Management of shear, pressure and microclimate by foam dressings

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Introduction

It is widely recognised that pressure ulcers are caused by a number of contributing factors; of which not only pressure, but also shear and microclimate are significant.1

Dressings are more commonly being used for the prophylactic prevention of damage to skin by the above factors. In this study, an investigation was conducted into the efficacy of four foam dressings* in their management of shear, pressure and microclimate.

Method

Microclimate

Dressings were applied to the opening of a non-permeable chamber, in which a high humidity had been generated. The humidity within the chamber was then monitored over 500 minutes (8.3 hours) at a temperature of 37°C±1°C. Any change in humidity within the chamber was due to the application of the dressing, and provided and indication of a dressing's ability to control microclimate at the skin surface.

Two tests were conducted; one in which the dressings were occluded and one in which they were not. This was to simulate dressings when covered by clothing or bedding, as well as dressings in free contact with the air.

Shear and pressure redistribution

Pressure and shear force redistribution were measured using a pressure sensing mat. A 1.75kg weight was applied to the pressure mat and the pressure generated by the weight recorded. The pressure gradient caused by the weight was also recorded, which is an indication of shear forces. To determine how the presence of a dressing affected the pressure and pressure gradient, a dressing was then applied between the weight and the pressure sensing mat, and the measurements repeated.

Results & Discussion

Microclimate

After a number of hours applied to the high-humidity containing chamber, the humidity underneath each dressing plateaued. The point at which the humidity plateaued varied from dressing to dressing and whether the dressing was occluded or not.

Studies have shown2 that when dressings are used prophylactically, moisture levels of the skin's environment should not drop below 40%RH. This is to preserve the skin's elasticity and protective barrier properties, and prevent the risk of dehydration. The same study also suggests that if humidity is above 70%RH moisture can become trapped at the skin surface and the skin viability may be comprised. The red lines on graph one indicate these optimum skin moisture levels.

Dressing A was the only dressing tested which could provide a humidity above the minimum value of 40%RH and below the maximum value of 70%RH. This was the case in both occluded and non-occluded trials. These results indicate that the majority of dressings do not provide the optimum skin moisture level when used prophylactically to prevent skin damage. There is a risk that these dressings would dehydrate or over-hydrate the skin during prophylactic use.

Pressure redistribution

The application of dressings between the pressure mat and the weight reduced the average pressure at the dressing-mat interface. The dressings all performed differently; with Dressing A reducing the average pressure by the greatest amount. This suggests that of the dressings tested in this study, Dressing A would most successfully protect the skin from pressure generated from external stimuli. Figure one and graph two show the results from the pressure redistribution experiment.

Shear force redistribution

When dressings were applied between the pressure sensing mat and the weight, a reduction in the average pressure gradient was seen for all dressings tested, see graph three. The lower the pressure gradient, the smaller the shear strain at the surface of the mat.

Graph three shows that each of the dressings reduced the average pressure gradient at the pressure mat by varying degrees, with Dressing A reducing the shear forces to the greatest extent. This suggests that in comparison with the dressings tested in this study, Dressing A would be most successful at protecting the skin from shear forces.

Conclusions

- Dressing A redistributed pressure and shear forces more successfully than the other dressings tested.
- Only Dressing A was able to maintain a favourable microclimate when tested both occluded and non-occluded.
- This suggests that not all dressings are equal in prophylactic protection of skin, and that careful consideration should be made during dressing selection.

References:


Graph one – Average relative humidity underneath dressings after eight hours applied to a high-humidity containing chamber. Results are shown from the dressings when occluded and not-occluded. Red lines indicate optimum humidity levels for prophylactic use.

Graph two – Average pressure recorded when a weight was applied with [no dressing] and without [no occlusion] a dressing to a pressure mat.

Graph three – Average pressure gradient recorded when a weight was applied with [no dressing] and without [no occlusion] a dressing to a pressure mat.