

Use of Comfiwave® in patients with lower limb swelling and ulceration

Leanne Atkin

Chronic lower limb ulceration represents a significant global health burden, affecting an estimated 1–2% of the adult population, with prevalence increasing with age and comorbidities (Guest et al, 2020). Venous disease remains the most common underlying cause, although arterial insufficiency, diabetes, lymphatic dysfunction, and mixed aetiologies are also frequent contributors. Oedema is a common and often under-recognised feature of chronic lower limb conditions, contributing to impaired wound healing, increased risk of infection, pain, and reduced mobility, all of which negatively impact quality of life (Moffatt et al, 2019). Compression therapy is widely regarded as the cornerstone of management for venous leg ulceration and chronic oedema. Clinical evidence consistently demonstrates that effective compression therapy accelerates healing rates and reduces recurrence, while also alleviating symptoms of heaviness and discomfort (National Wound Care Strategy Programme [NWCSP], 2023). Despite these benefits, compression can be challenging to implement in clinical practice, particularly in patients with complex needs. Poor concordance is further compounded by discomfort, difficulty with application, and lack of individualisation of therapy (Chitambira, 2019; Bar et al, 2021). As a result, there remains a need for innovative solutions that deliver effective compression while optimising comfort, ease of use, and patient acceptability in this diverse population.

KEYWORDS:

- Compression therapy ■ Chronic oedema ■ Venous ulceration
- Lower limb ulceration

Chronic oedema of the lower limb arises when the balance between capillary filtration, venous return, and lymphatic drainage is disrupted. Venous hypertension, most often resulting from venous reflux or obstruction, increases capillary pressure and fluid extravasation into the interstitial space (Eberhardt and Raffetto, 2014). Sustained oedema impairs oxygen and nutrient diffusion, promotes inflammation, and contributes to skin changes such as lipodermatosclerosis, hyperpigmentation, and ultimately ulceration (Moffatt et al, 2017). The

development of venous leg ulcers is therefore closely linked to the chronic cycle of venous hypertension, oedema, and tissue breakdown, with healing often delayed by persistent swelling and recurrent episodes of cellulitis (Guest et al, 2020).

Compression therapy remains the mainstay of management for both venous leg ulceration and chronic oedema. By applying sustained external pressure, compression counteracts venous hypertension, reduces capillary leakage, and enhances lymphatic drainage (Mosti and Partsch, 2013). This improves microcirculatory flow, reduces oedema, and creates a more favourable wound-healing environment. High-level evidence supports its use. Cochrane

reviews confirm that compression significantly increases venous leg ulcer healing rates compared with no compression, and reduces recurrence risk (O'Meara et al, 2012). Beyond wound healing, compression also alleviates symptoms such as heaviness, aching, and fatigue, improving patient mobility and quality of life (Conde Montero et al, 2020).

The physiological effects of compression are mediated through three principal mechanisms:

- ▶ Improved venous return — graduated external pressure narrows vein diameter, increases venous velocity, and restores valve competence, thereby reducing venous reflux and hypertension (Rabe et al, 2018)
- ▶ Reduced capillary filtration and oedema control — compression lowers capillary hydrostatic pressure, limiting fluid extravasation into tissues and enhancing reabsorption by venous and lymphatic pathways (Mosti et al, 2024)
- ▶ Enhanced microcirculation and tissue oxygenation — external pressure improves arterial inflow during muscle activity, counteracts leukocyte trapping, and reduces local inflammation, thereby promoting tissue repair (Mosti and Partsch, 2011; Rabe et al, 2018).

Practice point

Graduated compression works by improving venous return, reducing capillary leakage, and facilitating lymphatic drainage, thereby addressing the pathophysiological drivers of both ulceration and swelling (O'Meara et al, 2012).

Leanne Atkin, associate professor/vascular nurse consultant, University of Huddersfield/Mid Yorks NHS Teaching Trust

These combined effects explain why compression is considered the cornerstone of therapy. However, while its efficacy is well established, challenges remain around achieving consistent, comfortable, and sustained compression in complex patient populations.

COMPLEXITY OF COMPRESSION THERAPY IN WHEELCHAIR USERS

Although compression therapy is established as the gold standard in managing venous ulceration and chronic oedema (O'Meara et al, 2012; Moffatt et al, 2017), certain patient groups present significant challenges in its application, safety and tolerability (Rabe et al, 2020). One group of patients where there can be clinical challenges is for patients who are long-term wheelchair users, for example, as a result of spinal injury or spina bifida.

Long-term wheelchair users frequently have lower limb oedema due to limb dependency, lack of mobility, and inefficient muscular contractions, leading to venous and lymphatic insufficiency (Garcia and Dicianno, 2011; Viaene et al, 2019). In patients with spina bifida, the prevalence of lower limb oedema is 100 times higher than in the general population (Garcia and Dicianno, 2011).

The lack of normal function of the lower limbs is also linked to increased risk of cardiovascular disease; patients with spinal cord injury develop cardiovascular disease at a younger age than able-bodied individuals due to the physical deconditioning and vascular dysfunction (West et al, 2013). This increased cardiovascular risk has also been documented in patients with cerebral palsy and spina bifida (Peterson et al, 2020). A common cardiovascular disease is peripheral arterial disease (PAD), which could potentially be a contraindication to strong compression therapy (Rabe et al, 2020). Furthermore, lack of physical activity will negatively impact the microcirculation, leading to reduced tissue perfusion (Li et al, 2025; Palacios-Abril et al, 2025) and increasing the risk of pressure damage.

Additionally, many long-term wheelchair users can acquire foot/ankle deformities caused by the paralysis, decreased sensation and muscular imbalance/muscle hypotrophy (Swaroop and Dias, 2011). The muscle cell density decreases with inactivity, leading to muscle length reduction and fibrotic tendon changes (Skalsky and McDonald, 2012). This fibrosis can result in the tendon becoming more pronounced or limb contractions, therefore increasing the risk of medical device-related pressure injury from compression therapy (Robinson et al, 2023). Conversely, patients with foot drop, due to nerve malfunction, may require careful consideration when selecting the most appropriate compression system, thinking about compatibility with orthoses such as foot splints. If these ankle/foot deformities are combined with absent/reduced sensation, the patient is at significant risk of medical device-related pressure injury from compression therapy, as the patient lacks the ability to feedback pain/discomfort which may be related to ill-fitting/inappropriate compression (Robinson et al, 2023).

These complexities illustrate the significant challenges faced when selecting the most appropriate compression systems. At times, traditional compression devices may be ill suited for individuals with altered sensation, heightened cardiovascular risk and limb deformities, and may inadvertently increase the risk of pressure damage or medical device-related injury. This highlights an unmet clinical need for compression technologies that move beyond traditional designs — innovations that are adaptable to anatomical variation, safe in the presence of comorbidities, and sufficiently comfortable to encourage long-term adherence.

COMFIWAVE®

Comfiwave® (Haddenham Healthcare) is a compression garment designed to provide reduced pressure in the range of 15–21mmHg. Constructed from a high-elastic cotton knit, the garment is soft, breathable, and lightweight, offering

an alternative to conventional bandaging and compression hosiery. Its seamless design aims to maximise comfort, while the elasticity enables continuous gentle pressure without excessive constriction (Phillips and Lawrance, 2020). The therapeutic concept underpinning Comfiwave is the delivery of continuous low-pressure compression to the limb. While traditional compression therapy often applies higher pressures, in contrast, Comfiwave's consistent, lower-level compression is designed to reduce limb volume gradually by supporting venous return and lymphatic drainage. It is common to see channels and indentations on the skin from the corrugation of the device (Figures 1 and 2).

The strongest evidence base for Comfiwave use currently lies within lymphoedema management. Studies and case series have demonstrated reductions in limb volume, improvements in patient comfort, and high levels of adherence



Figure 1.
Indentations on the skin from the weave of the device.



Figure 2.
Channels on the skin from the corrugation of the device.

when compared with conventional hosiery or bandaging (Everett et al, 2020, 2021; Phillips and Lawrance, 2020). Patients have reported improved mobility, sleep quality, and acceptability when using the garment as part of long-term management. However, published evidence specifically within the wound care or venous ulcer population remains limited, highlighting the need for further clinical evaluation. In the author's clinical opinion, given its ability to reduce oedema and support venous and lymphatic return, Comfiwave may offer a valuable adjunct in the management of both patients with lower limb ulceration complicated by chronic swelling and those unsuitable for or unable to tolerate proven compression devices, such as multilayer bandages or compression hosiery kits.

For complex patients who are unable to tolerate higher levels of compression or where conventional solutions are impractical, in the author's clinical opinion, Comfiwave provides a comfortable, easy-to-use, latex-free alternative that may support ulcer healing by reducing limb volume and improving tissue microcirculation. Its potential role may be as a maintenance option in stable patients, an interim step for those unable to tolerate full compression, or as part of a stepped approach to long-term oedema control.

CASE STUDY

This 57-year-old married lady with spina bifida who has been a wheelchair user for the majority of her life is still able to transfer to allow independent toileting and continues to work full time. She presented to the vascular wound care clinic with non-healing ulceration to the right lower limb following trauma which had been present for 12 months (Figure 3). On examination, her femoral and popliteal pulses were present, but foot pulses could not be palpated due to oedema. However, the ankle brachial pressure index (ABPI) measurement was reduced at 0.69 with monophasic signals. Her toes and feet were purple/blue with slow capillary refill, all indicating a reduction in tissue perfusion. There

was a high susceptibility for arterial wastage due to long-term wheelchair use causing reduction in arterial supply to the distal aspect of the right foot. There was moderate-to-severe oedema, which was soft around the dorsum of the foot, but there were some mild fibrotic changes to the skin around the gaiter region.

The patient was fiercely independent and had tried compression hosiery and reduced compression bandages and compression wraps in the past, but was unable to tolerate them due to issues of leg spasms with the application of compression hosiery and the change in function of the foot with more bulky compression, which hindered independent transferring. Therefore, she was not currently in any form of compression as her number one priority was to maintain the ability to transfer independently, which was essential for her to keep working and not require assistance to toilet.

The wound was clean with no evidence of infection, with a low exudate volume and the wound edges were mostly healthy and rounded in places. However, there was no evidence of wound area reduction over the last six months. A silicone foam dressing was applied to the wound bed, and the patient was supplied with a Comfiwave lower limb compression device. Due to concerns about the risk of pressure damage, the patient was reviewed at two weeks by the outreach vascular nurse team in the community, where no concerns were identified and a formal review was planned for four weeks.

Four-week review

The patient was reviewed after four weeks of continued application of Comfiwave (Figure 4). Within this short time period, oedema had started to soften and there was no evidence of medical device-related pressure injury. The patient found the device comfortable and it did not interfere with her ability to transfer.

The wound appeared less inflamed with a reduction in depth in areas. The current treatment regimen was continued — silicone



Figure 3.
Non-healing ulceration to the right lower limb at presentation.



Figure 4.
Lower limb wound at four-week review.

foam dressing with the Comfiwave device. Figure 4 shows the changes in the appearance of the skin around the ankle crease — the channels and indentation were from the corrugation of the device.

At review after two months of treatment, the wound had significantly reduced in size and depth, and there was evidence of limb decongestion (Figure 5). The patient reported how

“Absolutely love it. Lovely compression to it, and so easy to pull on.”

- Patient feedback

Comfiwave



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comfortable she found the device and how her mobility had increased as the limb volume had decreased. Again, *Figure 5* shows the indentations and channels on the skin from the corrugation of the device.

At review three months after starting Comfiwave, the wound had healed (*Figure 6*). The patient continued to use Comfiwave to prevent recurrence of oedema and ulceration.

DISCUSSION AND CLINICAL IMPLICATIONS

Compression therapy remains the cornerstone of treatment for lower limb ulceration and chronic oedema. While multilayer bandaging, compression wraps and compression hosiery deliver proven efficacy in oedema reduction and ulcer healing (Ashby et al, 2014; Partsch, 2019), their bulk, difficulty of application, and discomfort can result in poor adherence (Finlayson et al, 2009; Gong et al, 2020), particularly among those with comorbidities, distorted limb shape, or fragile skin, as highlighted in this case study. Consequently, alternative approaches are needed to bridge the gap between therapeutic effectiveness and patient acceptability.



Figure 5.
Lower limb wound after two months of treatment.

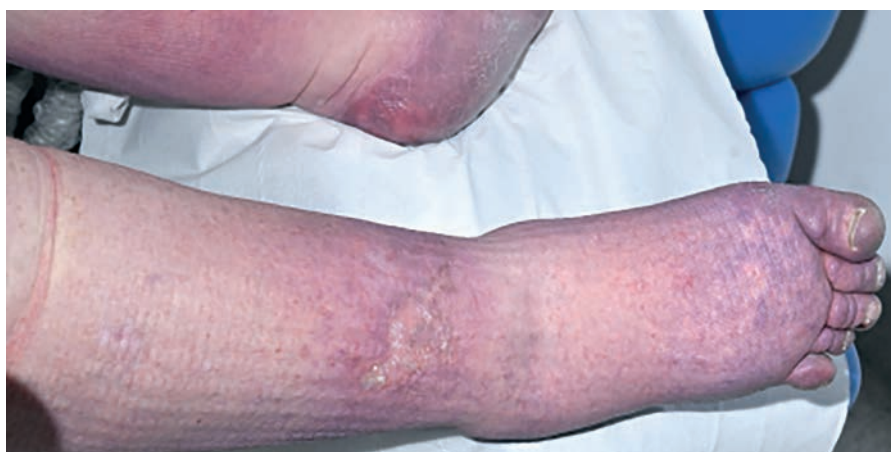


Figure 6.
Healed lower limb wound after three months of treatment with the Comfiwave device.

In the author's clinical experience, Comfiwave offers a potential solution within this context. By providing continuous low-pressure compression (15–21mmHg) through a high-elastic cotton knit, the device addresses some of the most common barriers to compliance, namely:

- ▶ Discomfort
- ▶ Bulkiness
- ▶ Restrictions on footwear or clothing

(Stevenson et al, 2024).

Its softer profile makes it a potentially more tolerable option for patients with sensitive skin or neuropathy.

Evidence to date, predominantly from the lymphoedema field, supports its ability to reduce limb volume and enhance patient quality of life (Phillips and Lawrance, 2020). Translating these benefits into a wound-care context, particularly in patients with venous leg ulceration complicated by oedema, appears logical. In the author's clinical opinion, Comfiwave could potentially be considered as:

- ▶ A step-up or step-down option — used in patients unable to tolerate full compression initially, or during transition phases of care
- ▶ Maintenance therapy — for long-term oedema control once ulcers have healed to reduce the risk of recurrence
- ▶ An adjunctive therapy — in complex patients where standard bandaging is contraindicated, impractical, or not tolerated.

However, as said, the current evidence base in ulcer care remains

limited, with most reports consisting of case studies or expert opinion rather than large-scale clinical trials. Further robust evaluation of outcomes, such as ulcer healing, recurrence rates, patient adherence, and cost-effectiveness is essential to truly understand the clinical and cost-effective impact. However, in the author's clinical opinion, this garment represents an important innovation in compression therapy, one that acknowledges the realities of patient comfort and tolerability, while retaining the therapeutic principles of oedema reduction and microcirculatory support, providing an additional/adjunct tool for clinicians when establishing patient-centred compression strategy.

CONCLUSION

Chronic lower limb ulceration and oedema continue to represent a major clinical and personal burden, with compression therapy remaining the cornerstone of management. Yet, as illustrated in this case study, conventional compression systems are sometimes not suitable for patients, particularly those with complex needs, comorbidities, or tolerance issues. Comfiwave offers an innovative alternative, providing continuous, gentle, low-pressure compression that is comfortable, easy to apply, and adaptable to patient lifestyle. Early clinical experience, alongside evidence from the lymphoedema field, suggests that it may support oedema reduction, wound healing, and quality of life in selected patients. While further robust clinical trials are required to

establish its role within ulcer care pathways, Comfiwave represents a promising adjunct or maintenance option in the drive towards more individualised, patient-centred compression therapy. **JCN**

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