>
<td>pale, oedematous easily vulnerable</td>
<td>pale, oedematous easily vulnerable</td>
</tr>
<tr>
<td>Epithelisation</td>
<td>NAD</td>
<td>NAD</td>
<td>often no new growth</td>
<td>no new growth</td>
<td>no new growth</td>
</tr>
</tbody>
</table>

**Key:** + positive - negative  O light exudation  O00 medium exudation  O000 heavy exudation

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### Wound infection - risks and clinical aspects

First and foremost, a case of wound infection has to be clinically diagnosed. In the process, the following aspects should be considered:

- The development of wound infection is contingent upon the pathogenicity and virulence of the microorganism and the immune competence of the host.
- The interaction between the pathogen and the host does not always lead to an actual illness; additional concepts and definitions for these steps are needed in this context.

In clinical terms, the transition from the stage of colonisation (which is typical of chronic wounds) to local infection is referred to as "critical colonisation". As this is a particularly critical phase in the treatment of wounds, the transition should by all means be prevented. A synopsis is presented in Fig 1.

The complication of infection is a huge risk factor in the process of wound healing, and its occurrence will affect the prognosis not only in "quod sanationem", but often also in "quod vitam" terms. Thus the prophylaxis and therapy of wound infection are important issues in the context of wound treatment.
The basic therapeutic principle is to use local treatment for local infections and adequate systemic treatment (which may be combined with local measures as required) for systemic infections. In the context of local treatment, the selection of appropriate antimicrobial substances is a major issue. From this we can see that the management of chronic wounds requires a concept which will not only have a positive influence on all the other environmental factors involved (management of environment, necrosis, and exudation), but also afford a high degree of safety with regard to the prevention of microbial complications ("microbial management").

Selection of antimicrobial substances

One substance which is particularly appropriate for this purpose is the cationic polymer polyhexamethylene biguanide (polihexanide; PHMB). Due to its unique properties, it lends itself to being used in the treatment of wounds. This applies in particular to its antimicrobial properties, which facilitate

- effective reduction of microbial loads,
- with a broad spectrum of activity,
- even in a long-term therapy setting.

Thus, the relevant criteria for use in typical chronic wounds are a reliable microbicidal effect against all pathogens that may be involved, a rapid onset of effect, and adequate objective and subjective tolerability without any relevant side effects.

According to the consensus recommendation for the selection of active substances for wound antisepsis, polyhexamethylene biguanide (PHMB, polihexanide, a cationic polymer) is the substance of first choice for long-term therapy and for the treatment of poorly healing chronic wounds.

With the advent of Suprasorb® X+PHMB, there is now a wound dressing available which combines the special properties of so-called HydroBalance and the antimicrobial effectiveness of PHMB. The result is a wound dressing with excellent antimicrobial properties, superior reliability and safety of use (even when dealing with multiresistant pathogens), great therapy comfort, and unique exudates management properties. This is the first product which provides the defined antimicrobial properties (also approved for infected wounds) in the form of a wound dressing.

It definitely constitutes a valuable addition to the existing therapeutic spectrum as a whole.

References