Silvercel™ Non-Adherent dressing: taking the pain out of antimicrobial use

Excess exudate management, critical colonisation, wound infection and trauma and pain at dressing change are all daily issues facing clinicians working in wound management. Absorbent dressings with antimicrobial activity are often necessary to reduce wound bioburden in heavily exuding wounds, however, they can adhere to the wound bed and result in trauma and pain on removal. Silvercel™ Non-Adherent (Systagenix, Gargrave) is a new dressing, which combines the antimicrobial efficacy of silver, the fluid handling properties of hydroalginate and a non-adherent EMA layer to provide a highly absorbent, antimicrobial dressing that does not adhere to the wound bed.

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Over the past decade a number of new antimicrobial wound care products have been developed in response to the issue of growing bacterial resistance to antibiotics. Much attention has been focused on silver and its effectiveness in killing micro-organisms within wounds. There are now many products available that contain silver, in varying quantities and in different formulations, and a growing body of clinical evidence that supports the use of silver in infected wounds and those at risk of infection (Leaper, 2006).

There has also been increased recognition of the issues of pain and trauma at dressing change, and the implications this has on wound healing. These factors have led to the development of hybrid wound care products, which can fulfil several functions. One such product is Silvercel™ Non-Adherent (Systagenix, Gargrave), a non-adherent hydroalginate dressing with antimicrobial efficacy.

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Importance of atraumatic dressings

In 1979, Turner identified the features of the ideal wound dressing, one of these being non-adherence. Despite this early recommendation, many of the wound care products that were in use in the 80s and 90s were likely to cause trauma when being removed, either to the wound bed, the surrounding skin or both. This practice has now been questioned and recently wound pain has been extensively covered in the literature and a huge amount of progress has been made in our understanding of when and why it occurs.

Pain is and always has been a major issue during dressing changes for patients with acute and chronic wounds. The findings of a large international survey to assess wound pain was carried out by Price (2006) and of the 2018 patients surveyed, 40.3% indicated that pain at dressing change was the worst part of living with a wound, while 53.8% reported suffering pain 'quite often' to 'all the time' during dressing changes.

In a survey of 373 UK nurses with an interest in wound care, 81% stated that patients experienced most pain during dressing removal. They cited leg ulcers, infected wounds and superficial burns, cuts and abrasions as being particularly painful at dressing times, in addition to pressure ulcers, arterial leg ulcers and skin graft donor cites (Hollingworth and Collier, 2002). Another survey of 447 nursing and medical practitioners (Kammerlander and Eberlein, 2002) reported that dressing removal was perceived to be the most painful wound care intervention, reflecting the findings of Hollingworth and Collier (2002).

It is important that the clinician recognises the potential to cause pain during dressing removal, as well as damaging the delicate healing tissue in the wound and surrounding skin. One way in which the pain and trauma associated with dressing changes can be minimised is through the use of products that are appropriate for the wound type, promote moist wound healing and are atraumatic on removal (World Union of Wound Healing Societies [WUWHS], 2004).

Retention of wound care products can be problematic, and many dressings contain adhesives that are necessary in order to keep the dressing on the wound site during its wear time. However, some dressings contain aggressive adhesives that are able to strip skin cells when they are removed from the wound (Rippon et al, 2007). This causes unnecessary suffering to the patient, and can result in delayed wound healing.

When selecting an appropriate dressing common sense applies, and

wounds which have low levels of exudate should not be treated with highly absorbent alginate products, which are likely to adhere to the wound bed. The inappropriate use of mesh dressings will lead to wound trauma on removal, as granulation tissue that has grown through the mesh pores is removed along with the dressing. Therefore, matching the properties of the dressing to the conditions of the wound and surrounding skin can help to minimise pain and trauma. The selection of a dressing with as long a wear time as possible can also help to avoid the need for frequent removal (WUWHS, 2004).

Moving forward, clinicians should consider using products which are low or non-adherent and which protect the surrounding skin.

The use of silver as an antimicrobial

Infection and critical colonisation remain troublesome complications when dealing with wounds and there is currently a large selection of silver dressings available that aim to improve conditions for wound healing, primarily by controlling wound bioburden.

Two forms of silver are used in topical wound dressings: compound (silver salts) and elemental (metallic). Both forms of silver release silver ions into the wound, providing antimicrobial activity. Silver compound rapidly dissociates giving rise to silver ions (Ag+), while elemental silver forms an intermediate, silver oxide (Ag_2O), on exposure to air or water (as present in the wound fluid). It is the silver oxide that then dissociates into silver ions. This ionic form of silver has been shown to be effective against a broad range of bacteria, including *Pseudomonas, Staphylococcus* and *Streptococcus* (Bowler, et al, 2001).

For silver-containing dressings to be effective, it is important that the solubility of silver is low (White, 2001). The development of a number of wound dressings that contain metallic silver and provide a sustained release of low but effective levels of ionic silver can be seen as a way of reducing the risk of silver toxicity (Teot et al, 2005). However, the toxicity of silver is usually associated with the silver carrier as opposed to the silver itself, so these effects are not regarded to be applicable to modern wound dressings (Cutting, 2001).

It is thought that silver exerts its antimicrobial effects in a number of ways:

- The positively charged silver ions are able to bind to the negatively charged bacterial cell wall (Maillard and Denyer, 2005), which can then lead to disruption of the cell membrane and leakage of the contents, which eventually leads to cell death
- The bacterial cell is able to transport silver cations into its cytoplasm where the silver ions can bind to cellular DNA increasing the stability of the double helix and impairing cell replication (Agranoff and Krischna, 1998)
- Silver can impact on cell respiration by inhibiting oxidative enzymes in the cell (Lansdown, 2002)
- Silver interferes with bacterial electron transfer
- Silver forms insoluble, metabolically ineffective compounds with bacterial anions, sulphydryl groups, histidine and enzymes.

Silvercel™ Non-Adherent: a non-adherent antimicrobial dressing

Silvercel Non-Adherent dressing is a new atraumatic, antimicrobial hydroalginate dressing. It consists of a sterile, non-woven pad composed of high G (guluronic acid), calcium alginate, carboxymethylcellulose (CMC) and silver-coated fibres with a non-adherent Ethylene Methyl Acrylate (EMA) layer on both sides of the product.

Absorbency and tensile strength

The absorbency of Silvercel Non-Adherent is attributed to the highly absorbent hydroalginate component of the dressing.

Alginate is a polymer composed of a mixture of two monomer units in varying proportions: Alpha–L-guluronic acid (G type) and Beta-D-mannuronic acid (M type). Alginate dressings vary in their structure, due to differences in their chemical make up, and this affects the performance of the product once it is *in situ* on the wound bed (Timmons, 1999). An alginate that contains largely G-type monomer units is referred to as high G alginate, as is the case with Silvercel Non-Adherent. High G alginates are firmer and do not gel as readily as those high in mannuronic acid, but they have a better wet tensile strength (Timmons, 1999).

In an evaluation that compared the properties of Silvercel Non-Adherent dressing with a range of commercially available products containing silver, Silvercel Non-Adherent was shown to have superior wet tensile strength and the lowest adherency, while displaying comparable absorbency (Stephens et al, 2009).

These properties are of particular importance when treating cavity wounds, where undermining may be present, since they allow the dressing to be removed intact when saturated, easing its removal from the wound and reducing the risk of fibres being shed onto the wound bed, which can act as a focus for infection. The inclusion of the non-adherent covering further prevents fibre shedding and eases removal of the dressing, minimising damage to the wound bed and discomfort for the patient. In a study by Hart and Bell (2009), which compared the performance of Silvercel Non-Adherent dressing with a silver hydrofiber dressing, Silvercel Non-Adherent was found to exhibit lower wound adherence and reduced debris deposition.

The exudate-handling properties of Silvercel Non-Adherent are further enhanced by the inclusion of CMC, which gives the dressing increased absorbency, similar to high M alginate (Teot et al, 2005; Stephens et al, 2009). The CMC component traps exudate within the dressing fibres, which decreases lateral wicking and improves absorbency. A study by Parsons et al (2005) highlighted the superior vertical wicking capability of Silvercel hydroalginate against other similar dressings including Aquacel® Ag (ConvaTec). In clinical terms, this can help to reduce the likelihood of exudate being allowed to reach the surrounding skin, which can help to reduce the risk of maceration. This component of the dressing also helps to maintain a moist wound environment.

The alginate and CMC combination also provides a certain level of gelling of the hydroalginate fibres, designed to maximise the conformability of the dressing to the wound contours and to ease dressing removal.

Silver release and antimicrobial efficacy

Silvercel Non-Adherent dressing contains fibres which are coated with elemental silver (8% w/w), and which give the dressing its antimicrobial properties. Silvercel Non-Adherent releases the ions in a sustained and controlled manner for up to seven days *in vitro* (Addison et al, 2006).

The antimicrobial action of Silvercel Non-Adherent dressing is effective against all common wound pathogens including methicillin-resistant *Staphylococcus aureus* (MRSA), Vancomycin-resistant enterococci (VRE), *Pseudomonas aeruginosa*, *Escherichia coli*, *Streptococcus pyrogenes*, *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Klebsiella pneumoniae* and *Candida albicans* (Addison et al, 2006; Stephens et al, 2009).

Clinical evidence

The published clinical evidence on Silvercel hydroalginate dressing includes results of a collection of selected case studies derived from a randomised controlled clinical trial, which demonstrate the product's ability to handle exudate, its tensile strength and antimicrobial properties even when used for treatment of heavily exuding wounds (Teot et al, 2005).

These preliminary results were confirmed in a randomised, controlled trial showing that Silvercel is well tolerated, successfully manages high levels of wound exudate, provides a moist wound environment and is easy to remove after saturation. In addition, when managing wounds at high risk of infection, Silvercel was described as a therapy that may have a clinically favourable influence on wound prognosis, as it helps to promote wound cleansing, control wound bacteria and improve healing rates, while preventing the use of systemic antibiotics (Meaume and Vallet, 2005).

The clinical body of evidence for the use of Silvercel hydroalginate is growing and Silvercel Non-Adherent has all of Silvercel's proven benefits, plus improved wet tensile strength and non-adherent properties.

Indications for use

Silvercel Non-Adherent is suitable for use on wounds, which are infected, critically colonised or judged to be at high risk of infection. The dressing can be applied to leg ulcers, pressure ulcers, diabetic foot wounds, surgical and traumatic wounds. Those with known sensitivity to alginates, silver and EMA should not use the dressing.

Silvercel Non-Adherent should be held in position by a suitable occlusive secondary dressing.

Conclusion

The importance of the 'no pain at dressing change' message should not be underestimated. Patients put their trust in healthcare professions, and therefore should not have to face the trauma of repeated painful dressing removal. In the past, this was an almost accepted part of care. Developing dressings in such a way that they are atraumatic is not always achievable, however, Silvercel Non-Adherent is a dressing that combines the proven benefits of a highly absorbent antimicrobial, with a non-adherent EMA layer that prevents the dressing from sticking to the wound bed during wear time, reducing the likelihood of pain and trauma on removal.

As we gain knowledge in wound care, it is essential that industry listens to patients and clinicians. This means developing products such as Silvercel Non-Adherent that focus on the needs of patients, rather than products that are manufactured and then matched with potentially suitable wound types. WUK

References

Addison D, Rennison T, DelBono M, Steadman M, Stephens S (2006) *An Antimicrobial Silver Alginate Dressing for the Management of Chronic Wounds*. Poster Presentation, SAWC, San Antonio

Agranoff D, Krischna S (1998) Metal ion homeostasis and intracellular paratism. *Mol Microbiol* **28(3):** 403–12

Bowler PG, Duerden BI, Armstrong DG. (2001) Wound microbiology and approaches to wound management. *Clin Microbiol Rev* **14:** 244–69

Cutting KF (2001) A dedicated follower of fashion? Topical medications and wounds. *Br J Nurs* (Silver supplement Part 1): 9–16

Hart J, Bell A (2009) *Evaluation of a Novel Non-adherent Antimicrobial Silver Alginate/ CMC Wound Dressing in the Porcine Partial Thickness Excisional Wound Model*. SAWC, Washington

Hollingsworth H, Collier M (2002) Nurses views about pain and trauma at dressing changes: results of a national survey. *J Wound Care* **9:** 369–73

Kammerlander G, Eberlein T (2002) Nurses' views about pain at dressing changes: a central European perspective. *J Wound Care* **11:** 76–9

Lansdown ABG (2002) Silver I: its antibacterial properties and mechanism of action. *J Wound Care* **11(4):** 131–6

Leaper D (2006) Silver dressings: their role in wound management. *Int Wound J* **3:** 282–94

Maillard JY, Denyer SP (2005) Demystifying silver. In: *Management of Wound Infection. EWMA Position Document*. MEP, London

Meaume S, Vallet D (2005) Evaluation of a silver-releasing hydroalginate dressing in chronic wounds with signs of local infection. *J Wound Care* **14(9):** 411–19

Parsons D, Bowler PG, Myles V, Jones S (2005) Silver antimicrobial dressings in wound management: a comparison of antibacterial, physical, and chemical characteristics. *Wounds* **17(8):** 222–32

Price P (2006) The psychology of pain and its applicaton to wound management. In: White R, Harding K, eds. *Trauma and Pain in Wound Care*. Wounds UK, Aberdeen: 162–79

Rippon M, White R, Davies P (2007) Skin adhesives and their role in wound dressings. *Wounds UK* **3(4):** 76–86

Stephens S, Clark R, DelBono M, Bayliff S, Abioye O (2009) *In-vitro Evaluation of a Non-adherent Antimicrobial Silver Hydroalginate Wound Dressing*. Poster presentation, EWMA, Helsinki

Teot L, Maggio G, Barrett S (2005) The management of wounds using Silvercel hydroalginate. *Wounds UK* **1(2):** 70–7

Timmons J (1999) Alginates and hydrofibre dressings. *Prof Nurse* **14(7):** 496–9, 501, 503.

Turner TD (1979) Hospital usage of absorbent dressings. *Pharm J* **222:** 421–6

White RJ (2001) An historical overview of the use of silver in wound management. *Br J Nurs* (Silver Supplement Part 1): 3–7

World Union of Wound Healing Societies (2004) *Minimising Pain at Wound Dressing-related Procedures. A Consensus Document*. MEP, London