Evaluation of Static Support Surfaces

Excerpt taken from clinical evidence conducted during the development of the Softform® Odstock Wedge and the Softform® Heelpad

Conducted by the Department of Medical Physics and Biomedical Engineering, Salisbury District Hospital

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Introduction

The incidence of pressure ulcers to the heels of those patients deemed 'at risk' from pressure damage is a constant concern to clinicians.

Heels present a specific concern because, although the heels are not heavy, the contact area is very small and the interface pressures are high. Work undertaken as part of the Department of Health Mattress Evaluation Project (1,2,3) showed that interface pressures on the standard King's Fund marbled mattress are of the order 150mm Hg. Static systems, which have a softer more deformable top layer, will enable the heel to sink into the mattress and increase the surface contact area. This method then helps to reduce contact interface pressures.

An option is to introduce alternating pressure mattresses and overlays for those individuals requiring more dynamic interventions in 'Very High Risk' groups. For some individuals this is not available due to budgetary constraints or availability. Neither does it address the necessity for repositioning of patients on such systems (5,6), nor does it consider the requirements of individuals who still prefer to share their bed with partners during ill health or in the concluding period of a terminal illness (7).

An alternative approach to using a simple replacement mattress or a more dynamic alternating system is to provide additional support behind the thigh and calf to enable the whole weight of the leg to be distributed over a larger area. The authors have observed this method and adopted it to alleviate pressure where an ulcer exists; or more frequently within specialist units where strategically placed pillows are positioned following a spinal cord injury. These pillows, placed lengthways behind the legs, position the heels and eliminate contact with the mattress to assist in reducing interface pressure.

At the time of development, a number of other methods had also been introduced to reduce pressure to the heels. Heel pads, stockings and even water-filled gloves had been introduced, but without success. Indeed, in some cases, their use has been proven to be detrimental to tissue integrity (8).

Several years ago, whilst taking measurements on a profiling bed, the Department of Medical Physics and Biomedical Engineering at Salisbury District Hospital found that better pressure relief could be achieved by contouring the lower section of the bed so that the knee is elevated, with the hip and knee flexed. It was found that the degree of knee flexion necessary to achieve substantial levels of pressure relief was relatively small. As a result, the concept of a wedge was designed to a prototype stage, to replicate the position adopted on a profiling bed. The results of this study were subsequently reported, (4) but it was believed that the design had room for improvement in the manufacturing process and greater effectiveness could be achieved by introducing specific amendments.

Furthermore, whilst the Wedge could assist in reducing interface pressures at the sacrum and heels, there were concerns that maintaining such positioning would limit patient movement whilst they were confined to the bed. On the removal of the Wedge, the heels would subsequently be subject to an increase in pressure. The concept of introducing a heelpad that was compatible to the Wedge, but which could also be used independently was explored by the Research and Development Team at Invacare Ltd (formerly Medical Support Systems Limited) and the Softform Heelpad was subsequently designed. A prototype was then introduced to clinical areas within a vascular department, to confirm design verification and to eliminate contraindications in this particular high risk group.

Workshops involving Clinical Specialists were held to further explore the design of both products and their prospective use in specific clinical areas and specialities. Comments and suggestions were taken on board, and the finalised versions of the Softform Odstock Wedge and Softform Heelpad were agreed and produced.

Objectives

Having agreed design verification with various disciplines, the products then required validation to establish the reduction that could be achieved in Interface Pressure Measurements. This project was devised as a mutually agreed methodology and the work undertaken by the Department of Medical Physics and Biomedical Engineering at Salisbury District Hospital.

METHODOLOGY

Subjects

An evaluation was taken of ten elderly but ambulant volunteers who were members of the hospital retirement fellowship. They were dressed in standard bedware: pyjamas, nightdresses or loose fitting underclothes.

EQUIPMENT AND EXPERIMENTAL PROCEDURE

Equipment

All readings were taken using a Mark II Oxford Pressure Monitor, employing techniques developed over the past twelve years. Measurements were taken on the sacrum, thigh, calves and heels, following a protocol similar to that developed as part of the Department of Health Mattress Evaluation Project. The equipment evaluated included: -

i) A standard hospital foam mattress

ii) A Propad Overlay with Dura Cover

iii) A Softform Odstock Wedge

iv) A Softform Heelpad

Experimental Procedure

The subjects were positioned on the bed in a semi-recumbent position with the back rest set at 45º. Readings were taken under the heels, on the posterior surface of the calves and the thighs and under the pelvic/sacral area. The 3*4 sensor array was used for the pelvic/sacral area and for the calves and thighs, but individual cells were used for the measurement of heel pressure. Initially measurements were made on: i) Standard foam mattress, 150mm thick with a nylon cover. The sensors were not attached to the subject but were moved until the area of highest pressure was measured.

When using the 3*4 array, the sensor was moved until the highest pressure registered on one of the two central sensors. ii) This technique was repeated on the mattress, mattress with wedge and heelpad, and a combination of each product tested.

In all readings, the maximum pressure measured at each site was used to undertake statistical analysis of the results obtained.

Results

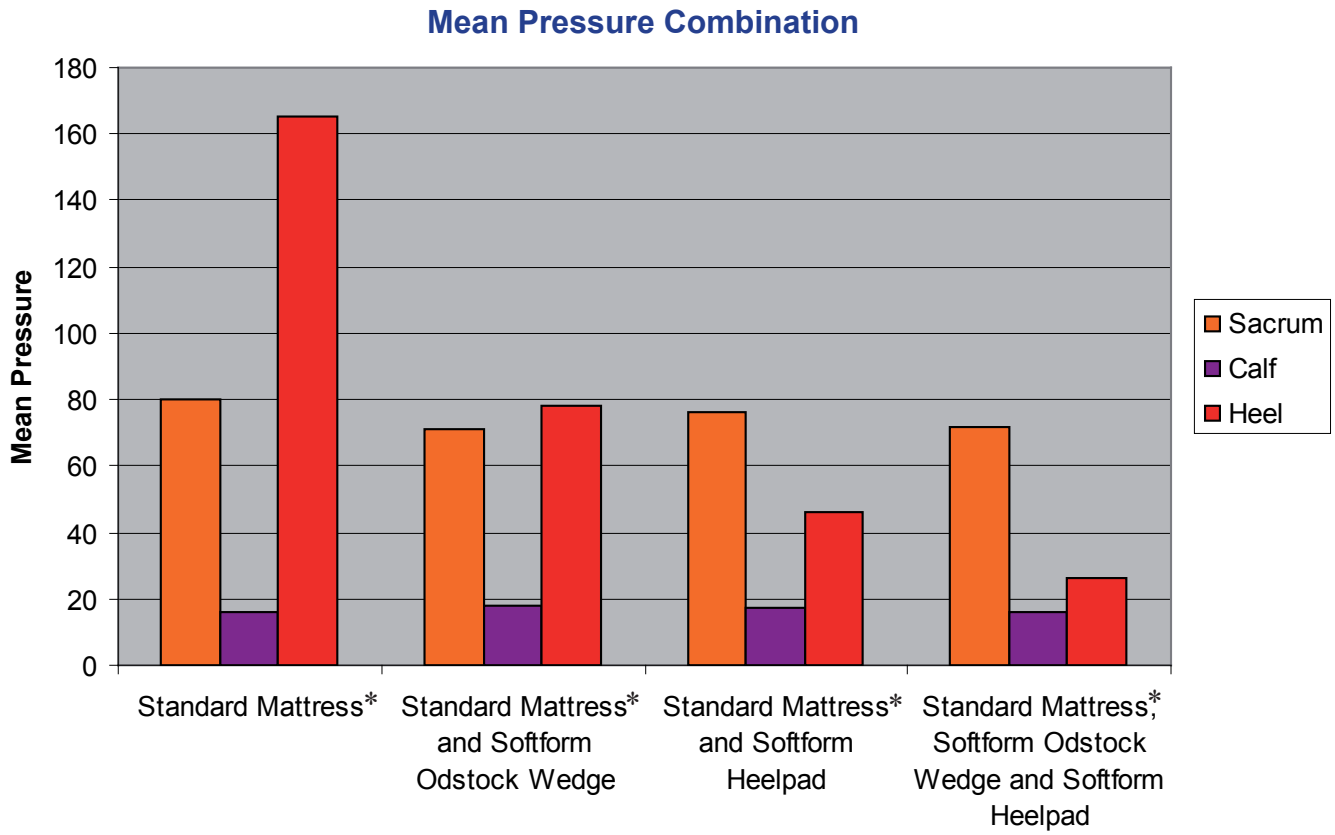
The results are shown in the graph. All results confirm the improvement in pressure reduction with the Wedge and Heelpad when compared with the standard NHS mattress alone. The results demonstrate that the use of the Softform Odstock Wedge significantly reduced the pressure on the heels without significantly increasing the pressure on the thighs or calves. The introduction of the Softform Heelpad, in conjunction with the Softform Odstock Wedge, reduces pressure to the heels even further.

All volunteers found the Softform Odstock Wedge and the Softform Heelpad to be comfortable. Their comments, in particular those stating the use of these aids reduced the tendency to slide down the bed, has implications for assisting in the reduction of shear forces and subsequent reduced pressure damage, similar to the effects of a profiled bed.

Findings

The results show that the use of the Softform Odstock Wedge, positioned behind the legs, can substantially reduce the pressure on the heels to a greater degree than can usually be seen with static mattresses and overlays. The pressure behind the calves is not significantly increased, so it does not, in principle, increase the potential for deep vein thrombosis. Furthermore, the pressure under the sacrum also reduces, albeit slightly.

As well as reducing pressure on the heels, the use of the additional support provided by the Softform Odstock Wedge behind the legs also has a number of other benefits. The main advantage is that when patients are semi-recumbent, more support is provided on the posterior thigh with the hips slightly flexed. This reduces the tendency for patients to slide down the bed, in turn reducing the shearing forces on the sacrum. All the volunteers said how much more comfortable they were when the Softform Odstock Wedge or Softform Heelpad were used.



* Non castellated foam mattress with nylon cover

The other main use for the Wedge has been to tilt the pelvis in order to reduce lumbar lordosis. This is often desirable either following back surgery or as an improved sleeping posture for people with chronic back problems. The usual way this pelvic tilt is achieved is by using pillows placed behind the knees. Although the use of pillows enables variation of the amount of hip flexion, it does have a disadvantage in that the pillows seldom stay in place, particularly when the patient is asleep. The use of the Softform Odstock wedge overcomes this situation and no such problems have been experienced with the prototype used on Orthopaedic wards in Salisbury over the last two years.

The Softform Heelpad, used without the Softform Odstock Wedge, was more effective than the Wedge alone in reducing the pressure under the heels, giving a mean pressure of 46mm Hg. The combination of the Softform Heelpad with the Softform Odstock Wedge was even more effective, giving a mean pressure of only 24mm Hg. This, in theory, should be sufficiently low not to cause any more pressure damage, even if the patient is unable to move, providing the heels remain in contact with the gel in the Heelpad. The standard deviation was also low at 8, with the maximum recorded pressure being 38mm Hg.

Discussion

In Conclusion

On seeing the Softform Odstock Wedge, some people have expressed concern that the elevation and flexion of the knee will cause restriction of venous drainage and increase the pooling of blood in the calf. From the pressures measured on the calf, the authors consider this to be most unlikely.

It must also be remembered that, as with all equipment, these products play only a part, albeit a significant part, in providing better pressure reduction. They must also be observed when used in patient care to confirm that the limbs are appropriately positioned and the heels remain in contact with the gel, to gain maximum effect from the products. Used appropriately, they will add another dimension to patient comfort, facilitate repositioning and enhance pressure reduction with minimum effort.

Essential nursing care is pivotal in pressure ulcer prevention. These products will positively contribute to the outcome of a pressure ulcer prevention care plan. Education, clinical judgement and action based planning based on vulnerability are fundemental factors in the prevention of pressure ulcers. Any formal methods of assessing the risk of pressure ulcers should be used in conjuction with an informal assessment (informed nursing judgement). Informal assessment is considered to be of greater importance and clinical value.

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Invacare Products

Softform® Heelpads

Available in Single or Double sizes

Width:
Double - 62 cm
Single - 32 cm

Length:
48 cm

Height:
5 cm, 3.5 cm

Weight:
3.58 kg

Softform® Odstock Wedge

Width:
57 cm

Length:
86.5 cm

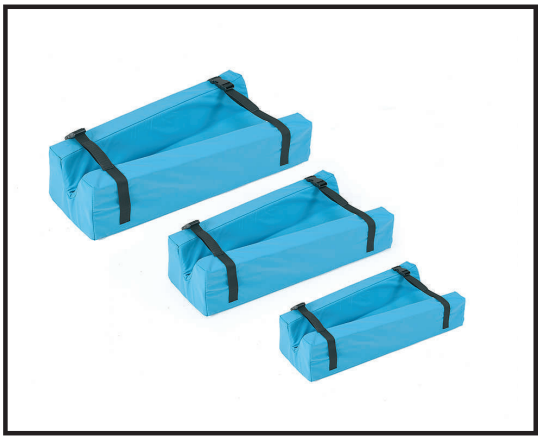
Height:
11.5cm

Weight:
1.5 kg

Invacare Products

Other Invacare Accessories and Products available:

Propad® Leg Trough



Elevates the heels and allows them to be suspended over the edge of the trough, providing pressure relief for the vulnerable heel area.

Softform® Flexipads

Highly versatile pads filled with silicone gel, used to position and support limbs, joints, the torso or the head.

Softform® Premier Active

Unique patented design features an alternating air insert beneath the castellated foam of the tried and trusted Softform Premier mattress, transforming into an alternating surface, delivering additional levels of pressure relief.

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Yes, you can.