

USE OF A VELCRO® WRAP SYSTEM IN THE MANAGEMENT OF LOWER LIMB LYMPHOEDEMA/CHRONIC OEDEMA

Sue Lawrance

Abstract

Lymphoedema and chronic lower limb oedema are conventionally treated with multi-layer bandaging, followed by compression hosiery. Inevitably, this management system can be difficult to maintain in some patients, especially those with hand weakness, back problems, obesity, or those who are elderly, have abnormal limb shapes or are palliative patients. Farrow Wrap™, a Velcro® wrap system, is designed to accommodate these patients by providing easily applicable, graduated support. In this article, two case reports are used to compare the effect of conventional treatment with Farrow Wrap. Treatment outcomes were comparable to those achieved using conventional methods, suggesting potential savings in time and resources for patients and therapists.

Key words

Lymphoedema
Farrow Wrap™
Chronic oedema
Compression therapy
Short-stretch compression

Lymphoedema and chronic oedema are common problems which have many causes; both are often incurable, progressive conditions that can have considerable physical and psychological implications. Due to their chronic nature, the principle aim of treatment is rehabilitation with the view of reducing disability as far as possible, while maintaining patient independence and providing patients with the skills to manage the condition themselves.

Sue Lawrance is a Clinical Nurse Specialist in lymphoedema at the Florence Nightingale Hospice in Aylesbury, UK

Treatment centres around a two-phase approach. The initial intensive phase (phase one) is known as decongestive lymphatic therapy (DLT) and is managed by a specialist practitioner. This aims to reduce the size, 'normalise' the tissues, skin and appearance of the affected limb, and improve patient mobility and function.

The key to good maintenance is adequate graduated compression, which not only requires patient compliance, but also the availability of suitable garments for the affected limb.

A full course of DLT treatment takes 60–90 minutes daily over 2–3 weeks, amounting to a total of 22 hours for a three-week course. DLT consists of an individualised regime of manual lymphatic drainage (MLD), multi-layer bandaging (MLLB), skin care and exercise.

Phase two focuses on maintenance of the limb, primarily by the patient but

with the support of a qualified healthcare professional. Maintenance of the limb relies on patient compliance to use the prescribed compression garments and follow a regime, including 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. Inevitably, however, there are patients who are more unstable, and who 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 not only requires patient compliance, but also the availability of suitable garments for the affected limb. Although the range of compression garments and applicators has improved in recent years, there are still circumstances where they are not suitable for certain groups of patients. These include patients with weak hand strength, back problems, obesity, abnormal limb shape, and elderly or palliative patients.

Farrow Wrap™ has been designed to address the needs of this group of patients. This system uses the principles of short-stretch bandaging, providing a low resting/high working pressure garment. Farrow Wrap consists of a protective silver liner, over which the wrap is applied — 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 La Place's law (Lymphoedema Framework, 2006). The system is flexible, however, allowing the user to vary the degree of compression to the limb, depending on patient requirements. The Farrow Wrap system consists of a foot wrap, a lower leg piece, and the option of a thigh wrap, which interconnects to the below-knee garment with Velcro.

In the author's opinion, an advantage of Farrow Wrap over conventional short-stretch bandaging to maintain limb size is its ease of application. This allows the patient to self-apply, thus reducing the need for clinical intervention.

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

Another small study by Humen-Davey and Mayrovitz in 2006 compared sub-bandage pressures achieved by Farrow Wrap with conventional short-stretch bandages. It concluded that both systems achieved static and dynamic pressures within accepted therapeutic ranges. However, there was a smaller standard deviation of static pressure achieved with Farrow Wrap, which might suggest more uniformity of application pressure than with the standard bandage technique (Tables 1 and 2). Patient feedback on this system

declared it to be more comfortable to wear, less bulky and it took less time to apply and remove compared with standard bandages. Although this study was performed on upper limb oedema, the same principles should apply to both upper and lower limb management.

The method of limb volume measurement for the following case reports uses 4cm measurements along the length of the limb and the formula:

$$\text{volume per 4cm} = \frac{\text{circumference}^2}{\pi}$$

Case report 1: 16-year-old female

The following case report shows the use of Farrow Wrap in comparison to conventional short-stretch MLLB and a non-elastic legging. The case report was not part of a controlled trial of the product.

Diagnosis

Katie was diagnosed with primary lymphoedema distichiasis syndrome in 2002, 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. However, the valves were incompetent which allowed reflux of fluid back down the limb again.

To complicate the situation further, Duplex scans revealed Katie 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 the lymphatics and veins allowed rapid retention of fluid in her legs.

In March 2005 Katie presented with gross bilateral oedema, mainly affecting the distal segment of her legs (Figure 4), and her left leg was bigger than the right. Clinical examination showed that the condition of the skin was good, but she had firm subcutaneous tissues with deep skinfolds around the ankles, distorted limb shape, severely oedematous feet, and a positive Stemmer's sign, i.e. the inability to pick up a fold of skin at the base of the second toe (Mortimer, 1995).



Figures 1–3. Application of Farrow Wrap™.

At the time of her referral Katie had complex issues, both physical and psychological. Her mood was generally low and she was reluctant to receive further intensive treatment as a result of her previous clinical experience. Katie 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 quiet and withdrawn.

Table 1

Comparison of static pressures (mmHg) between Farrow Wrap™ and short-stretch compression bandages

Subject	Farrow Wrap	Short-stretch
1	21.0	28.2
2	19.3	19.6
3	24.6	18.9
4	26.5	15.8
5	23.0	34.1
6	23.4	22.5
Average	23.0	23.2
Standard deviation	2.6	6.8

(Humen-Davey and Mayrovitz, 2006)

Table 2

Comparison of dynamic pressures (mmHg) between Farrow Wrap™ and short-stretch compression bandages

Subject	Farrow Wrap			Short-stretch		
	Max	Min	Dynamic	Max	Min	Dynamic
2	28.4	19.2	9.2	22.2	14.3	7.9
3	36.0	24.9	11.1	33.1	15.1	18.0
4	43.7	25.7	18.0	20.3	12.7	7.6
5	29.0	20.8	8.2	56.4	35.1	21.3
6	44.6	24.2	20.4	43.6	23.1	20.5
Average	36.3	22.9	13.4	35.1	20.1	15.1
Standard deviation	7.7	2.8	5.5	15.1	9.3	6.8

(Humen-Davey and Mayrovitz, 2006)

Katie had previously been treated at another local clinic and was known to a specialist team, but all attempts at managing her extensive oedema had been limited and poorly maintained.

In 2006 Katie 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. Katie was still at school, so treatment was scheduled during the summer holidays.

Treatment

Katie initially received routine advice about skin care, calf-pump exercises, and the importance of leg elevation at rest. She was then booked for 10 sessions of MLD and full-leg MLLB over two weeks.

Prior to treatment, Katie's right distal volume was 6,718ml, and the left 9,324ml: the left being 2,606ml bigger. The proximal volumes were remarkably similar, with her right measuring 3,768ml, and the left 3,741ml (Figure 5).

At the end of treatment, Katie's right distal volume was 4,746ml, a reduction of 1,972ml; and the left was 5,931ml, a reduction of 3,393ml (Figure 5).

Katie was fitted with made-to-measure, flat-knit class 4 thigh-length hosiery, and instructed on how to 'night bandage' with a short-stretch bandage system.

When Katie was reviewed four months later, the distal right leg measurements had increased by 547ml to 5,293ml, and the left by 701ml to 6,632ml. Although not a huge increase distally, it was enough to re-develop the ankle skinfolds, thus affecting the fit of her stockings.

There was also some proximal increase, mainly as a result of Katie turning down the thigh-length stockings to the knee.

To reduce the increasing ankle size and developing skinfold, a non-elastic legging was introduced for Katie to use at night, instead of night bandaging. This legging is another Velcro wrap compression system which has been used for maintaining lymphoedema for some time, and its use as a maintenance tool was reviewed by Lund in 2000.

After six months of using the non-elastic legging, there was a 75ml reduction of right distal volume and a 107ml left distal reduction (Figure 5). Unfortunately, her ankle skinfold was still causing problems. At this time Katie was given the opportunity to replace the non-elastic legging with the Farrow Wrap at night, however, no other changes were made to her maintenance regime.



Figure 4. Katie pre-treatment, July 2006.

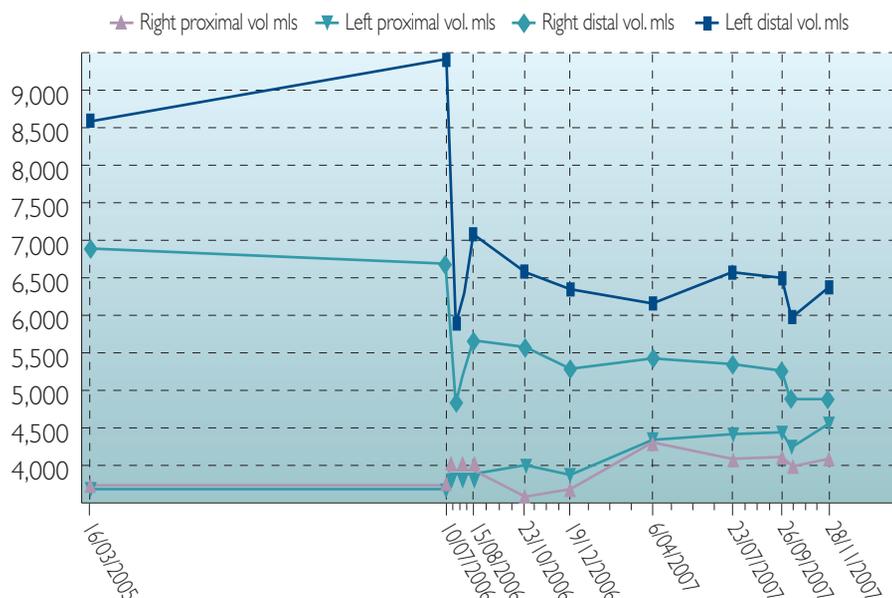


Figure 5. Case report 1 — graph of distal and proximal limb volume measurements.

Katie was re-measured after using Farrow Wrap for two weeks (Figures 5 and 6). At this time, the right distal volume was 4,850ml, indicating a reduction of 368ml, and the left was 5,965ml, indicating a reduction of 560ml (Figure 5). The limb shape had improved around the ankle and Katie's circumferential limb measurements and distal limb volumes were comparable to those achieved after two weeks of conventional DLT (Figure 5).

When reviewed a month later, the circumference measurements at the left knee had increased slightly. This distorts the final volume on the graph in Figure 5, giving the impression that the limb volume calculations in the whole distal section have increased, rather than just one measurement. This also accounts for the apparent increase in the proximal volume: again, one



Figure 6. Two weeks post Farrow Wrap™.

measurement at the knee has distorted the total volume measurement. We hope to reduce this using the thigh wrap (which was not initially available when the trial was performed) and are encouraging Katie with simple lymphatic drainage massage.

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

Conclusions from case report 1

Prior to trying Farrow Wrap, Katie had been due to be booked into clinic for another two-week course of intensive DLT. After using the wrap the need for this course was removed, which was much more convenient for Katie and cost-effective for the clinic.

Katie's personal assessment of Farrow Wrap was that it was more comfortable and easier to use than the non-elastic legging. It improved Katie's quality of life. She is now more independent and confident and is able to wear normal training shoes and trousers.

The plan is for her to self-maintain using made-to-measure, flat-knit class 4 hosiery, with Farrow Wrap at night. If Katie is aware of rebound oedema occurring, she may in future use it during

the day instead of attending the clinic for further intensive treatment. She will be followed-up every six months for limb measurements and hosiery fittings.

Case report 2: 40-year-old male

Diagnosis

Paul is a 40-year-old male with paraplegia, who presented with chronic bilateral below-knee lymphovenous oedema in 2007. However, following a deep vein thrombosis and an episode of cellulitis, his left leg was 41% bigger than the right. Paul's skin was in good condition with the exception of a small area of hyperkeratosis around the left ankle. The subcutaneous tissues were firm with slight pitting and skinfolds around the left ankle and at the base of the toes, with a positive Stemmer's sign.

Paul's limb dependency and lack of calf-pump activity were exacerbating his condition. The weight of his left leg was making movement to or from his wheelchair difficult, and was affecting his ability to be independent. Paul was advised about appropriate skin care, elevating his leg and passive calf-pump exercises.

Treatment

In June 2007 Paul received ten sessions of bilateral intermittent compression pump therapy using the 'Huntleigh Hydroven™ 12 Pump' on the 'Lymphassist' cycle, followed by traditional MLLB to his left leg, and class 2 calf hosiery to the right. The bandaging was limited to below the knee to enable Paul to move independently.

Prior to treatment, Paul's left distal volume measurement was 8,007ml, an excess of 3,170ml compared to the right leg (Figure 7). At the end of treatment with conventional DLT, his leg had reduced to 4,922ml distally, a reduction of 3,085ml, and his total leg volume was reduced to 11% volume difference.

Paul was fitted with flat-knit class 2 below-knee hosiery and encouraged to continue his regime of skin care, passive calf-pump activity and elevation.

Upon review three weeks later, a small amount of rebound oedema was

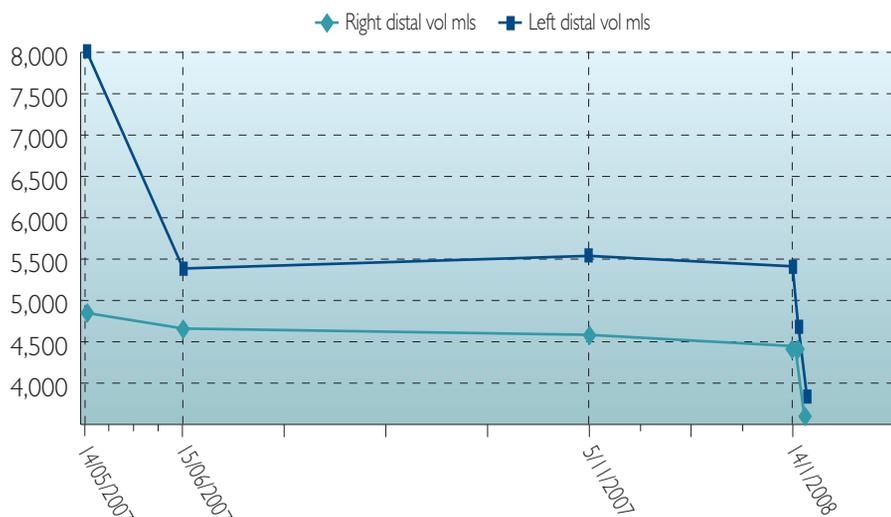


Figure 7. Case report 2 — graph of distal limb volume changes.

observed; two months later, the distal measurements had increased by 60 l ml. Although this was not a huge increase, the circumferential measurements from ankle to mid-calf had all increased by 3–4cm. This distorted his ankle shape, thus affecting his stockings, and making his leg heavy to lift.

Paul was scheduled for two weeks of DLT in January 2008, this time continuing with the bilateral Hydroven™ pump as before, but replacing the MLLB with Farrow Wrap to his left leg.

Prior to treatment, his left distal volume measurements were 5,418ml. After only one day of using Farrow Wrap, a reduction of 62 l ml was observed.

After two weeks, Paul's left distal volume measurement was 3,839ml, a reduction of 1,579ml, and his circumferential measurement was comparable to, and at some points lower than, his initial post MLLB measurements. His right leg was treated with the pump and a class 2 stocking only and showed a volume reduction of 520ml.

Conclusions from case report 2

The plan now is for Paul to maintain his leg with class 3 hosiery and use Farrow Wrap to reduce any rebound oedema, as it occurs. Paul feels this will give him more control over his situation and enable him to have a better quality of life, as the size and consequently

the weight of the limb is critical to his independence.

As a precaution, and because of the neuropathy associated with Paul's condition, he is using a layer of orthopaedic wadding along the tibial crest and around the maleolus to protect the bony prominences. The optional Farrow Foam™ foam liner was not available to us at the time of this trial.

Conclusion

Farrow Wrap is intended to reduce oedema in the foot, leg and thigh associated with chronic oedema, lymphoedema, and venous insufficiency. The wrap 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 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, palliative patients, or those with fragile skin, and additional foam under padding for those patients needing more protection.

Farrow Wrap is not designed to take over from MLLB/DLT. However, as demonstrated by these case reports, it is a valuable aid to help maintain

Table 3

Contraindications

Contraindications for the use of Farrow Wrap™

- » Infection and acute inflammatory episode
- » Fragile/broken skin
- » DVT
- » Severe cardiac failure

Proceed with caution

- » Peripheral neuropathy
- » Diabetes

chronic oedema and reduce the need for repeated courses of DLT. Its ease of use also offers the potential to reduce the workload of specialists and district nurses, both within community settings and clinics.

Farrow Wrap has only recently been launched in the UK, but has been used for some time in the US. Although, as yet, there is little research into its use, the initial small-scale studies are encouraging and more studies are planned for the future.

Contraindications

The same contraindications as for any compression garments also apply to Farrow Wrap and should be considered during use (Table 3). JL

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