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In vitro performance of a new silicone foam dressing* compared with four silicone foam dressings used for pressure injury prevention and wound treatment

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Introduction

Pressure injuries represent a burden for healthcare systems worldwide, are a major cause of mortality, and negatively impact patient's quality of life.[1]

Over the last 20 years, dressings have been introduced as an additional protective measure for pressure injury prevention (PIP) and became part of standard protocols for PIP in patients at risk.[2]

The aim of this study is to evaluate in vitro characteristics of a new five-layered silicone foam dressing* in comparison with four other five-layered silicone foam dressings on key performance parameters for PIP and wound treatment.

Methods

Pressure injury prevention key parameters

(n= 5 for dressings #, † °and ¤, n=29 for dressing *)

Pressure redistribution: the pressure redistribution performance of dressings was determined by performing Interface Pressure Mapping (IPM) using a pressure sensor type 5051 from Tekscan™. The samples were placed on the pressure sensor with the top film side downwards facing the pressure sensor (silicone adhesive upwards). A predefined compression load was applied to the dressing, and the pressure sensor recorded the force distribution. Data analysis of the recorded force distributions results in the evaluation of pressure redistribution performance with two parameters; peak pressure and coefficient of variation (COV). The peak pressure is an indicator of the maximum pressure, and the COV is an indicator of how evenly the pressure is distributed.

Static and dynamic friction coefficients on whole wound care products: the friction test was performed by attaching and folding the dressings around a steel sledge. The sledge with the dressing on was then attached to the tensile testing machine by a string. The force required to pull the sledge with the top film side of the dressing facing a Teflon substrate was measured. The static friction is measured as the force that prevents initial motion between the top film and the Teflon substrate while the dynamic friction is the force measured when the object is already in motion.

Peel adhesion: was evaluated by determining the force needed to remove the adhesive border part of the dressings in a 180° pull angle from the steel plate. The test is repeated 5 times to achieve a total of 6 measurements (initial adhesion and adhesion after 5 reapplications).

Waterproofness: dressings were tested for waterproofness according to the method described in EN 13726-3, Test methods for primary wounds dressings – Part 3: Waterproofness.[4] Three samples of each dressing were tested. Testing was performed at the external lab Danish Technological Institute.

Wound treatment key parameters

24h fluid handling: dressings were tested for fluid handling capacity (FHC) according to the method described in EN 13726-1, Test methods for primary wounds dressings – Part 1: Aspects of absorbency, section 3.3. Five samples of each dressing were tested.[5] Testing was performed at the external lab Surgical Materials Testing Laboratory (SMTL).

Results

A comparison of means was performed for all pairs using a Tukey-Kramer HSD with 95% confidence interval (JMP13, SAS Institute).

The pressure redistribution properties of the dressings were evaluated with the two parameters, peak pressure and COV. The lower the peak pressure and the COV, the better a dressing can redistribute and reduce pressure transmitted to the patient's tissue.

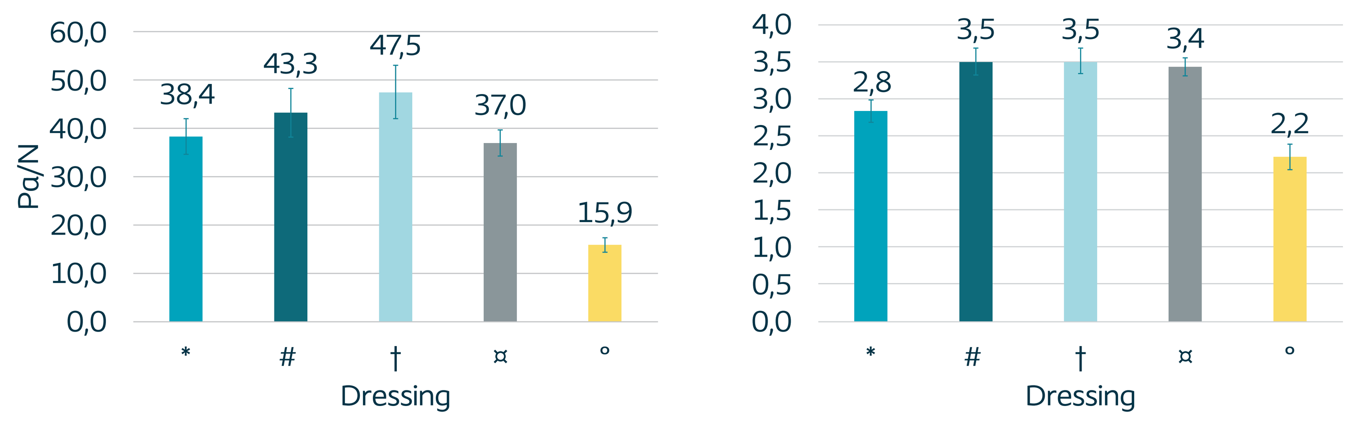

Figure 1: The average pressure re-distribution performance of five dressings. Lower scores indicate better redistribution and reduction of pressure transmitted to the patient's tissue.

- Peak pressure: dressing* had a statistically significant lower peak pressure than dressing † (p<0.0001), and numerically lower peak pressure than dressing # (p=0.0824). Peak pressure for dressing* was on par with dressing ¤ and significantly higher than dressing ° (fig 1)
- Coefficient of variation: dressing * had a statistically significant lower COV than dressings † , # and ¤ (p<0.0001). The COV of dressing * compared with dressing ° was statistically higher ((p<0.0001) (fig 1)

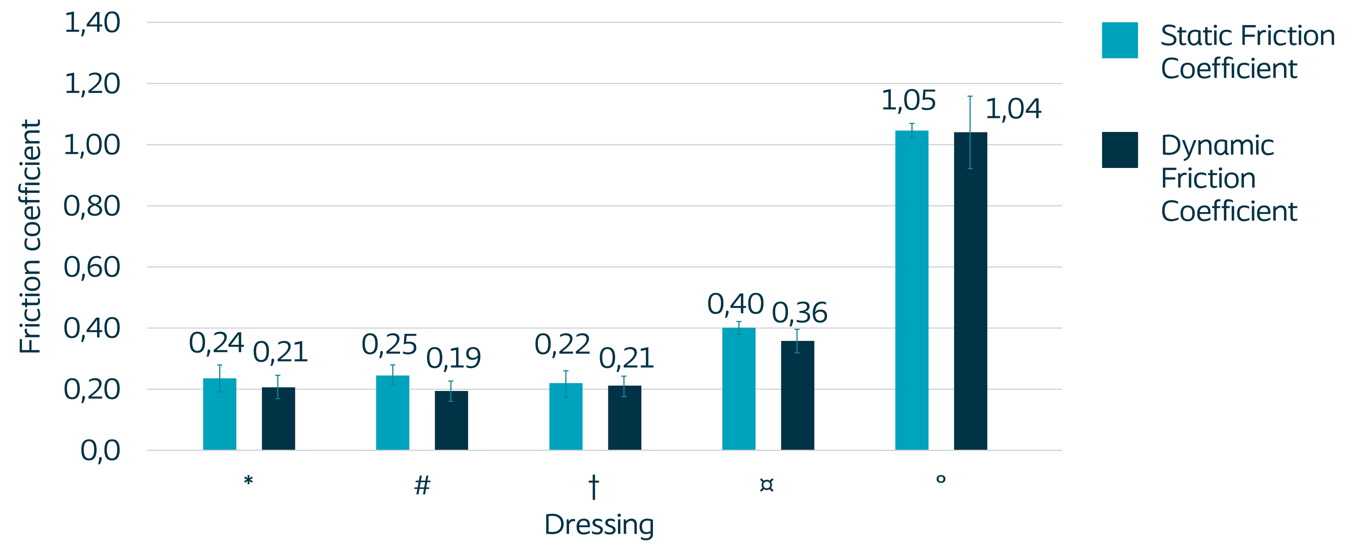

Figure 2 : The average static and dynamic friction coefficients of five dressings. Lower friction coefficients indicate better dressing performance in reducing friction transmitted to the skin.

Low friction coefficients indicate reduced resistance to friction forces; the dressing is able to move more easily across surfaces, which in turn means less stress is transmitted to the tissue.[3]

Both static and dynamic friction coefficients for dressing * were on par with dressings # and †, and they were significantly lower than dressings ° and ¤. (p <0.0005).

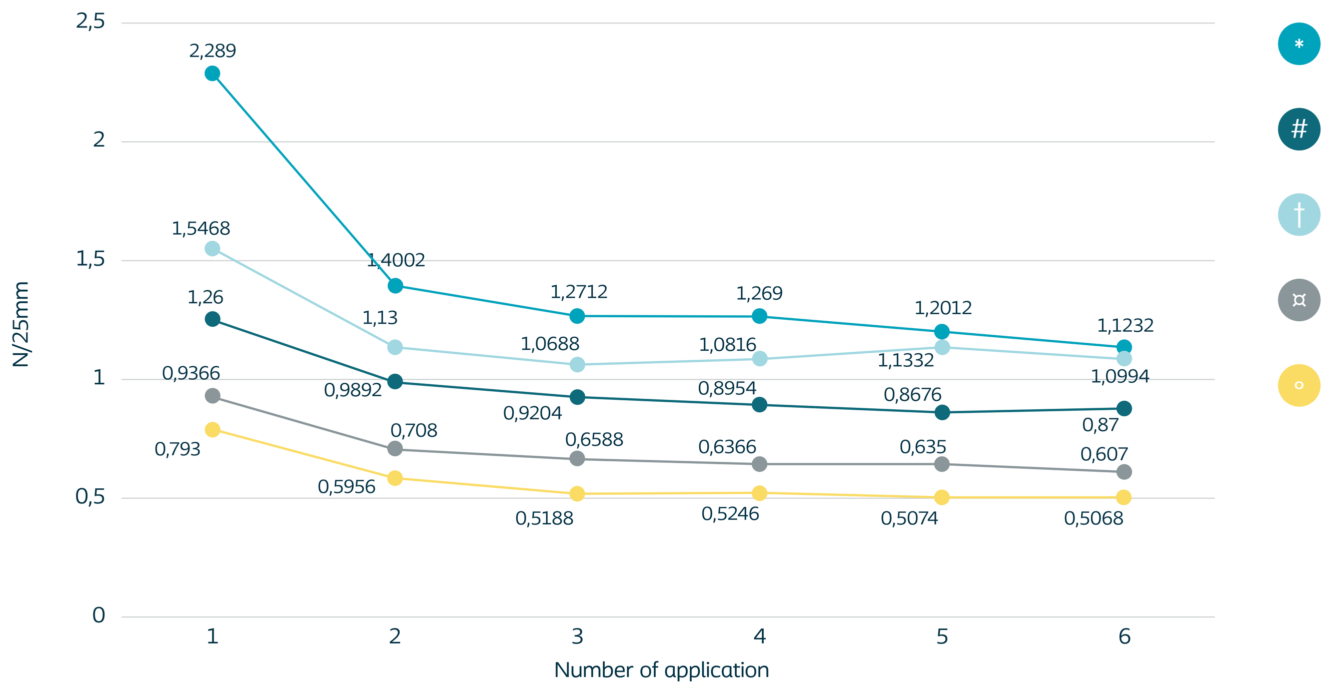

Figure 3: The average peel adhesion from steel plate following initial adhesion and re-adhesions of five dressings.

As part of pressure injury prevention protocols, maintaining peel adhesion over multiple reapplications is important to support skin inspection and help keep the dressing in place (fig 3 shows average peel adhesion following initial adhesion and reapplications).

Reduction of shear forces is provided through good adhesion to the skin (fig 3), high loft and lateral movement of the dressing layers.[1] Test dressing * is evaluated to be on par with comparators regarding absorption of shear forces.

When used for wound treatment, FHC (absorption + moisture vapor transmission) is a key performance parameter, as absorption of exudate and a moist wound environment are essential for wound healing

Dressing * had a significantly higher FHC compared to the four other tested silicone foam dressings. (p<0.0001)

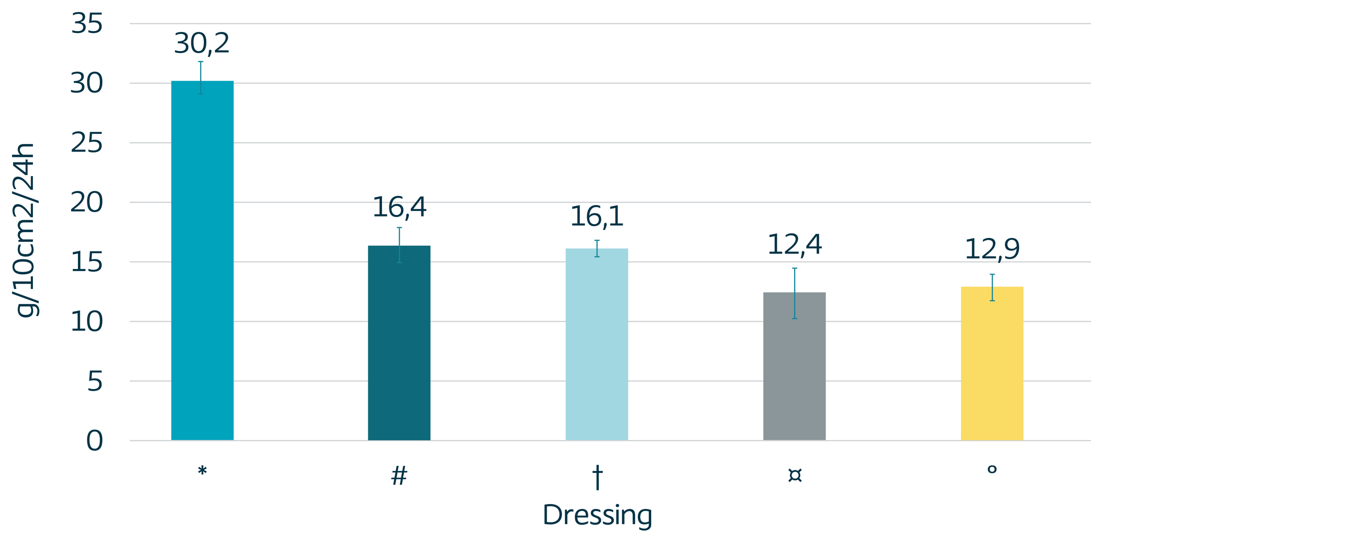

Figure 4: The average fluid handling capacity of five dressings.

All tested dressings passed the waterproofness test. Microclimate management was evaluated through the combination of FHC and waterproofness test. Test dressing* has a higher FHC which indicates that the dressing could more effectively absorb and transmit moisture.

Conclusion

In summary, the new silicone foam dressing * showed a significantly higher fluid handling capacity than the four tested silicone foam dressings and had strong performance on key parameters for pressure injury prevention, meeting the demands of acute care settings.

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References

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*Biatain® Silicone Fit (Coloplast), # Mepilex Border Sacrum and † Mepilex Border Flex, (Mölnlycke Health Care AB), °Allevyn Life (Smith & Nephew), ¤Optifoam Gentle EX (Medline)

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