A 95-year old patient with a pressure ulcer. The wound was located on the left heel and had been present for 2 weeks. On randomisation, the wound had improved; at 14 days there was a reduction in tendon exposure and granulation tissue was beginning to cover the wound edge. The remainder of the wound environment had progressed. Upon the development of healthy granulation tissue, the treatment dressing was changed to HydroClean® plus and secured with a film dressing. Once the wound was cleaned and healthy granulation tissue covered the wound bed, HydroTac® was used to promote the latter stages of wound healing, in particular contraction and associated concentration action of the foam layer, which once it is taken up by the foam layer acts as a semipermeable membrane to protect the wound edge, and the impact of patients’ quality of life (Table 3).

### CASE STUDY 1. PRESSURE ULCER WITH 100% NECROSIS

**Introduction**

HydroTac® and the sustained epithelialisation of wound healing are key requirements for the efficient management of chronic wounds and wounds with impaired healing. Wound bed preparation offers a systematic approach to all stage wound progression towards promoting wound bed preparation and wound healing (Table 1).

**Clinical evidence for HydroTac®**

Clinical evidence for HighHydro® derives from a number of studies, including 75 patient, multicentre, open randomized and controlled studies (e.g. Schultz et al., 2013) with a combined patient population of over 2300. In a double-blind, placebo-controlled study involving 64 patients with chronic wounds (Günter et al., 2008), the HydroTac® group showed significantly faster wound closure with a numerical advantage when compared with the placebo group. In a recent study, HydroTac® was used to treat 401 patients with chronic wounds (Günter et al., 2014). The application of HydroTac® significantly reduced the time to complete wound closure when compared with the untreated control arm.

**TABLE 1. Summary of TIME components**

| Component | Definition | Time | Location | Implication | Therapy
|-----------|------------|------|----------|-------------|--------
| Infection control | Prevention and management of wound infection | Early | Whole wound | Inhibits wound healing | Control of infection
| Inflammation | Management of inflammation | Early | Whole wound | Inhibits wound healing | Antihistamines, non-steroidal anti-inflammatory drugs
| Edge protection | Protection of the wound edge | Early | Whole wound | Inhibits wound healing | Foam dressings, hydrogels
| Tissue and foreign material removal | Debridement of tissue and foreign material | Early | Whole wound | Inhibits wound healing | Surgical debridement, enzymatic debridement

**Table 1. Summary of TIME components**

**REFERENCES**

- Rogers, 2007.)

**WHY ARE SOME WOUNDS DIFFICULT TO HEAL?**

Normal wound healing progresses through a series of interdependent overlapping steps; it includes the phases of tissue inflammation and inhibit healing (WUWHS, 2007; Chen and Rogers, 2007). Wounds may become chronic as a result of insufficient shock in the inflammatory phase. Standard healing on chronic wounds (e.g., vascular disease, diabetes) play a critical role in determining the subsequent phases of the healing process. It is noted that if one of these steps is not properly managed, wound progression is impeded, on such, if progression does not proceed normally on average, healing will be affected (Chen and Rogers, 2007).

Wound healing is a critical component of wound healing and can be difficult to manage. The importance of wound care differs according to the extent and severity of the wound. The development of modern, advanced wound dressings that are designed to manage wound exudate, optimise tissue hydration levels, and provide a moist wound environment has been significant in recent years. The impact of wound care on healing is critical, and the implementation of a treatment plan that stimulates wound healing and promotes wound closure is essential. This Made Easy framework (Table 1) allows for ideal conditions for the cellular processes necessary for wound healing via the benefits noted in Table 2. The moist environment promotes granulation and the sustained epithelialisation of wound healing are key requirements for the efficient management of chronic wounds and wounds with impaired healing. Wound bed preparation offers a systematic approach to all stage wound progression by promoting the necessary prerequisite of a moist wound environment — a wound bed devoid of devitalised tissue (including necrosis and slough) (Dawes and Neevel, 2010).
WHAT IS HYDROTHERAPY?
HydroTherapy is a sequential wound treatment programme that delivers specific physiological steps to the wound, whatever the wound type. Through the use of two innovative and complementary wound dressings (HydroClean® plus and HydroTac® (Sigma Pharmaceuticals)), HydroTherapy supports the healing process from the cleansing phase (start of treatment) through to epithelialisation (healed wound) (Figure 1).

HydroClean® plus
HydroClean® plus is a Hydro-Response Wound Dressing Comprising Aqueous and Polyacrylate SAPs, which is intended for use in a special mode of action. The dressing comprises soft and comfortable padding, which contains a hydrogel wound contact layer, a hydrogel polyacrylate SAP and a Sigma Papillon® layer. The dressing contains a special SAP that serves as a reservoir for Ringer’s solution, which is allowed to continuously deliver fluid to the wound bed. This SAP is designed to de-activate factors that inhibit healing; its presence in the dressing ensures that wound cleansing and preparation is maximised by absorption of wound exudate, which is then resorbed by the dressing. The dressing action results in the donation of fluid from the dressing and in wound cleansing, which is the initial phase of wound healing. The absorptive action of HydroClean® plus is shown in Box 1.

HydroTac®
HydroTac® is a HydroTac® Wound Dressing with Ringer’s solution, which is intended for use in a special mode of action. The dressing is a polyacrylate SAP and absorptive dressing that releases Ringer’s solution as a result of the dressing’s polyacrylate SAP’s ability to absorb wound exudate and release fluid. The donation of fluid from the dressing and in wound cleansing, which is the initial phase of wound healing, is continued through to epithelialisation (healed wound). The absorptive action of HydroTac® plus is shown in Box 2.

WHAT IS THE EVIDENCE FOR USE?
The reality of acute and chronic wounds is that they are complex lesions involving the whole wound micro-environment. In a laboratory model system (Smola et al, 2016), it was shown that HydroClean® plus (adapted from Dowsett, 2005) is able to continously deliver these results and that it actively enhances the physiological properties of the wound bed and the wound micro-environment to lead to the accumulation of elevated growth factor levels and an optimally hydrated wound environment, which has been suggested to promote epithelial closure (Stevenson et al, 2006). The efficacy of HydroClean® plus has been shown in a variety of wound healing models (Box 2).

Reduction of pain perception
Lower infection rates
Promotion of granulation tissue formation
Promotion of epithelialisation

Table 3. Evidence of HydroTherapy (Quaye et al, 2016a)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>HydroClean® plus</td>
<td>Reduction of pain perception</td>
</tr>
<tr>
<td>HydroTac®</td>
<td>Lower infection rates</td>
</tr>
<tr>
<td>HydroClean® plus</td>
<td>Promotion of granulation tissue formation</td>
</tr>
<tr>
<td>HydroTac®</td>
<td>Promotion of epithelialisation</td>
</tr>
</tbody>
</table>

In a 20-patient study, >50% of patients reported a reduction in wound pain over the course of 14 days’ treatment. In a 221-patient observational study in patients with chronic wounds, the number of wounds rated as having ‘moderate’ or ‘severe’ exudate levels. This level reduced to 4% after 1 month of therapy. In a 270-patient observational study in patients with a variety of ulcers, 75% of wounds were reported reduction in erythema, maceration, eczema and hyperkeratosis.

Table 2. Wound bed preparation: TIME in practice (adapted from Dowsett, 2005)

<table>
<thead>
<tr>
<th>Stage</th>
<th>Time</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Therapy start</td>
<td>2 minutes</td>
<td>Patient education, wound cleansing and dressing change</td>
</tr>
<tr>
<td>Wound cleansing</td>
<td>3 minutes</td>
<td>Removal of exudate and debris</td>
</tr>
<tr>
<td>Granulation</td>
<td>4 minutes</td>
<td>Promotion of granulation tissue formation</td>
</tr>
<tr>
<td>Epithelialisation</td>
<td>5 minutes</td>
<td>Promotion of epithelialisation</td>
</tr>
</tbody>
</table>

Figure 1. What is HydroTherapy?
Reduction of pain perception
Lower infection rates
Promotion of granulation tissue formation
Promotion of epithelialisation

Figure 3. The unique cleansing/absorbing action of HydroClean® plus
A. The dressing action results in the donation of fluid from the dressing and wound cleansing. B. The absorptive action of HydroClean® plus is shown in Box 1.
C. The dressing action results in the donation of fluid from the dressing and wound cleansing.

Figure 2. HydroTherapy 3-step Wound Healing Process