

HEEL PRESSURE ULCERS: AN OVERVIEW OF PRESSURE- RELIEVING EQUIPMENT

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The most recognisable causes of ulceration are pressure, shear and friction. When considering the heel area these forces can be created in various situations, such as when patients use their heels to push themselves up in bed and in cases of poor manual handling. Although there are numerous heel pressure-relieving devices available, all choices must be underpinned by good communication, knowledge of the pathogenesis of pressure ulceration, and holistic patient assessment.

Patients are at risk of developing pressure ulcers, especially on or around bony prominences, such as the heel. The heels are the second most common site of ulcer development after the sacrum (Cheneworth et al, 1994).

This is because of the thin layer of subcutaneous tissue between the skin and the bone, which provides minimal protection from the applied forces of pressure, shear and friction (De Keyser et al, 1994). In some patients, these forces can lead to occlusion of the blood supply to the heel. Prolonged occlusion leads to local ischaemia, resulting in necrosis of the surrounding tissue (Hampton, 2003) and ulceration.

The incidence of heel ulcers is increasing within the inpatient population (Meehan, 1994; Collier, 2000). They result in increased morbidity and mortality, place a financial burden on the NHS (Bennett et al, 2004)

and increase patients' pain and suffering (Hampton and Collins, 2004). Thus, appropriate prevention and treatment of heel ulcers is vitally important, and consideration must be given to the use of appropriate pressure-relieving devices. The reduction of pressure at the site of an ulcer will aid the microcirculation of the area, prevent further damage and act as treatment (University of York, 1995). The use of pressure-relieving equipment in the at-risk patient as determined by the use of a risk assessment tool in conjunction with clinical judgment can also reduce the risk of ulcer development.

Risk factors for pressure ulcer development

Pressure ulcers are caused by a variety of intrinsic and extrinsic factors (Banks, 1997). The National Institute for Health and Clinical Excellence (NICE, 2005) identified common factors that create vulnerability to pressure damage (*Table 1*).

Extrinsic factors

Maklebust and Sieggreen (1996) suggested that the most recognisable causes of ulceration are pressure, shear and friction.

Table 1

Risk factors for pressure ulcers*

Intrinsic factors:

- » Sensory impairment
- » Acute illness
- » Level of consciousness
- » Extremes of age
- » Vascular disease
- » Severe chronic/terminal illness
- » Previous history of pressure damage
- » Malnutrition/dehydration
- » Reduced mobility/immobility

Extrinsic factors:

- » Pressure
- » Shear
- » Friction

Other factors:

- » Medication
- » Moisture

* From NICE (2005)

- ▶▶ Shear is a force that is applied tangentially or in parallel, in all directions (Bliss, 1993). Phillip (2003) gives a similar definition of shear as being: '...the stress resulting when one body attempts to slide past another and encounters resistance.' In the case of the heel area, shear forces are encountered when sliding down in a bedside chair or in bed. An ergonomically poor position in a bedside chair also increases the risk of these forces. Collins (2000) associated sitting out of bed with the heels on the floor with the development of ulcers. Indeed, the patient who slides down in a chair with his or her heels firmly pushed into the floor will cause tissue damage and subsequent pressure ulceration.
- ▶▶ Friction is caused by the rubbing together of two surfaces (Hampton, 2003). It can occur when the skin rubs against bed sheets or the floor, and during poor manual handling techniques. Examples of poor manual handling include leaving hoist slings or slide sheets under patients, which can lead to tissue damage, and the use of short slide sheets that protect the sacrum but leave the heels to be dragged against the bed sheet during repositioning.
- ▶▶ Pressure is the force that is applied vertically to a surface (Hampton, 2003), and occurs when patients are not regularly repositioned if they are unable to move themselves.

Intrinsic factors

In addition to the external factors of pressure, moisture, friction and shear, there may also be specific factors that predispose individuals to ulcer development on the heel:

- ▶▶ Arterial disease can be present at both a macro- and microvascular level, including neuroischaemic and autoimmune disorders (Hampton, 2003).
- ▶▶ Diabetes can affect the neuropathic pathways and includes both sensory and motor neuropathy: sensory neuropathy occurs when the sensory nerves are damaged, resulting in the loss of sensation and potential risk of unrecognised injury and possible necrosis and/or amputation (Hampton, 2003); motor neuropathy causes muscle wastage and subsequent foot deformity.
- ▶▶ Anti-embolic stockings should not be used for patients with arterial disease, diabetes or rheumatoid arthritis without Doppler ultrasound as they can cause occlusion and damage to poorly perfused heels and feet (Hampton, 2003).
- ▶▶ Medications that induce sedation and/or anaesthesia and medical/surgical interventions also reduce the frequency of movement and lower the perfusion of blood to the peripheries, which increases the risk of tissue damage (Hampton, 2003).
- ▶▶ Underlying disease processes such as multiple sclerosis and immobility of the lower leg as a result of injury and/or paralysis also increase the risk of ulceration (Collier, 2000).

When assessing the individual patient, the clinician should always consider these factors.

Pressure ulceration assessment

Pressure ulcers are complex wounds that present in a variety of ways (Banks, 1997). They can vary

from erythematous, granulating, epithelialising and sloughy to necrotic and blistered. Each ulcer requires full assessment, accurate recognition of tissue type and grading with the aid of the European Pressure Ulcer Advisory Panel pressure ulcer grading scale (EPUAP, 1999), in conjunction with appropriate wound management. It is important to remember, however, that the full extent of tissue damage is not always visible on initial assessment of the skin.

On darkly pigmented skin it may not be possible to visualise any redness or erythema (Bennett and Moody, 1995); an erythematous (red) area can be the first clinical indication of underlying tissue damage and is recognised by pressing a finger onto the area (Hampton and Collins, 2004). When the tissue between the bone and the support surface becomes occluded, it becomes blanched. When the pressure is removed the tissue flushes bright red (reactive hyperaemia). The tissue is not yet damaged but can act as a warning for the at-risk patient. This then moves onto non-blanching hyperaemia where the red area is firm and hot to touch. This can be classified as a grade 1 pressure ulcer (EPUAP, 1999). These areas of pressure damage are anecdotally known as 'inside out' pressure ulcers, as the damage begins at the point of highest pressure (the bone) and advances to the lowest pressure point (the skin surface) (Hampton, 2003). The pressure over the heel is suggested to be three to five times greater over the bone than at the tissue surface (Le et al, 1984), thus resulting in damage. This is also known as the cone of pressure (David, 1983).

Pressure ulcer risk assessment

There are a variety of risk assessment tools that are available within the NHS; the tools most frequently used have been devised by Waterlow (1985), Norton et al (1962) and Braden and Bergstrom (1987). These tools aim to identify the patients who are at higher risk of pressure ulcer development and are designed to be used in conjunction with the practitioner's clinical judgment (Cullum, 2001).

Cullum (2001) and NICE (2005) recognise the need for the risk assessment to be completed within six hours of hospital admission, and at regular intervals post-initial assessment. Assessment of the heels should be included as part of risk evaluation, but it has been suggested anecdotally that this area is awkward anatomically to assess in the bed-bound and seated patient and, as such, is not regularly observed. If this is the case, there may be a need to incorporate the heel inspection within another aspect of care, such as personal hygiene needs, to ensure the heels are examined during washing.

It is imperative that any findings are documented and/or relayed to the appropriate member of staff. It is also vitally important to remember that the completion of any risk assessment tool and skin inspection must be acted upon. Flanagan (1993) noted that a risk assessment becomes a pointless exercise if preventative measures, such as the use of pressure-relieving products, are not implemented.

Providing pressure-relief

The first step in pressure ulcer prevention is for healthcare professionals to reposition patients who are unable, or unwilling, to do this by themselves. The NHS Quality Improvement Scotland (NHS QIS, 2005) suggest that patients should be positioned adequately to minimise pressure, shear and friction. This includes:

- ▶▶ Resting at a 30° tilt while in bed
- ▶▶ Appropriate use of manual handling equipment
- ▶▶ Provision of a dynamic mattress/cushion
- ▶▶ Short seating times while in a bedside chair
- ▶▶ An ergonomically good seating position.

All of these should be documented to ensure good communication between the multidisciplinary team involved in patient care, to show evidence for the treatment provided and to give a rationale for the provision of pressure-relieving equipment.

NICE (2005) state that all patients assessed as being at risk of pressure ulcer development should be provided with a high-density foam mattress to redistribute pressure. Sideranko et al (1992) suggested that the support surfaces on which patients are nursed influence the development of heel pressure ulcers (Collier, 2000).

When considering dynamic mattresses and overlays it is important to ensure that good assessment directs need and provision, and considers patient choice. NICE (2005) provides guidelines for underpinning mattress choice, including factors such as the need to identify risk within an holistic assessment,

the patient's previous history of pressure ulcer prevention, individual clinical history, and when other low-tech devices have failed. The use of these types of mattress, however, does not mean that the patient is not repositioned if he or she is unable to move, or that regular assessment of the individual should not occur. The use of further pressure-relieving devices may also be necessary, especially at the heel area.

Products for the heel

There are numerous heel pressure-reducing devices available, but several factors should be considered to ensure their appropriate use:

- ▶▶ The device's pressure-relieving effectiveness
- ▶▶ Cost
- ▶▶ Ease/accuracy in application and use
- ▶▶ Patient comfort/choice
- ▶▶ Anatomical position of the ulcer site (Wilson, 2002).

All of these should be considered in conjunction with the need for evidence-based practice and the examination of current research/literature relating to the individual products. The examples of pressure-relieving devices below is not exhaustive, but provides a selection of some that the author has experience of using in her trust.

Sheepskin boot

The sheepskin boot is an example of ritualistic and non-evidence-based use of equipment for the prevention of pressure ulceration that is still used by many people today. Dealey (1991) suggests there is no evidence to support that sheepskin boots reduce the incidence of ulceration or provide direct pressure relief. Indeed,



Figure 1. The heel-lift suspension boot.



Figure 2. The Leeder boot.



Figure 3. Repose heel protector.

Heel-lift suspension boot

A more suitable choice of device for the relief of pressure at the heels is the heel-lift suspension boot (Figure 1).

This is a suspension boot for use in patients who are confined to bed, and has anecdotally been suggested to produce a good level of pressure relief. The boot relieves pressure by suspending the heel in a cavity space and may be used for pressure ulcer prevention and treatment. It is made in soft foam and has adjustable hook-and-loop straps and elevation pads, which reduce friction and enhance movement in bed. It is hand washable and is a universal size (one size fits all).

Leeder boot

The Leeder boot (Figure 2) is another off-the-shelf product that can be used in the prevention and treatment of pressure ulcers. It may also be used effectively in patients with foot drop and non-fixed plantar flexion contractures, and as a night splint for pressure relief at the heel. There are ambulatory and non-ambulatory (walking/non-walking) versions available. It is a foot brace covered in a comfortable, washable material, such as fleece or artificial sheepskin.

The repose foot protector (Figure 3) is designed specifically to reduce the risk of pressure damage to the heels. It comprises an inflatable trough with an incorporated pressure-relieving splint that rests the heels while protecting the malleoli with air-filled compartments. The protector is most effective in patients confined to bed or in those with their feet elevated, and can be cleaned

with soap/detergent and water. The device is easy to use; Wilson (2002) found that these protectors were successful in preventing heel ulceration in her postoperative evaluation of the product within an orthopaedic unit.

Smaller devices are also available to locally protect the heel area. Historically, these local devices included water-filled gloves, foam pads and heel rings. These were a concern to Norton et al (1962), among others, and are hopefully not used in practice today. This is because of the poor redistribution of pressure as a result of the small surface area, and the adverse affect on lymphatic drainage and circulation which is more likely to cause rather than prevent pressure damage (RCN, 2001).

There are now a variety of foam and gel pads available, made from various substances such as polymer gels and silicones.

However, there is little evidence to support reduction in pressure at the heel area with the use of these products. They are at risk of displacement from the local site as a result of movement and/or repositioning, and may require a sleeve/securing device. Also, bandaging and the application of any pressure at the heel increases the risk of tissue damage. The benefit of using local pressure-relieving devices is debatable.

Conclusion

Pressure-relieving devices may be used in conjunction with an appropriate mattress to ensure pressure is relieved at the heel. All choices of equipment

according to Russell et al (2000), their use could result in pressure ulceration.

Additionally, the RCN (2001) support the recommendation that sheepskin boots should not be used as a pressure-relieving aid. They are, however, considered as a comfort aid but should be used with caution, and care is needed with regard to cross-contamination and laundering (RCN, 2001).

must be underpinned by good communication, adequate knowledge of the pathogenesis of pressure ulceration, holistic assessment and, where possible, be evidence-based. However, there is limited research to support the use of many of these devices, with most of the support being anecdotal and/or experience driven; thus further examination and research is needed. **WE**

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Key Points

- ▶ The heel is a bony area with little tissue cover, which is prone to pressure ulcer development.
- ▶ The most commonly suggested causes of ulcer development are pressure, moisture, friction and shear, but in the heel area there may be specific factors that predispose individuals to ulcer development.
- ▶ Assessment tools aim to identify the patients who are at higher risk of pressure ulcer development and are designed to be used in conjunction with the practitioner's clinical judgement.
- ▶ Appropriate treatment of heel ulcer sites is vitally important, and consideration must be given to the use of appropriate pressure-relieving devices.
- ▶ The choice of pressure-relieving equipment should be considered in conjunction with the need for evidence-based practice and the examination of current research/literature relating to the individual products.

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