JCN

KerraMax®: managing highly exuding wounds

Sylvie Hampton discusses the use of KerraMax®, a super absorbent dressing, in the management of exuding wounds

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Controlling fluid loss from a highly exuding wound has presented a problem for clinicians since the time of the Egyptians. However, recent advances in science and technology have resulted in dressings that simplify the clinicians' role by addressing the complexities of wound healing and balancing this with increasing the patient's quality of life. One such dressing is KerraMax® (Ark Therapeutics), a novel superabsorbent dressing, which has been available on prescription since November 2008.

A detailed knowledge of dressing materials and their performance is essential to be able to successfully treat highly exuding wounds. This product focus discusses how KerraMax® has been designed to manage exudate and so may be a valuable addition to the '*tool box*' in wound care.

What is wound exudate?

Injury to body tissues results in an inflammatory response. This inflammatory process begins with inflammatory mediators being released into the extracellular fluid. The blood vessel walls then dilate, and become more permeable thus allowing protein-rich fluid – exudate – to filter from the circulatory system into the inflamed tissues (Vowden & Vowden, 2004). This fluid is believed to have antibacterial properties (Kreig & Eming, 1997) and it contains molecules and cells that are vital to support the healing process (Fletcher, 2002). In normal healing, the volume of exudate will decrease as the wound heals but when healing is delayed, through infection or underlying aetiologies such as venous hypertension, exudate levels may increase or fail to reduce (Adderley, 2010).

In chronic wounds the wound does not progress through the phases of wound healing in a timely manner, but appears to be '*stuck*' in an early stage of healing, frequently the inflammatory phase. The molecular and biochemical composition of wound exudate in chronic wounds differs from acute wounds. Chronic wound fluid has been shown to inhibit angiogenesis, the formation of new blood vessels, in non-healing venous leg ulcers (Drinkwater *et al.*, 2002). Further, this wound fluid has been shown to inhibit or fail to stimulate the proliferation of cells central to wound healing, notably fibroblasts, endothelial cells and keratinocytes (Bucalo *et al.*, 1993). Matrix metalloproteinases (MMPs) play an essential role in tissue repair and remodelling in normal wound healing. However, their levels are elevated in chronic wounds, which can prolong the inflammatory phase of wound healing (Okan *et al.*, 2007). Protease activity can result in degradation of the wound bed together with excoriation of the peri-wound skin, further delaying wound healing (Cutting & White, 2002; Fletcher, 2002; Okan *et al.*, 2007).

In chronic wounds, exudate is not simply detrimental to the healing process, but it also causes problems on a more practical level. Excess exudate can cause malodour (through provision of an ideal environment for microorganisims), leakage and soiled clothing and bedding, which in turn can lead to anxiety, sleep disturbance and social isolation for patients (Adderley, 2010). Wound care dressings and nursing time are two of the greatest costs associated with chronic wounds. As a result, wound exudate can be considered the key management challenge in many wounds (Dealey *et al.*, 2006). Not surprisingly, a key feature of the ideal wound healing environment is, therefore, that exudate levels are controlled (Lee *et al.*, 2009).

Managing high exudate levels

Caring for a wound tends to fall into one of two categories: managing or treating the wound. Managing is where the clinician identifies a problem (i.e. high exudate, pain and/or odour) and '*manages*' the problem (packs thick cotton dressings around the wound, applies carbon dressings to absorb the odour and provides analgesia to mask the pain). The knowledgeable clinician who '*treats*' the wound will identify the challenges in the same way but will have an understanding of what is causing the problem and will work to address the hindrance to healing by removing or reducing the cause, (i.e. by reducing the bacterial load, elevating legs, discontinuing amorphous hydrogels, applying compression bandages, using dressings to reduce pain, etc).

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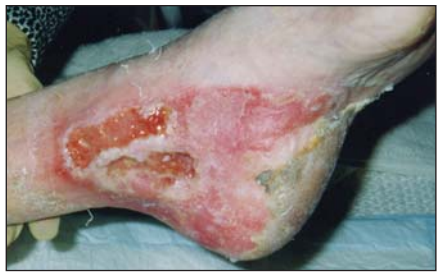

Figure 1: Damage caused by proteolytic enzymes when the wound is kept too wet

In the meantime, whilst treating the wound, they will look for a dressing that has a high fluid handling capacity (such as a superabsorbent dressing) without padding the patient with large bulky dressings, which would restrict their movements. There is clearly an important distinction between *'mopping up'* exudate as an end in itself as opposed to handling exudate while trying to address the cause of the fluid production (Anderson, 2002).

Dressing choices for exuding wounds

Clinicians do not always understand the concept of moist wound healing (Hampton & Collins, 2003) and often apply wet dressings such as amorphous hydrogels to highly exuding wounds, believing that this provides moisture. Although a '*moist*' environment is the ideal, accomplishing this to the correct degree consistently, provides a challenge to the practitioner (Cutting & White, 2002). The level of moisture required for healing has never successfully been defined; nevertheless, there is now an awareness of the dangers of a '*wet*' wound which causes maceration of the wound margins and can '*waterlog*' the granulation tissue, causing it to over-granulate (Vandeputte & Hoekstra, 2006). Therefore, the wound surface should be kept moist by its own fluid loss but not allowed to become saturated thus preventing maceration from overly moist wounds which causes damage to the peri-wound area (*Figure 1*).

Cutting and White (Cutting & White, 2002) have determined that the following should be considered when selecting a dressing to successfully treat wounds whilst minimising the potential for maceration:

- Level and nature of wound exudate
- Fluid-handling capacity of the dressing
- Site and condition of the wound
- Optimal wear time for dressing on the wound
- Specific needs of the patient
- Environmental factors
- Possible adhesive damage to peri-wound skin.

The amount of exudate a dressing can hold is influenced by the way the material handles the fluid (Fletcher, 2002). Simple products, such as gauze, will absorb exudate at the point of contact with the fluid and, when full, will '*reflect*' the exudate back onto the skin. Cotton dressings, such as Gamgee, will give additional absorbency, but they also add bulk, which may complicate patients' lives further by interfering with practical issues such as wearing shoes (Anderson, 2002). Therefore, high levels of exudate present a challenge in terms of selecting appropriate dressings (Fletcher, 2002).

A greater understanding of wound healing coupled with advances in technology has enabled the development of specialised superabsorbent dressings which have been designed to create an ideal wound healing environment. Unlike '*sponges*' and methyl cellulose based dressings which will take up water or water based fluids and release them under pressure and/or heat, superabsorbent polymers (SAP) chemically react with the water and hold the water molecules in place. As a result, when SAP dressings absorb fluid they create a gelatinous mass converting the liquid to a solid or semi-solid phase. During this process, the SAP swells several times and the weight for weight gain can be many times greater than the original SAP material. One problem encountered with traditional SAPs is that they are limited by the amount of fluid they can absorb, above this limit they suffer from a phenomenon known as '*gel-lock*'. In this instance, the swollen SAP particles create a barrier preventing further fluid ingress even though there will be some unreacted SAP material remaining. A new generation of SAP is now available that overcomes this problem. These dressings reduce the problem associated with bulky dressings such as being able to wear comfortable and aesthetically pleasing shoes and the fluid is unlikely to '*reflect*' back onto the wound and surrounding skin.

KerraMax®

KerraMax® is a superabsorbent dressing for use in moderate to heavily exuding wounds (*Figure 2*). It contains a super fine cross linked polyacrylate superabsorbent material that is milled into a fine

Figure 2: KerraMax®

powder and so retains a smooth, flexible gel like texture even when completely saturated. KerraMax® has been created to never become rigid when wet and never develops pockets of coarse material. This means no ridges or pressure points that can damage the wound bed or cause pain and discomfort to the patient. Additionally, absorption of fluid does not result in gel locks, or lumps. KerraMax® locks away wound exudate when the superabsorbent material chemically reacts with the water. Due to its unique mode of action there are fewer leaks under pressure compared to traditional foam dressings which simply soak up liquid.

As with all SAPs, the absorption capacity of KerraMax® is great (*Table 1*). The less ionic the fluid the greater the absorption capacity.

KerraMax® is designed to be used where management of high levels of exudate is a treatment objective. This includes pressure ulcers, delayed closure of surgical wounds, leg and some foot ulcers but the major indication is exudate treatment in venous ulcers. Exudate treatment dressings cannot always be used in high compression bandaging system as they can distort pressure locally delivering higher pressures than those recommended. However, with its ability to gel evenly and its thin profile, KerraMax® can be used under lower compression regimes.

The superabsorbency property of KerraMax® results in reduced dressing changes ensuring disturbance to the wound bed is minimised. Further, by locking away the exudate from the wound and surrounding skin, the superabsorbent polymers help prevent maceration. Pain at dressing change is minimised as the soft moist gel does not adhere to the wound site, thus reducing trauma and pain during both wear and dressing change. KerraMax® is suitable for use under compression as the fluid

Table 1: Absorption capacity of KerraMax®*

Dressing size	Free absorption capacity (mL)	
	0.9% saline	Water
10 x 10cm	50	143
10 x 22cm	120	343
20 x 22cm	240	686
20 x 30cm	380	1,086

**in wound care, the absorption capacity is expressed as an ability to absorb water and 0.9% saline*

Table 2: Free swell capacity after 60 minutes

Dressing	Mean Free Swell Absorption (g/100cm²)
Eclypse (10 x 10cm)	52.29 (4.706)
Mesorb (10 x 10cm)	76.16 (4.526)
KerraMax (20 x 22cm)	74.14 (6.392)

remains locked away, even under pressure. However, the maximum absorbency capacity will be reduced under compression. Further, costs are favourable compared to Mesorb and Eclypse and almost a third the price of other superabsorbent dressings on Drug Tariff.

KerraMax® has the ability to absorb wound fluid in a free swell condition as well as Mesorb, which is predominantly composed of methylcellulose and absorbs exudate into the spaces between the molecules. The disadvantage of methyl cellulose is that under pressure, it firstly cannot retain as much fluid as it is not locked away chemically as with KerraMax® and secondly when it is applied dry on a wound under any pressure, it will not absorb as much wound fluid as KerraMax®. Laboratory tests, undertaken by Ark Therapeutics, established that in the free swell situation, KerraMax® is significantly more absorbent than Eclypse. The tests also confirmed that, in a clinical situation where a highly absorbent dressing is required with no compression bandaging then KerraMax® will absorb and lock away more chronic wound fluid than Eclypse and as much as Mesorb (*Table 2*).

KerraMax® has been designed to absorb large volumes of exudate in a free swell situation and under mild to moderate compression. KerraMax® is very easy to use as it can be placed on the wound as a primary or secondary dressing in any position. With its unique technology, KerraMax® does not require a water repellent backing and so can be '*stacked*' resulting in better treatment of highly exuding wounds (*Figure 3*). It does not have a water repellent side and therefore does not encourage maceration when not changed with sufficient frequency.

Nurse and patient acceptance

Introduction of new wound care dressings is a regular event. Assessment of each new dressing is essential before choosing to include it in our ever increasing armamentarium of wound care dressings. At the Wound Healing Centre, Eastbourne, KerraMax® was initially used on two patients with the aim of demonstrating the reduced potential for maceration in wounds with high levels of exudate and to determine the acceptability of the dressing by both nurses and patients. In both patient A and patient B the wounds at the start of treatment with KerraMax® were non-healing and the peri-wound skin was macerated (*Figure 4*). Treating the wound with KerraMax® ensured that the potential for peri-wound maceration was diminished and healing was optimised (*Figures 5, 6 and 7*). Patient and nurse acceptability of KerraMax® was high in both cases.

KerraMax® is used at the Wound Healing Centre, Eastbourne, as either a primary dressing or as a secondary dressing (*Figure 8*). It has been shown to be extremely versatile and offers the potential of applying it over high compression to ensure that fluid is drawn away from the wound. It is the author's experience that by applying KerraMax® directly onto the wound and under compression excellent results are achievable.

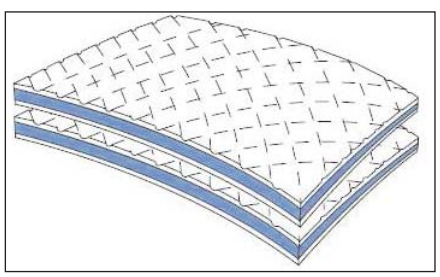

Figure 3: KerraMax® can be stacked to increase absorbency when necessary. However, thought should be given to this as, when filled with fluid, the dressing will increase in weight and this could be too much for the patient.

Conclusion

Clinicians should always '*treat*' wounds,

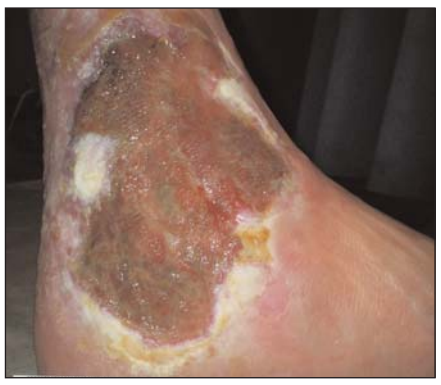

Figure 4: Peri-wound skin is macerated and the wound is pale with little granulation

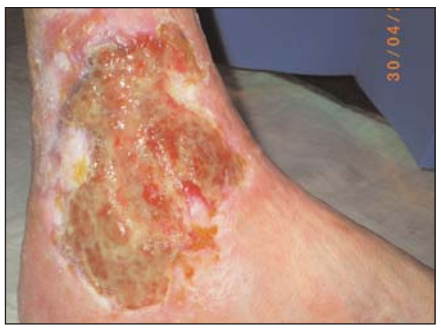

Figure 5: The surrounding skin is no longer macerated and there is healing occurring within the wound.

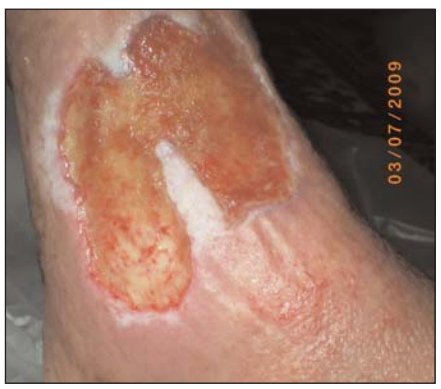

Figure 6: Maceration has improved with KerraMax® and healing is now obvious.

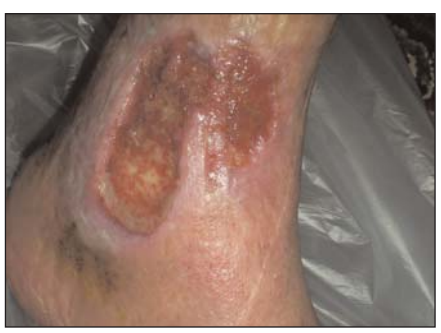

Figure 7: Healing continues with KerraMax®.

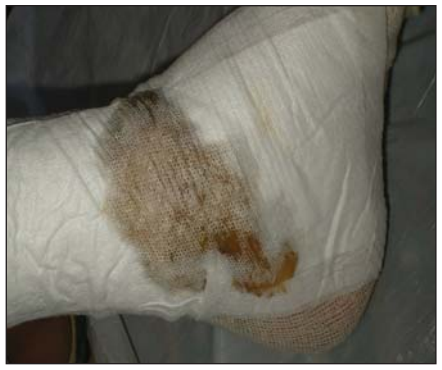

Figure 8: KerraMax® used as a secondary dressing to treat the exudate level. This supports the primary dressing by reducing the amount of 'wetness' at the wound surface.

using their knowledge and experience to select the most appropriate dressing for the wound especially when considering the cause of the high exudate levels. KerraMax® is an ideal dressing to be used in primary care to manage excess wound fluid as it performs well under mild to moderate compression and can be used as a dressing to absorb wound fluid from other parts of the body where optimum absorption is required. The widespread availability of KerraMax® affords health care professionals a real solution to treating a wound by managing exudate, a clinically challenging and costly problem.

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