

Increasing the use and impact of compression therapy: understanding the barriers to optimal provision

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ABSTRACT

Compression therapy brings impactful therapeutic intervention and is the cornerstone of treatment for venous ulceration; unfortunately, this potent therapy is poorly used, creating non-healing leg ulceration, destroyed lives and unwarranted costs to the health economy. This paper brings a focus on the properties that deliver this impact, the role that compression plays in delivering a healing intervention for most leg wounds, and the barriers that prevent its optimal use. Clinicians need to understand the scientific theory behind this therapy in order to be persuaded of its critical benefit and then be able to sell this often difficult intervention to their patients. To be confident in the range of its use requires knowledge of its essential properties and skilful application to achieve tolerance and the delivery of compression at a therapeutic level or dose. Yet compression therapy and leg ulceration, including those that suffer with this, appear to be associated with an unhelpful narrative. To turn this around, our language and our descriptors need to be challenged. It is imperative that we bring positive descriptors to both compression and leg ulceration as a specialism; this will bring a more active and targeted approach to care delivery. Optimising compression therapy and its potent properties will bring significant benefits to the patient, our workforce and the health economy.

Keywords compression, evidence-based care, leg ulceration, venous ulcers, wound healing

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KEY MESSAGES

- Compression therapy is the cornerstone to venous leg ulcer management but poorly used, creating significant cost to individuals and the health economy. Optimising this critical therapy is required to reduce the burden of leg ulcers to the population.
- This article aims to help the clinician optimise compression for venous and other aetiologies by having a greater appreciation of its additional properties. Understanding how to optimise compression therapy and the level of dose the limb receives is critical to the treatment's success.
- There is a negative narrative surrounding leg ulcer management contributing to the poor clinical outcomes for patients. This can be challenged by adopting positive and active descriptors of leg ulcers and compression therapy.

INTRODUCTION

Compression therapy brings impactful therapeutic intervention and is the cornerstone of treatment for venous ulceration. This paper brings a focus on the properties that deliver this impact, the role that compression plays in providing a healing intervention for most leg wounds, and the barriers that prevent its optimal use. Clinicians need to understand the scientific theory behind this therapy in order to be persuaded of its critical benefit and then be able to sell this often difficult intervention to their patients. To be

confident in the range of its use requires knowledge of its essential properties as well as skilful application to achieve tolerance and the delivery of compression at a therapeutic level or dose. Yet compression therapy appears to be associated with an unhelpful narrative. To turn this around, our language and our descriptors need to be challenged.

In Schuren's thesis on compression therapy, he quotes Thomas Hunt from 1857¹ who finds that whilst compression has "no essential defect" it is, however, notoriously ineffective because:

... the application of a bandage is looked upon as an easy and simple operation... whereas I know of few operations in surgery more difficult to perform, or requiring more painstaking a practice, than the application of a bandage to the human leg in such a manner as that every portion of the limb, from the toes to the knees (including especially the hollow between the heel and the inner and outer malleolus) shall receive equal and abiding support. In the careless manner in which a bandage is commonly applied, it often does more harm than good. If it be tighter round the leg... than round the foot, the foot and ankle will become swollen and oedematous.

As Schuren noted in 2011, not much had changed since 1857; this seems still to be the case in 2023. Compression is considered a challenging task to be carried out and the skill that is required to ensure it is both tolerable and therapeutic is not understood. Some of the barriers hindering excellent use of this indispensable therapy are the inadequate understanding of its unique therapeutic properties and

the language and descriptors used when referencing both leg ulcers and the people with these wounds. The lack of benchmarks for monitoring its use and efficacy keeps these important issues hidden.

PROPERTIES AND ROLE OF COMPRESSION THERAPY

There is a growing recognition of the costs of lower limb care as well as the increasing prevalence and the inadequate healing rates for leg ulceration²⁻⁶. The impact on the quality of life of people with non-healing leg ulcers has been widely documented⁷⁻⁹ and the impact on the workforce of this non-healing and non-use of compression therapy has been explored¹⁰. It is clear that healing or non-healing is not always a simple equation and that social determinants of health certainly play their part^{11,12}.

Compression is a potent therapy¹³. Compression therapy is a powerful therapeutic tool in the right hands; however, application requires skilled practitioners¹⁴ to achieve the correct sub-bandage pressures. This inherent challenge is the reason for a growth in new compression systems that will guide the applicator to achieve safe and correct levels of compression¹⁵.

Compression therapy for venous leg ulceration is the cornerstone of management^{1,16-18} and is indicated for oedema with a venous and lymphatic origin. According to Partsch, the beneficial effect on "chronic venous insufficiency is mainly owing to an improvement of the venous pump and lymphatic drainage"¹⁹. The role of the calf-muscle pump and good ankle range of motion is recognised as critical in promoting efficient venous return and its dysfunction increases the risk of non-healing leg ulceration^{20,21}.

Elastic or short-stretch textiles and their subsequent layering create a casing to the leg that reduces oedema and impacts positively on the microcirculation. The support to the calf-muscle pump creates peak pressures when walking, inducing a massaging effect to the limb; compression therapy reverses venous ambulatory hypertension and, in superficial veins, incompetent valves become competent again¹⁹. The sub-bandage pressure that the limb receives from the compression bandage components are determined by limb shape, position and the materials used. According to Partsch and Mortimer, the amount of pressure that the limb receives is defined "by the force of compression applied... (and) is directly proportional to the tension of the applied fabric and indirectly proportional to the radius of the limb"¹⁷. Sub-bandage pressures are described as mild (<20mmHg), moderate (≥20–40mmHg), strong (≥40–60mmHg) or extra strong (>60mmHg)¹³. The static stiffness index created by the compression regime, and the promotion of materials that specifically create high working and low resting pressures, are considered key indicators for comfort and effectiveness²².

The efficacy of compression therapy for venous ulceration is not in doubt. Numerous best practice statements have been developed through expert panels to support the understanding of this complex device and assist in the optimisation of this therapy for venous ulceration²³⁻²⁵. The complexity of balancing the benefits of this therapy with the perceived risk of adverse events has led to an international working group making 21 recommendations²⁶ to explore and clarify the concerns that are often raised in the clinical setting.

These concerns can be considered significant enough by clinicians to discontinue or prevent use.

The use of this therapy is directly linked to healing rates. Venous ulceration, unlike other wound types, has evidence that can be implemented and outcomes that can be measured. Healing rates as a quality indicator for venous ulceration were identified in the seminal work by Moffatt et al in 1992²⁷, with 69% of people with venous leg ulcers healing at 12 weeks and 83% at 24 weeks. Evidence from randomised controlled trials investigating interventions for the healing of leg ulcers demonstrates that high or full compression reduces healing time¹⁶. Unfortunately, a recent review by Guest estimated that only 47% of people with leg ulcers healed within 1 year²⁸. Thus, optimising compression therapy in the real world to increase healing rates is now considered an important focus. It was the motivation for the EWMA compression project (compression therapy: ewma.org) and also has been featured in many opinion pieces and editorials.

INADEQUATE USE OF EVIDENCE-BASED CARE

Various prevalence studies have found that wounds classified as leg ulcers account for around 25–34% of the wound burden in the UK²⁸⁻³¹. This was replicated in a recent survey¹⁰, but when position of the wound was also noted, the number of lower leg and ankle wounds were found to be around 50% of the wound prevalence for these audit sites. As the authors contend, the classification chosen by the clinician can be due to the wound duration and underestimates the extent of leg ulcer management burden, being hidden within other wound types which are often classified as non-healing surgical or traumatic wounds; this replicates Milne et al's findings³². The extent of leg wounds in a population creates a significant burden on the workforce when weekly activity is considered. Identifying these additional leg wounds as having venous pathology cannot be assumed; audit studies rely on the clinician's understanding and classification.

However, when the sub-optimal or non-use of compression therapy is added into this mix, the burden of leg wounds and their associated non-healing is considerable; where compression was not used for all lower limb wounds (excluding critical ischaemia), activity increased by 37%¹⁰. Hopkins and Samuwiro¹⁰ found a significant issue with the sub-optimal use of compression therapy even for the classified venous leg ulcers and lymphorrhoea; greater use was found in leg ulcer clinics and the least use was in the home, with compression usage also reducing with age. Thus, despite compression being the cornerstone of care for venous leg ulcers and taught within every study day on leg ulceration, many patients are missing out on this therapeutic intervention.

The use of reduced or light compression has grown, possibly in response to nursing requests based on their perceived fear of doing harm. A lack of knowledge or confidence continues and perpetuates a "lack of courage to compress"³³; however, consequently, the sub-optimal compression creates harm. Nevertheless, unlike other wound types such as diabetic foot ulcers or pressure ulcers, there appear to very few claims for negligence; anecdotally, delays in assessment or diagnostics, non-healing or lack of use of compression in venous ulcers are rarely investigated but instead accepted as the norm in the

healthcare system. Thus it is paramount that the education of nurses should aim to increase confidence and competence in compression therapy application alongside the courage to address system delays that create a detrimental impact on their patients.

The under use of compression is being challenged; clinicians across societies and interest groups are raising their voices to alert decision makers about the lack of use of this critical evidence-based therapy and the direct impact this has on the workforce. There is a growing confidence amongst clinicians and educators to describe the harm they see being perpetuated^{2,4,6}, for example the EWMA compression therapy project; note the bold language in EWMA's video³⁴.

OPTIMISING COMPRESSION THERAPY

Within the UK, increasing the use of evidence-based therapy is a core proposal to improve the outcomes of people with leg ulceration⁴. For venous leg ulceration, the focus is moving from simply ensuring they are in some form of compression therapy to ensuring they are accessing evidence-based strong compression therapy.

In addition, there is now greater awareness and a new weight placed on ensuring the wider benefits of compression therapy are made available for all lower limb wounds, not just venous leg ulcers, and to increase early access to compression. This assumes that leg wounds and ulcers of other pathologies, excluding the critically ischaemic limb, will benefit from compression therapy. It recognises the role that gravity plays in the lower leg and dependency of the limb¹⁷ and gravity's contribution to slowing the healing for a leg wound or injury. The assumed benefits of compression therapy for all leg wounds are not new³⁵⁻³⁸ but there are an increasing number of publications seeking to clarify the use of compression in non-venous pathologies. Compression to counteract the gravitational forces on any limb is considered to be a "most reasonable basic remedy" and a cornerstone for managing leg wounds of other origins¹⁷.

The development of the National Wound Care Strategy in the UK has sub-groups made up of key opinion leaders and researchers, specialists in their field. Their experience of clinical practice in the real world led to the launch of new evidence-based guidelines and the focus on provision of a national early intervention strategy. It is hoped that education and the early adoption of compression therapy will improve usage across all pathologies and also reduce the fear factor that surrounds compression use. There is an increasing focus on the use of compression wraps and two-layer hosiery kits, both of which require minimal training compared to bandaging and also favour supported self-management.

For this to be implemented robustly, leg ulcer management and the use of compression therapy needs to be seen in a more positive light. A recent round table discussion with the Legs Matter campaign discussed the marginalisation of people with leg ulcers, the often lack of enthusiasm from vascular surgeons and the poor understanding of the impact on an already depleted community nursing service³⁹. To address this negativity a more positive approach is required and a greater knowledge of other important and beneficial properties of compression therapy.

OPTIMISING THE POTENT PROPERTIES OF COMPRESSION

In addition to reversing venous ambulatory hypertension, compression therapy has several properties that need to be grasped if we are to understand the worth and immediate impact of this therapy.

Delivering anti-inflammatory properties

Compression therapy reduces pro-inflammatory cytokines, resulting in an anti-inflammatory effect on the limb and ulcer area^{17,40,41}. This will have a positive influence on the wound bed, reduce oedema and soften the fibrosed skin⁴². Compression bandaging or garments will reduce pain and the trophic changes associated with venous disease, resulting in the skin staining being less livid. Pain reduction and an immediate anti-inflammatory impact with application is an important feature that clinicians can promote; compression possibly releases analgesic mediators¹⁹. Pain reduction can seem counter-intuitive, especially when compression is believed to be a painful therapy and has such a negative press; this underscores the need for the clinician to have a deep understanding of its anti-inflammatory properties, and the benefits this gives, so that this can be promoted to patients and indeed their colleagues. To ensure this anti-inflammatory property is delivered, the correct level or dosage of compression is required.

Making compression therapeutic

It is important that clinicians distinguish between compression therapy that is on the limb and that which is delivering a therapeutic impact and thereby creating the healing environment. For compression bandaging, this is a notoriously inconsistent situation for patients which often nursing is reluctant to address. Substantial variations of sub-bandage pressures have been demonstrated⁴³ and delivery of optimal and consistent bandaging can seem illusive.

Getting the dosage and sub-bandage pressure correct for the limb and ulcer aetiology can be an art, but the clinician needs to understand the need to evaluate the effect of the compression therapy. Extended use of super absorbents to manage high levels of exudate may demonstrate that the compression dose is insufficient and not acting at an optimal or therapeutic level; inadequate exudate management significantly increases the risk of wound infection and cellulitis. A lack of knowledge, as well as the inability to apply stronger compression or escalate to someone who can, perpetuates the excessive and wasted effort of nursing activity and also increases the risk of admissions for cellulitis. Clinicians need to simply ask 'is this working?' and if not 'why?'; creating consistent efficacy is the secret to success and healing.

Achieving moderate to strong compression is required to aid ulcer healing¹³. However, in the non-standard limb, compression therapy needs to be adjusted to meet the patient's therapeutic needs:

- For the taller person, strong or extra strong levels of compression may be required⁴⁴.
- Where the ulcer site resides in the retromalleolar fossa, additional compression techniques such as pads or strapping may be required^{17,22,45,46}; this is due to its concave shape preventing local compression to the ulcer bed at this site.

Compression therapy is unfortunately an art and patients are quite knowledgeable about who they see as a 'good bandager'. Again, understanding the theory of how compression works with the site of the ulcer and shape of the leg, and the impact of materials and their layers have on the limb, is regrettably critical to the success of that application and how this therapy becomes therapeutic. Education at an advanced level with the associated nuances and motivation is vital for all leaders in this clinical field. As Partsch and Mortimer observed on compression application¹⁷, there is the requirement to adjust the stretch to the curvature and thus "careful stretch in slim legs, strong stretch in fat legs". As with all therapies, care needs to be taken not to over-compress. Partsch found an inverse principle when strong compression of between 60–90mmHg was applied, delivering less oedema reduction, and was therefore counterproductive¹⁷.

The art of the bandaging technique makes the therapy tolerable to the patient⁴⁷; learning from the patient's experience and adapting to their needs is vital. If it is considered painful, then the technique and the skill of the practitioner needs to be examined. The rationale for the therapy needs to be explained and understood. Non-compliance is a patient tolerance issue that is nearly always in the gift of the clinician to solve.

A reduced dosage of this therapy should only be for a short period to gain trust and confidence, but care needs to be taken that in this period the ulcer does not deteriorate due to sub-optimal therapy; it is important to bust the myth that a 'little compression is better than none'. Accepting refusal of compression appears to have been normalised in leg ulcer services; this clinical attitude needs to be challenged. This is an opportunity for shared learning and decision making and greater understanding of what is required to enable people to accommodate a difficult therapy in their lives. However, fundamentally, patients would use it if they are convinced of its benefits; people cannot be expected to adhere to a sub-optimal treatment that is failing them or not managing destructive exudate.

Understanding the importance of moderate compression in ischaemia

Initially only discussed in relation to venous ulceration, the efficacy and safety of compression for the moderately ischaemic limb is now recognised but remains little used outside of specialist teams. It is known that, in limbs with an ABPI of 0.5–0.8 defining moderate arterial disease, mild to moderate compression is beneficial^{19,38,48–50}.

- Compression increases arterial flow and perfusion through the reduction of oedema and the subsequent increase in skin capillaries.
- Inelastic compression systems are preferable due to their provision of low resting pressures.
- Sustained compression is contraindicated if the systolic ankle pressure is below 60mmHg or 30mmHg for toe pressures.
- Mild compression is suitable and beneficial for those who also have oedema or lymphorrhoea associated with heart failure.

Increasing the impact of compression therapy with exercise

Activating the calf muscle and plantar foot pumps

augment the impact of compression therapy on the venous hypertension. It is common for people with venous leg ulcers to present with biomechanical issues and reduced ankle range of movement. Access to biomechanical or gait review is limited for most patients or services and thus poor functioning foot and calf pumps can be missed. There is often a focus on increasing a person's exercise but a focused regime that will activate the calf muscle more effectively should be promoted^{51,52} to increase the efficacy of compression therapy and thus aid healing; this also requires the foot structures to be intact and functioning to amplify the foot pump⁵³. The provision of safe and stabilising footwear⁵⁴ is also required, with the possible addition of orthotics, supporting improved venous return and the prevention of falls.

COUNTERING THE NEGATIVE NARRATIVE

It is incumbent on leaders in the field to recognise the culture in which we work and the influences of this on our inability to effect system change for people with leg ulcers. The benefits of compression therapy are evident yet poorly utilised or optimised; there is a distinct cultural negativity surrounding the delivery of leg ulcer care and the use of compression therapy. Culture is a shared way of thinking, feeling and behaving⁵⁵. This culture is evident in the language we use:

- Patients are described as non-compliant. Morgan and Moffatt summarised this attitude as labelling patients as bad, difficult, disobedient⁵⁶. They are an unpopular patient group⁵⁷ and as such will be marginalised. It is critical that we learn from a person's difficulties of tolerating this therapy; there can be multiple reasons for this including the practitioner technique as well as their own fears and concerns.
- Patient non-compliance is often cited as the reason for non-healing¹⁰. Poor use of compression therapy is secondary. Clinicians need to evaluate their own techniques and understanding first and foremost.
- Leg ulcers are referred to as chronic even if they are a new wounding. This is often due to the long-standing nature of venous disease, yet leg ulcers often become chronic due to a failure in the healthcare system and poor use of evidence-based interventions. Interestingly, a slow healing surgical wound is still classified as an acute wound. Thus, the word 'chronic' can suggest that the wound will be difficult to heal⁵⁸ and promotes a negative vision of the future. Describing the wound as acute in nature can provide a focus on action and clinician accountability.
- The poor use of compression therapy is known and normalised; poor use has now been substituted with the term 'sub-optimal' provision, therefore identifying this as sub-standard care.
- Compression therapy was deemed to be in use if on the limb; this passive approach is now being transformed by acquainting compression therapy with 'dose' and the provision of a therapeutic intervention. Similar to medication, providing a dose of compression promotes a sense of urgency and action.

Thus, by adjusting our language into a greater emphasis on action and evaluation, it is hoped that this supports the optimisation of compression therapy.

FURTHER ACTIONS TO OPTIMISE COMPRESSION THERAPY

There are two areas in which the international community could lead the way and support a focus on optimising this critical and undervalued therapy, without which the barriers discussed will remain hidden. Firstly, in designing a framework in which to capture and monitor venous ulcer healing rates. Secondly, in establishing the expectations or benchmark for caseload use of mild, moderate and strong compression therapy within leg ulcer management.

Healing rates as a quality indicator for the management of venous ulceration were identified in the seminal work by Moffatt et al in 1992; 30 years later there are no national or international standards to benchmark services, and process and outcomes metrics have not been agreed. Leg ulcer healing rates are often reported at a local level⁵⁹ so comparisons between services remain limited. A system for measuring and reporting on venous ulcer healing rates is therefore required for the international community as well as an agreed process for monitoring this. To use this same system for all leg ulcers would also lead to greater understanding of the caseload, system interventions and gaps in pathway design.

The benchmark expected for the use of compression therapy in a standard population is unknown. The recent series of audits, supported by EWMA¹⁰, found a wide range within and between services. It also found that a high percentage of reduced or mild compression therapy was customary. It is incumbent on the leaders in the field to set a reasonable target underpinned by rationale and expert opinion. This will likely need to be adjusted to the age of the populations, demographics and the aetiology of the caseload. If we are to optimise compression therapy use, then there needs to be an identified standard that can be reached for through a quality improvement programme.

CONCLUSION

Compression therapy is the cornerstone of venous leg ulceration management and is suitable for most lower leg wounds. Compression therapy is poorly used and little understood by the majority of generic clinicians who use this on a daily basis. Whilst education is critical, the impact of the negative culture surrounding leg ulcer management has wrought a terrible disservice to our citizens and is a barrier to the effective and enthusiastic provision of evidence-based treatment. By using positive language, grasping the power of this potent therapy and learning from our patients, compression therapy can be optimised and delivered at therapeutic and life enhancing values. This will mean that non-healing legs ulcers are the exception rather than the rule.

CONFLICT OF INTEREST

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