

Managing dry wounds in clinical practice: challenges and solutions

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Achieving the optimal moisture balance for wound healing remains a key challenge in clinical practice. Typically, the literature focuses on the production of copious amounts of exudate; however, it is important to understand the role of moisture, and that the challenge of managing dry wounds can also be significant. In managing dry wounds, where there is insufficient moisture production, there are specific challenges that may need to be addressed (i.e. autolytic debridement, inflammation and dressing adherence). This paper discusses effective management, which broadly encompasses two combined strategies: appropriate dressing selection and use of additional topical treatments where required, such as KERRALITE COOL™ Hydrogel Moisture Balancing Dressings and NU-GEL™ Hydrogel with Alginate.

Achieving the optimal moisture balance for wound healing remains a key challenge in clinical practice. While there may be an emphasis on managing excessive volumes of exudate, managing dry wounds with low exudate production also represents a challenge. Exudate is a natural and essential part of the wound healing process, facilitating several crucial components of healing (Lloyd Jones, 2014).

Table 1 lists the essential components of exudate and their beneficial effects on the wound healing process, such as immune defence, blood clotting and cellular growth.

Table 1. Exudate components and their benefits to wound healing (adapted from WUWHS, 2019).

Exudate component	Benefit to wound healing
Water	Prevents tissues drying out
Fibrin	Blood clotting
Glucose	Cellular energy source
Immune cells (e.g. lymphocytes and macrophages)	Immune defence, growth factor production
Platelets	Blood clotting
Proteins (e.g. albumin, fibrinogen, globulins)	Transport of other molecules, anti-inflammatory effects, blood clotting, immune functions
Growth factors	Stimulates cellular growth
Proteases (protein-degrading enzymes)	Degradation of proteins, assisting in autolysis and cell migration, scar remodelling

The role of moisture in wound healing

Moist wound healing is a well-known concept; however, typically, the literature focuses on the production of copious amounts of exudate (Gardner, 2012; Chamanga, 2015; Moore and Strapp, 2015; Vowden et al, 2015), and that the overproduction of exudate can adversely affect wound healing (Moore and Strapp, 2015). Despite this, it is important to understand the role of moisture, and that the challenge of managing dry wounds can also be significant.

The general rule is that exudate can delay wound healing and extend treatment time if in the wrong amount, wrong place or of the wrong composition (WUWHS, 2019) — and it is worth remembering that this includes too little exudate, which is often overlooked. For a wound to progress through the normal wound healing cycle, sufficient moisture needs to be produced, in order to promote cell proliferation and support the removal of devitalised tissue (WUWHS, 2019).

The aim of all treatment should be to create an optimal moisture balance [Figure 1], protect surrounding skin and manage symptoms, which requires a structured and coordinated approach. Achieving these factors can help to improve patients' quality of life and enable the wound to progress to healing.

The challenges of managing dry wounds in practice

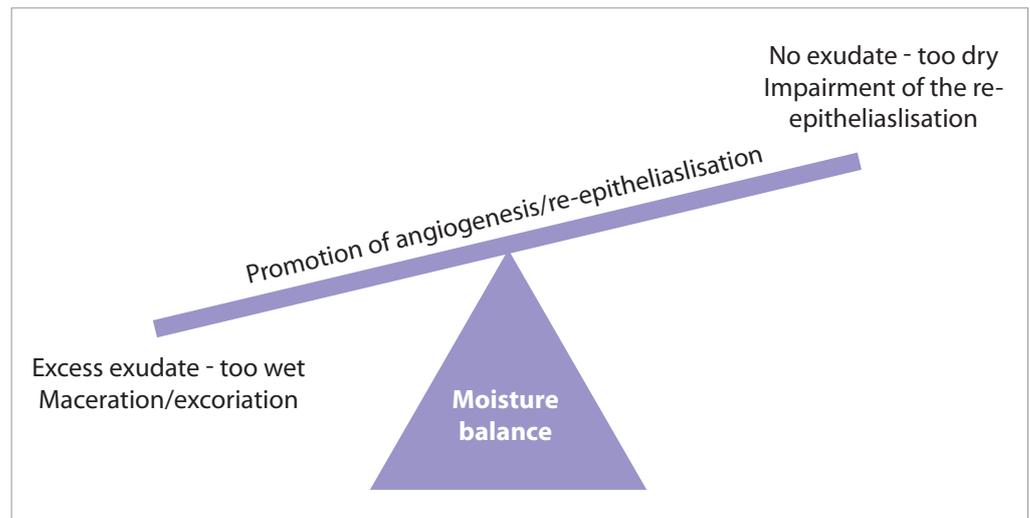
In managing dry wounds, where there is insufficient moisture production, there are specific challenges that may need to be addressed in clinical practice.

Autolytic debridement

Insufficient exudate production may inhibit

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Figure 1. The moisture balance 'see-saw' (Bishop et al, 2003).



autolytic debridement and consequently delay healing (WUWHS, 2007).

Autolytic debridement is defined as 'selective, slow debridement that occurs naturally and can be aided by using topical agents and contemporary wound dressings' (IWII, 2016). The removal of devitalised tissue by autolytic debridement can help to facilitate wound healing, as the prolonged presence of devitalised tissue within the wound can increase the risk of infection and cause further complications.

Removing devitalised tissue via autolytic debridement provides a wound environment that is less likely to support a growth of bacteria; reducing the bioburden (and the potential presence of biofilms) within the wound further inhibits the proinflammatory responses, encouraging formation of granulation tissue in the wound bed (Wolcott et al, 2009).

Inflammation

In a wound, the initial injury initiates the inflammatory response — an early stage of the healing process. Inflammation is initially caused by signals released from damaged tissue, and results in swelling, heat, redness and pain (Fletcher and Chadwick, 2019). Acute inflammation is a natural part of the wound healing process, but a suboptimal wound environment can prolong the inflammatory phase (Yastrub, 2009).

Insufficient moisture during this stage — along with factors such as hypoxia, ischaemia, infection or biofilm — can result in wounds becoming stalled or 'stuck' and, therefore, failing to progress to the proliferative phase. A wound bed that is too dry prevents cell migration, which results in poor wound healing.

If the factor(s) causing prolonged inflammation

are not addressed quickly — which may include the wound being too dry — this can stall healing and cause further tissue breakdown, thus becoming a self-perpetuating cycle of non-healing (Gibson et al, 2009).

Dressing adherence

Too little moisture can cause over-adherence of dressings to the wound bed (WUWHS, 2019). This can cause further damage to the wound and to the surrounding skin, and can increase risk of complication through leaving debris in the wound bed (Romanelli et al, 2014).

Crucially, this can cause considerable pain and distress to the patient, which can create anxiety around dressing change (Romanelli et al, 2014).

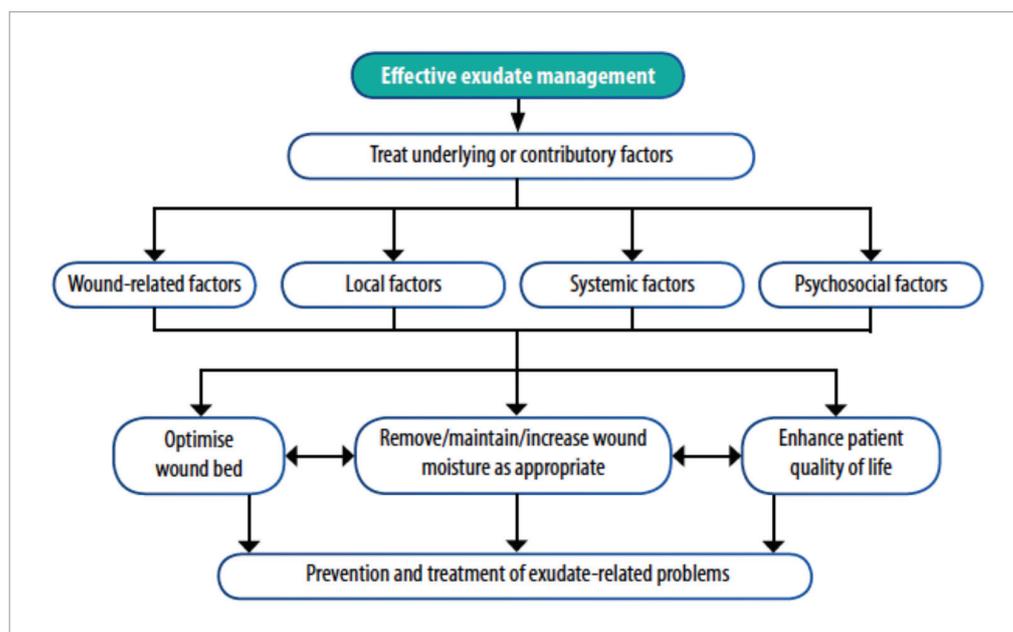
The importance of assessment

When a wound is dry and producing too little exudate, it is important to identify the cause, so that effective management strategies can be introduced. Indicators at assessment may be: the wound bed is dry; there is no visible moisture and the primary dressing is unmarked; the dressing may be adherent to the wound, and the patient may experience pain during dressing removal.

Low exudate production may indicate a systemic problem — e.g. dehydration, hypovolaemic shock, microangiopathy (Romanelli et al, 2014) and, therefore, a full holistic assessment of both the patient and their wound is important, particularly in ruling out and helping to manage any underlying causes.

A structured approach, including comprehensive documentation, is recommended. Regular comprehensive assessment and documentation of the patient and their wound are essential for monitoring change and aiding decision-making; identifying appropriate

Figure 2. Principles of exudate management, adapted for dry wounds (adapted from WUWHS, 2007).



treatment goals (usually healing, but this may vary in individual patients) can help to guide decision-making in practice and assess ongoing treatment efficacy (Romanelli et al, 2014; WUWHS, 2019).

Addressing relevant patient factors and comorbidities should help to identify any underlying issues that will affect wound healing – these may include overall health or lifestyle adjustments (e.g. nutrition, hydration, mobility, smoking cessation) that may help to improve outcomes (WUWHS, 2019).

The wound should also be assessed using a structured framework, such as the TIME clinical decision support tool (CDST; Moore et al, 2019). This enhancement of the original TIME framework (Dowsett and Newton, 2005) includes a structured patient assessment for each step of the four components:

- Tissue (addressing non-viable tissue — i.e. autolytic debridement in dry wounds)
- Infection/inflammation (which may be high-risk in dry wounds; Junker et al, 2013)
- Moisture balance (of key importance in assessment)
- Edge (which may include debridement issues or other related factors, or non-healing if the wound edge is non-advancing).

The moisture component in the TIME CDST includes a focus on different approaches to restoring the optimal moisture balance for wound healing (Moore et al, 2019). *Figure 2* also illustrates suggested rationale and steps that should be taken in identifying and managing moisture issues, adapted for dry wounds (WUWHS, 2007).

Overcoming the challenges

Effective management of the key issues in dry wounds (i.e. autolytic debridement, inflammation and dressing adherence) broadly encompasses two combined strategies: appropriate dressing selection and use of additional topical treatments where required.

An outline of suitable product choices for dry wounds, and how they address these key issues, follows below. *Table 2* highlights the challenges, and how these can be overcome in practice.

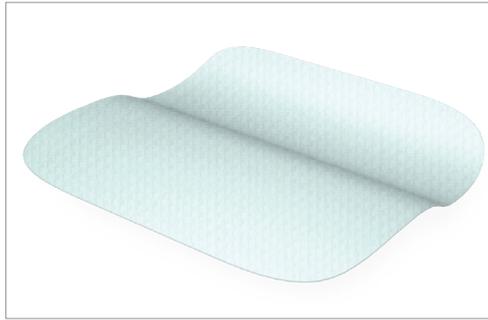
Dressing selection

Selecting a dressing to aid moisture balance is a key component in managing dry or low exuding wounds. The ideal dressing needs to help maintain an optimal moisture balance for the wound to progress to healing. It is important for a dressing to work responsively and to balance moisture as needed. This may be by donating moisture or being able to dynamically draw fluid to the wound bed from surrounding tissues when the wound is dry, but also by absorbing fluid as exudate levels increase. Moisture balancing sheet hydrogels are designed to both donate moisture and absorb exudate in this way, thereby providing an optimal moist wound healing environment.

KERRALITE COOL™ Dressings are one option of a moisture-balancing sheet dressing suitable for use on dry wounds, or wounds with low exudate levels. The dressing consists of a hydrolytic polymer gel matrix with a polyurethane (PU) film barrier, designed to actively respond to different wound conditions [*Figure 3*].

Other dressing options to achieve optimal moisture balance may include wet dressings

Figure 3. KERRALITE COOL™ Dressings.



(e.g. hydrofiber or alginate dressings), or a hydro-responsive wound dressing (Moore et al, 2019).

Topical solutions

In managing dry wounds, topical solutions — e.g. amorphous hydrogels that are applied directly to the wound bed — are a further option for helping to achieve a moist wound healing environment.

NU-GEL™ Hydrogel is a transparent, hydroactive amorphous hydrogel that contains sodium alginate [Figure 4]. The gel is simple to apply directly to the wound bed and can be used to manage dry wounds, in conjunction with appropriate dressings, to create an optimal moisture balance.

Figure 4. NU-GEL™ Hydrogel.



Autolytic debridement

By reacting dynamically to the wound environment, and donating or absorbing moisture as needed, moisture balancing sheet hydrogels, such as KERRALITE COOL™ Dressings, can help to facilitate autolytic debridement of devitalised tissue from the wound bed (Morris, 2006). The dressing is also able to help facilitate osmotic debridement, a key differentiator between moisture balancing sheet hydrogels. Essentially, the strong osmotic nature of the gel found in KERRALITE COOL™ Dressings is able to create a chemical pull, thereby lifting and removing necrotic tissue, whilst helping to draw fluid from the underlying tissues into the wound

bed (Ivins, 2014). This means that the dressings are indicated for use on dry, sloughy or necrotic wounds; however, they are also suitable for use on a variety of wound aetiologies and at all stages of the wound healing process.

NU-GEL™ Hydrogel also encourages natural autolytic debridement, by facilitating rehydration of the wound and softening and hydrating eschar. The sodium alginate component enhances the gel's absorptive capabilities.

Inflammation

An *in vitro* study using KERRALITE COOL™ Dressings (Ivins, 2014) found the dressing was effective in reducing protease activity (MMP-2 and MMP-9), through what is believed to be a combination of modifying the ionic environment and selective protease depletion, which is a key factor in converting a stalled or hard-to-heal wound into a healing state. In a pilot study (Ivins, 2014), patients' wounds showed 'positive signs of wound improvement', with rapid changes observed in wounds that were previously stalled and had not yet responded to treatment, which is in part attributable to the dressings ability to reduce MMPs levels.

If wound dryness is contributing to the wound being 'stuck' in the inflammatory phase, and healing being stalled, providing additional moisture via NU-GEL™ Hydrogel may also be beneficial.

Dressing adherence

The absorbent properties of KERRALITE COOL™ Dressing's hydropolymer gel matrix derives from a super-absorbent polymer and which, unlike fibrous dressings, is able to maintain its gel-like consistency even if the wound exudate level decreases, meaning that the dressing will not adhere to or dry out the wound bed (Ivins, 2014). If absorbency is required, the dressing is designed to draw excess fluid and its components vertically – directly to the top of the dressing — which can also help to reduce the risk of maceration of the periwound skin.

The dressing is also available with a gentle adhesive border, which helps the dressing to remain secure and in place, particularly on areas that may be hard to dress.

Additionally, use of KERRALITE COOL™ Dressings was found to reduce the patients' pain levels and resulted in reduction of analgesia use (Ivins, 2014). The conformability of the dressing was noted, and treatment was well tolerated by patients, including when used beneath compression garments. The clinicians

Table 2. Key challenges in managing dry wounds and the benefits of using KERRALITE COOL™ Dressings and NU-GEL™ Hydrogel to create a moist wound healing environment.

Key challenges in managing dry wounds	Benefits of using KERRALITE COOL™ Dressings	Benefits of using NU-GEL™ Hydrogel
<i>Autolytic debridement</i>	Able to donate and absorb moisture as required, facilitating autolytic and osmotic debridement and helping to maintain the correct moisture balance.	Rehydrates the wound, softening and hydrating eschar.
<i>Inflammation</i>	Reduces protease activity, stimulating healing in stalled or 'stuck' wounds.	Helps to create an optimal moisture balance for wound healing.
<i>Dressing adherence</i>	Matrix maintains its gel-like consistency in dry wound conditions, so the dressing will not adhere to or dry out the wound bed. Minimises pain at dressing change.	Provides direct hydration, minimising the risk of the secondary dressing adhering to the wound bed.

involved noted that the dressing was easy to apply, with no apparent discomfort or stinging on application, and was easy to remove with irrigation. It was also noted that less maceration was visible to the surrounding skin, in comparison to a non-adherent hydrogel sheet dressing — achieved by the dressing's ability to absorb fluid and its components vertically.

If additional moisture only is required in a dry wound, NU-GEL™ Hydrogel may be used in conjunction with an appropriate secondary dressing.

Tips and tricks for management in practice

Moisture imbalance can delay wound healing (Winter, 1962) and cause pain to the patient, particularly if the wound is too dry to stimulate the wound healing process (Richardson and Upton, 2010). The treatment of patients with chronic wounds is a challenge for the multidisciplinary team (MDT; Atkin et al, 2019).

Through regular assessment of the patient's wellbeing, their wound and the involvement of the MDT and/or informal carers, the promotion of holistic patient care is key (Moore et al, 2019). Holistic assessment and care is particularly important in treating underlying causes and barriers to wound healing [Box 1]. The appropriate treatment should be evaluated on a regular basis to measure the outcomes of wound healing.

There are different options for the management of exudate levels. If the wound is too dry, it needs hydration. Different dressing options are available — for example, hydrogels,

Box 1. Checklist for assessment.

To achieve optimal moisture balance, the wound should be assessed – including the wound bed, wound edge and surrounding skin (Rippon et al, 2016).

- Surrounding/periwound skin
 - Are there signs of maceration or desiccation?
 - If yes, is too much or too little moisture present? Is the dressing wrong for the wound? Are there any other potential causes?
- Wound edge
 - Are there signs of maceration or desiccation? If yes, is too much or too little moisture present? Is the dressing wrong for the wound? Are there any other potential causes?
 - Are there signs of dry necrotic tissue or eschar/slough? If yes and there is no peripheral arterial disease present, than the wound may be too dry, or the dressing is wrong for this wound
 - Is there an epibole present? This can be a sign of oedema and may be responsible for moisture imbalance
- Wound bed
 - Are there signs of dry necrotic tissue or eschar/slough? If yes and there is no sign of peripheral arterial disease, than the wound may be too dry, or the dressing is wrong for this wound
 - Is there pain present? Maybe the wound is too dry or the wrong dressing is being used (Richardson and Upton, 2010)

alginate or hydrofiber, or a hydro-responsive wound dressing (WUWHS, 2019).

If a possible moisture imbalance persists and the cause cannot be confirmed, the MDT should be involved.

Conclusion

It is well established that moisture is needed to facilitate wound healing, and a moist environment is optimum for healing. When discussing moisture management, the emphasis is often on managing excessive volumes of exudate. However, it is important to remember that too little exudate can be as damaging to the wound as too much exudate. Exudate contains components that are vital to the processes of wound healing, and if the wound environment is too dry, this can result in the wound becoming stalled and healing being delayed.

A thorough holistic assessment process is vital, assessing both the patient and their wound. If a wound is dry, underlying causes should first be identified and managed. A suitable treatment plan can then be devised, which should encompass dressing selection and any adjunctive topical measures (e.g. use of a hydrogel) if necessary.

KERRALITE COOL™ Dressings have been proven to be effective in managing dry wounds, stimulating healing and reducing patients' pain levels (Ivins, 2014). NU-GEL™ Hydrogel can also be used in conjunction with dressings if the wound bed needs to be directly hydrated, in order to facilitate autolytic debridement in dry wounds and create a moist environment to support wound healing.

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