

Case series evaluation: Using SILVERCEL® Non-Adherent in wound infections



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UNDERSTANDING LOCAL BARRIERS TO WOUND HEALING

INFECTION AS A BARRIER TO HEALING

Wound infection is a major cause of delayed healing and may produce symptoms, such as malodour and pain, which distress patients and are a challenge for clinicians to manage (WUWHS, 2008). The cost of healing wounds that have become infected has been found to be up to several times higher than the cost of healing uninfected wounds (Driver and de Leon, 2008). In recent years, concerns about antibiotic resistance have stimulated widening usage of topical antimicrobial dressings, such as those containing silver or iodine, to manage wound infection. It is therefore essential that clinicians be able to identify wound infections correctly and, when appropriate, choose the right topical antimicrobial and/or systemic antibiotics for treatment, with the goals of preventing/eradicating infection to promote wound healing.

IDENTIFYING CLINICAL SIGNS AND SYMPTOMS OF WOUND INFECTION

All wounds are contaminated with a variety of microorganisms (Stotts, 2004; WUWHS, 2008). In general, these microbes are harmless skin flora naturally found on the skin's surface. Intact skin provides a physical barrier against these microbes. The creation of a wound, acute or chronic, damages this defence mechanism, letting microbes enter the body. Thus the presence of bacteria in a wound may result in increasing clinical problems along the continuum of infection, from contamination at the mild end, to systemic infection at the critical end (WUWHS, 2008).

Wounds generally require intervention when they reach the stage of localised infection, which is often characterised by pain, heat, swelling, redness and loss of function (WUWHS, 2008). To diagnose critical colonisation or local infection, clinicians must undertake and document a holistic assessment of the wound, including examination of the wound bed and periwound area, documenting any signs of redness, unexplained pain or malodour (Ousey and Cook, 2012). Other signs and symptoms of wound infection include purulent exudate, medium to high level of exudate and bleeding.

However, particularly in chronic wounds, a wound's healing may be stalled despite the absence of obvious indicators (WUWHS, 2008). To ensure clinical diagnosis of infection, then, undertake thorough and regular holistic assessment and documentation of the wound so any deterioration is detected.

NEED FOR EARLY DIAGNOSIS AND TIMELY INTERVENTIONS

Prompt recognition and timely treatment of wound infection with a topical antimicrobial such as silver have the potential to reduce the economic, social and personal impact of delayed healing. However, effective management and treatment of wound infections is challenging, and wounds can improve or deteriorate over time, so timely recognition of any changes is essential (Wounds UK, 2013). Clinicians should therefore perform an initial wound and patient assessment, and regularly reassess to spot changes that might indicate wound infection or increased bacterial burden. The assessment should account for a number of factors, including those presented by the patient's lifestyle (Box 1).

Further, wound assessment should account for considerations presented by the differences that manifest due to variations inherent in each wound aetiology. For example, in leg ulcers, it is particularly important to assess for and address underlying causes (eg superficial or deep vein incompetence), and refer patients to vascular services if the wound is not healed at two weeks (NICE, 2013). In addition, infection in the diabetic foot is often difficult to recognise, as up to 50% of infected DFUs will not present with the classical signs of redness, heat, swelling and pain due to neuropathy (Edmonds and Foster, 2006), poor blood supply or an immunocompromised patient. In the absence of pain or altered sensation, other, often more subtle, signs of infection might be visible and should not be ignored (Edmonds et al, 2004).

Once infection is recognised, the next challenge is to ensure that the wound and the infection are managed appropriately and effectively. In 2008, the World Union of Wound Healing Societies (WUWHS) published guidelines on the management of wound infection. These and more recently published guidelines include the appropriate use of topical antimicrobial dressings (WUWHS, 2008;

BOX 1: Holistic assessment (Wounds UK, 2013)

A comprehensive wound assessment must consider and document the following factors:

- Underlying cause
- Wound location and size
- Comorbidities
- Nutritional status of the patient
- Smoking habits
- Drug/alcohol use
- Mobility of the patient
- Circulation
- Infection
- Inflammation
- Odour
- Exudate
- Medication
- Site and type of pain, changes in nature or onset-triggers of pain
- Colour
- Periwound skin
- Wound bed
- Patient-centred concerns
- Patient's psychological status

Wounds UK, 2013). The guidelines recommend that, for wounds not showing improvement after 10–14 days of topical antimicrobial therapy, the patient and management approach should be re-evaluated.

THE TWO-WEEK CHALLENGE: SILVER'S ROLE IN MANAGING WOUND INFECTION

Despite the widespread use of silver as an antimicrobial agent, the exact mechanisms of action have not been fully determined (DTB, 2010). Silver ions are thought to affect multiple sites within a bacteria cell by binding to negatively charged cell components (eg the cell wall, DNA and RNA), disrupting the function of these cell elements and causing cell lysis and interference with electron transport, enzyme function and cell division (Lansdown, 2002). A recent consensus document on the use of silver dressings for treating wounds suggested an initial 14-day period could be seen as a two-week 'challenge' during which the efficacy of a silver dressing could be assessed (Wounds International, 2012) (Figure 1).

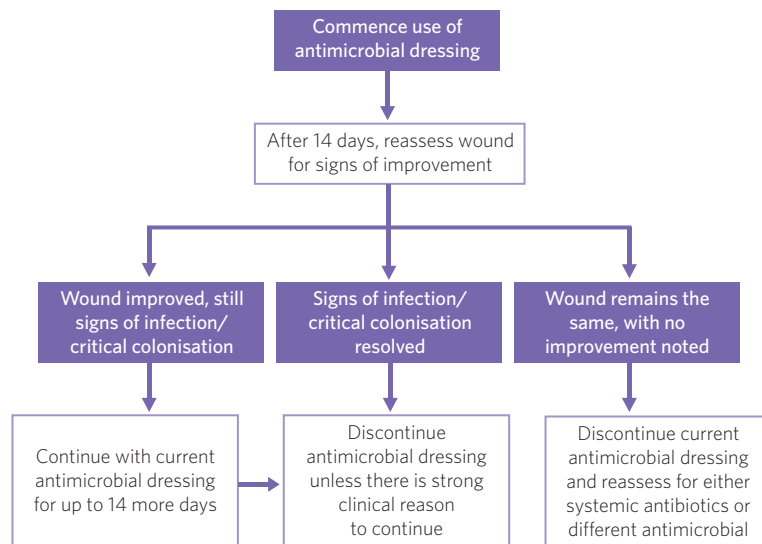


FIGURE 1. Decision-making flowchart for the use of antimicrobials

EVALUATING THE USE OF SILVERCEL® NON-ADHERENT

SILVERCEL Non-Adherent is an absorbent antimicrobial wound dressing for use in wounds that are moderately to heavily exuding, and infected or at an increased risk of infection. It is designed to absorb wound exudate and contains silver-coated fibres (X-STATIC®) that exhibit broad-spectrum antimicrobial activity (Lansdown, 2002). The dressing features an ethylene methyl acrylate outer film layer that uses EasyLIFT™ Precision Film technology. This outer porous layer is designed to keep the dressing from adhering to the wound or shedding fibres (Clark et al, 2009a), which can help reduce pain at dressing changes (Stephens et al, 2010) and associated patient discomfort and anxiety. The antimicrobial action of SILVERCEL Non-Adherent relies on the absorption of wound exudate into the dressing, ensuring the availability of positive silver ions. The dressing's absorptive properties (Stephens et al, 2009; Clark et al, 2009b) help manage the increased exudate production often associated with infected wounds, while maintaining the moist wound environment that assists wound healing and protecting the surrounding skin from the potentially damaging effects of exudate (Fleur, 2009). Laboratory tests show it is effective against many common wound pathogens, including methicillin-resistant *Staphylococcus aureus*, methicillin-resistant *Staphylococcus epidermidis* and vancomycin-resistant *Enterococcus*. It also prevents and disrupts biofilm (Clark et al, 2009c; McInroy et al, 2010).

In vitro assessment has shown the release of silver ions from SILVERCEL Non-Adherent is sustained for

up to seven days, even when challenged with high levels of fluid (mimicking wound exudate) (Stephens et al, 2009). This is likely to be longer than the wear time of the dressing on an infected wound, but suggests the dressing could remain *in situ* for up to a week while maintaining antimicrobial efficacy.

A new, four-week, prospective, non-comparative evaluation has examined the effect of SILVERCEL Non-Adherent on signs and symptoms in infected wounds of a variety of aetiologies. The wounds involved were diverse and, often, complex infected wounds that had been referred for specialist wound care. Many of the patients had risk factors for delayed healing and infection. SILVERCEL Non-Adherent had a positive effect by the second assessment on all clinical criteria examined. Particularly notable were the overall reductions in the proportion of patients with malodour, purulent exudate or bleeding at dressing change, and in pain scores.

The positive effects on all criteria were apparent by the first assessment even though over 90% of wounds were considered still infected at that stage. This is not unexpected, because improvements in signs and symptoms are likely to precede reclassification of a wound as uninfected. In patients who continued the dressing beyond the second assessment, the positive changes continued for some clinical criteria (eg malodour and exudate descriptor) but generally were maintained at similar levels. This was despite continued reductions in the proportion of wounds that remained infected, perhaps suggesting that other wound-related factors were contributing to the signs and symptoms.

The six case studies presented on the following pages have been selected from the study evaluation. They describe the use of SILVERCEL Non-Adherent in a range of wound types, and demonstrate its positive effects with regard to wound infection and amelioration of signs and symptoms of wound infection over a two- to four-week period.

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CASE STUDIES

CASE 1: LEFT ANKLE WOUND AFTER FRACTURE AND SURGICAL REPAIR

INTRODUCTION

Mr L, a 69-year-old male, had been in a motorbike accident 50 years ago that caused a left-ankle fracture that required reconstructive surgery 40 years ago. In 2010, he had had an ulcer on the medial aspect of the left ankle for about three years. A loose bony fragment remaining after the accident was determined to be responsible for the breakdown. He underwent surgery to remove the fragment.

The healed area broke down in September 2013. He was under the care of a vascular specialist for a period of time and underwent angiogram, compression therapy and other vascular treatment, but the wound still did not heal. When it began to deteriorate, the patient was referred to the plastics wound specialist clinic.

TREATMENT

On presentation, the wound on the medial aspect of the left ankle measured 5cm x 3cm, and had a sloughy wound bed with moderate levels of haemoserous exudate and spreading periwound erythema. There was no malodour, and the patient did not have pain. The wound was considered to be probably critically colonised and it was decided to initiate use of SILVERCEL® Non-Adherent with dressing change once weekly.

Week 1

One week later, the wound had reduced to 3.5cm x 2cm in size. Periwound erythema had reduced, but the wound continued to produce moderate levels of haemoserous exudate. The slough was removed on each visit but it was no longer adherent. Due to high levels of exudate and the presence of *Streptococcus* Group B, SILVERCEL Non-Adherent was continued, with dressing changes increased to twice weekly.

Week 2

After two weeks of treatment with SILVERCEL Non-Adherent, the wound size and level of haemoserous exudate had not reduced. Swabs that were taken showed the presence of *Streptococcus* Group B in the wound. The dressing was continued with twice-weekly changes.

Week 3

The wound was again unchanged in size after a further week. However, the exudate, though high in level, was now serous. The patient remained pain free.

Week 4

Due to the wound's continued progress, the wound was considered clear of *Streptococcus B* and was not swabbed. After four weeks of treatment with SILVERCEL Non-Adherent, the wound had reduced in size to 3cm x 1.5cm, and the exudate level was much lower.

DISCUSSION

Although the wound had improved, friable tissue, malodour and discolouration continued. As such, it was decided to continue with SILVERCEL Non-Adherent. The patient appreciated the ease of application and removal, and the clinician reported that he did not have experience pain at any time whilst wearing the dressing.



CASE 2: AXILLARY WOUND AFTER SURGERY

INTRODUCTION

Ms C, a 30-year-old female, has a history of hydradenitis of the right axilla. In June 2013, she underwent surgery for the condition. The resulting flap dehisced; it was free from infection until early September 2013, when the wound was found to contain moderate highly resistant methicillin-resistant *Staphylococcus aureus* (MRSA).

The patient presented with a wound that was L-shaped, and measured 7cm x 5cm along the 'legs' of the 'L'. There was also a 4cm track to another wound, 1.5cm long, nearby. The patient was pyrexial (38.1°C). Over two weeks, the main wound dehisced and the patient reported that, when this occurred, the pain increased. The wound was friable and had high levels of haemoserous exudate. Pain score (on a zero to 10 scale) before dressing change was three and a six during dressing change.

TREATMENT

Because the wound contained MRSA, a microbiology consultant advised topical treatment with SILVERCEL® Non-Adherent, but not oral antibiotics. The wounds were dressed with SILVERCEL Non-Adherent flat dressing (main wound) and rope (associated wound). Dressings were changed daily due to the high exudate level.

Week 1

After one week of treatment, the wounds were improved, and the main wound was smaller (7.0cm x 4.5cm). The size of the associated wound had not changed. However, spreading erythema was observed. The exudate volume had reduced to a moderate level and was now clear in colour. Pain levels were reduced, and the patient reported no pain between or during dressing changes. The patient was no longer pyrexial, and a swab taken after one week of treatment was negative for MRSA.

Week 2

After a further week, the patient continued to be pain free, and the main wound had reduced in size to 6.5cm x 3.5cm. The track to the associated wound had decreased to 2cm. However, the exudate level had increased and was haemoserous again. Daily dressing changes continued.

Week 3

At the end of three weeks of treatment with SILVERCEL Non-Adherent, the wound measured 6cm x 3cm. The track to the associated wound had reduced to 1cm. Peri-wound erythema was now minimal, and exudate was serous and had reduced in level to moderate. SILVERCEL Non-Adherent was continued, as were daily dressing changes. The patient continued to be pain free.

Week 4

The main wound had improved further, now measuring 4cm x 4cm, the track had almost healed, and the associated wound now measured 0.5cm. The exudate continued to be serous, and the patient was pain free. A swab was positive for MRSA and vancomycin-resistant *Enterococcus*.

DISCUSSION

SILVERCEL Non-Adherent was continued due to the presence of clinical infection. The patient noted that she felt comfortable whilst

wearing the dressing, and was 'delighted' to experience reduction in pain and infection and no pain on dressing removal. The clinician reported the dressing to be easy to use.



FIGURE 1. Baseline



FIGURE 2. Week 1



FIGURE 2. Week 3



FIGURE 3. Week 4

CASE STUDIES

CASE 3: WOUND OF THE FIRST METATARSOPHALANGEAL JOINT

INTRODUCTION

Mr S, a 71-year-old male with diabetes, presented with a wound over the first metatarsophalangeal joint on the plantar aspect of his right foot in September 2013. The wound had been present for two weeks and measured 2.2cm x 2.1cm x 1.4cm deep.

TREATMENT

An X-ray showed that there was no osteomyelitis. However, the wound was moderately malodorous, had periwound erythema and local warmth, and was producing high levels of purulent exudate. The patient did not have any pain as a result of diabetic peripheral neuropathy. He did note that he was embarrassed by the wound's malodour. As the wound was infected and highly exudative, SILVERCEL® Non-Adherent was initiated, with twice-weekly dressing changes, as was a forefoot offloading boot. He was advised to minimise walking.

Week 1

After one week, the malodour although still present had decreased. The wound size was 2.0cm x 1.8cm. The exudate remained purulent and high in level.

Week 2

A further reduction in wound size occurred by the end of the second week: the wound measured 1.8cm x 1.5cm. The wound remained infected, but the malodour had disappeared, and exudate production had reduced to moderate levels of haemoserous exudate. There was a visible reduction in macerated tissue around wound edges, along with decreased inflammation and swelling. As the wound was still infected but improving, SILVERCEL Non-Adherent was continued with twice-weekly dressing changes.

Week 3

When assessed at the end of week three, the wound was smaller (1.6cm x 1.5cm) and was no longer infected. The wound was producing minimal levels of serous exudate. As the wound bed was granulating and had no obvious signs of infection, SILVERCEL Non-Adherent was discontinued.

DISCUSSION

The dressing was changed to an iodine-containing dressing with foam and an offloading boot due to continued delayed healing, to prevent infection. Monitoring continued twice weekly.

The clinician noted that SILVERCEL Non-Adherent was easily applied and removed at all dressing changes, and that it stayed in place and managed exudate levels 'very well — it did not adhere to wound bed or cause any tissue trauma on removal'.

Although the patient is neuropathic and therefore could not report reduction in pain levels, he was happy with wound progress at every dressing change, which lifted his spirits. The patient also commented positively on the reduction in odour.



FIGURE 1. Baseline



FIGURE 2. Week 2

CASE 4: NEUROISCHAEMIC ULCERATION OF FOOT WITH GANGRENE

INTRODUCTION

Mr S, a 72-year-old male smoker with diabetes, dyslipidaemia, hypertension and peripheral vascular disease, underwent a right femoropopliteal bypass in April 2013. In May 2013, he developed neuroischaemic ulceration of the dorsal/lateral aspect of right foot and associated gangrene of the area. The gangrene was debrided.

TREATMENT

The wound was progressing well but, in September 2013, developed increased malodour, redness, friable granulation tissue and local heat. The wound measured 9cm x 3.5cm. SILVERCEL® Non-Adherent was chosen to treat the infection and the dressing was changed three times each week.

Week 1

After one week of SILVERCEL Non-Adherent, the malodour was much reduced and the local heat had gone. The wound now measured 7.2cm x 2.0cm. SILVERCEL Non-Adherent was continued with thrice-weekly changes.

Week 2

At the second assessment, the wound had again improved, although it remained the same size as the previous week.

Weeks 3-4

After three weeks of SILVERCEL Non-Adherent, the wound had reduced in size to 6.5cm x 1cm. There was no evidence of infection, so SILVERCEL Non-Adherent was discontinued and a low adherent dressing was initiated. A week later, the wound measured 6.0cm x 0.6cm.

DISCUSSION

Infection had resolved, and the wound had moved towards healing with use of SILVERCEL Non-Adherent. The clinician reported that the dressing performed well, and no fibres were left in the wound. The patient was pleased with the rapid healing of the wound.



FIGURE 1. Baseline



FIGURE 2. Week 2



FIGURE 3. Week 4

CASE STUDIES

CASE 5: ULCERATED AREA ON A MOLE

INTRODUCTION

Mrs W is a 72-year-old female who lives in a nursing home. She has osteoarthritis and hypothyroidism. She developed an ulcerated area on a mole on her right thigh three months before presentation in August 2013.

TREATMENT

The ulcerated area measured 2cm x 4cm and had a dark red wound bed that bled very readily. It was producing moderate amounts of haemoserous exudate and was malodorous. The patient rated pain before dressing change as two on a scale of zero to 10, and 10 during dressing change with an alginate fibre dressing due to sticking upon removal. SILVERCEL® Non-Adherent was commenced with twice-weekly dressing changes to minimise adherence (particularly as the wound was vascular, and difficult removal could lead to excessive bleeding), and because the wound appeared to be infected.

Week 1

After one week of SILVERCEL Non-Adherent, the malodour had reduced, but the wound had not otherwise improved. The wound was diagnosed as a melanoma, but due to the patient's comorbidities, heart problems and frailty, the decision was made to not remove the mole. The goal of treatment was, therefore to enhance quality of life by reducing pain, trauma and odour. The patient was now pain free between dressing changes and, after analgesia was administered, rated dressing change pain as six out of 10. SILVERCEL Non-Adherent did not stick to the wound.

Week 2

The odour was greatly reduced and the wound bed was less friable, but the wound was still considered to be infected. After adjustment of analgesia, the patient had no pain before dressing change and scored pain as two out of 10 during dressing change.

Weeks 3-4

The wound size remained unchanged, but now had minimal malodour and much reduced exudate production and bleeding at dressing change. The patient did not experience any pain between or during dressing changes.

DISCUSSION

This melanoma was vascular in origin, and the dressing came off whole without leaving particles in the wound to be cleaned off, which would have caused further trauma. It was decided to continue SILVERCEL Non-Adherent with once weekly changes because of the reduction in malodour, improvement in pain and lack of sticking. The clinician reported that the dressing was easy to use, with no right or wrong side to apply to the wound, that staff were happy with the dressing, and that the patient found it 'very comfortable' to wear.

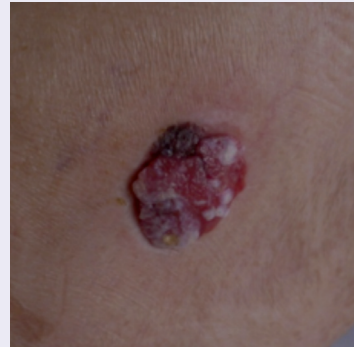


FIGURE 1. Baseline

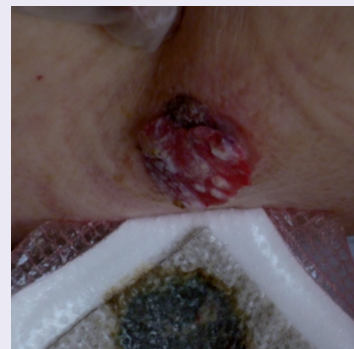


FIGURE 2. Week 3

CASE 6: GRADE III PRESSURE ULCER ON BUTTOCK

INTRODUCTION

Mrs R, an 82-year-old woman living in a nursing home, had poor mobility, diabetes and hypertension. She developed a chest infection in September 2013 and very quickly developed a category III pressure ulcer on her right buttock. Mobility was very reduced.

TREATMENT

The wound was debrided and was making some progress. An accurate size for this wound was difficult to establish, as there was a lot of necrotic tissue at first, and some remained even after debridement. On initial measurement, the wound was 10cm x 6cm. However, after four weeks, the wound measured 13cm x 6cm. The wound bed was a dull pink colour and had an appearance of non-healthy tissue that was very friable and damaged. The wound easily bled if touched, and odour was present. The wound was producing moderate amounts of haemoserous exudate and bled at dressing change. Due to the colour and fragility of the wound, it was judged to be infected. The patient rated pain on a scale of zero to 10 as three before dressing change and eight during dressing change. As the wound was considered to be infected, SILVERCEL® Non-Adherent was commenced.

Week 1

When assessed again one week later, the patient reported no pain during or between dressing changes, and the wound bed was less friable, with healthier colour and decreased odour.

Week 2

A further week later, the wound was no longer considered to be infected. It had reduced in size to 12cm x 5cm, was no longer malodorous and was producing minimal amounts of serous exudate. The patient continued to report being pain free.

DISCUSSION

As infection was no longer present, the SILVERCEL Non-Adherent was discontinued. The clinician noted that the non-adherent property of the dressing made it 'ideal' for delicate infected wound beds, and that the dressing did not cause trauma to the wound bed or pain to the patient. In fact, pain was reduced from patient rating of eight during dressing change to zero. In addition, the clinician said the dress conformed well to different areas of the body and performed well against infection. The patient reported the dressing was comfortable to wear.

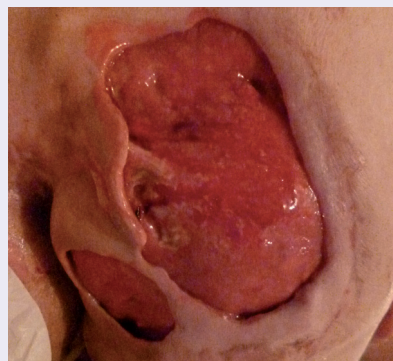


FIGURE 1.
Baseline



FIGURE 2.
Week 2

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