

Case studies: Octenilin® Wound Irrigation Solution in practice

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Article points

1. Increased bioburden in chronic diabetic foot ulcers causes a vicious circle of delayed healing and biofilm, in particular, is a significant issue that needs to be addressed.
2. Using a wound cleansing solution in addition to standard care resulted in improved infection control, which improved healing in stalled/chronic diabetic foot ulcers.
3. Both patients and clinicians were, overall, highly satisfied with treatment, which resulted in improvements to patients' quality of life (such as reduction in pain, malodour and exudate).

Declaration of interest

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The following case studies assess the effects of Octenilin Wound Irrigation Solution (octenilin® range, schülke) on chronic diabetic foot ulcers. The wounds assessed had all previously failed to improve within the expected timeframe and healing had stalled which, in turn, raised issues of bacterial bioburden and suspected biofilm.

It is now accepted that at least 60% of all chronic wounds have biofilm (Phillips et al, 2010). In chronic wounds, this creates a vicious cycle of delayed healing, as biofilm causes healing to stall and for wounds to become chronic. In turn, chronic wounds are associated with increased bacterial bioburden and infection risk. Biofilm not only delays healing, but can also act as a precursor to infection if not managed effectively (Phillips et al, 2010).

In diabetic foot ulceration in particular, hard-to-heal wounds are common and the risk of amputation directly increases in line with wound chronicity (Armstrong and Lavery, 1998; Aumiller and Dollahite, 2015). Diabetic foot ulcers often become infected, which can cause increased pain, delayed wound healing, increased risk of amputation and further factors (such as malodour and high exudate levels) that can affect a patient's quality of life (White, 2009; Richards and Chadwick, 2011).

Octenilin® Wound Irrigation Solution (schülke) is designed for cleansing and decontaminating chronic wounds, and can also be used to loosen encrusted dressings. It has been found to effectively and rapidly remove pathogens, necrotic tissue, slough and debris from the wound bed. It is particularly suitable for difficult-to-access areas, making it ideal for use in diabetic foot ulcers.

Octenilin Wound Irrigation Solution has also been found to be effective both in preventing biofilm, and disrupting and removing established biofilms. Laboratory testing has demonstrated

that the solution is effective against *Staphylococcus aureus* biofilms, providing almost complete removal of a 24-hour established biofilm (Cutting and Westgate, 2012).

Case 1 Presentation

The patient was a 76-year-old female with type 2 diabetes, and comorbidities including eczema and complex pain syndrome. The patient's medications included morphine and gabapentin.

The patient's ulcer was caused by a flare up of venous eczema combined with oedema, causing blistering. The wound was located on the dorsum of the left foot and had been present for two years (Figure 1).

Pre-treatment, the wound measured 70 mm in length, 64 mm width and 'moderate' depth. The healing process had stalled and the wound was described as non-healing. Previous treatments had included topical skin treatments for eczema, compression hosiery, and various foam and silver dressings, but the wound had failed to respond.

The wound bed was described as 100% sloughy, displaying as unhealthy and discoloured with friable tissue. The wound was extremely painful, with unpleasant odour and high levels of serous exudate. The odour was described as having increased in the past 2-3 weeks, along with pain levels. The patient's pain level was rated as 9 out of 10.

The wound was categorised as critically colonised, but not as infected, since the wound

did not show signs of heat, erythema, pus or swelling. Biofilm was suspected due to the stalled healing and discoloured appearance of the wound. Microbiology results showed the presence of *Staphylococcus aureus*.

Initial application

The decision was made to use Octenilin Wound Irrigation Solution to cleanse the wound, aid desloughing and gently remove debris, as the patient was unable to tolerate sharp debridement.

The wound was irrigated well with the solution and then gauze soaked in the solution was applied to the wound for five minutes. The ease of application was rated as 'excellent'.

A foam dressing was used, with dressing changes planned on alternate days. The patient was also prescribed antibiotic therapy (flucloxacillin), and steroids were prescribed by the Dermatology team.

Week 1

At week 1, the wound showed improvement and signs of healing (*Figure 2*). Although some well-adhered slough remained present, the wound bed appeared healthier, with some granulation tissue (40% granulating tissue, 60% slough). The surrounding skin appeared healthy, with less evidence of excoriation and irritation. The wound continued to be extremely painful, and the patient's pain levels remained at 9 out of 10.

Exudate levels were now classified as moderate (reduced from high) and malodour was reduced, which had a positive impact on the patient's quality of life. The patient was particularly satisfied with the treatment, as this was the first time in months that the wound had showed any signs of improvement. The decision was made to continue with the treatment regimen unchanged.

Week 2

The wound showed continued signs of improvement, with less discoloured slough and more granulating tissue (60% granulating tissue, 40% slough). The periwound area appeared healthy.

The wound was still extremely painful (rated at 9 out of 10). The wound had decreased in size, although no measurements were available at this visit.



Figure 1. Wound on presentation.



Figure 2. Wound at week 1.



Figure 3. Wound at week 3.

Key words

- Biofilm
- Diabetes
- Foot ulcer
- Infection control
- Wound irrigation

Moderate exudate levels had also reduced, and no noticeable malodour was now present.

The patient and clinician were both highly satisfied with treatment and decided to continue using Octenilin Wound Irrigation Solution. The reduction in odour in particular had improved the patient's quality of life. The decision was made to continue with all treatments, including oral steroids and a dressing change every other day.

Week 3

The wound continued to be painful on dressing change, but pain levels had reduced slightly (to 8 out of 10). Signs of healing and improvement continued (Figure 3). The wound had further reduced in size (although no measurements were available).

Exudate levels were now low and there was no recurrence of malodour. More healthy granulation tissue (80%) was now evident, with only some areas of superficial slough remaining (20%). The surrounding skin was healthy.

Both patient and clinician continued to be highly satisfied with treatment. The ulcer continued to reduce in size and improvement on the patient's quality of life was evident. The decision was made to continue treatment with Octenilin Wound Irrigation Solution until full healing.

Case 2 Presentation

The patient was a 65-year-old female with type 2 diabetes, lymphoedema and generalised chronic pain. Her medications included metformin, furosemide, morphine, codeine and pregabalin.

The patient experienced swelling and blistering in the right leg, due to cellulitis, which resulted in diabetic foot ulcers on the dorsum of the right first and second toes (Figure 4). The wounds had been present for 4 weeks on presentation.

The wounds were shallow, measuring 45 mm by 45 mm on the first toe and 25 mm by 25 mm on the second toe. The wounds were sloughy and macerated, comprising 20% granulating tissue and 80% slough.

The wounds had failed to progress in the expected timeframe and were expanding in

size over time. Presence of *pseudomonas* was found, along with localised erythema and heat, indicating infection and suspected biofilm. Various dressing options, including silver and impregnated antibacterial dressings, had been used, but the wounds had failed to respond.

Exudate levels were moderate, but had been rising, and the surrounding skin was macerated. Moderate malodour had become a problem over the past few days. The wounds were painful, rated at 6 out of 10 on the pain scale.

Initial application

The decision was made to use Octenilin Wound Irrigation Solution to help reduce *pseudomonas*, cleanse the wounds and promote desloughing.

The affected area was thoroughly irrigated with Octenilin Wound Irrigation Solution, then gauze soaked in the solution was applied to the wounds for 5 minutes. The ease of application was rated as 'excellent'.

Non-adherent dressings were used and secured with a bandage. A daily dressing change was planned. An offloading sandal was used, and an antibiotic treatment (co-amoxiclav) was prescribed. An additional instruction was given to irrigate the toes daily with Octenilin Wound Irrigation Solution.

Week 1

During week 1, the dressings were changed daily by the patient's carer. The wounds showed signs



Figure 4. Wounds at presentation.



Figure 5-7. Wounds at week 1 (Figure 5), week 2 (Figure 6) and week 3 (Figure 7).

of healing and improvement (Figure 5). The wounds now measured 45mm in length and 40mm width (first toe) and 20mm by 20mm (second toe).

The *pseudomonas* infection that had been present had now completely cleared. Slight maceration was still present, but much improved. Some slight slough remained, with the wounds displaying increased healthy granulation tissue.

The surrounding skin continued to be macerated and low levels of serous exudate were present. Odour had improved and no malodour was now present, which had a positive effect on the patient's quality of life.

Both the patient and the clinician were highly satisfied with treatment and the decision was made to continue with daily irrigation using Octenilin and daily dressing change. The patient also continued using the offloading sandal plus the addition of compression hosiery, and continued on antibiotic treatment.

Week 2

Dressing changes continued to be conducted by the patient's carer, with a podiatry appointment once a week. Pain on dressing change was now rated at 4 out of 10 on the pain scale.

The wounds showed further signs of improvement, with much less slough and no *pseudomonas* present (Figure 6). The wounds were now 100% healthy granulating tissue. The surrounding skin was healthy with no maceration. Exudate levels continued to be low.

The patient continued to be highly satisfied with treatment, and was particularly pleased to be able to see improvement to the wounds and that there was

no recurrence of malodour. The decision was made to continue with the treatment regimen.

Week 3

The treatment and dressing change regimen continued as before. Pain had decreased at dressing change, now rated as 3 out of 10 and not considered painful by the patient.

The wounds continued to improve and the toes were dryer (Figure 7). Some slight thin slough was still present.

Levels of serous exudate were moderate and slight maceration to the surrounding skin was observed. The patient was satisfied with treatment, particularly that there was no recurrence of *pseudomonas* or malodour.

It was decided that the treatment regimen should continue until the wounds fully healed. It was also noted that the patient was instructed to reapply compression stockings, as she had not been using them over the holiday period.

Case 3

Presentation

The patient was a 58-year-old male with comorbidities including type 2 diabetes, epilepsy, neuropathy and a previous toe amputation due to osteomyelitis. His medications included metformin, gliclazide, simvastatin, aspirin and insulin.

He presented with a diabetic foot ulcer that was caused by excessive shear/pressure from his footwear. The wound had been present for three months and was located on the right plantar fourth metatarsal head.

On presentation, the wound measured 20 mm in length and 20 mm in width. The depth of the

wound went down to the bone, and the wound was expanding in size. The wound bed was in poor condition and was failing to progress within the expected timeframe.

The patient had previously been treated using adhesive foam dressings, which were changed to superabsorbers. He had been prescribed co-amoxiclav as osteomyelitis was present.

The wound was classified as non-healing. The wound bed comprised mainly slough (80%), with granulation tissue present at the periphery (20%), with a macerated callous on the periwound area and evidence of heavy *pseudomonas*. Biofilm was suspected due to the static nature of the wound, the heavy slough and *pseudomonas*.

The wound was not odorous, although the level of exudate was heavy and green in colour, and the surrounding skin was macerated. The wound was not painful, due to the patient's neuropathy (1 on the pain score).

Initial application

The decision was made to use Octenilin Wound Irrigation Solution, to cleanse and decontaminate the wound of *pseudomonas*. At initial application, sharp debridement was also used on the wound bed (*Figure 8*). The wound was then irrigated with the solution and gauze soaked in Octenilin was applied to the wound for five minutes. Ease of application for Octenilin Wound Irrigation Solution was rated as 'excellent'.

A superabsorbent dressing was used, with the next dressing planned for 2 days' time. The patient also used an offloading sandal and antibiotic treatment continued.

The decision was made to irrigate the wound with each dressing change, ensuring that any green-coloured exudate and loose debris were removed along with the solution.

Week 1

During week 1, a dressing change was carried out every other day by district nurses. The dressing change was not painful (due to neuropathy). The wound appeared to have

improved, although it had not reduced in size (*Figure 9*).

A piece of bone was removed from the wound along with slough on dressing change. However, there was less evidence of *pseudomonas*. Following debridement, there was evidence of granulation tissue present.

Exudate levels had now reduced to moderate. There was less green exudate present on dressing removal and the maceration to the periwound skin had also improved — it was now described as generally healthy, with a little maceration to the periphery. The patient was particularly satisfied that the green discoloration had reduced.

The decision was made to continue with the same dressing regimen, cleansing the wound using Octenilin Wound Irrigation Solution at every dressing change. Antibiotic treatment was continued, with amoxicillin also added.

Week 2

Exudate had further decreased at week 2, now classified as low to moderate (and described as serous, rather than green). Only slight periwound maceration was observed, which was much improved (*Figure 10*). Virtually no sign of *pseudomonas* remained. Both patient and clinician were satisfied with the treatment and improvement observed.

The wound had also decreased in size, now measuring 18mm in length and 14mm in width, with the depth still classified as 'deep'. The wound bed was described as mainly granulation tissue with a small amount of slough.

The decision was made to continue using Octenilin Wound Irrigation Solution and the same dressing regimen. However, an X-ray also showed deteriorating osteomyelitis and the decision was made to switch to intravenous antibiotics.

Week 3

The wound had not further reduced in size, but was described as improved. The wound appeared healthier, with some slough still present (20%), but mainly granulation tissue (80%).

No *pseudomonas* was evident. Serous exudate levels remained low to moderate, with the periwound skin classified as healthy with some slight maceration.

Both patient and clinician were satisfied with the treatment, and the decision was made to continue using Octenilin Wound Irrigation Solution as it had helped to clear the *pseudomonas*.

However, due to osteomyelitis, the patient continued to be on intravenous antibiotics and would possibly require amputation of the fourth toe.

Week 4

At week 4, the wound bed was 100% granulating and had reduced in size — 18 mm length, 10 mm width; still classified as ‘deep’ (Figure 11). Exudate levels had now reduced to low.

Octenilin Wound Irrigation Solution had helped to clear the *pseudomonas*. However, the patient’s osteomyelitis had failed to respond to intravenous antibiotics. Treatment was discontinued as the patient was undergoing amputation.

Conclusion

Octenilin Wound Irrigation Solution was found to help with symptoms in chronic diabetic foot ulcers, such as pain, exudate and malodour,



Figure 8. Wound at initial treatment.



Figure 9. Wound at week 1.

as well as kickstarting stalled healing and eradicating biofilm. The product was easy to use and both the patients and the clinician were satisfied with treatment. Patient tolerability was generally excellent and resulting improvements to the patients’ quality of life were observed. ■

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Figure 10. Wound at week 2.



Figure 11. Wound at week 4.