

Why is casting underutilised in the management of neuropathic foot complications?

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The number of people diagnosed with diabetes is on the increase, along with the financial burden placed on healthcare providers. Amputation rates vary across the UK, but the majority are preceded by ulceration. Thereby early intervention and promoting best practice for preventing and healing the diabetic foot ulcer is vital. NICE (NG19) recommends the application of a non-removable total contact cast for the treatment of neuropathic foot complications. There is no consistent approach to the application of casts and despite the evidence the use of cast has not been widely adopted. A multidisciplinary working group was set up to look at the standardising casting techniques and developing strategies to improve the availability of casting nationally, thereby improving clinical outcomes.

The prevention and management of diabetes, and its subsequent complications represent a global challenge for healthcare providers. There are now 3.2 million people in the UK with diabetes and this is expected to rise to at least 5 million by 2025 (Diabetes UK, 2012). Amputation remains one of the most feared complications of diabetes.

The successful management of diabetic foot complications still presents challenges. It is estimated that 61,000 people with diabetes have a foot ulceration (Kerr et al, 2014) and only 55% of foot ulcers heal within 6 months (Jeffcoate et al, 2006). In the UK, 135 people with diabetes undergo an amputation every week and in 84% of cases it is preceded by a foot ulceration (Pecoraro et al, 1990). There is a 10-fold variation in amputation rates across the UK (Holman et al, 2012) and one factor often cited as contributing to this variation is the model and type of care provided to patients.

Over the past few years, several international and national guidelines have been published to provide commissioners and practicing clinicians with guidance on the management of diabetic foot disease. It is widely acknowledged that in order to heal foot ulceration, clinicians need to

assess and treat the following: metabolic control, infection, vascular status, wound control, patient education and offloading (NICE, 2015).

There are a variety of different approaches to offloading a wound depending on the type of ulceration and its location. For plantar neuropathic non-infected ulcerations, the non-removable cast often known as a Total Contact Cast (TCC) is recognised by many clinicians as the 'gold' standard treatment. This treatment was originally developed by Dr Paul Brand, a missionary and practised orthopaedic surgeon who was the first to widely use TCC in the mid 1960s to offload the insensate foot in Hansen's disease. It was soon adopted to treat people with diabetes.

Following the principles developed by Dr Brand, a true TCC is manufactured from plaster of Paris with the patient in a prone position. It is reinforced with fibreglass tape, has very limited padding, and the toes are enclosed. Over the years and with the introduction of modern casting materials, clinicians have modified casting techniques considerably. Nowadays, the term TCC is used to describe a variety of cast manufacturing techniques, often using polyester-based casting materials with various levels of

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Article points

1. Casting is underutilised
2. Misconceptions of the risk of complications
3. Greater access to training is now available.

Key words

- Casting
- Neuropathic
- Ulceration

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padding and reinforcement, the toes maybe either enclosed or exposed.

Despite the variations in manufacture, the principles of how a cast works remain consistent; through load redistribution and load sharing. The cast increases the surface area over which the load is distributed. The cast wall has been shown to carry up to 48% of the load during ambulation (Begg et al, 2016). The force is transferred to the tibia and this is believed to be just as important as redistribution in offloading the ulcer. Casts also control oedema (Greenhagen, 2012), reduce ankle movement, protect the healing surface, limits shear/friction movement and can reduce stride length and cadence.

Systematic reviews (Lewis and Lipp, 2013; Morona et al, 2013) found that non-removable interventions were more effective than other forms of pressure-relieving devices. The TCC and non-removable walkers have been shown to reduce peak pressure by up to 87% in the forefoot (Cavanagh and Bus, 2010). For non-infected, non-ischaeamic plantar neuropathic foot ulceration healing rates have been reported to be between 72% and 100% (Armstrong et al, 2001; Faglia et al, 2010).

One of the factors that have been cited for the improved healing rates associated with non-removable devices, such as the TCC, is the forced compliance with treatment. One study demonstrated that patients only wore their removable device 29% of the time (Armstrong et al, 2003).

In the UK, casting for non-infected, neuropathic plantar foot ulceration is recommended in the Scottish Intercollegiate Guidelines Network (SIGN) Management of Diabetes — A national clinical guideline (SIGN 2013) and the recently published National Institute for Clinical Excellence (NG19) — Diabetic foot problems: prevention and management (NICE, 2015). The recommendation from the International Working group on the Diabetic Foot (IWGDF) is the use of non-removable devices to heal plantar neuropathic forefoot ulcers, but not specifically casts (Bus et al, 2016). Variations in the search methodologies and data extraction and analysis between the different groups have led to these

differences in the recommendations. What is clear from the literature, however, is that non-removable devices have been shown to be associated with improved outcomes compared to removable devices.

Despite the evidence to support the use of casting it has not been widely adopted. In USA, <2% of clinician's report using the TCC for the treatment of diabetic foot ulcers (Wu et al, 2008). In Europe, only 35% of plantar ulcers treated in specialist centres received casting and only half of this was with a TCC (Prompers et al, 2008). In the CDUK study, only 35.4% of people received initial offloading of the foot with a non-removable device; Only 40% received non-removable offloading at any time (Game et al, 2012).

There are a variety of reasons for this. Many clinicians are concerned over the risk of complications developing as a result of casting neuropathic limbs; however, the evidence does not necessarily support these concerns. A recent abstract presented at IWGDF showed patients treated in a TCC had fewer complications than patients treated with below-knee walker (Lavery et al, 2015). The majority of complications described are minor — 93% dermal abrasions and these healed quickly not affecting the prescribed treatment, these iatrogenic wounds were generally not on plantar surface of the foot (Wukich and Motko, 2004). Other factors often reported by clinicians as reasons for not casting include: access to training and ongoing mentorship, time needed to apply the cast, increased use of consumables and different healthcare reimbursement systems.

Regular review can reduce the risk of complications occurring or going unnoticed under a cast. The careful monitoring for signs of infection is required while the individual is in a cast. Patients need to be educated on risk of being in cast and made aware of signs and symptoms of infections, such as an unexplained raise in blood glucose levels and/or rise in temperature, flu-like symptoms or feeling generally unwell and the need to report this to the healthcare professional. If there is increased leakage from the wound, patients' casts can begin to smell or they get pain or discomfort in the foot or leg they need

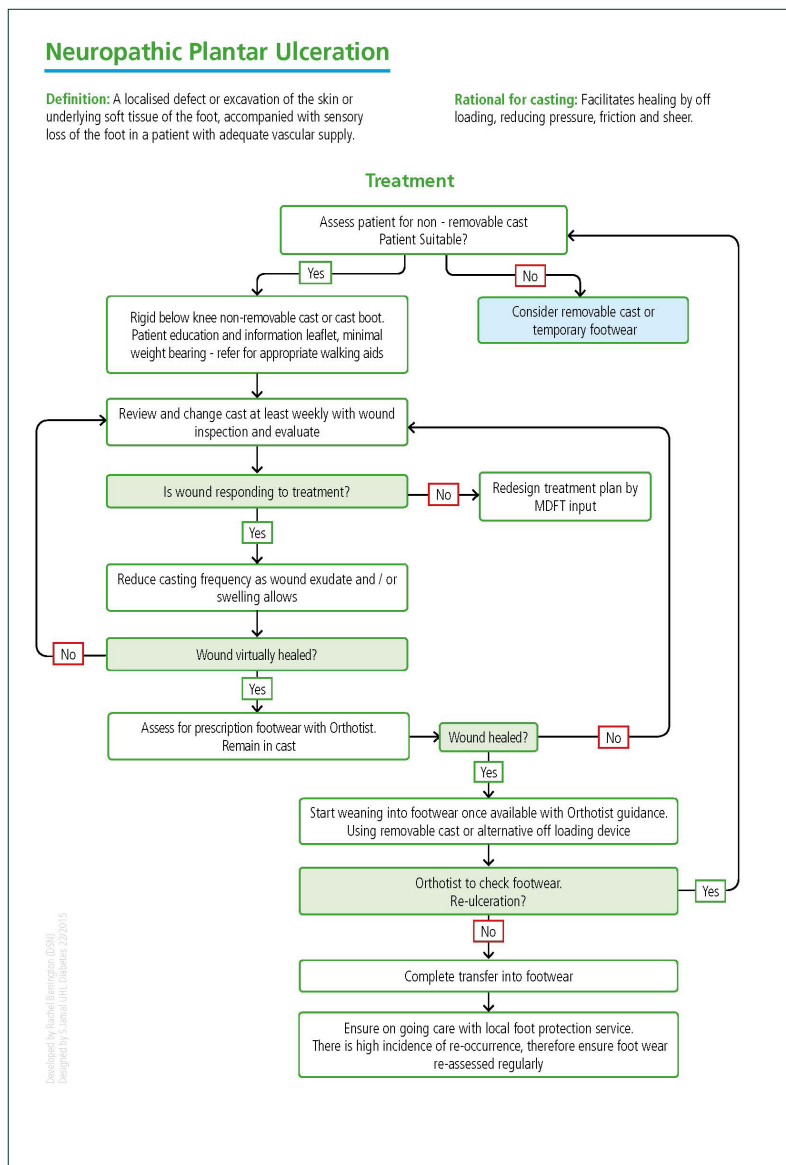


Figure 1. Algorithm for casting neuropathic planter ulceration.

to get the cast changed immediately. Although an extremely rare complication, a swollen painful calf may require assessment for deep vein thrombosis (Voukali et al, 2016).

Some clinicians prefer to use the instant total contact cast (iTCC), as it requires less training and is quicker to fit and remove. This is an adaptation to a removable below-knee walker boot which is rendered irremovable by the application of a secondary fixator, such as a layer of polyester casting tape. Studies have shown the iTCC to be as effective as a cast in healing rates 82.6% shallow plantar ulcers healed at 3 months versus 51.9% in a removable cast walker (Armstrong et al, 2005).

In the presence of even minor foot deformity, an iTCC may be unable to accommodate the foot and increase the risk of iatrogenic lesions. This means there remains a need for clinicians to be able to manufacture a custom-made cast.

TCC is contraindicated in patients with infection or peripheral arterial disease. They should also be used with caution in those with visual or postural instability, those with contralateral foot ulcers or a major amputation on the opposite side (Faglia, 2010). Therefore, carefully selection of patients is essential to minimise the risk of complications. When non-removable devices are contraindicated there are a large variety of removable devices available to offload the foot. Research has shown that fewer wounds heal and that they are slower to heal in these types of devices. This is due to the devices being less effective at offloading pressure and the increased possibility of non-compliance. Offloading shoes have been shown to be less effective than devices that extend above the ankle.

It is a clinician’s preference, access to materials and lack of access to training rather than the evidence base which often dictates the choice of offloading offered to patients.

Working group

The evidence supports the treatment of non-infected, non-ischaemic plantar foot ulceration in a non-removable device such as a cast, this should alleviate clinician’s fears of the increased risk of complications. However, access to casting is still varied and limited to a few large multidisciplinary foot care services (MDFS). In 2011, a group of healthcare professionals from across the UK representing 10 different MDFS came together to discuss the underutilisation of casting and set about developing strategies to improve access to casting nationally. The group reflected the wide variety of professionals responsible for offloading the diabetic foot including, podiatrists, plaster technicians, orthotists, diabetes nurses, fracture clinic teams, and diabetologists. The mission of the group was to improve clinical outcomes for people with diabetes suffering from diabetic foot complications.

This would be achieved through two routes; developing a standardised training programme

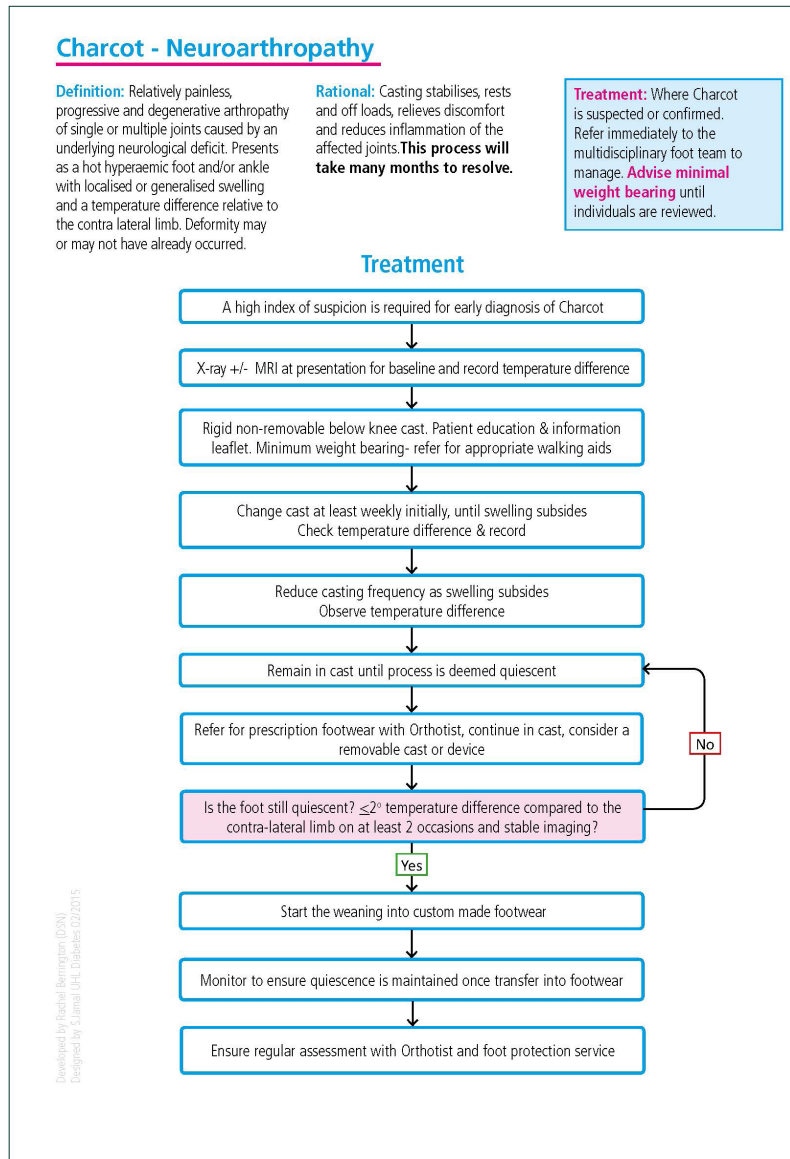
for clinicians to develop skills in casting and introducing agreed clinical algorithms. The group have agreed on standardised methods of manufacture, which will be taught on the course, recognising that when clinicians develop more experience in applying casts they will adapt these techniques based on individual patient assessment. The group have recommended standardising the terminology used to describe cast, using TCC only to describe a cast manufactured according to Brand's principals and using the term 'ridged below-knee cast' or 'cast boot' to describe more modern methods of casting. The group propose that all future publications on offloading include a description of the materials and casting methods used.

To support clinicians introducing a casting service into their clinical practice, algorithms on the management of neuropathic foot ulceration (Figure 1) and acute Charcot neuroarthropathy (Figure 2) were agreed.

The course lasts for two days and is run by experienced casters from MDFs across the country. It teaches the theoretical and practical knowledge of how to apply a non-removable, below-knee cast and cast boot. At the end of the course, participants should be able to assess an individual patient's suitability for casting, choose an appropriate offloading casting device, demonstrate the skills necessary to apply and remove different types of cast. On completion of the course, participants have the opportunity to continue to work with more experienced casters to further develop their knowledge and skills to become an independent safe caster. Funding from the Scottish Foot Action Group has allowed the group to apply for accreditation for the course from the College of Podiatry, which has just been awarded.

Conclusion

Poor offloading contributes to poor outcomes. Inequalities in offloading could be one factor in the variation in amputation rates. It is likely that data from the National Diabetic Foot Audit to be published later this month will show regional and hospital-based variations in ulcer healing outcomes, which could, in part, be due to differences in offloading options adopted. It is



hoped that with increased access to a recognised training programme, the numbers of MDFs offering a casting service will expand. There is little evidence to support many of the available offloading products and it is often contradictory. As with many aspects of diabetic foot management there is a need for large-powered, multi-centre, randomised controlled trials (RCTs) on offloading interventions. It is vital that the research methodology and casting manufacture techniques are clearly described to allow the outcomes to be interpreted and transferable. In parallel to these RCTs, a health economic analysis needs to be completed to identify whether the

Figure 2. Algorithm for casting Charcot neuroarthropathy.

perceived excess treatment costs of casting can be offset against improved healing times and, therefore, demonstrate an overall decrease in treatment cost. ■

For further information on the course please email podiatrysecs@nnuh.nhs.uk

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