An assessment of heel shaped pressure offsetting devices

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Introduction

It is estimated that 412,000 individuals develop a new pressure ulcer (PU) annually in the United Kingdom[1]. This level of occurrence has the potential to put huge strain on the resources of the NHS, with treatment of a stage 4 pressure ulcer costing up to £14,108[2]. Pressure ulcers are formed when pressure and shear forces on the skin cause breakdown or injury to the underlying tissue. These ulcers commonly occur over areas of bony prominence such as the sacrum or heel as these prominences increase pressure over the area. Many dressings and devices have been developed in order to alleviate the factors which may lead to a pressure ulcer.

This study looks at the ability of KerraPro Heel and OASIS Heel Cups to offset both shear and pressure in order to reduce the potential for formation of pressure ulcers.

Method

Pressure and shear force redistribution were measured using a pressure sensing mat. A 1kg 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, showing the change in pressure across the mat. Shear is a parallel force (sideways) to the force applied (Figure 1), and therefore measuring the gradient gives an understanding of the shear forces created by application of a weight. The lower the pressure gradient, the smaller the shear stress.
To determine how the presence of a heel device affected the pressure and pressure gradient, each device was then applied between the weight and the pressure sensing mat, and the measurements repeated (n=10).

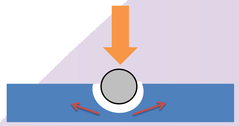


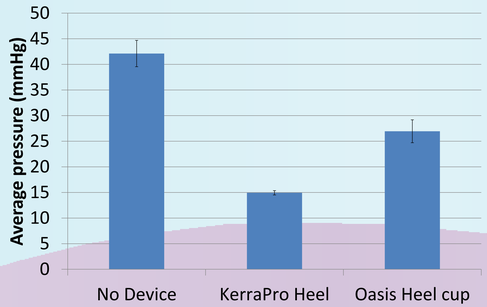
Figure 1- A diagram demonstrating shear caused by the application of pressure to the skin's surface. The red arrows show shear forces.

Results & Discussion

Pressure

Graph 1 shows the average pressure recorded beneath the 1kg mass on the control and each product.

- Beneath the weight with no device present, an average pressure of 42.12mmHg was recorded.
- With KerraPro Heel beneath the weight, an average pressure of 14.93 mmHg was recorded.
- With Oasis Heel Cups beneath the weight, an average pressure of 26.94mmHg was recorded.



Graph 1- Average pressure recorded beneath the control (no device), and each device. Error bars show standard error (n=10)

These values equate to an average pressure reduction of 65% when KerraPro Heel is in place and a reduction in pressure of 36% when using the Oasis Heel cups in comparison to the use of no offsetting device.

Figure 2 shows the representative pressure profiles for each device, with white showing areas of low pressure, and green showing areas of higher pressure.

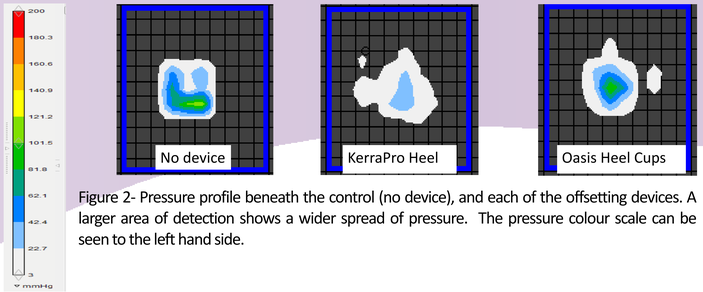
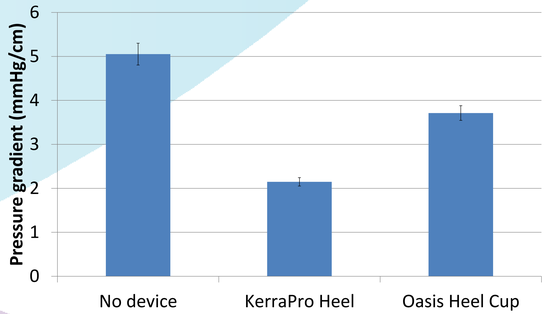


Figure 2- Pressure profile beneath the control (no device), and each of the offsetting devices. A larger area of detection shows a wider spread of pressure. The pressure colour scale can be seen to the left hand side.

Shear

The pressure gradient beneath each device also varied. Graph 2 shows the average pressure gradient beneath the control and each device.

- With the use of no device, the average pressure gradient recorded was 5.05mmHg/cm.
- With KerraPro Heel beneath the weight, the average pressure gradient recorded was 2.15mmHg/cm.
- With an Oasis Heel Cup beneath the weight, the average pressure gradient recorded was 3.71mmHg/cm.



Graph 2- Pressure gradient recorded beneath the control (no device), and each device. Error bars show standard error (n=10)

This equates to a 57% reduction in shear forces with the use of KerraPro Heel, and a 27% reduction in forces with the use of an Oasis Heel cup compared to the use of no offsetting device.

Conclusion

A difference in performance was seen between the two devices tested. Both devices reduced the pressure and shear in comparison to the use of no device, however in this study we see that KerraPro Heel was able to reduce both pressure and shear detected beneath the weight to a greater extent.

References-

1)Bennett, Gerry; Dealey, Carol; Posnett, John (2004) The cost of pressure ulcers in the UK. *Age and ageing,* **33**(3), p230-235
2)Dealey, C; Posnett J; Walker A (2012) The cost of pressure ulcers on the United Kingdom. *Journal of Wound Care,* **21**(6)