Right product, right wound, right time?

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Ulceration of the foot is a common complication of diabetes and is responsible for a significant number of hospital admissions annually (Diabetes UK and NHS Diabetes, 2009). It is estimated that only two-thirds of diabetic foot ulcers progress to healing, while the remainder result in some form of amputation or are active at the time of death (International Working Group on the Diabetic Foot, 2005). Furthermore, the cost of amputation – both in respect to the persons' quality of life and the NHS budget – is significant (Papanus and Edmonds, 2005).

Strategies for healing diabetic foot ulcers often involve multidisciplinary assessment followed by a period of treatment that may include, as appropriate, debridement of nonviable tissues, management of infection, offloading and revascularisation. Additionally, the holistic clinical management of the person with diabetes and foot ulceration would include achieving good glycaemic control, cardiovascular risk reduction, foot health education and so on (Papanus et al Edmonds 2005).

Wound dressings play a role in the treatment of diabetic foot ulcers. At the most basic level, they provide a barrier to the wound from the environment and absorb exudate, but they may also treat infection and promote healing (Caputo et al, 1997). However, most dressings lack trial evidence to support their use. Furthermore, evidence for the efficacy of many dressings specifically in the treatment of diabetic foot ulceration is frequently lacking.

New research

A recent multicentre, prospective, observer-blinded, parallel group, randomised controlled trial published by the Health Technology Assessment Centre, assessed three dressing preparations on diabetic foot ulcers (Jeffcoate et al, 2009): N-A (Johnson & Johnson Medical, Berkshire), a non-adherent, knitted, viscose filament gauze; Inadine (Johnson & Johnson Medical), an iodine-impregnated dressing; and Aquacel (ConvaTec, Middlesex), a newer hydrofiber (described in the article as a hydrocolloid) preparation.

The authors sought to test whether a modern dressing product was more clinically effective than traditional dressings, and to determine the relative cost-effectiveness of each dressing. Health-related quality of life and pain were also assessed for participants in each of the three arms.

A total of 317 people with diabetes and a foot ulcer were randomly assigned 1 : 1 : 1 to the dressing treatment arms. Ulcers varied in size and the randomisation was stratified to account for this, with small, medium and larger ulcers divided equally into each of the treatment group. A total of 88 people withdrew from across the study arms by study end.

Participants who achieved healing in <12 weeks did so in a mean of 42.9 days in the Aquacel group, compared with 49.2 days in the N-A group. This 7-day difference in mean time to healing was not considered statistically significant. At 12 and 24 weeks the N-A group had lower healing rates than either of the other two arms, but this was not statistically significant. At 24 weeks, 35% of people randomised to N-A had withdrawn.

No significant difference between the three dressings with regard to percentage healed by 24 weeks by per protocol analysis, or in mean time to healing, was found.

The cost (mean cost/person) associated with the provision of dressings was significantly different, with the higher cost of Aquacel compared with Inadine and N-A was not offset by fewer dressings required for that arm.

While the authors should be congratulated on their thorough and robust trial, some elements of the trial design and findings raise questions.

Dressing choices

The right dressing for the right wound?

One of the problems of randomising people in trials of dressings is whether the characteristics of each wound randomised to a specific dressing correspond to the characteristics that the dressing was designed to manage.

A large number of participants in Jeffcoate et al's study were reported to have light or no wound exudate (64%, 66/103). Aquacel was designed for use on wounds with moderate to heavy wound exudate (Timmons, 1999). Thus, only 36% (37/103) of wounds randomised to treatment with Aquacel would have received that dressing type under normal conditions, were the manufacturer's instructions followed. The authors do not provide data on the condition of skin surrounding the index ulcer during the study period.

Maceration is of particular importance when making decisions on the most appropriate dressing, especially for highly exuding wounds. N-A is not an absorbent dressing and therefore it will not manage moderate to high levels of wound exudate – which made up 42% (45/106) of all wounds randomised to the N-A arm – well.

Use of a non-absorbent dressing in a moderately to highly exuding wound may result in strike-through and associated malodour. The use of a non-absorbent dressing in 45 moderately to highly exuding wounds may explain the high withdrawal rate seen in the N-A arm (35% [37/106] withdrawn by 24 weeks). Inadine is also non-absorbent and its use in moderately to highly exuding wound could have resulted in similar problems. However, the antimicrobial properties of Inadine may have reduced the burden of malodour. Aquacel on the other hand is designed for use on moderately to highly exuding wounds.

Secondary dressings

The choice of secondary dressing is an important factor in wound management and impacts on the wound environment. The authors' use of Telfa (Covidien, Mansfield, MA) and Melolin (Smith & Nephew, Hull) as secondary dressings may not be standard practice and these dressings could impact on the microenvironment within the wound. Telfa and Melolin dressings do not have occlusive backing, and their use may lead to wounds drying out. There is a risk, when using non-occlusive dressings, of wound infection, primarily as the result of dressing strike-through, although this is not extensively supported in the literature.

Modern foam dressings, conversely, are designed to promote moist wound healing by maintaining optimum moisture levels. This is achieved by using polyurethane foams that absorb exudates and external films and which allow moisture vapour to be transmitted at a controlled rate (Lin et al, 2009).

Dressing change protocol

The question of how often and by whom dressing changes were performed is another area where Jeffcoate et al's study protocol can be questioned. Dressings were changed daily, on alternate days or three times a week, according to need or the availability of professional staff. Participants or their carers who wished to change dressings themselves received training to do so. Those who did not elect to be responsible for dressing changes had their dressings changed by a district or practice nurse.

Aquacel can be left *in situ* for up to a week, although this may not be desirable in the management of the diabetic foot (Timmons, 1999). The same cannot be said of the other two dressings, which are more often changed on a daily basis. Thus, the appropriate interval between dressing changes is both a function of the specifics of the individual wound and the design of the dressing.

The involvement of patients and carers in dressing change throws some doubt on the conclusions made by the authors. It could be questioned whether patients and carers were skilled enough to make the decision that a dressing change was required. While the empowerment of people with wounds and their carers in this way is admirable, we question whether this was appropriate as part of a trial. To provide a platform for comparison, the dressings should have been changed according to manufacturer's guidance and by an experienced clinician.

Wound pain

The authors of the study assessed the presence and intensity of pain in the ulcer region. While there was no significant between-group difference in the presence of pain, a significant difference between groups in the change in pain reported between baseline and the second week was found. A mean increase in pain was reported for Inadine and Aquacel, while there was a mean reduction for N-A (Aquacel vs N-A, P=0.016).

The increase in pain intensity scores in the Inadine group may be related to the drawing effect of iodine when in contact with the wound (Wilson et al, 1986). It is also possible that the too early removal of Aquacel – before the dressing had time to gel – would have increased the pain experienced by the participant. This further highlights the need to follow manufacturer's instructions, and have the need for dressing changes judged by an experienced clinician.

Infection

Microbial pathogens delay wound healing through several mechanisms, including persistent production of

inflammatory mediators and metabolic waste and the maintenance of activated neutrophils, which produce cytolytic enzymes and free oxygen radicals (Laato et al, 1988). Jeffcoate et al's exclusion criteria included infection extending to tendon or bone, known osteomyelitis, soft tissue infection requiring systemic antibiotic therapy, limbs being considered for revascularisation and gangrene. While these exclusions minimise the confounding role that infection or ischaemia may play in the assessment of dressings, it also reduced the relevance of the study to people at high risk of amputation who, in our experience, form a large percentage of cases in clinical practice.

Those excluded from the trial may have observably benefited from the use of advanced wound care products, while their counterparts with non-infected wounds and good vascular supplies would heal with equal readiness regardless of dressing type. For example, exudate management in infected wounds can be vital in the prevention of further wound and periwound deterioration, thus the application of a dressing designed to manage high volumes of exudate may make a material difference in the healing of such a wound.

Although Inadine is a commonly used dressing, the manufacturers advise its use only in wounds with signs of clinical infection (Johnson & Johnson Medical, 1996). In this study, Inadine was used on wounds without signs of clinical infection at baseline and, therefore, was used contrary to the manufacturer's guidance.

Taking into account the different withdrawal rates between the groups, the incidence of secondary infection (expressed as a function of the total number of dressing changes) was not significantly different between the groups (Inadine, 0.01; Aquacel, 0.01; N-A, 0.009). The authors comment that "the lack of difference tends to negate any suggestion of a benefit from using antiseptic preparations".

Inadine is described by the authors as a modern antiseptic dressing, yet this product has been available for more than 30 years. Inadine contains povidone iodine (Johnson & Johnson Medical, 1996), which animal studies have failed to confirm efficacy in the reduction of bacterial count (Pierard-Franchimont et al, 1997). Its use as an antimicrobial in complex, limb-threatened wounds should be questioned. Other antimicrobial agents used to impregnate dressings (e.g. honey [Molan, 2005], silver [Russell and Hugo, 1994], cadexomer iodine [White et al, 2001]) are possibly more effective and should not be dismissed based on the failure of this single antiseptic preparations to produce a reduction in secondary infections in the present study.

Conclusions

The authors of this study should be congratulated for bringing more scientific rigour to the literature that clinicians may consider when choosing a dressing for use on a diabetic foot ulcer. The results reminds us that dressings are only a small component in the process of achieving healing in a diabetic foot ulcer; if the core elements of good wound care – offloading, debridement, revascularisation, infection control – have not been attended to, a dressing is unlikely to compensate.

Criticisms could be levelled at the authors for failing to allocate dressings to the wound types for which they were designed, or control the frequency and appropriateness of dressing changes. It would be of interest to see if improved healing and reduced costs would result from the use of Aquacel and Inadine in accordance with their respective manufacturer's instructions. Furthermore, data is needed on the role of various dressings in cohorts that are more representative of diabetic foot clinics on the ground (e.g infected or ischaemic feet).

This study highlights the need for dressing manufacturers to carry out clinically relevant studies prior to the launch of new dressings. Such data would clarify the positioning of new dressings in the range of products already available, and enable clinicians to make informed choices about what is appropriate for the individual they are treating. ■

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