

# An introduction to the guideline for the provision of heel casts for the treatment of heel ulcers

## KEY WORDS

- ▶ Diabetic foot ulcer
- ▶ Focus-rigidity cast
- ▶ Heel cast
- ▶ Pressure ulcer

Heel ulcers are often caused or delayed in their healing by some form of external pressure, either walking or static pressure. To promote wound healing, the heel ulcers require off-loading modalities such as heel casts (Lewis and Lipp, 2013). Although commonly used across the UK, there is currently limited guidance for the use of heel casts. The evidence for use is low but in practice and through small-scale case series heel casts have been shown to improve healing times (Stuart et al, 2008; Dagg, 2013). An expert group from North West Podiatry Services working predominantly in wound care discussed and agreed current practice and knowledge in order to produce a guideline that offers a consensus agreement on the use of heel casts in practice. It is intended to give advice on safe and appropriate use and a method of application for heel casts in relation to heel ulcers; this article provides an introduction and an overview of the guideline.

The main cause of ulceration to the heel is as a result of pressure either walking pressure or prolonged static pressure, with or without shear and friction (Nabuurs-Franssen et al, 2005; European Pressure Ulcer Advisory Panel [EPUAP] and National Pressure Ulcer Advisory Panel [NPUAP], 2009; Lewis and Lipp, 2013; NPUAP, EPUAP and Pan Pacific Pressure Injury Alliance [PPPIA], 2014). The pathway to heel ulceration is localised trauma leading to the breakdown of the skin integrity (Edwards and Stapley, 2010; McGinnis and Stubbs, 2014). Underlying comorbidities, such as peripheral neuropathy and/or peripheral arterial disease (PAD), can increase this risk (National Institute for Care and Excellence [NICE], 2012; 2015). The skin integrity breakdown and the feedback from pressure damage can become compromised by underlying comorbidities such as peripheral neuropathy or PAD, increasing the risk of ulceration to the foot and in particular the heel. Pressure to the posterior heel can also make it susceptible to pressure damage due to its anatomical design. From the posterior heel the pressure is at increased risk when the body is laid flat because the heel bone becomes a

bony prominence with little subcutaneous fat or soft tissue on the posterior aspect (back) of the heel. This bony prominence when the person is lying makes it susceptible to pressure damage and attributes to the fact it is the second most common site to develop a pressure ulcer (Gefen, 2010; McGinnis and Stubbs, 2014).

In order to understand how we heal ulcers on the heel, we need to consider what is pressure? In its most basic description, pressure is force over an area, therefore, to reduce pressure we must reduce the force, increase the area, or provide a combination of both. In practice the increase in time or intensity of pressure to an area is known to increase the level of damage, hence the national and international guidelines advocating the removal of pressure (EPUAP and NPUAP, 2009; NPUAP, EPUAP and PPPIA, 2014). In live animal studies this was also demonstrated where greater levels of tissue damage were shown to be proportional to the length of time and intensity of the pressure (Kosiak, 1959).

One way to achieve reduction of plantar (walking) pressures that has been demonstrated to be effective, and remains the gold standard for plantar heel ulcer treatment, is total contact

ANDREW SHARPE  
Advanced Podiatrist and Team  
Leader, Southport and Ormskirk  
NHS Trust, Burscough Health  
Centre Stanley Court Burscough

casting (Nabuurs-Franssen et al, 2005; Lewis and Lipp, 2013). Casting techniques have been used in plantar foot ulceration treatment for around 18 years, first described by Petty and Wardman (1998) and the cumulative effect from trials is demonstrated by the Cochrane publication of Lewis and Lipp (2013), leading to NICE guidelines (NG19) (2015) advocating the use in diabetic foot ulcer management. Over more recent years, there are small-scale studies and case series to support the use of focus-rigidity casts in a similar way, the added benefit being that ischaemia does not necessarily negate their use, severe/critical limb ischaemia may contraindicate their use (Stuart et al, 2008; Dagg, 2013).

In practice there is increased use of focus-rigidity casts to treat heel ulcers, the Manchester 'Martini' Cast and soft cast heel protection devices have shown small-scale, case series evidence to advocate their use in ischaemic and/or diabetic foot ulcers, as well as pressure ulcers (Stuart et al, 2008; Hutchinson et al, 2010). There is a multi-site randomised control trial currently ongoing for heel casts being produced by the Foot Ulcer Trial Unit (FUTU) to assess the effectiveness in diabetic foot ulcers on the heel (<http://www.futu.co.uk/>).

While there is anecdotal evidence to support the use of heel casts in practice a regional podiatry interest group — the North West Podiatry Clinical Effectiveness Group, recognised that the current production and application of the casts were being done quite differently by clinicians, the group, therefore, aimed to address the key elements required for production and provide guidance to clinicians on the use of heel casts.

### AIM

To produce a guideline to offer consensus agreement on the use of heel casts in practice. Where the evidence base is lacking, the group will discuss and agree current practice and knowledge to agree on the guidance. The objectives were to:

- ▶▶ Review current evidence for the use of focus rigidity casts for the treatment of ulceration
- ▶▶ Discuss the indications for use, as well as identify contraindications and cautions
- ▶▶ Agree principles for heel cast fabrication and application

- ▶▶ Advise on additional requirements of casting, such as supportive footwear.

### METHOD

A literature search was undertaken to establish what evidence was available to support the use of heel casts in the treatment of heel ulceration. Relevant studies were identified after a comprehensive search of the literature. This was achieved by identifying key words, the key words were developed using the review group from the North West Podiatry Clinical Effectiveness Group. The terms agreed and searched were ['foot' OR 'feet' OR 'heel'], ['focus' AND 'rigid\*'], ['cast\*'], broader scoping terms used were ['diabetes' OR 'pressure ulcer']. The search yielded no suitable results, therefore, we reviewed the publications of known clinicians working within the field. From the group's experience and previous work by Dagg (2013) helped identify three suitable poster presentation publications (Stuart et al, 2008, Hutchinson et al, 2010 and Hutchinson et al, 2011). The work previously done by Dagg (2013) is different to this as the focus of this guideline is heel ulceration and heel casting rather than focus-rigidity casting and plantar foot ulceration, therefore, the search terms used previously were not applicable here.

The databases searched were Cumulative Index to Nursing and Allied Health (CINAHL), United States National Library of Medicine (MEDLINE), British Nursing Index (BNI), and Health Management of Information Consortium (HMIC). These are commonly used by researchers when searching for health-based citations (Mulrow and Cook, 1994). Each database has specific characteristics and should, therefore, yield a better return. When deciding on the appropriate electronic databases to search consideration of the advantages and disadvantages of each needs to be taken. Collectively, the output from all these databases should have the net result of ensuring fullness, effectively exhausting all search parameters (Barton, 2000).

To review the evidence, a consensus group of clinicians working in the field of podiatry and wound care, with the inclusion of podiatrists



Figure 2. The heel cast – prior to final cutting down and fitting



Figure 3. Creating a 'slab' layer

## CAST FABRICATION AND APPLICATION

### Dressing

Dressings should be appropriate to be used with the heel cast. Bulky, non-conformable, non-occlusive dressings may not be suitable. The heel cast is made over the dressing and if the dimensions of the limb and foot change significantly then a new cast should be considered to prevent the cast from rubbing the surrounding skin.

### Base layer

A layer of tubular bandage (e.g. Comfifast) should be applied over the dressing, this is essential to prevent the cast coming into contact with the skin (Figure 1). If orthopaedic wool is being used then it should be applied on top of the base layer as it may cause irritation if applied directly to the skin. The size of the tubular bandage should

be appropriate to the limb and should fit well without excess material that may crease or be too tight and cause compression.

### Additional layer (OPTIONAL)

An additional layer of orthopaedic wool can be used. There is some debate over the use of this layer and it is the recommendation of this guideline that the practitioner should make the decision on its inclusion or exclusion taking into account the patient's level of risk. If used, a single layer with no greater than 50% overlap would be appropriate.

### Heel cast

The cast is made by applying casting tape on to tubular bandage (Figure 2). It should be applied ensuring conformity. There should be no gaps in the cast and minimal overlapping of the casting tape is recommended for conformity. A 'slab' or 'fan' technique is applied over the ulcerative area using 4–5 layers of casting tape (Figure 3). Where indicated, a splint casting material may be used to reinforce the cast. The distal and proximal edges of the cast should avoid the malleoli and styloid process; however, in some cases, the cast may be taken over the malleoli to secure the cast. Casts are bespoke and patient dependant.

### Retention layer

The cast should be secured to the foot with a retention layer of tubular bandage to ensure the cast does not shift. Use of bandages with elastic characteristics should be avoided as they could cause compression, particularly in ischaemic patients.

Once the cast is fitted, it must be reviewed by a suitable person in a timely manner, as per a management plan. It is the responsibility of the person applying the cast to ensure the cast is reviewed. The guideline advises that a heel cast can be used for an agreed time-frame once the ulcer is healed, to protect newly intact skin. Appropriate long-term pressure relief should be addressed, if not already in place.

### Footwear

In mobile patients or those who sit out of bed, the heel cast should be used with protective footwear.

## ACKNOWLEDGMENT

A special thanks to all the members of the Podiatry North West Clinical Effectiveness Group for Diabetes, Peripheral Arterial Disease and Tissue Viability. In particular, Graham Holt, Carol Fletcher, Hazel Whitehead, Jenna Tilbury and Dr Jane McAdam.

working in musculoskeletal management was set up. Where there are gaps in evidence, agreement is reached.

**RESULTS**

The extent of the evidence for the use of heel casts is limited. Both Hutchinson et al (2010; 2011) and Stuart et al (2008) have demonstrated the effectiveness in treating diabetic and pressure heel ulcers, even when PAD/ischaemia is noted. Previous evidence in casting has excluded the inclusion of ischaemia (Armstrong et al, 2001; NICE, 2015). As highlighted, total contact casts remain the gold standards for plantar foot ulcers, however, there is a current lack of randomised control trials specifically for heel casts, which are a form of focus rigidity casting (Lewis and Lipp, 2013; Dagg, 2013). Despite the lack of evidence, heel casts continue to be used in regular practice. It is, therefore, deemed to be appropriate to give guidance based on current knowledge and consensus agreement.

**DISCUSSION**

Heel casts can be considered in the use of heel ulcers, however, if it is a true plantar heel ulcer (where it is entirely on the plantar surface) then below-knee, non-removable TCC or removable walker should be considered as a first line treatment (Armstrong et al, 2001; Nabuurs-Franssen et al, 2005; Lewis and Lipp, 2013).

The key benefits seen in heel casts are an improvement in wound healing and/or pain reduction (Stuart et al, 2008; Hutchinson et al, 2010). From the consensus group, other benefits observed in practice, and included, are improvement in mobility and the ability for the cast to be removed to allow for ulcer inspection. The potential risks seen are wound deterioration, pain, fall risk and trauma to surrounding tissue, as well as clinician error from inappropriate training in use and/or application and the casts have been thrown away by uninformed users. The risks can be minimised by empowering the patient and their carers, giving advice on managing the risk and only selecting in the appropriate situation. The appropriate situation is determined by considering the contraindications and cautions (Table 1).

Table 1. Contraindications and cautions to the use of heel casts	
<b>Contraindications</b>	
Patient refusal	
Cast is the cause of deterioration or further ulceration	
Allergy to any of the products used	
Lack of training — it is recommended that practitioners use following suitable training and review/assessment	
<b>Cautions</b>	
Ischaemia	
Non-concordant patients — the cast cannot be made as non-removable and so is not appropriate for patients who may remove or interfere with the cast or protective dressings, e.g. patients with dementia	
Lower limb contractures — the potential to cause rubbing from the heel cast to the opposite limb or same limb needs to be considered	
Poor mobility/stability/falls risk — the cast can potentially alter gait and must be used with caution in patients with poor mobility/stability or at increased risk of falls	
Patients who may not use the cast correctly — e.g. patients with dementia	
Oedema — oedema must be managed as an increase may lead to constriction from the cast	
Infection — due to the lower limb being dressed, deteriorating or spreading infection may not be evident and should be monitored	
Exudate levels and/or incontinence — high levels of exudate or urine/faeces may soil the cast and increase bacterial risk to the ulcer	
Footwear — consider patients footwear, ensure it is accommodative for additional material	
Lack of awareness — staff involved in the ulcer care should be aware of the cast and know how to apply/review	



Figure 1. The base layer for heel cast

This will depend on the dressing regimen and the number and type of layers used with the cast. The choice of footwear should not compromise the effectiveness of the cast nor exacerbate the risks of using the cast. The cast can still be used even if the patient has no footwear, e.g. in patients who are bed bound or immobile.

The cast can be used with the patient's own footwear. An assessment of fit and function with the dressing and cast in place should be made to ensure other sites on the foot are not put at risk of damage. Postoperative sandals are a good alternative to the patient's own footwear. Similarly, the risk of ulceration to other sites on the foot should be assessed before providing the sandal.

The ability of the patient to walk safely in the cast, and particularly in any alternative footwear provided, should be assessed. It may be appropriate for assistive devices (e.g. walking stick, crutches) to be provided to enhance patient stability and confidence.

## CONCLUSION

The guideline is intended to give advice on safe use, appropriate use and a method of application for heel casts in relation to heel ulcers. Heel ulcers are often caused or delayed in their healing by some form of external pressure, either walking or static pressure. To promote wound healing the heel ulcer requires offloading. In plantar foot ulcers TCCs are advocated, where their use may not be indicated, e.g. in the non-ambulatory or on the posterior aspect of a heel, modalities such as heel casts have been shown to reduce pain and/or aid healing (Stuart et al, 2008; Hutchinson et al, 2010). Heel casts are based on the focus rigidity casting principles. Although heel casts are commonly used across the UK, there has previously been limited guidance on their use. The evidence for heel casts is currently low; however, the potential benefit is of high impact. Further research into the use of heel casts is needed. The guideline is intended to support those who have undergone training in casting techniques. The reader should note that this is not intended as an instruction on the application of heel casts, and that training in this technique is essential.



## REFERENCES

- Armstrong D, Nguyen H, Lavery L, Carine H et al (2001) Off-loading the Diabetic Foot Wound. A randomized clinical trial. *Diabetes Care* 24(6): 1019–22
- Barton S (2000) Which clinical studies provide the best evidence? The best RCT still trumps the best observational study *BMJ* 321(7256): 255–6
- Dagg A (2013) What is a focused rigidity cast? Where do they come from and what is the evidence? *Wounds UK* 9(2): 12
- Edwards J, Stapley S (2010) Debridement of diabetic foot ulcers. *Cochrane Database Syst Rev* (1): CD003556
- European Pressure Ulcer Advisory Panel and National Pressure Ulcer Advisory Panel (2009) *Treatment of Pressure Ulcers: Quick Reference Guide*. Available at: [http://www.epuap.org/guidelines/Final\\_Quick\\_Treatment.pdf](http://www.epuap.org/guidelines/Final_Quick_Treatment.pdf) (accessed 26.04.2016)
- Gefen A (2010) The biomechanics of heel ulcers. *Journal of Tissue Viability*. 19(4): 124–31
- Hutchinson K, Alexander R, Cawley S (2010) Audit results of the use of soft cast heel protection devices on patients with heel pressure ulceration. *J Foot Ankle Res* 3 (Suppl 1): 12
- Hutchinson K, Goulding V, Cawley S, Alexander R (2011) *Results of a Year-Long Service Evaluation into the Use of Heel Casts to Treat Pressure Ulcerations and Lesions*. Poster presented at: Society of Chiropodists and Podiatrists Annual Conference, Harrogate
- Kosiak M (1959) Etiology and pathology of ischemic ulcers. Archives of physical medicine and rehabilitation. *Arch Phys Med Rehabil* 40(2): 62–9
- Lewis J, Lipp A (2013) Pressure-relieving interventions for treating diabetic foot ulcers. *Cochrane Database Syst Rev* 1: CD002302
- McGinnis E, Stubbs N (2014) Pressure-relieving devices for treating heel pressure ulcers. *Cochrane Database Syst Rev* 2: CD005485
- Mulrow C, Cook D (1994) *Systematic Reviews. Synthesis of Best Evidence for Health Care Decisions*. American College of Physicians, Philadelphia
- Nabuurs-Franssen M, Sanders A, Slegers R et al (2005) Total contact casting of the diabetic foot in daily practice: a prospective follow-up study. *Diabetes Care* 28(2): 243–7
- National Institute for Health and Clinical Excellence (2012) *Peripheral Arterial Disease: Diagnosis and Management. CG 147*. Available at: <https://www.nice.org.uk/guidance/cg147/resources/peripheral-arterial-disease-diagnosis-and-management-35109575873989> (accessed 26.04.2016)
- National Institute for Health and Care Excellence (2015) *Diabetic Foot Problems: Prevention and Management (NG19)*. Available at: <https://www.nice.org.uk/guidance/ng19> (accessed 6.04.2016)
- National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance (2014) *Prevention and Treatment of Pressure Ulcers: Quick Reference Guide*. Available at: <http://www.npuap.org/wp-content/uploads/2014/08/Quick-Reference-Guide-DIGITAL-NPUAP-EPUAP-PPPIA-Jan2016.pdf> (accessed 26.04.2016)
- Petty A, Wardman C (1998) A randomised controlled comparison of adjustable focused rigidity primary casting technique with standard plaster of Paris/ synthetic casting technique in the management of fractures and other injuries. *Journal of Orthopaedic Nursing* 2(2): 95–102
- Stuart L, Berry M, Wiles P (2008) *The Manchester 'Martini' Cast - Any Time, Any Place, Anywhere!* Poster 27 presented at the Diabetic Foot Study Group, Lucca, Italy. Abstract available from: <http://bit.ly/Q2ERgc> (accessed 03.06.2015)