

# Prophylactic heel dressings for the prevention of heel pressure ulcers in orthopaedic patients

## KEY WORDS

- ▶▶ Advazorb Heel
- ▶▶ Heel ulcers
- ▶▶ Pressure ulcers
- ▶▶ Prevention

Pressure ulcers on the heels make up about 28% of all cases of pressure ulcers (Barczak et al, 1997) and are particularly prevalent in older people who are immobile. The significant cost of treating pressure ulcers could be avoided by preventing their development. This evaluation involved ten older patients who had all fractured the neck of their femur and were treated with Advazorb Heel dressings upon admission to the orthopaedic ward. None of the ten patients developed ulcers on the heel. The author suggests that a bigger evaluation of the product is necessary but that its use could have the potential for significant cost savings to the NHS.

As the population of older people continues to grow, finding ways to prevent and treat skin breakdown more effectively will have a huge economic impact on the NHS. The cost of preventing and treating pressure ulcers is difficult to quantify as charges are distributed across many different areas of patient care, however, the overall costs are substantial. A 2004 study suggested that the cost of treating ulcers varies from £1,064 for a grade 1 ulcer to £10,551 for a grade 4 ulcer (Bennett et al, 2004). The total cost of pressure ulcers in the UK is estimated to be between £1.4–2.1 billion, equating to 4% of the NHS budget (Bennett et al, 2004).

It is essential to recognise and manage skin lesions at an early stage to avoid the development of pressure ulcers (White et al, 2009). The prevention of pressure ulcers became a key target for the Commissioning for Quality and Innovation (CQUINS) framework and the Department of Health has driven the agenda to reduce the number of hospital-acquired pressure ulcers since 2012. Monthly Safety Thermometer surveys, which measure the prevalence of pressure ulcers that are grade 2 and above enable organisations to review the percentage of patients who receive harm-free care and provide data which builds up a national picture (Health and Social Care Information Centre, 2013).

The heel has been identified as the second most common site for a pressure ulcer, accounting for up to 28% of all cases (Barczak et al, 1997). Heel ulcers are notoriously difficult to heal and their management and treatment can be costly. This has an undeniable impact on patient quality of life and can cause near constant pain, reduced mobilisation, a longer time in hospital and possible amputation (Stuart et al, 2008).

Patients with fractured hips are at high risk of heel pressure ulceration. This group tends to be older, more frail, have limited mobility and they are also more likely to have dementia. The incidence of pressure ulcers in this population is therefore high (Rademakers et al, 2007; Heyneman et al, 2009; Campbell et al, 2010). Recent NICE guidelines (2014) on pressure ulcers discusses the need for adults with pressure ulcers on the heel to have the pressure offloaded from their heels. This article looks first at the causes of pressure ulcers, particularly how they develop on the heel, and then presents the findings of an evaluation exploring the use of prophylactic heel dressings for pressure ulcer prevention in an orthopaedic ward.

## PRESSURE ULCER FORMATION

A pressure ulcer is defined in international guidelines (National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel,

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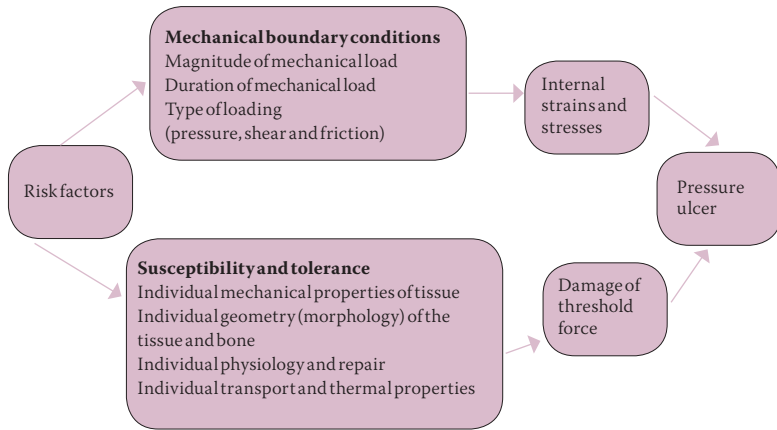


Figure 1. Factors that may influence the risk of developing pressure ulcers (adapted from Coleman et al, 2013)

and Pan Pacific Pressure Ulcer Alliance (NPUAP, 2014) as:

*“An area of localised damage to skin and underlying tissue, usually over bony prominence, as resulting from sustained pressure, or pressure in combination with shear. A number of contributing or confounding factors are also associated with pressure ulcers; the primary which is impaired mobility.”*

Pressure ulcers develop as a consequence of the body’s internal response to sustained mechanical load applied to soft tissue, generally near a bony prominence. Both intrinsic and extrinsic factors influence pressure ulcer development. Intrinsic factors are those that cannot be altered such as age, sex and physical status, as well as factors that may respond to therapy or modification, such as disease condition, nutritional and fluid status (Stephen-Haynes, 2010). There are also a number of extrinsic factors that influence pressure ulcer development, which are discussed below.

**Mechanical loading**

The mechanical load comprises all types of forces that are applied to a person’s skin. If a force is exerted perpendicular to the affected tissues the magnitude of the mechanical load can result in pressure on the skin that is higher than the capillary return. This slows the flow of blood in capillaries and lymph nodes resulting in

insufficient supplies of oxygen (ischaemia) and nutrients and inadequate evacuation of waste products, which can result in cell death (Defloor, 1999; NPUAP, 2014).

**Shear**

Shear forces are a significant problem facing patients who are semi-recumbent or spend a lot of time in a chair. Shearing forces cause thrombosis of the underlying vessels and this leads to destruction of the micro-circulation and can occur when patients slip down the bed or if their heels are dragged on the bed while being lifted up (Versluisen, 1986; Defloor, 1999; Waterlow, 2005; NPUAP, 2014). In older patients, the degree of shear forces that is required to occlude blood flow is less than that for direct pressure so the effect of shear is enhanced (Smith & Nephew Foundation, 2007).

**Friction**

Friction can be described as the resistance of one surface to another moving over it (NPUAP, 2014). As the two surfaces rub together, friction causes the top epithelial cells of skin to be scraped off, leading to superficial ulceration on such areas as heels and elbows (Dealey, 1994; Waterlow, 2005; Cooper et al, 2006). When the patient is slid along a sheet rather than being lifted, superficial blistering of the skin may occur, which can result in secondary infection when the blister bursts (Smith & Nephew Foundation, 2007). The majority of pressure ulcers that occur to the heels are a combination of pressure and friction, with purple discolouration to underlying tissue (known as deep tissue injury) (Cooper et al, 2006).

**Mechanical tissue tolerance**

Mechanical load is applied to soft tissue near a bony prominence. Pressure gradients induced from sustained deformation of the skin and deeper tissue caused by pressure, shear and friction (Figure 1). This will result in cell damage at a microscopic level within a few minutes and sustained loading becomes deep tissue injury or a pressure ulcers (NPUAP, 2014). Patients with multiple risk factors are susceptible to tissue damage, when they lack the ability to be able to keep warm and transport oxygen around their body. Tissue tolerance is the individual susceptibility

or threshold to occlusion of the blood pressure vessels resulting in damage caused by ischaemia. Due to variations in individuals' tolerance and confounding extrinsic factors it is impossible to determine thresholds in terms of time and pressure (Liner-Ganz et al, 2006). If the pressure exerted on the skin and subcutaneous tissues is many times greater than capillary blood pressure, a pressure ulcer may develop (*Figure 1*). This will also be affected by tissue mass, age, dehydration, protein intake, reduced vitamin C levels, stress and use of corticosteroids (Defloor, 1999).

### Microclimate

There is evidence to support the relationship between the microclimate of the skin and the support surface, playing a role in the development of grades 1 and 2 pressure ulcers (NPUAP, 2014). The microclimate refers to the support surface involved and the humidity and the temperature of the skin. When the humidity and temperature of the skin increases, it becomes weaker and more vulnerable to damage. More research is required to identify the optimal microclimate for pressure ulcer prevention (NPUAP, 2014).

### PROPHYLACTIC HEEL DRESSINGS

The NPUAP guidelines (2014) discuss the use of prophylactic dressings to prevent pressure ulcers and there has also been research that has explored this. Ohura et al (2005) measured the pressures of shear forces on the skin and subcutaneous tissues *in vitro*. Their findings demonstrated that when various dressings were applied, shear forces decreased. Research has also suggested that prophylactic dressings influence the microclimate by affecting the levels of moisture and humidity close to the skin (Call et al, 2013).

The NHS Midlands and East's Stop the Pressure campaign highlighted that heels required offloading from pressure. Therefore the tissue viability team at a Midlands General Hospital decided to undertake a small evaluation on the orthopaedic ward as there had been an increased incidence in heel ulcers in this area. All of the patients on this ward were at high risk of developing pressure ulcers on their heels and the Advazorb Heel (Advancis Medical) dressing was chosen to evaluate for its effectiveness in preventing heel pressure ulcers.

### ADVAZORB HEEL DRESSING

The Advazorb Heel dressing comprises hydrophilic, polyurethane foam, with a breathable film backing. It has been designed to contour around the heel. The foam has the ability to absorb exudate and retain it within the dressing (Black et al, 2013; Santamaria et al, 2013), which allows for a healthy microclimate. The film backing provides a bacterial barrier and reduces the friction and shear from bedclothes. The Advazorb Heel dressing is easy to apply and remove and allows easy inspection of the patient's heels twice daily when used in conjunction with a bandage or ComfiFAST stockinette (Synergy Health) to secure it in place.

### AIMS AND OBJECTIVES

The audit aimed:

- ▶ To provide evidence from 10 case studies to demonstrate the benefits of using Advazorb Heel dressing to prevent heel pressure ulcers in patients with a fractured neck of femur.
- ▶ To monitor the incidence of pressure ulcers when the Advazorb Heel dressing is used in the prevention of heel pressure ulcers.
- ▶ To explore staff member opinions on the performance of the Advazorb Heel dressing in preventing heel pressure ulcers in patients with fractured neck of femur.
- ▶ To calculate the cost of using Advazorb Heel dressing as an indicator versus the cost of treating a grade 2 pressure ulcer.

### METHODOLOGY

This evaluation was undertaken on an orthopaedic ward using 10 patients with neck of femur fractures who were followed from admission to discharge (or death as there were four patients recruited who died after 48 hours of admission). Patients were excluded if they were unwilling to participate, if they were readmitted with pressure ulcers or if they weighed more than 159kg (25 stone). All ward staff — nurses and healthcare assistants — were trained to use Advazorb Heel a week before the trial began. They were also trained on the protocol — which involved dressing changes every two days on both heels and the monitoring of patients' skin.

On admission to the ward, patients were assessed using the Waterlow (2005) pressure ulcer

**Box 1. PULSE skin assessment tool**

- P** = Press reddened skin to check for blanching.
- U** = Uncover the skin and remove stockings and socks
- L** = Lift and check heels with a mirror
- S** = Search for redness on the sacrum
- E** = Evaluate elbows for redness

risk assessment score, the SSKIN (NHS Midlands and East, 2012) and PULSE tool skin assessments (*Box 1*) (Rafter, 2012). All patients admitted with neck of femur fracture had the Advazorb Heel dressing applied to both heels secured with ComfiFAST stockinettes from toe to knee. A body map chart was commenced and completed twice daily to check the skin integrity of both heels. All patients with a fractured neck of femur were placed on Dyna-Form™ Mercury Advance (DirectHealthcare Services) or AlphaXcell or Nimbus 3 mattresses (ArjoHunteligh) according to Burton Hospitals' NHS Trust Pressure Ulcer Prevention and Treatment Policy (2012), and they were repositioned every two hours.

An evaluation form designed from previous studies (Rafter, 2011) was employed to monitor the development of pressure ulcers using the body map. Data was also collected regarding the patient's Waterlow score, the Malnutrition Universal Screening Tool (MUST) score (BAPEN, 2011), serum albumin levels, demographics, mental status and other medical conditions. Medication, the repositioning of patients and the mattresses used were all documented. Any pressure ulcers that developed were graded and validated by the tissue viability team and the heels were assessed for their vascular status with assessment of foot pulses. Any pressure ulcers that developed were to be photographed according to current policy and with consent.

After the 14-day evaluation period, all ward staff members were given a questionnaire to gain their opinions of the Advazorb Heel dressings. This audit was registered with the trust's clinical audit department.

**RESULTS**

All of the patients had neck of femur fractures and were emergency admissions to a general hospital. There was one man and nine women with an age range of 57–89 years (mean age = 85 years) (*Table 1*).

The patients' mean Waterlow score was 20 and ranged from 13 to 44; the MUST score range was 0 to 2 (mean = 0.5). The patients' body mass index ranged from 14 to 27 (mean = 22) and the serum albumin ranged from 24 to 44 (mean = 36). The haemoglobin ranged from 8.6 to 10.1 (mean = 9.8). The data presented gives the central tendency of group of patients audited. All of the patients were nursed on alternating mattresses and were unable to turn themselves, so were turned either every two or four hours. There were no adverse events or allergic reactions related to the Advazorb Heel dressings. None of the patients developed pressure ulcers on their heels.

**Staff questionnaires**

Fourteen of the 20 nurses completed the questionnaire. Staff felt that the Advazorb Heel dressing was a very positive addition to enable them to deliver better patient care. As none of the patients in the audit developed heel pressure ulcers, the staff felt it enhanced the quality of care they were able to deliver for their patients. All of the respondents stated that the patients were very comfortable using the Advazorb Heel dressings. Nursing staff commented on how the dressing conformed to patients' heels and they felt the Advazorb Heel dressings were easy to use. All respondents stated that they would like to continue to use the Advazorb Heel to help reduce the number of heel pressure ulcers.

**DISCUSSION**

The evaluation looked at a small group of patients, all emergency admissions with similar comorbidities, ages and Waterlow scores. These patients were all at high risk of pressure ulcer development on their heels. During the audit period, none of these elderly patients with fractured hips developed pressure ulcers on their heels when using the Advazorb Heel dressing. The Advazorb Heel dressing was used in conjunction with an alternating pressure mattress, which is normally employed to prevent pressure ulcers. Staff members were able to inspect the patients' skin twice daily using the PULSE assessment tool, as the Advazorb Heel dressings are easy to remove and reapply.

This audit was run over an eight-week period and patients were recruited for a treatment

Table 1. Patient demographics

Age	Sex	Diagnosis	Waterlow score	MUST	Days on audit	Alternating Mattress	Able to reposition	Frequency of reposition	Outcome
85	F	Palliative care and fractured neck of femur	30	2	8	AlphaXcell	No	Every 2 hours	No ulcers
88	M	Fractured neck of femur	14	0	6	Alpha X Cell	No	Every 2 hours	No ulcers
89	F	Hypothyroid, kidney failure, fractured neck of femur	20	0	13	Dyna-Form Mercury Advance	No	Every 2 hours	No ulcers
85	F	Liver cancer, fractured neck of femur	15	0	8	Dyna-Form Mercury Advance	No	Every 2 hours	No ulcers
89	F	Breast cancer, fractured neck of femur	17	0	12	AlphaXcell	No	Every 2 hours	No ulcers
85	F	Hypothyroid, migraine, fractured neck of femur	16	1	9	Nimbus 3	No	Every 4 hours	No ulcers
57	F	Multiple sclerosis, fractured neck of femur	21	0	13	AlphaXcell	No	Every 2 hours	No ulcers
89	F	Lymphoedema, cancer of the breast and colon, fractured neck of femur	44	0	11	AlphaXcell	No	Every 4 hours	No ulcers
88	F	Osteoporosis, dementia, fractured neck of femur	14	2	7	AlphaXcell	No	Every 4 hours	No ulcers
85	F	Diabetes, fractured neck of femur	13	0	8	AlphaXcell	No	Every 2 hours	No ulcers

period of 14 days, and therefore results may not accurately reflect practice in comparison to an audit run over a longer period. In addition, no statistically significant information can be demonstrated given the small patient group. However, it appears that the Advazorb Heel dressings help to prevent the development of pressure ulcers on heels and feedback from staff about using the dressing was extremely positive.

The cost savings of preventing ten grade 1

pressure ulcers would be £10,640, and for ten grade 2 pressure ulcers would be £52,410 (Dealey et al 2012). Multiplied over a year, this would equal a very beneficial cost saving, even with the cost of the Advazorb Heel dressings added. The cost of Advazorb Heel dressings is £4.75 per dressing, while the Comfast stockinette for a 5-metre box costs £9.29 per use to secure the heel dressing in place. If the Advazorb Heel dressing is changed every two days it costs about £38 a week period,

which would still constitute substantial savings on the cost of treating a grade 1 or grade 2 pressure ulcer. This evaluation suggests that further research into the possible savings to trusts in the use of Advazorb Heel dressings to help reduce the number of heel pressure ulcers is required.

### RECOMMENDATIONS

A large audit of the Advazorb Heel dressings is needed to demonstrate statistical significance.

### CONCLUSION

The effectiveness of the Advazorb Heel dressing cannot be viewed in isolation and must be considered in the context of nursing care provided alongside the alternating pressure mattress. The best insurance for safe patient care is to identify patients who are at risk the moment they are admitted to care. Prompt interventions to prevent heel pressure ulcers are not only economically sound, but also ultimately result in high-quality patient care. The Advazorb Heel dressing could therefore be a very useful tool in the fight against pressure ulcer development on heels.



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