

# Clinical effectiveness and patient considerations in oedema management

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## Key words

Chronic oedema, compression therapy, inelastic bandages, patient concordance tolerable resting pressures

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The management of oedema should be a partnership between the clinician, who seeks safety and effectiveness of treatment, and the patient who has to live with the therapy. These sentiments are echoed in the NHS White Paper that focuses on the patient-centred domains of safety, effectiveness of care, and, importantly, patient experiences (Department of Health, 2010).

Chronic oedema and lymphoedema are interchangeable terms used to describe swelling that persists for more than 3 months and does not resolve on elevation (British Lymphology Society, 2007). Epidemiological studies on leg ulcers and oedema have identified that prevalence and associated costs vary from country to country, with management tailored to local resources, reimbursement policies and training (Muldoon, 2013). The management of oedema is largely dependent on the aetiology and severity of the condition, comorbidities, and patient acceptance or tolerance of treatment.

Compression therapy is needed for all

## Abstract

This article aims to strike a balance between compression bandaging to treat oedema and a positive patient experience.

Compression therapy is well recognised as a key component in the management of venous and lymphatic conditions. Science indicates that intermittent pressures provided by inelastic bandage systems rhythmically stimulate venous and lymphatic flow to reduce and contain oedema. However, sustained high pressures are not always tolerated by patients who wear bandages. This may be overcome by applying inelastic bandages with high working and tolerable lower resting pressures. As compression is vital to prevent prolonged suffering caused by ulceration and oedema, concordance and listening to patients is the key to successful treatment.

types of oedema, including primary and secondary aetiologies. The positive action of compression on venous return and the lymphatic system plays an important role in capillary filtration oedema, which occurs when the lymphatic system becomes overwhelmed in the presence of venous hypertension. Similarly, noncapillary filtration oedema caused by reduced lymph drainage also benefits from compression to promote lymph flow (Topham and Mortimer, 2002).

This article will focus on the management of chronic oedema associated with poor venous return, examining the balance between clinical effectiveness and patient quality of life.

## Physiology of the venous system

In a standing position, the hydrostatic pressure of the lower extremity corresponds to the weight of the blood column between the measuring point and the right heart. This equates to approximately 80–100 mmHg in a dorsal foot vein. When walking, due to the action of the calf muscle and with

competent venous valves, the pressure falls to between 10–20 mmHg. If there is valvular insufficiency, refluxes occur with each step, so the intravenous pressure in the distal leg may remain at 50 mmHg or higher. This is called venous insufficiency and leads to ambulatory venous hypertension. Increased fluid will move into the tissue and that may result in chronic inflammation, skin changes, lipodermatosclerosis, and venous ulceration. (Nicolaidis, 2000; Partsch, 2006).

## Factors affecting venous return

Non-return valves in the deep veins may become faulty with age or injury – such as external trauma or deep vein thrombosis – resulting in venous reflux with pooling and oedema in the extremities. As veins become more distended, the vessel walls become thinner and more permeable, allowing fluid to seep into the interstitial spaces. Vessel walls may also be affected by hormonal changes (e.g. fluctuations associated with pregnancy and menopause).

As well as affecting the valves, trauma

such as deep vein thrombosis can cause the vein walls to become fibrosed and thickened, thereby decreasing the size of the lumen and increasing the intravenous pressure. Similarly, oedema in the interstitial spaces can exert pressure on neighbouring structures, such as veins and arteries, thus raising the pressure in squeezed vessels. For these reasons, failure to address oedema can lead to nonhealing of venous ulceration.

Muscle wasting, reduced mobility, and comorbidities can contribute to reduced venous return due to poorly functioning calf and foot muscle pumping action.

The calf muscle has been identified as an aid to intermittent pressures and venous return during contraction and relaxation, which starts with efficient foot pump activity (Uhl and Gillot, 2012). For this reason, compression that facilitates foot movement and supports the calf muscle has been shown to reduce oedema (Gardner et al, 1990). However, poorly applied or inadequate compression may have a negative effect on concordance and effectiveness (Moffatt, 2004).

**Link between venous disease and oedema**

The circulatory system of the body consists of the arteries, veins, and lymphatic vessels. Fluid and proteins leak out from the blood capillaries into the tissue spaces (capillary filtration) and the lymphatic system will remove fluid, cell debris, and plasma proteins from these spaces, thus maintaining homeostasis (Levick and McHale, 2003). Normal function is maintained when waste products and fluids are removed at the same rate as they are produced (Stanton, 2000). Oedema formation results from an imbalance between capillary filtration and lymph drainage that results in an abnormal collection of fluid in the tissues. Studies

**Figure 1.** Debridement of hyperkeratosis assists emollient therapy and lymph flow. (By kind permission of Wound Healing Centre, Eastbourne.)



suggest a close link between venous leg ulceration and oedema (Bull et al, 1993; Prasad et al 1999) with compression therapy and skin care indicated for both conditions.

**The role of the skin**

Skin care has always been recognised as an important aspect of oedema management (Figure 1) (Lymphoedema Framework, 2006), and the harmful effects of hyperkeratosis on the lymphatics are well-established (Butcher and Hoover, 1955; Browse et al, 2003; Whitaker, 2012).

Whitaker (2012) explained that damage to the lymphatics, increased bacterial infections and the barrier of thickened skin to emollients could be avoided by effective debridement of the skin and compression therapy. The patient in Whitaker’s case study was managed using Debrisoft® (Activa Healthcare), a simple debridement method, and Actico® (Activa Healthcare) cohesive inelastic compression bandage system for 2 weeks before progressing into compression hosiery (Whitaker, 2012).

**What is compression?**

Compression has been described as the application of external pressure on an organ, achieved by using bandages, stockings, or intermittent pneumatic pressure. Compression therapy aims to increase venous and lymphatic return, thus reducing oedema, venous, and capillary pressure in the limb (Vicarett, 2010). The aims of compression are summarised in Box 1.

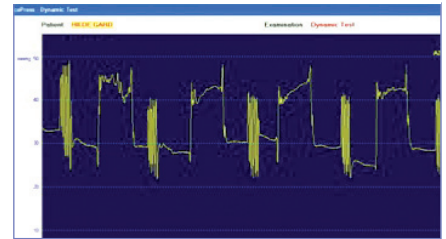
Clinician inexperience may lead to the use of inappropriate bandaging systems (i.e. those more suited to managing venous disease) when attempting to treat lymphoedema and this can result in toe swelling and delayed healing (Williams, 2009).

**The science of compression and relevance to clinical practice**

The science of compression shows that high working pressures alternating with lower resting pressures stimulate venous and lymphatic flow, which is further enhanced by pressure peaks or amplitudes on movement (Figure 2)

It is recommended that because compression bandages – particularly short stretch inelastic bandages – lose pressure after application they should be applied with

**Figure 2.** Good amplitudes with an inelastic bandage system.



intentionally high pressure (>50 mmHg) to accommodate this pressure loss (Partsch, 2010). Bandage pressures measured with a validated pressure monitor (e.g. PicoPress®; Microlab) provide useful information on recording amplitudes, working and resting pressures that can be related to clinical and patient outcomes in practice.

The difference between working and resting pressures in bandages is termed the static stiffness index (SSI). The therapeutic effects of a high SSI and the elevated pressure peaks (amplitudes) on movement are sustained even at rest. This provides the lower levels of support at night that are well-tolerated by patients who wear compression bandages.

An additional benefit of lower resting pressures is the use of inelastic bandages where the arterial circulation may be compromised. Partsch (2006) advocates that the massaging effect of inelastic compression material will reduce swelling and increase arterial flow.

<p><b>Box 1.</b> Aims of compression</p> <ul style="list-style-type: none"> <li>● Provide safe and competent treatment following holistic assessment</li> <li>● Reverse venous hypertension</li> <li>● Aid closure of incompetent valves</li> <li>● Increase deep venous return</li> <li>● Reduce oedema by stimulating the lymphatics according to severity</li> <li>● Reduce exudate by exerting hydrostatic pressure</li> <li>● Increase efficiency of calf muscle pump by providing support for exercising</li> <li>● Improve nutritional condition and ulcer healing</li> <li>● Reduce the risk of infection by reducing inflammation</li> <li>● Improve skin condition and limb shape</li> <li>● Improve quality of life</li> <li>● Reduce the cost of short and long term treatment</li> </ul>
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**Box 2. Patient concerns**

- Pain day and night
- Quality of life that may be affected by:
- Exudate, odour, shoes, clothing and appearance
- Heaviness of limb, lack of mobility and weight gain
- Slippage of bandage and loss of confidence

**Common myths associated with compression bandaging**

Compression bandaging has previously been guided by the work of Stemmer (1999), which stated that pressures of 40mmHg were understood to be required to reverse venous hypertension and that pressures exceeding 40mmHg may be dangerous. It is now known that this would apply only to sustained high pressures (Partsch, 2007), therefore alternating pressures with pressure peaks do not present the same risks. The benefit of this action is the rhythmic massaging that allows refilling and drainage of the lymphatics and stimulation of venous return (Mortimer and Levick, 2004; Partsch, 2007).

With the theory that calf muscle activity is required to create pressure peaks and that pressures drop at rest with short stretch inelastic pressures, has come the misconception that these bandages are only suitable for patients who are mobile. This has led to less mobile patients being denied treatment with this therapy and subsequent non-resolution of their oedema and venous ulceration. Numerous studies have shown this to be an incorrect assumption (Lindsay et al, 2003; Campbell and Coulter, 2008, Mosti, 2010).

Frequency of bandage change is sometimes dictated by availability of nursing time at weekends (Adderley and Thompson, 2007). Exudate strikethrough, reduction of oedema, bandage intolerance or deterioration of a patient's condition should alert the practitioner that rebandaging is indicated. Prolonging bandage wear time unless clinically indicated may be false economy if the overall treatment time is extended (Beldon, 2012).

Patients who have leg ulcers have often been labelled non-concordant or wishing to prolong their condition in order to remain under the care of the district nurse. Research by Brown (2005) and Charles

(2010) have highlighted the case for patient consideration and attention to patient reporting to determine tolerance and concordance. Patient concerns are shown in Box 2.

The following quotes were taken from case studies where patients were treated successfully with the Actico® cohesive inelastic short stretch compression bandage system.

**Mobility**

Compression bandages should allow for good ankle flexibility with sufficient padding to protect vulnerable areas without impeding movement (European Wound Management Association, 2005). Compression bandages are often seen as bulky and restrictive; however, unresolved oedema poses a similar threat to ankle mobility. In this case reduction of oedema with bandages is more beneficial to the patient than the freedom of an unbandaged leg.

*“Could wear shoes and clothes that he had not been able to wear in 10 years.”* (Lewis, 2010)

*“He can now walk half a mile, can get on a bus and has a more active social life.”* (Stigant, 2008)

**Effectiveness**

If patients are being managed inappropriately without reassessment to determine treatment effectiveness, oedema may persist for many years with detrimental effects to social well-being.

*“She had been treated with many different bandages. [Following the new treatment] for the first time in 30 years she is free of bandages and nursing care. The bandages were reapplied daily, reducing to 3 times a week, then once weekly after 28 days of treatment and the patient was encouraged to walk whilst wearing the bandages.”* (Finn, 2008)

**Management of lymphorrhoea**

Patients have reported excess fluid and odour as being socially embarrassing and affecting their lifestyle (Figure 3). Once the correct treatment was implemented, this has changed their lives.

*“Each time I ride on the taxi, they tell me I leave a bad odour in their car. If I had had this treatment [cohesive inelastic compression bandages] before, it would have saved me the best part of my life.”* (Chamanga, 2011)

*“[Before treatment] the exudate used to run down her legs, into her slippers and onto the carpet.”* (Moody, 2001)

**Figure 3.** Excess fluid is treated with super absorbent dressings and compression bandages. (By kind permission of Wound Healing Centre, Eastbourne.)



**Reduction of pain and discomfort**

Pain at night with compression bandages is often overlooked as patients may only report pain on application.

*“He removed the [previous] bandages due to the pain he had at night. Mr P found the [Actico] bandages comfortable even at night.”* (Prytherch et al, 2000)

**Clinician considerations and effectiveness**

Clinicians who decide on treatment need to consider whether treatment is safe, effective and appropriate for each individual patient (Box 3).

**Assessing effectiveness and the importance of reassessment**

At the beginning of treatment, there will be slippage due to oedema reduction. This is a positive effect of compression and more

**Box 3. Clinician considerations and effectiveness**

- Safe and effective treatment for all aetiologies
- Patient concordance
- Attention to all limb shapes and sizes
- Exudate management and infection control
- Evidence-based practice
- Training and resource deployment/cost
- National, local guidelines and formularies
- Realistic outcomes within a time frame
- Reduction/elimination of pain and oedema
- Wound healing and skin improvements
- Patient's quality of life improvement, including mobility and slippage minimisation

**Figure 4.** Following successful oedema reduction with bandages, patients are maintained in stiff compression hosiery. (By kind permission of Activa Healthcare.)



frequent clinic or nurse visits associated with extra bandage changes should be factored into the treatment plan. It might be necessary to re-bandage daily, alternate days or three times weekly. When the oedema stabilises and the limb shape improves, compression bandages may remain in place for longer. It is recommended that the standard intensive treatment period is 2–4 weeks, during which time manual lymphatic drainage may be implemented alongside compression bandaging (European Wound Management Association, 2005).

Timelines are important to assess whether treatment is effective to prevent prolongation with treatment that may not be appropriate (Hopkins and Worboys, 2005). Guidelines recommend that if improvements are not observed, treatments should be changed or the patient referred for specialist opinion as stated in the SIGN guidelines. Re-assessment of leg ulcers should be conducted at 12 weeks to record non-healing, as this should trigger the need for specialist referral (SIGN, 2010).

At present there are no clear guidelines advising on the point at which to refer patients with oedema that recurs or does not subside. Patient reporting outcomes of successful treatment may be increased mobility, better fitting footwear and clothing, improved skin condition and shape. Additionally the limb should feel lighter, and pain or discomfort should reduce. Once the limb has improved, compression hosiery should be chosen according to the patient's needs i.e. ability to apply the garment, patient tolerability and the stiffness of the garment to manage oedema levels (Figure 4).

## Conclusion

With knowledge, combined with safe and effective compression that is well-tolerated by the patient, positive outcomes may be reached in terms of reduced treatment time and costs to the care providers.

More importantly, reduced patient suffering and improvements in daily living can be achieved.

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