

# Innovations in the management of chronic oedema

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Chronic oedema and its potential progression to lymphovenous oedema and lymphoedema are common problems encountered by primary health care teams (Williams, 2003). Recent work by the Lymphoedema Framework Project has highlighted the extensive nature of chronic oedema, identifying a prevalence of 1.33 per 1000 of the UK population (Moffatt et al, 2003). Yet resources to deal with this condition are often poor and primary care teams generally lack the knowledge of treatment measures available for these patients (Logan et al, 1996). This often leads to a delay in patients being referred to the appropriate practitioner (Sitzia et al, 1998), as a result patients often present with advanced skin and tissue changes that could have been reduced by early intervention.

## Chronic oedema

Chronic oedema can be caused by a number of different aetiologies, and is generally recognized as a long standing oedema that has been present for at least three months. Accurate assessment and diagnosis is essential to identify the cause and best management approach, as each patient presents with specific characteristics and requires slight variations in management (Green and Mason, 2006). Regardless of their cause chronic oedemas are often incurable, progressive conditions that can cause considerable physical and psychological problems.

Because of their chronic nature the principle aims of treatment are rehabilitation by reducing the risk of complications and further disability, maintaining independence

and providing patients with the skills to manage the condition themselves.

## Classification

### 1. Gravitational/dependency oedema

This is commonly seen in immobile or elderly patients who spend long periods sitting/sleeping in a chair. Muscle pump activity lessens, venous and lymphatic flow is reduced, there is an increase in lymphatic load, decreased lymph transportation and oedema forms. Elevation, calf pump exercises and light compression at this stage will often resolve the problem.

### 2. Lymphovenous oedema

This develops as a result of a combination of venous and lymphatic insufficiency. Increased capillary filtration overloads the lymphatic system resulting in oedema. It is usually associated with chronic venous insufficiency, venous ulceration or post-thrombotic syndrome. Classic signs of this type of chronic oedema are haemosiderin staining, varicose eczema, atrophie blanche, lipodermatosclerosis and ulceration.

If untreated, the pitting oedema will change to fibrotic tissue as more lymphatic drainage becomes compromised.

This type of chronic oedema will respond well to elevation, exercise and compression—initially it is likely to need simple short stretch multi-layer bandaging to reduce the oedema, followed by maintenance in Class 2 RAL standard hosiery. RAL is the German compression standard and is the compression range used in garments generally used for chronic/lymphoedema management (*Table 1*).

### 3. Lymphoedema

Lymphoedema can be defined as the accumulation of lymph in the interstitial spaces caused by failure of the lymphatic system to drain fluid back into the circulation (Green and Mason, 2006).

This may be 'Primary lymphoedema' as a result of an abnormality in the system, or 'Secondary lymphoedema' resulting from damage or obstruction to the lymphatic system. The latter is often associated with cancer treatments—surgery or radiotherapy.

As with lymphovenous oedema, there are characteristic signs to aid differential diagnosis. They include:

- ◆ Hyperkeratosis
- ◆ Papillomata

## ABSTRACT

Chronic oedema is a common problem faced in primary care and community nurses are ideally placed to identify and manage uncomplicated cases. Lymphoedema and chronic lower limb oedema are conventionally treated with multi-layer bandaging followed by compression hosiery, however new innovations are becoming available to help manage this complex condition. This article outlines the basic management of chronic oedema and discusses treatments that are available in specialist lymphoedema clinics such as FarrowWrap™. A case study of the use of FarrowWrap™ is provided to illustrate how effective intensive treatments can be.

## KEY WORDS

Chronic oedema ◆ FarrowWrap™ ◆ Kinesio® tape ◆ Lymphoedema

**Table 1. Comparison of compression standards**

	<b>British standard</b> (BS 66112:1985)	<b>German standard</b> (RAL-GZ 387-2000)
Class 1	14–17mmHg	18–21mmHg
Class 2	18–24mmHg	23–32mmHg
Class 3	25–35mmHg	34–46mmHg
Class 4	Not reported	>49mmHg

- ◆ Lymphangioma
- ◆ Shape changes and thickening tissues with classic skin folds at the ankles.

Lymphoedema no longer responds to elevation and fibrotic tissue does not pit. Patients with lymphoedema are more prone to infections and cellulitis with the associated cost implications of possible hospitalization, so management should aim to prevent or reduce the risk of this occurring.

The management of lymphoedema is more complex depending on the extent of the oedema, but is likely to include decongestive lymphatic therapy (DLT) i.e. complex multi-layer bandaging and compression therapy, along with manual lymphatic drainage massage (MLD), skin care, exercise and elevation.

#### 4. Lipoedema

This condition is more unusual and presents as a symmetrical deposition of fat which causes enlargement usually of the legs. This condition is not well understood but it may occur due to disturbance within venous and lymphatic systems as a result of overloading of the capacity of an otherwise normal lymphatic system (Harwood et al, 1996).

#### Uncomplicated chronic oedema

With education and support this group of patients can be managed by community and practice nurses.

All chronic oedema management should incorporate the basics of skin care, elevation, exercise and compression. The extent of intervention will vary depending on the degree of the problem and the differential diagnosis.

#### Skin care

This is essential in all chronic oedemas to maintain skin integrity and prevent infection. Normal skin should be moisturized daily with a water-based emollient. A urea-based lotion should be used on any dry or hyperkeratotic skin (Wigg, 2006). Advice should be given to patients to reduce the risks of accidental skin puncture, initial first aid treatment (clean wound, use of antiseptic and cover skin break), awareness of the initial signs of infection and the need to respond quickly to obtain antibiotics.

#### Exercise

Exercise programmes should be realistic and individualized, aiming to increase muscle pump action and improve lymphatic drainage and venous return (Linnett, 2005).

Simple calf pump exercises and elevation are often all that is needed, especially in dependency and lymphovenous oedema and should be encouraged on a regular basis. Compliance with elevation will improve if the limb is supported along the full length thus supporting and relieving downward pressure on the knee joint.

#### Compression

Compression is used to limit the accumulation of subcutaneous tissue fluid, provide graduated compression to encourage fluid to move to the root of a limb, and provide muscle support, thus enhancing muscle pump action and venous return (Jeffs, 1992). This may take the form initially of simple short stretch bandaging to reduce oedema prior to fitting with appropriate hosiery. As a result of the Lymphoedema Framework Project an increased range of hosiery is now available on FP10 to treat chronic oedema in the community. This new range is specifically intended for chronic oedema/lymphoedema and is a higher grade compression than that previously available. Prescribers need to be aware of the different compression ranges between the previously available British Standard compression garments and the new RAL standard compression garments (Table 1) to ensure the optimum maintenance of their patients' oedema.

If compression is used appropriately in the early stages of chronic oedema it may not develop into a complex lymphoedema which becomes much more complicated to manage and requires specialist intervention.

#### Complex lymphoedema management

Patients with a diagnosis of lymphoedema and those who have progressed from an initial chronic oedema diagnosis provide more of a challenge in their management. Treatment now centres around a 'two-phase' approach.

#### Phase one

Phase one, the initial intensive phase known as decongestive lymphatic therapy (DLT), is managed by a specialist practitioner. This phase aims to reduce the size of the affected limb, 'normalize' the tissues, skin and appearance of the limb, and improve mobility and function. DLT consists of an individualized regime of MLD, multi-layer bandaging (MLLB), skin care and exercise.

MLD is a massage technique that encourages fluid movement away from swollen, congested areas of the body to areas where it can drain normally (Leduc and Leduc, 1992).

MLLB is used when a limb is a distorted shape and too oedematous to allow compression hosiery. This technique uses short stretch bandages to produce graduated pressure which is greater at the ankle and decreases up the limb, encouraging drainage towards the root of the limb. Padding and foam are used to create a uniform shape and protect the limb (Jeffs, 1998). This system provides a low resting, high working-pressure bandage that is effective at reshaping limbs and reducing oedema.

A full course of DLT treatment takes 60–90 minutes

daily over 2–3 weeks, amounting to approximately 22 hours for a 3 week course.

### Phase two

Phase two consists of maintenance of the limb, primarily by the patient but with support of a qualified professional. Maintenance of the limb relies on patient compliance to use the prescribed compression garments, and follow a regime of skin care, exercise and simple lymphatic massage.

There are groups of patients who follow a course of DLT and remain well maintained in Phase two without need for further intensive intervention. However, there are inevitably patients who are more unstable, and require regular sessions of DLT, which is time consuming and costly for both patient and therapist.

The key to good maintenance is adequate graduated compression, which requires patient compliance, but also the availability of suitable garments for the affected limb.

Although the range of compression garments and applicators have improved in recent years, there are still instances where they are not suitable for certain groups of patients. These include patients with weak hand strength, back problems, obesity, abnormal limb shape, the elderly and palliative patients.

## Innovations in lymphoedema management

Until relatively recently there has been little else to offer patients but new innovative products are now becoming available to specialist lymphoedema clinics, to help deal with this more complex group of patients.

### Velcro-wrap systems

These garments are designed to provide compression when hosiery is not a suitable option, MLLB is not available on a regular basis possibly due to lack of local resources, or because patients want to be more independent in maintaining their oedema.

Circaid® was the original version of these systems and used with good effect for maintaining lymphoedema, it's use as a maintenance tool was discussed by Lund (2000).

A more recent addition is FarrowWrap™ which has been available in the UK since 2007.

This system uses the principles of short stretch bandaging, providing a low resting/high working pressure garment. It consists of a protective silver liner, over which is applied the wrap—multiple overlapping short stretch bands interconnected by a spine (*Figures 1–3*). The bands are secured using Velcro, and the degree of compression is determined by the user applying the wrap at near 'end stretch' of the material as well as by the circumference of the leg and the position and activity of the user. Graduated compression is achieved by the end stretch of the material as well as the shape of the limb in accordance with the modified LaPlace's law. The system is flexible, allowing the user to vary the degree of compression depending on patient requirements. The FarrowWrap™ system consists of 'a foot wrap', a 'lower leg piece' and the option of a 'thigh wrap' which interconnects

to the below knee system with Velcro.

The advantage of this system over conventional short stretch bandaging to maintain limb size, is its ease of application, allowing the patient to self apply and thus reducing the need for clinic intervention.

There is as yet little research into the effectiveness of the Farrow Wrap™, however it has been used successfully in America for patients who were poor candidates for compression stockings (Smith and Allbright, 2005).

Another small study by Humen-Davey and Mayrovitz (2006) compared sub-bandage pressures achieved by FarrowWrap™ with conventional short stretch bandages. It concluded that both systems achieved static and dynamic pressures within accepted therapeutic ranges. There was however a smaller standard deviation of static pressure achieved with the FarrowWrap™, which might suggest more uniformity of application pressure than with the standard bandage technique. Patient feedback on the FarrowWrap™ found it to be more comfortable to wear, less bulky and took less time to apply and remove. Although this study was performed on upper limb oedema, the principles should apply to both upper and lower limb management.

FarrowWrap™ is intended to reduce oedema in the foot, leg and thigh associated with chronic oedema, lymphoedema and venous insufficiency. It is designed to increase interstitial pressure, relieve tension on venous walls, and facilitate the calf muscle pump system thus aiding venous return and lymphatic drainage. The adjustable bands provide a firm support which can be modified easily by the patient or therapist depending on fluctuating needs.

In addition to the 'Classic' wrap for chronic/lymphoedema, there is a 'Lite' garment, which is recommended for elderly or palliative patients, or those with fragile skin, and additional foam under padding for those patients needing more protection.

### Application of FarrowWrap™

*Figures 1–3* show the application of FarrowWrap™.

### Contraindications

The same contraindications as for any compression garments also apply to FarrowWrap™ (*Box 1*), so it should be used with these factors in mind.

## Other specialist therapies

### Low level laser therapy

Low level laser therapy (LLLT) has been used in Australia for some time and is making an appearance into a small number of UK clinics.

Trials in Australia using LLLT for the treatment of fibrous scar tissue in post mastectomy patients have shown significant decreases in tissue fluid (Piller and Thelander, 2000). LLLT is also thought to have an influence on fibroblasts (Street, 1998), to encourage lymphogenesis, stimulate lymphatic motoricity (Lievens, 1985; 1991), and may affect macrophage cells (Lievens, 1991).

All of these actions indicate that LLLT would be an



**Figure 1.** Start with foot piece over the liner, extend the wrap to cover the foot.



**Figure 2.** Start at ankle, stretch both sides maximally, reduce tension slightly, and secure velcro.



**Figure 3.** Work your way up the leg using the same procedure as in step 2.

#### **Box 1. Contra-indications for use of FarrowWrap™**

Infection and acute inflammatory episode

Fragile/ broken skin

Arterial insufficiency

DVT

Severe cardiac failure

Proceed with caution:

—Peripheral neuropathy

—Diabetes

appropriate treatment for post-mastectomy lymphoedema, and potentially lower limb lymphoedema.

#### **Kinesio® tape**

Kinesio® tape originated in Japan in 1973 as a sports taping system but more recently has been used successfully to reduce oedema. The tape is applied to the skin surface while the skin is stretched with the effect of lifting the skin away from muscle fascia, facilitating lymphatic drainage. Unfortunately there is still little research available, but anecdotal evidence supports its use as an alternative treatment, especially in truncal oedema where other options are more limited (*Figure 4*).

#### **Intermittent compression pumps**

Pneumatic compression pumps involve a multi-chambered inflatable sleeve attached to a motor driven pump. The older pumps started at the distal part of the limb, used high pressures, which can damage lymphatic vessels (Casley-Smith, 1996) and usually only had either a single or 3 chambers. With long term use they could cause genital oedema (Hardy, 2006; Boris et al, 1998) and fibrosis at the root of the limb (Casley-Smith, 1996). However there have been recent developments to introduce programmes that stimulate lymphatic drainage and the new Flowtron Hydroven12 with Lymphassist® mode manufactured by Huntleigh Health Care, mimics the process of MLD by starting at the root of the limb. These new pumps also have more chambers (12), which have been demonstrated to be more effective than single or 3 chamber pumps (Bergan et al, 1998) and the maximum pressure is also restricted to 40mmHg during this cycle. There is ongoing research into this type of pump which is yet to be published, but initial feedback and anecdotal evidence suggest it is an effective new tool for lymphoedema management.

A small study by Wigg (2006) suggests this system produces results similar to the effects of MLD. This has potentially huge time saving advantages for practitioners undertaking DLT programmes and the possibility for community use under supervision.

#### **FarrowWrap™ case study**

The following case study shows the use of FarrowWrap™ in comparison to conventional short stretch MLLB and the CircAid® legging. The case study was not part of a con-

trolled trial of the product. The method of limb volume measurement for this case study used 4cm measurements along the length of the limb and the formula:

$$\text{Volume per 4cm} = \frac{\text{Circumference}^2}{\pi}$$

**Diagnosis**

In 2002 Miss A was diagnosed with primary lymphoedema distichiasis syndrome, with mutations of the FoxC2 gene. Lymphoscintigraphy studies showed she had patent lymphatics with adequate transport of lymph up the limb to groin node level, but incompetent valves allowing reflux back down the limb again.

To complicate the situation further, duplex scans revealed she also had gross bilateral sapheno-femoral junction incompetence with significantly dilated junctions, and long saphenous vein incompetence. Although the deep veins appeared competent, the valve failure in both lymphatics and veins allows rapid retention of fluid in her legs.

Miss A presented in March 2005 (Figure 5) with gross bilateral oedema mainly affecting the distal segment of her legs, her left leg was bigger than the right. On clinical examination the skin condition was good but she had firm sub-cutaneous tissues, with deep skin folds around the ankles, distorted limb shape, severely oedematous feet, and a positive Stemmer's sign i.e. an inability to pick up a fold of skin at the base of the second toe (Mortimer, 1995).

At the time of her referral Miss A had complex issues, both physical and psychological. Her mood was generally low and she was reluctant to under go further intensive treatment due to her previous experience. She was unable to wear her normal size shoe, and had difficulty finding clothes to fit over her large leg, her self confidence was low and she was generally quiet and withdrawn.

Miss A had previously been treated at another local clinic, and was also known to another specialist team, but



Figure 4. Kinesio® taping.



Figure 5. Miss A pre-treatment July 2006

all attempts at managing her extensive oedema were limited and poorly maintained.

In 2006 she had pioneering vascular surgery using endovenous laser ablation to her long saphenous veins, which was seen as the least traumatic solution to her venous drainage insufficiency.

**Treatment**

Miss A initially received routine advice about skin care, calf pump exercise, and importance of leg elevation at rest. She was then booked for 10 sessions of MLD and full leg MLLB over 2 weeks. Prior to treatment careful measurements were taken of her legs to enable limb volumes to be calculated and her progress monitored. At the end of initial treatment her right ankle had reduced by 10cm and calf by 8cm with the left ankle by 22cm and calf by 17cm. Measurements above the knee remained fairly static. She was fitted with made-to-measure flat knit RAL Class 4 thigh length hosiery, and instructed on how to 'night bandage' with a short stretch bandage system .

When Miss A was reviewed 4 months later the right ankle measurements had increased by 5cm, and the left by 10cm. This was enough to redevelop the ankle skin folds, and thus affect the fit of her stockings. There was also some increase above the knee, mainly as a result of Miss A turning down the thigh length stockings to the knee.

To reduce the increasing ankle size and developing skin fold, the CircAid® legging was introduced to use at night instead of night bandaging. After 6 months of using the CircAid® there was a reduction of both legs but unfortunately her ankle skin fold was still causing problems. At this time Miss A was given the opportunity to replace the



Figure 6. Two weeks post FarrowWrap

CircAid® with FarrowWrap™ at night, no other changes were made to her maintenance regime.

## Measurements were repeated after 2 weeks using FarrowWrap

The right ankle reduced by 5cm and calf by 3cm while the left ankle reduced by 8cm and calf by 3cm. The limb shape had improved around the ankle and her circumferential limb measurements and distal limb volumes were comparable to those achieved after 2 weeks conventional DLT.

When reviewed a month later the circumference measurements at the left knee had increased slightly. This was later reduced using the FarrowWrap™ thigh wrap—which wasn't initially available when we did the trial—and by encouraging her to do simple lymph drainage massage and the correct use of her thigh length stocking.

The importance of using the full leg system is highlighted by this case study in order to reduce oedema in the proximal limb when there is evidence of full leg oedema.

## Case study conclusion

Prior to trying FarrowWrap™, Miss A was due to be booked into clinic for another 2 weeks intensive DLT. Using the wrap removed the need to do this, which was much more convenient for her, and cost effective for the clinic.

Miss A's personal assessment of the FarrowWrap™ was that it was more comfortable, and easier to use than the CircAid®. The FarrowWrap™ has improved her quality of life, she is more independent and confident and is now able to wear normal training shoes and trousers.

The plan is for her to self maintain using, made to measure Class 4 flat knit hosiery and the FarrowWrap™ at night.

If any rebound oedema occurs she can use it during the day instead of needing to attend the clinic for further intensive treatment. She will be followed up every 6 months for limb measurements and hosiery fittings.

## Conclusion

The importance of collaborative working between community nurses and specialist lymphoedema clinics should not be underestimated in order to provide optimum care to this group of patients. The development of innovative products such as FarrowWrap™ and kinesio® tape are providing new methods of relieving chronic oedema, and can be used within community settings with appropriate training. The FarrowWrap™ is not designed to take over from MLLB / DLT, but as this case study shows it is a valuable aid to maintaining chronic oedema, reducing the need for repeated courses of DLT. The ease of use will enable its development both within community settings and clinics, and has the potential to significantly reduce the workload of specialists and district nurses.

**BJCN**

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## KEY POINTS

- ◆ Chronic oedema can be caused by a number of different aetiologies, and is defined as a long standing oedema that has been present for at least three months.
- ◆ Accurate assessment and differential diagnosis is essential to identify the cause and best management approach.
- ◆ All chronic oedema management should incorporate the basics of skin care, elevation, exercise and compression.
- ◆ If chronic oedema is appropriately managed in the early stages it may not develop into lymphovenous/ lymphoedema which becomes much more complicated to manage and requires specialist intervention.
- ◆ The importance of collaborative working between community nurses and specialist lymphoedema clinics should not be underestimated in order to provide optimum care for patients with chronic oedema.

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