

Treating chronic oedema of the lower limb using circular knit garments: how garment characteristics affect outcomes

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There is a wealth of literature to demonstrate that compression therapy is an integral part of management of venous disease. Consensus and expert opinion informed clinical practice for many years where compression garments were to be used in lymphoedema. However, more robust research is now available to underpin the use of compression in both diseases (Wounds UK, 2021). What is clear is that treatment decisions should be made by clinicians who have a greater understanding of how compression therapy should be prescribed, while considering the textiles to be used, components of the devices and theoretical principles that underpin their use (Partsch et al, 2008).

The purpose of this article is to introduce the reader to concepts in clinical decision making when using compression hosiery and increase understanding of the difference between circular and flat knit hosiery and how using stiffer circular knit

fabrics, such as Haddenham Doktus, can improve outcomes in self-management in chronic oedema and lymphoedema. Quite often, there is a lack of knowledge and experience from generalist health practitioners in distinguishing between the characteristics of a range of garments that are classed as flat or circular knit, and, while class of compression is an important factor, the elasticity and characteristics of a garment are equally important, in addition to the underlying patient assessment (Partsch et al, 2008).

Compression decisions in chronic oedema management

The mechanisms by which chronic oedema occurs have been discussed in previous articles and will not be addressed here. However, it is important to understand that chronic oedema can be defined as a swelling that has been present for more than 3 months, and this term has been adopted as the umbrella term, which includes lymphoedema and swelling related to venous disease, as well as other causes (Burian et al, 2021). Swelling-related conditions are often chronic, life-long conditions, with treatment aimed toward patient self-management—overseen by a trained physician—and focused around skin care, exercise, manual lymphatic drainage (MLD) and compression therapy using bandages, adjustable compression wraps or compression garments.

Compression is the mainstay of treatment in venous and lymphatic disease. The difference between flat and circular knit garments lie in how they are constructed. A flat knit garment is knitted flat on a knitting machine and will then have the edges stitched together to form a seam usually along the length of the garment at the back (Lee and Wigg, 2012). Flat knit garments usually use thicker inlayed yarns and have a higher stiffness and a more even distribution of pressure along the limb (Bjork and Ehmann, 2019). Circular knit garments are made by constructing the weave knitting continuously on a cylinder to produce a garment without a seam, which

ABSTRACT

The use of compression therapy to treat chronic oedema of the lower limbs can be a challenge, especially when this is undertaken by clinicians who have limited experience and knowledge of the theoretical principles which underpin its use in clinical practice. This article aims to discuss the reasoning which underpins the use of compression hosiery in the management of lymphoedema and how this understanding can improve treatment outcomes and reduce the burden of disease on patients and clinical resources.

KEY WORDS

- ◆ Chronic oedema ◆ Lymphoedema ◆ Circular knit garments
- ◆ Compression therapy ◆ Rebound oedema

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is thinner and seen as more aesthetically pleasing (Lee and Wigg, 2012).

Compression will work in several ways in both venous and lymphatic disease. Its influence on both systems is intertwined, as each system does not work in isolation of the other. When compression is applied to the leg, it will enable an increase in the blood returned to the heart (venous return) by supporting poorly functioning veins and encouraging an increase in the force asserted by the calf muscle pump. This, in turn, decreases hydrostatic pressure within the capillaries and tissue spaces where oedema may be present (Partsch and Moffatt, 2012). Furthermore, if oedema is present in the tissues, then this is a sign that the lymphatic system is becoming overwhelmed in its ability to remove tissue fluid. When compression is applied, it supports the small lymphatic structures to encourage uptake of fluid from the tissues, thereby increasing lymphatic drainage (Zalesk et al, 2015). Additionally, as all compression is graduated, by having the greatest pressure at the distal portion of the limb, the force exerted by the compression will encourage drainage to the root of the limb as the compression profile is reduced towards the proximal end. According to Belgrado et al (2016), where there is lymphatic failure, the fluid in the tissues is rerouting through the dermis to find deeper lymphatic pathways, and graduated compression can enhance the drainage through dermal rerouting.

Key treatment outcomes must include removal or reduction of oedema from the tissues, alleviating pain, heaviness and aching, as well as enhancing quality of life (Board and Anderson, 2018). Compression garments achieve these improvements by the way in which they work, as detailed above, by increasing interstitial pressure; this improves tissue fluid drainage and can aid breaking down the fibro-sclerotic tissue within the limb (Carati et al, 2009).

Patient concordance with wearing hosiery has been found to vary, with some reporting that they do not tolerate compression and being described as non-concordant (Chan, 2018). For many, wearing compression garments as much as possible is a key element in their daily routine, with some patients reporting structuring their lives to incorporate the elements of self-management (Fu, 2010). However it is important to remember that support should always be available for those who are self-managing their oedema with compression, so that problems can be identified and rectified early (Wound Care People, 2019).

Since treatment of chronic oedema with compression is likely to be life-long, with many patients managed in the community and secondary care settings, clinicians must ensure that the chosen garment is fit for purpose. Sheer (2017) highlighted the importance of prescribing correctly fitting garments. The author noted several important issues which should be considered: adequate graduated compression to manage the oedema; comfortable fit; acceptable design for the patient's lifestyle; appropriate wear regime; and manageable costs for replacement garments. A poorly fitting garment may result in worsening of the oedema, wastage of resources and poor concordance, with an adverse effect on the patient's ability to self-manage their condition. In

addition, hosiery that is poorly applied and poorly fitting can result not only in discomfort but also in trauma to the skin, pain, an increase in oedema and pressure damage (Wound Care People, 2019).

Determining the most appropriate garment for the patient can be a complex process, with Wounds UK (2021) suggesting that the hosiery type selected for any individual patient will be influenced by many patient- and disease-related factors, such as the ability to apply garments and the underlying cause of the oedema. Therefore, adequate time and attention must be given to a thorough assessment of the patient's medical history, the history of the oedema and full clinical assessment of the oedema itself, including the skin and tissues, as well as the patient's lifestyle. It has been recognised that hosiery must meet patients' clinical and lifestyle needs (International Society of Lymphology (ISL), 2020). To aid in the decision-making process for use of Haddenham Healthcare compression products, a garment pathway (Figure 1) has been developed, which highlights the considerations mentioned previously as part of decision making, for example, level of oedema, shape, skin, tissues and if the condition is likely to rebound, as discussed below. Further, the decision as to which class and compression standard of garment a patient needs can also be confusing. Figure 2 highlights the differences between the compression standards used to underpin compression classification in relation to pressure: French (Affnor), European (RAL), British (UK) and American compression classifications all have different pressure ranges for each class. It is important for the clinician to recognise the differences in pressure between classes of compression across the standards, as any change in the pressure range when switching between standards will have an effect on treatment outcomes. For example, a British standard class 1 garment is a lower pressure than a RAL class 1 garment. If a clinician switches between compression standards from RAL to British and the patient's limb condition deteriorates, this may be due to the reduction in pressure. Further, historically, it was suggested that much of the hosiery used to treat lymphoedema was RAL compression, but, according to the ISL (2020), patients should be given the highest level of compression that they can tolerate.

The Haddenham Compression Garment Pathway (Figure 1) helps the user to decide which of the Haddenham fabrics is most appropriate for the patient along with levels of (RAL) compression. This has been based on clinical and company expertise and testing of various fabrics to determine not only the correct level of compression but also the ability of a fabric to achieve an adequate static stiffness. According to Partsch et al (2008), static stiffness is a useful parameter to define the elastic properties of compression bandages, but, in clinical practice, it can also be related to garments. The elastic properties of a device determine the ability of that product to stretch when a force is applied. In the case of compression bandages and garments, this stretch usually occurs when the patient is mobilising and the calf muscle contracts. The readings for compression are usually taken when the patient is lying and again when standing, at the point on the limb

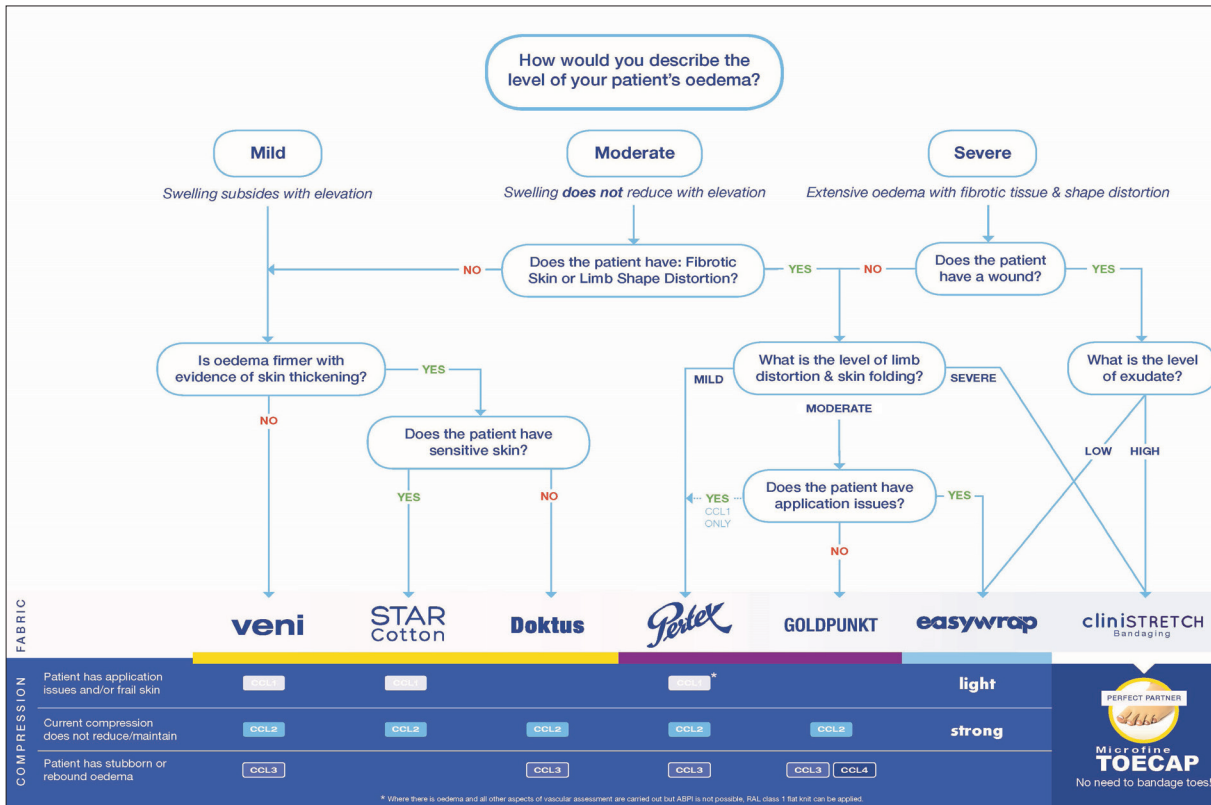


Figure 1. Haddenham Compression Garment Pathway (available to download from www.hadhealth.com)

where the Achilles tendon meets the gastrocnemius. If the pressure difference is greater than 10mmHg, then the compression device can be defined as achieving a good static stiffness index (SSI) (Parsch et al, 2008). Different garments will have different levels of rigidity due to the elastic properties within them, with some being much stronger and able to resist the force of muscle contraction, as well as resist the force of oedema rebound. Therefore, these will create a higher pressure on standing.

Furthermore, in clinical practice, clinicians will often opt for a flat knit compression garment if a higher static stiffness is required or if a patient is prone to rebound oedema. This is due to the inlayed yarn and weave of circular knit garments and how they will stretch along the limb, becoming more see-through as the limb size increases towards the thigh compared with a flat knit garment, which does the opposite. According to Bjork and Ehmann (2019), circular knit garments are less likely to achieve an even distribution of pressure, unless they sit within the category of stiffer circular knit, which they state are a hybrid between circular and flat knit garments and are better able to distribute pressure and contain the oedema along the length of the limb.

Haddenham Doktus range of compression garments

The Haddenham Doktus range of hosiery is a circular knit, soft, comfortable garment to wear, yet it is made of robust fabric, with a high SSI. Doktus is the stiffest garment available in the Haddenham circular knit range and is especially suitable for stubborn oedema or oedema prone to rebound

| Class | British Standard mmHg | Ral Standard mmHg | American Standard mmHg | French Standard mmHg |
|-------|-----------------------|-------------------|------------------------|----------------------|
| 1 | 14-17 | 18-21 | 20-30 | 10-15 |
| 2 | 18-24 | 23-32 | 30-40 | 15-20 |
| 3 | 25-35 | 34-46 | 40-50 | 20-36 |
| 4 | | >49 | >49-60 | >36 |

Figure 2. Differences in compression standards

(see below). Doktus is available in either a class 2 or 3 RAL compression. The choice of class will depend on the severity of the lymphoedema, ease with which the patient is able to put on and take off the garment and any complicating comorbidities; class 3 compression is usually reserved for stubborn, long-standing lymphoedema.

According to Todd (2015), rebound oedema usually occurs if patients do not address the underlying factors which contribute to their swelling, have inappropriately fitting compression garments, are noncompliant with compression therapy or who have worsening of the underlying cause

of oedema, such as tumour progression. Research findings indicate that hosiery with a higher SSI has advantages in controlling lymphoedema, especially where rebound is a problem (Bjork and Ehmann, 2019). Yet, being circular knit, Doktus is also cosmetically pleasing. It is useful for patients with a regular limb shape and for those patients whose lymphoedema is proving difficult to control, but who do not need or want a flat knit garment (Figure 3).

Both Hunter (2017) and Sheer (2017) agreed that selecting the correct size, class and material of a garment can be challenging, especially for inexperienced health professionals, and they underlined the importance of spending time with the patient to consider the various options of hosiery available, including fabrics, styles and compression levels. In addition, the importance of exploring both practical and body image issues when discussing and choosing appropriate hosiery must not be underestimated, since the correct choice of garment will influence treatment outcomes by



Figure 3. Light beige Doktus tights

enhancing concordance and improving quality of life (ISL, 2020). Self-management of a long-term condition such as lymphoedema must be recognised as key to the successful outcome of its treatment.

Accurate measurement of limbs in lymphoedema management has long been acknowledged as being an important factor in achieving a positive outcome from treatment, with Carati et al (2009) going so far as to say that measuring accurately for a garment is, in fact, ‘the prime determinant’ of an excellent, good or adverse outcome for the patient’s limb. The Haddenham Healthcare measuring chart for Doktus (Figure 4) is simple and straightforward to use, highlighting the appropriate measuring points to ensure an accurate garment fit.

In addition, there are many different styles and options available in the Haddenham made-to-order range, so clinicians can feel reassured that they are able to fit their patients not only with a garment that is clinically most appropriate but also one that best suits their patients’ lifestyle needs, further enhancing self-management. Figure 5 illustrates the choices available when ordering Doktus using the made-to-order service. These forms can be used when ordering Doktus on Drug Tariff, making the prescribing process easier and reducing mistakes, wastage, costs and resources.

If a successful outcome from lymphoedema treatment is to be realised, the patient’s ability to successfully self-manage must be encouraged, with patient education seen as paramount, both in wearing and caring for the garment. The aim of self-management is to slow disease progression, as well as to improve symptoms and quality of life (Barley and Lawson, 2016), with Remnerud and Haag (2015) suggesting that as many as 80% of patients can be enabled to manage their condition with supported self-management. Furthermore, correctly fitting compression hosiery will facilitate self-care and self-management (Sheer, 2017).

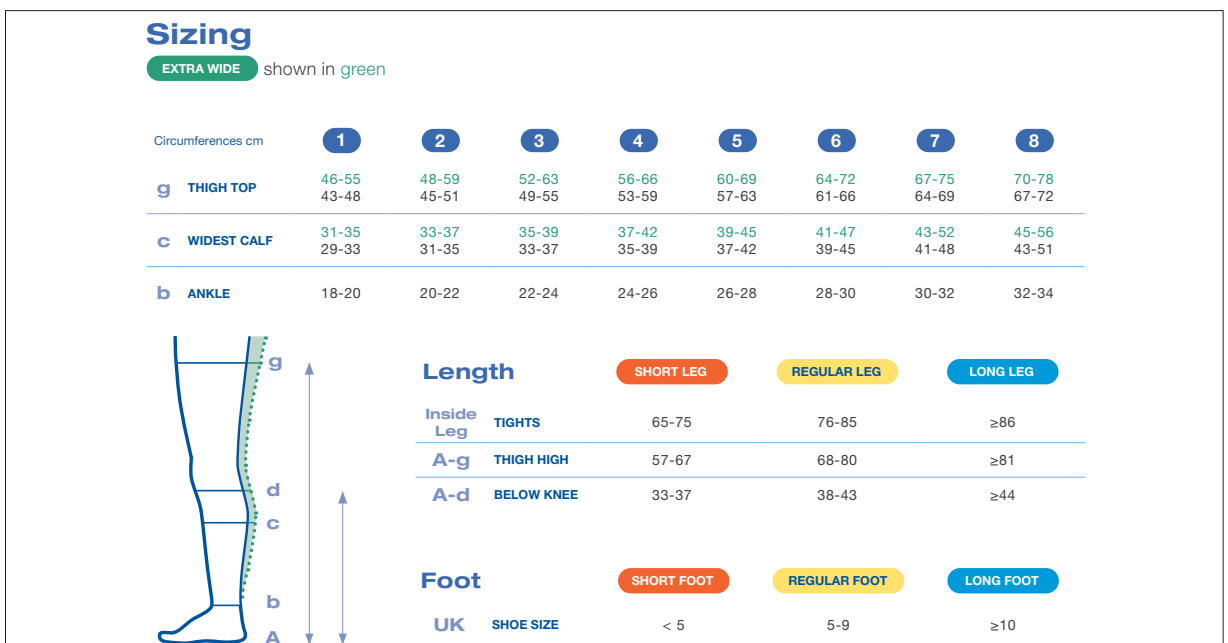


Figure 4. Doktus measuring and sizing chart

The following case studies illustrate how Doktus has helped to achieve self-management in three patients attending different lymphoedema clinics in England.

Case studies

Case 1: Ann

Ann was diagnosed with primary lymphoedema when she was 18 years of age, although she did not come under the care of the lymphoedema service until several years later, at age 29. Following the birth of her first child, Ann's legs had increased in size, and she was measured for Haddenham Veni thigh-length stockings by the hospital orthotics department.

Ann's job as a physiotherapist involved her being on her feet for most of the day, and she soon found that, although she liked the Veni stockings for their light texture and good aesthetic appearance, they were not keeping the lymphoedema under control. It was at this time, as Ann became more concerned about the worsening of the lymphoedema, that she asked her GP to refer her to the lymphoedema clinic.

At the initial assessment, bilateral leg lymphoedema was identified extending from the base of the toes to mid-thigh, with the skin well nourished and tissues mainly soft and non-pitting, but there was some firmness palpated on both lower legs, which would indicate that the tissues were starting to thicken. Ann was taught skin care, exercise and movement, simple lymphatic drainage (SLD) and was measured for a flat knit stocking. Ann was also offered an intensive course of MLD, intermittent pneumatic compression (IPC) using the Haddenham LymphFlow Advance and bandaging, which resulted in a 20% reduction in both legs. Ann was pleased with this result, especially as her legs now felt more comfortable, and 'moveable', and she continued to attend the clinic every 6–8 weeks for top-up sessions of MLD and LymphFlow.

Following the birth of her second child and with careful monitoring and regular top-up treatments, as detailed above, to ensure the lymphoedema stayed well controlled with this pregnancy, Ann asked if she could be changed from flat knit hosiery, which she was finding hot, too thick and heavy for work during hot weather, to something a little easier to manage. Ann was prescribed Haddenham Doktus and chose tights, feeling that these would be more practical for work. Subsequent reviews and re-measurements show that the Doktus tights are keeping the lymphoedema well controlled, helped by ongoing self-management on Ann's part; Ann keeps fit, follows a healthy diet and maintains a sensible weight, as well as continuing with a meticulous skin care and exercise regime, and carrying out SLD as often as she can fit this into her busy lifestyle. Ann has been happy with the Doktus hosiery, finding that it does what it sets out to do, holding her 'stubborn' lymphoedema well.

Case 2: Mary

Mary is a 79-year-old woman who was diagnosed with primary lymphoedema in 2002. Assessment showed bilateral leg swelling extending into the thigh and a positive Stemmer's

Figure 5. Haddenham Doktus made-to-order form

sign—the inability to pinch the skin at the base of the second toe, indicating toe oedema. Her past medical history revealed no comorbidities, but she had previously undergone a hysterectomy.

Mary was fitted with Doktus thigh-length stockings with a grip top, class 3, short leg and closed toe, with small-sized Microfine toe caps applied underneath. She has always been concordant with hosiery application and manages donning and doffing of her hosiery well. Mary's weight is stable, but she feels she is starting to 'slow down' as she gets older, although she remains as active as she can. Initially limb volumes were at a 12% excess, with a 620-ml difference between legs at her last review. Two years after commencing treatment with Doktus, her limb volume is maintained at 4% with a 207-ml difference between legs.

KEY POINTS

- ◆ Holistic assessment of the patient, including previous experiences with using compression therapy, will ensure appropriate self-management of chronic oedema
- ◆ Understanding characteristics of a compression garment, including compression type, static stiffness and levels of compression, enable appropriate garment selection
- ◆ Use of hybrid, stiffer circular knit garments can enhance oedema reduction and minimise rebound oedema, without the need to use custom-made flat knit garments

CPD REFLECTIVE QUESTIONS

- ◆ What factors should be considered when selecting circular knit hosiery for a patient with chronic oedema?
- ◆ What should you do when a patient tells you that they do not like wearing their compression garments?
- ◆ If a patient is wearing compression and their oedema is getting worse, what would you do?

Case 3: Julie

Julie is 54-year-old woman who has lymphoedema of the left leg secondary to treatment for cervical cancer. She attended clinic for optimisation of compression therapy, as she felt her oedema could be further improved. At initial assessment, her limb volume showed a 15% excess compared with the unaffected leg, with an excess volume of 1290 ml. To optimise compression therapy, she was prescribed a Doktus class 2 one-leg panty, as well as Easywrap strong and a Comfiwave leg garment for nighttime use. Her compression regime included this combination of therapy and using Comfiwave under IPC, as well as at rest, at times with the easywrap on top. During the day, she used her one-leg Doktus panty, as this was more aesthetically pleasing when going out. This continues to be the patient regime for optimisation and long-term management. At a 5-month review, the overall reduction in the affected limb was 961 ml, with circumference reductions of 1–5 cm throughout. Her tissues are softer, and she is very pleased with how her oedema is being managed. She now fits into a smaller-size Doktus, which she states helps her leg maintain its size towards the end of the day, when previously she would notice a refill.

Conclusion

The case studies demonstrate that the Doktus range of hosiery can achieve better management of lymphoedema due to the high stiffness and robust nature of its fabric. Also highlighted are the benefits of Doktus, particularly for patients with stubborn lymphoedema or lymphoedema where there has been rebound with lighter circular knit hosiery and where limb shape is good. Because this range of hosiery is aesthetically pleasing for patients, who report that Doktus is also comfortable to wear, this aids concordance with self-

management. Self-management can be further improved due to the availability of Doktus on Drug Tariff, with made-to-order options ensuring a wide range of choice, making it easier for patients to obtain repeat orders of hosiery without them necessarily needing to attend their lymphoedema clinic, or needing to attend so often. In addition, by helping to facilitate self-management and thereby improve patient outcomes, the pressure on already over-stretched service providers should begin to ease. **BJCN**

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