A Fluid Handling Assessment of Foam Dressings

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Introduction

Fluid controlling capabilities of advanced wound dressings are of paramount importance when it comes to managing wound exudate. Poor wound exudate handling by a wound dressing can lead to fluid leakage from around the dressing or strike through, both of which can lead to soiled clothing and malodour; exacerbating patient social isolation. Additionally if the dressing is not capable of absorbing or transmitting wound fluid away from the wound or skin, then the consequences are generally tissue maceration, causing pain, delayed wound healing and infection. It is vital therefore that wound dressing fluid management data be made available to the clinician to allow them to choose the most appropriate dressing in relation to the fluid levels that are exuding from the wound. In providing this data a variety of methods have been used to provide information with regards to the fluid management capability of the dressing. However many of the methods that are currently in use are static and do not take into account many of the physical challenges that the dressing may undergo.

Method

Four foam dressings* were tested for their total absorptive capacity in an ionic solution at 37°C (142mmol sodium ions, 2.5mmol calcium ions). The weighed dressings were fully submerged in an excess of the solution for 30 minutes. The dressings were then reweighed. Total absorbency was determined by subtracting the dry dressing weight from the wet dressing weight. The test was repeated in triplicate. Fluid uptake was determined by inverting a test tube containing 10ml of Solution A onto the wound contact surface of each dressing. The time taken for the dressing to fully absorb all of the fluid was recorded. This test was repeated in duplicate.

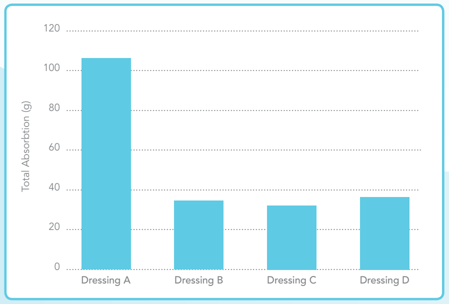
Dressings were then tested using a simulated wound model (adaptation of the method described by Thomas & Fram[1]). In this method, weighed dressings were applied to a steel plate (heated to 37°C), which contained a fluid inlet port. On the steel plate, a 1cm long channel allowed Solution A to be delivered to the dressing at a rate modelling that of a highly exuding wound; 2ml/hr[2].

An overflow beaker was placed underneath the model to capture any fluid not absorbed by the dressing.

A 500g container of desiccant placed on top of the dressing provided even pressure over the dressing; simulating compression yet allowing transpiration of fluid. After a period of 24 hours the dressing was removed and re-weighed. Subsequently the saturated dressing was applied to a perforated surface and then a 5kg weight applied for 30 seconds (to remove excess fluid) and again weighed. Each measurement was undertaken in triplicate. Retention of fluid in the dressing was calculated as the weight after compression minus the wet dressing weight, and expressed as a percentage of the total fluid absorbed by the dressing.

Results

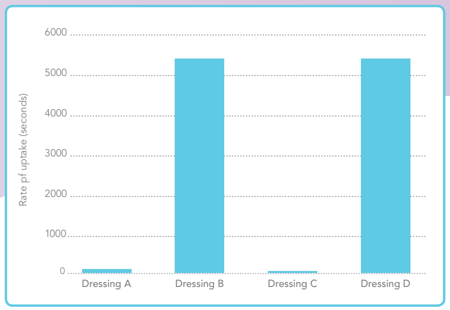
Graph one shows the total absorption of each of the four foam dressings tested. Dressing A achieved a superior absorption capacity than the other three dressings tested.



Graph one – total absorption of Solution A by four foam dressings

Graph two shows the rate of uptake of 10ml of solution A by each of the four foam dressings.

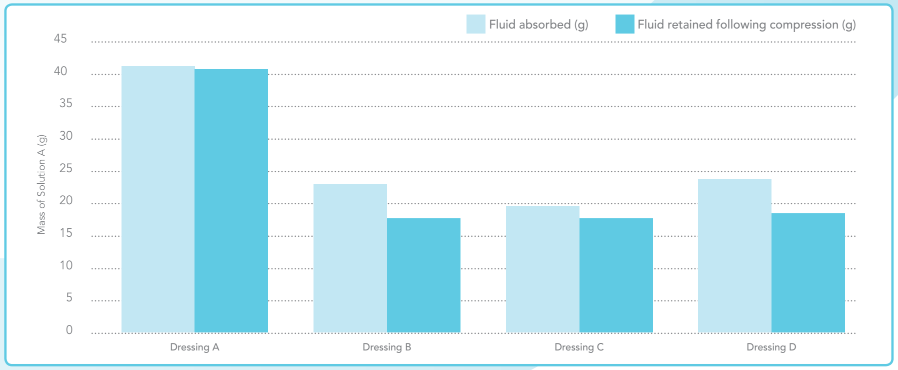
Note – Dressing B and Dressing C took longer than 90 minutes (5400 seconds) to absorb the fluid, after which time the experiment was stopped.



Graph two – time taken for foam dressings to absorb 10ml of Solution A

Dressing	Fluid fed in (ml)	Fluid absorbed (g)	Fluid not absorbed (g)	Fluid retained following compression (g)	Fluid retained following compression (%)
Dressing A	48.1	40.87	0.00	40.81	99.88%
Dressing B	48.0	22.57	1.60	18.31	85.83%
Dressing C	48.2	19.68	13.79	17.84	92.93%
Dressing D	48.0	24.14	11.96	18.60	81.74%

Table one – fluid handling of foam dressings when tested using a simulated wound model



Graph three – fluid absorbed and fluid retained following compression when tested using a simulated wound model

The results of the simulated wound model can be seen in Table one. Dressing A had a fluid retention of 99.88% of Solution A and absorbed 40.87g.

Each of the other dressings failed to absorb the total fluid delivered over 24 hours; therefore lost fluid to the overflow cup.

Graph three shows the fluid absorbed during the simulated wound model and the quantity retained following compression with a 5kg weight.

Discussion

Data relating to fluid absorption in wound dressings is required in order to aid the clinician to decide which dressing is most appropriate for use with different wound types/exudate management challenges. Some static tests do not take into account the fact that exudate absorption into a dressing is dynamic. This modified fluid absorption/retention test provides a test that is more allied to the clinical situation in terms of delivering fluid at a clinically acceptable rate over a period of time. As such the results can be extrapolated to how dressings would deal with exudate flow from a wound (under compression) over a period of 24 hours. The results clearly show that Dressing A both absorbs and retains more fluid within the dressing than the comparators. In addition, the rate of fluid uptake by Dressing A was significantly faster than that of Dressing B and Dressing C.

Conclusion

The challenges of exudate management require a clear understanding of wound dressing capabilities; this study shows that Dressing A would be the dressing of choice in moderate to highly exuding wounds.

*Dressing A – KerraFoam Gentle Border (Crawford Healthcare), Dressing B – Allevyn Gentle Border (Smith & Nephew), Dressing C – Aquacel Foam (Convatec), Dressing D – Mepilex Border (Mölnlycke Healthcare)

References:

1. Thomas S, Fram P. The development of a novel technique for predicting the exudate handling properties of modern wound dressings. World Wide Wounds, 2001.
2. Dealey C, Cameron J, Arrowsmith M. A study comparing two objective methods of quantifying the production of wound exudate. J. Wound Care, 2006; 15(4)