

Pressure redistribution in podiatry: evidence, evolution and education

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This is the third in a series of articles celebrating 25 years of significant developments in the delivery of diabetes-related foot care. One of the key elements in managing diabetes-related foot disease is the provision of effective pressure redistribution. The evidence for pressure management when treating neuropathic plantar forefoot ulcers without ischaemia or uncontrolled infection in individuals with diabetes is compelling with the International Working Group on the Diabetic Foot (IWGDF) evidence-based guidelines grading the recommendation of a non-removable knee-high device with an appropriate foot–device interface as ‘strong’ and the quality of evidence to support this recommendation as ‘high’ (Bus et al, 2015). Alternatives to the non-removable device are acknowledged as efficacious, however, with reduced gradings and strength of evidence for non-removable knee-high devices (‘weak’ and ‘moderate’), and for forefoot offloading shoes, cast-shoes or custom-made temporary shoes (‘weak’ and ‘low’).

To acknowledge the importance of this area of practice, and to explore the complex issues relating to implementing evidence in practice, David Wylie, co-chair of the Foot in Diabetes UK (FDUK), invited 10 members of the FDUK executive committee to respond to six questions about pressure redistribution for individuals with diabetes-related foot disease.

Here, he edits their responses into an insightful overview of the major issues relating to pressure redistribution — frequently and colloquially referred to as ‘offloading’ — with a view to understanding the challenges in implementing clinical evidence, the evolution of thinking in this

area and the education required to underpin and shape future clinical practice.

1) What have been the most significant developments in the development and delivery of lower-limb pressure redistribution over the last 25 years?

There are at least two areas where major developments have taken place in the delivery of lower-limb pressure redistribution that are worthy of consideration. The first relates to clinical developments and the second involves collaboration — particularly between podiatrists, orthotists and the biomechanics community.

Clinical developments

Significantly earlier than the 1980s, the total contact cast (TCC) was established in India by Dr Paul Brand as an integrated, immediately applicable element of treatment for the redistribution of pressure in neuropathic foot ulcers for individuals with Hansen’s Disease. In 1965, he took this technique to Carville, LA, in the US, and began treating neuropathic foot ulcers in patients with Hansen’s Disease and diabetes.

On a visit to Carville in the early 1980s, Ali Foster learned the technique and brought it back to King’s College Hospital, where she taught it to fellow podiatrists in the unit and further afield. Other significant contributors to the casting courses offered by King’s include Maureen Bates, Rachel Berridge and Catherine Gooday.

Concurrently, the ‘Scotchcast boot’ was being developed in Leicester Diabetic Foot Clinic (Burden et al, 1983), providing a less technically demanding manufacturing and removal process, thereby improving accessibility to improved

pressure redistribution for patients being treated in emerging multidisciplinary diabetic foot clinics. The TCC rapidly gained recognition as the 'gold Standard' in pressure redistribution, finding its way into all clinical guidelines since its introduction, including the most recent IWGDF (Bus et al, 2015).

Collaborative developments

The collaborative multidisciplinary team approach that revolutionised management of the foot in diabetes has benefited significantly from the involvement of orthotists and biomechanical specialists. An increasing numbers of orthotists have been employed within the NHS over the last 25 years, and this has enabled closer inter-professional collaboration and pathway development in multidisciplinary teams within those employing organisations.

More recently, during the pandemic, a number of musculoskeletal (MSK) podiatrists found themselves having to support the work of their wound management colleagues due to the suspension of non-urgent podiatry interventions, with increased connectivity and collaboration between previously siloed sub-specialisms in podiatry generally viewed as a positive development.

2) Who or what have been the major influences in the development of pressure redistribution in the UK?

All too often biomechanics is forgotten in the treatment planning of patients with diabetes-related foot disease, with the focus frequently being primarily on wound management. In addition to the pioneers mentioned above, orthotist Willie Munro was cited by the contributors for his influential clinical and educational contributions in Scotland and internationally with respect to supporting learning and education across the multidisciplinary workforce involved in managing pressure redistribution within the lower limb.

A significant volume of excellent research in lower-extremity biomechanics related to injury prevention in diabetic foot disease has also emerged in recent years. Most of this has involved

international collaborations with contributions of Professor Sicco Bus and Dr Jaap van Netten particularly influential. Dr Peter Cavanagh's work in this field is also noteworthy, particularly his contribution in designing optimal footwear for reducing plantar pressures and his work in understanding the mechanical characteristics of skin and the properties of diabetic bone.

In terms of prevention of pressure damage in the foot and ankle, the work done by Duncan Stang, Professor Graham Leese and the Scottish Diabetes Foot Action Group in implementing CPR for Feet has provided a clinical framework for pressure redistribution being integrated into in-patient admission protocols across Scotland with a commensurate reduction in iatrogenic harm due to pressure damage in the foot and ankle (Wylie et al, 2020)

Access to such influential clinicians at conferences and learning events over the last 25 years also represents a significantly influential element in shaping clinical practice and behaviours in relation to pressure redistribution. Furthermore, the proliferation during this period of academic literature specifically focused on the foot in diabetes and ensuing clinical guidelines such as those published by Scottish Intercollegiate Guidelines Network (SIGN), National Institute for Health and Care Excellence (NICE) and the IWGDF have all contributed positively in this area.

3) What have been the main barriers to effective pressure redistribution in your own experience?

There is a growing sense that since the advent of total contact casting over 25 years ago, things seem to have stalled, or at the very least, failed to progress as quickly as they might have. The challenges faced by services and patients in implementing the gold standard of TCCs leaves the impression that it may remain an unachievable goal.

Although evidence from Gutekunst et al (2011) indicated that removable walker boots delivered greater forefoot load reduction, non-removable TCCs delivered a higher healing rate for ulcers indicating that patient compliance when removal of pressure-relieving devices is an option to them

remains the biggest single determining factor in healing outcome rates with Armstrong et al (2005) demonstrating that removable devices were worn for only 30% of active time each day.

However, because TCCs are technically difficult to use and time consuming to place, they are not widely used in most clinics worldwide. In essence, in most clinical communities they remain an ideal gold standard of treatment and not the true reflection of actual clinical practice. Instead, many clinicians choose to compromise and use less-demanding and often less-effective pressure offloading therapies.

It may be the case that non-removable total contact casts, although gold standard for pure neuropathic ulcers, do not match the needs of people living with recurrent foot ulcers and limbs that remain at lifelong risk. Removable pressure relieving devices are portrayed as inferior in most current literature, based on biomedical absolutes of empirical effectiveness. However, as outlined by Gutekunst et al (2011), forefoot pressure reduction offered by removable devices is actually higher than that offered by non-removable TCCs.

This confirms that the reduced empirical efficacy of removable walkers is due entirely to the lifestyle choice made by patients to remove them. This tension between patient and clinician may render clinicians feeling guilty that they are somehow failing patients by being unable to provide the gold standard of care when, in reality, the gold standard is actually achieved by removing patient choice (as to whether they are able to remove their pressure-redistributing device or not) from the therapeutic equation. This scenario demonstrates the delicate balance between 'enforced' patient compliance and 'elective' patient compliance.

There are further challenges across the health care system in gaining widespread acceptance from managers that the best option for a patient may involve training multiple members of clinical staff to carry out what may be perceived historically to be a plaster technicians skill, together with the round-the-clock plaster room access that patients may require to be seen out of hours. There are also the issues relating to patient acceptability of non-removable devices as part of their treatment plan.

The provision of pressure-relieving devices in community settings is also challenging due to the costs of carrying stock in multiple clinical locations, together with the challenge of maintaining clinical competencies across the wider non-hospital-based workforce.

This can often lead to non-evidence based pressure relieving methodologies being employed such as the continued use of felt in many podiatry services. This is particularly marked when coupled with the lack of access to effective pressure redistributing devices in community services together with a lack of confidence and competence in prescribing and fitting such devices in most podiatry services lead to a lack of ownership and responsibility in leading effective first contact offloading across podiatry services.

This is exacerbated by the historic problem of effective pressure redistribution via total contact insoles and specialist footwear still largely accessible via orthopaedic and orthotic teams in acute hospitals, rather than fully integrating these within high-risk foot and diabetes teams and community and primary care-based podiatry services.

Furthermore, as with removable pressure reducing devices, patient adherence to wearing their specially designed footwear appropriately for more than 80% of daytime is poor with less than 30% of patients reported as compliance (Bus et al, 2013).

Seamless and locally agreed pathways that clearly outline responsibilities for pressure-relieving provision between orthotists and podiatrists can be problematic with a lack of consistent clinical terminology sometimes presenting problems in consistency of communication narrative for patients and clinicians alike.

Thus, the reasons why high level evidence for pressure redistribution is not being implemented on scale remain complex. They undoubtedly include challenges around staff availability relating to competencies pertaining to manufacturing, removing and reapplying non-removable devices combined with the increasing availability of removable devices that are easier to fit and that offer more lifestyle flexibility for individuals wearing them.

In summary, the findings here are broadly congruent with the reasons for non-adoption of evidence-based practice described by Shafaghat

et al (2021). They describe the main barriers to implementing evidence based practice — even when, as in this case, there is compelling research to support it — as a lack of organisational commitment and support and a lack of available staff or limited knowledge and skills. These factors seem to be representative of the current situation relating to the use of TCCs across the healthcare system.

4) Has the pandemic changed the way patients have engaged with their pressure redistribution?

This question can be answered with both a “yes” and a “no”! On the negative side, there seems to have been no reported or published change in the incidence of ulceration caused by a lack of access to pressure redistribution during the early phases of the COVID pandemic. This is likely to be multifactorial, however aspects of it may correlate with individuals in high-risk or active ulceration categories being less active.

Some services were more hesitant to put people into TCCs because of the risk of patients contracting COVID 19 and then requiring the cast to be removed while in the intensive care unit (ICU), or being unable to attend appointments with the cast being left on much longer than originally planned or clinically appropriate.

On the affirmative side, well-informed patients have had opportunity to take a more empowered approach to their treatment. Patients had to take a higher level of ownership and responsibility for the management of their condition and clinicians had to ‘allow’ this to happen. Utilisation of virtual interventions increased and, in spite of some ongoing resistance to giving more responsibility to patients in managing their own pressure relief, given ongoing capacity issues more of this will need to happen. Further, collaborative approaches and partnership and confidence in the ability of other professions to support aspects of shared care will be required moving forward.

5) How much do you think targeted patient information alongside a comprehensive pressure redistribution strategy would benefit both patients and clinicians?

Targeting patient information is generally

considered to be essential to evidence patients have been informed of all the risks and benefits of any intervention and what to do if there are concerns particularly within an increasingly litigious healthcare culture.

However, it is vital to recognise the limitations of traditional modes of patient information. Health literacy is a particular challenge, particularly when these links are already well established with areas of poverty and deprivation, and the commensurately disproportionate rate of ulceration and amputation in these areas (Hurst et al, 2020).

Furthermore, a more person-centred approach to informing patients and involving them in decision making relating to their care is now being advocated with motivational interviewing and associated methodologies found to be an effective intervention associated with positive behaviour change and patient adherence (Binning et al, 2019).

Improving engagement for people with high-risk limbs at an individual level in a way that creates meaningful and shared understanding of their aims and desires for their intervention, including the role of pressure redistribution in that process, will potentially open the door for meaningful discussions relating to modifiable risks of ulceration, subsequent amputation and associated early death. It will also, possibly most importantly, provide opportunity to involve patients in leading on their own high-risk limb management, including informed choices relating to effective pressure-redistribution options.

The current medical model almost chastises individuals trying to live with lower limbs at risk of ulceration, potentially using fear as the main motivation for engagement. There is a need to generate a better narrative to support success in pressure redistribution that prioritises patient understanding and engagement. Achieving greater patient involvement in the decision making process as to how pressure and shearing stress may best be relieved in a part of the body essential for daily living, activity and independence can only improve the patient experience and long- and short-term clinical outcomes.

It is generally considered that services manage Charcot diagnoses very well as the consequences

of not doing so are serious and inevitable. It may be that more honest discussions involving patients fully in joint decision making as a routine element of clinical practice, not just where Charcot is present, may improve patient adherence and clinical outcomes due to improved joint decision making in relation to pressure-redistribution strategies and intervention options.

As well as potentially improving outcomes, this would also greatly enhance mutual expectation levels for both clinician and patient, thereby rendering perceived ‘failure’ by either party to be less likely.

It must be completely overwhelming for patients to be recommended certain offloading devices, particularly for the length of time they require to be worn. Clear, joint understanding of the rationale, and risks and benefits would only enhance outcomes for all, as well as taking patients’ mental health and general wellbeing into account.

6) How do you envisage pressure redistribution changing in the future and how do we continue to develop the workforce to build on the progress that has been made over the last 25 years (or more recently)?

Up until recently, the design of footwear has been based on the expertise, skills and experience of healthcare professionals and its efficacy was judged by whether the foot ulcer that led to its prescription would recur.

Plantar pressure measurement now allows us to construct more effective individualised footwear and this should be the hallmark of future approaches to pressure redistribution (Bus, 2016).

Plantar pressures have historically been measured while standing or walking and providing only a “snapshot” measurement. Ideally, plantar pressures should be assessed throughout the day, to give an overall picture of the ongoing pressure challenges facing the individual during their normal ambulation patterns.

In a recent prospective, randomised proof-of-concept trial, participants wore an innovative, smart insole system, which provided visual and auditory plantar pressure feedback to the intervention group during daily-life activities,

while a control group had the same sensors without receiving any pressure feedback (Abbott et al, 2019). The feedback, derived from eight sensor sites on both feet, was provided to the intervention group via a wrist-worn smart watch. The smart insole system resulted in a 71% reduction in DFU recurrence in the intervention group which rose to 86% in the most highly compliant participants.

Van Netten et al (2020) have proposed a paradigm shift from stratified healthcare towards personalised medicine, where individualised diagnostics should concentrate on modifiable risk factors for ulceration, including structured biomechanical and behavioural profiling.

This vision of the future of pressure redistribution represents a radical shift from the somewhat stale, unidimensional, paternalistic, under-funded, poorly led model of complex, high-risk lower-limb management. It envisages a high profile, well-informed, patient-led service, with technologically enabled pressure redistribution. This requires to be augmented by a range of lifelong attractive options, that enable people with high-risk limbs to live their best and most active, independent lives, based on outcomes that they themselves wish to achieve whilst providing them with access to the best biomedical solutions for ulcer prevention and healing.

These models of care require to be facilitated by podiatry led multidisciplinary teams that include immediate access to orthotic and prosthetic clinicians. How the system incorporates the psychological and aesthetic patient-centred elements of care with the functional design of devices to support pressure redistribution may also be vital in improving accessibility, wearability and social acceptability of the therapeutic options available.

However, it is likely that the biggest challenge in the future will remain as it is today: how can we make effective pressure redistribution more accessible, acceptable, empowering and effective? ■

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