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# Haddenham Star Cotton: improving treatment outcomes in maintaining chronic oedema

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Lymphoedema is a chronic condition where there is a failure of the lymphatic system, which results in a persistent swelling of affected tissues. It can affect any area of the body and predisposes the patient to infection and tissue changes, while impacting on their physical and emotional wellbeing (Moffatt et al, 2016). Chronic oedema is an umbrella term used to describe oedema of all causes which has been present for 3 months, and in all instances demonstrates that the lymphatic system is unable to cope with the transportation of tissue fluid (Mortimer and Rockson, 2014). Lymphoedema can be either primary or secondary, and a patient should be holistically assessed to determine the cause and stage of oedema as this will inform treatment decisions (Warrilow, 2018). A mainstay of treatment in lymphoedema/chronic oedema is compression therapy, which can be in the form of bandages, adjustable compression wraps and

compression garments. This is also the treatment for lipoedema and venous disease.

The purpose of this article is to introduce the Haddenham Star Cotton range of compression garments and its unique ordering process, which aims to address the many challenges faced by clinicians and patients when managing conditions which require compression therapy. Case studies will demonstrate how these garments are used, and how increased knowledge and skill in the theory and use of compression garments can improve clinical outcomes.

## Raising awareness through collaboration

Lymphoedema affects approximately 240 000 people in the UK with a prevalence of 3.99 per 1000 population (Moffatt et al, 2016). The awareness of health professionals of lower-limb conditions is increasing with collaborative approaches, such as the Legs Matter campaign (Sneddon, 2018) and the compression industry working closely to support the strategies of charities including Lipoedema UK, The British Lymphology Society, Lymphoedema Support Network and Lindsay Leg Club. In light of this, the impact of lower-limb conditions is reaching a wider audience.

Furthermore, the National Lymphoedema Partnership, established in 2012, demonstrates how collaboration has further increased awareness of the challenges that patients face. Alongside this, the Gower Labour MP, Tonia Antoniazzi, highlighted in parliament the concern of health professionals of the inequity of UK services for patients suffering from lymphoedema (Humphreys, 2018). However, there is still a long way to go to achieve equity of services across the UK and access to treatment for those with lymphoedema and lipoedema. Furthermore, a patient's access to compression garments is still impeded by the difficulty health professionals face ordering and obtaining the correct garments. There can be significant problems in ordering hosiery via the Drug Tariff route, as patient's garments can be delayed by incorrect prescriptions or delayed ordering (Board

## ABSTRACT

The aim of compression therapy is to apply pressure on the skin and underlying structures to counteract the force of gravity, supporting venous and lymphatic function, to prevent or minimise oedema in the affected tissues. Compression therapy to manage lymphoedema is supported by a plethora of research, as it helps to increase the velocity of flow and lymphatic contraction of the lymphatic collecting vessels. This encourages drainage to the route of the limb, which increases fluid drainage from the tissues into the lymphatics. It is becoming more apparent that with an increase in clinical knowledge of how compression therapy works, clinicians are becoming less focused on the level of compression and more concerned with the stiffness of fabrics. This article looks at how adapting compression therapy regimes can improve patient outcomes of treatment and maintenance, while empowering patients to self-manage.

### KEY WORDS

- ◆ Compression garments ◆ Lymphoedema ◆ Chronic oedema
- ◆ Static stiffness index ◆ Star Cotton

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and Anderson, 2018). The detrimental impact of delayed compression therapy or incorrect compression on a patient is well-documented, often leaving the patient at risk of complications, such as leaking legs (lymphorrhoea), wounds and cellulitis (Lay-Flurri, 2018). The risk of delayed access to compression garments was further highlighted during the parliamentary debate in 2018, where Antoniazzi discussed one constituent who had attended accident and emergency 3 times due to an infection in her leg. Earlier treatment would have prevented her hospital visits and reduced the burden of treatment on the NHS (Humphreys, 2018).

### Compression therapy principles

The principle of compression therapy is to apply pressure on the skin and underlying structures to counteract the force of gravity, thus preventing or minimising chronic oedema in the tissues (Wounds International, 2013). Compression therapy is the mainstay of treatment for lymphoedema (Lymphoedema Framework, 2012), as it helps to increase the flow velocity and lymphatic contraction of the lymphatic collecting vessels, which encourages drainage to the route of the limb. This increases the drainage of fluid from the tissues into the lymphatics (Carati et al, 2010).

The imaging of venous disease (through ultrasound and venographic images) has demonstrated an increase in venous flow when compression therapy is used, as compression therapy squeezes veins and valves to reduce backflow into the tissues (Hunter and Mortazavi, 2014; Partsch et al, 2008). Furthermore, lipoedema may benefit from compression therapy, as it reduced pain in 55% of patient respondents surveyed by Lipoedema UK (Fetzer and Wise, 2015). Compression therapy can also minimise the formation of oedema if the lymphatic system has become compromised in lipoedema (Fetzer, 2016).

Garments vary in construction, containing elastic or inelastic fibres, knitted together on a circular knitting machine for round/circular-knit garments or on a flatbed knitting machine for flat-knit garments (Wounds UK, 2015). Circular-knit garments tend to have a greater elastic content and are thinner and less rigid than flat-knit garments (Warrillow, 2018). When a garment has less elastic properties, it is more rigid and provides a higher level of stiffness to the patient, as the ability of the garment to stretch is reduced and it applies greater pressure to the underlying skin.

Using short-stretch compression therapy bandages is a common method of treatment for oedema (Wong et al, 2012). This is because short-stretch compression therapy bandages have a consistent lower resting pressure and peak of higher working pressures, in response to movement (Nazarko, 2017). Garments are classified according to the standard used by the manufacturer (Table 1), which can be confusing as there is no single global standard for compression hosiery. However, as health professionals become more educated in the theory of compression and understand the pressures applied to the affected areas in mmHg, there is a shift towards choosing garments based

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

Table 1. Compression standards chart

on the static Stiffness Index (Noble-Jones, 2018). This is the difference in pressure of compression, exerted on a limb, when the patient goes from supine to standing. If the pressure increases by a greater unit than 10 mmHg, then it is understood to have a Static Stiffness Index which is more effective at reducing oedema (Partsch, 2005).

### Improving patient outcomes and self-management of chronic oedema

Haddenham Healthcare compression therapy products are a mainstay of treatment in venous, lymphatic diseases and lipoedema. In 2017, Haddenham pioneered and launched Veni made-to-order (MTO), which ensures clinicians have access to a wide range of treatment options from the Veni circular-knit compression range, on prescription, while trying to keep the process of ordering as simple as possible. The Drug Tariff process for ordering garments can be complex, especially when a range of garments can include thousands of different combinations. However, the decision to include a large range of options was both clinician and patient-driven (Noble-Jones, 2018).

There is a clear need for a wide range of garments to improve patient concordance, as patients are more likely to maintain a compression therapy regime if the garments are comfortable and appropriate for their needs (Warrillow, 2018). As well as this, increasing a health professional's understanding of compression therapy materials, types and levels of compression can lead to better patient treatment, as shown by the case studies included in this article. It is also important to titrate care (Lymphoedema Training Academy, 2018), which enables health professionals to step up or step down treatment as a patient's symptoms change.

### Haddenham Healthcare compression therapy products

In May 2018, Haddenham followed Veni MTO with the launch of Star Cotton MTO. The range has 10 different garment styles (Table 2), in two colours, suitable for both men and women and with footless options. There are two compression classes, with all garments conforming to Reichsausschuss Für Lieferbedingungen (RAL) compression standards. Star Cotton is a soft, yet firm fabric, with a 100% cotton lining in contact with the patient's skin. The cotton fabric is beneficial for patients with sensitive skin or eczema. It is also useful for cases where patients need a stiffer fabric, but do not need a



**Size & Width**

Circumferences cm		I	II	III	IV	V	VI	VII	VIII
EXTRA WIDE SC-EW	g THIGH TOP	43-55	45-59	49-63	53-66	57-69	61-72	64-75	67-78
	f MID THIGH	39-49	41-52	44-55	47-58	50-61	53-64	56-67	59-70
	d CALF	28-34	30-36	32-38	34-41	36-43	38-45	40-49	42-54
STANDARD Default	c MID CALF	29-35	31-37	33-39	35-42	37-45	39-47	41-52	43-56
	g THIGH TOP	43-48	45-51	49-55	53-59	57-63	61-66	64-69	67-72
	f MID THIGH	39-43	41-46	44-49	47-52	50-55	53-58	56-61	59-64
	d CALF	28-30	30-34	32-36	34-38	36-41	38-43	40-45	42-47
c MID CALF	29-33	31-35	33-37	35-39	37-42	39-45	41-48	43-51	
b ANKLE	18-20	20-22	22-24	24-26	26-28	28-30	30-32	32-34	

  

Leg Length		SHORT	REGULAR	LONG
Lengths cm		SC-SL	Default	SC-LL
A-d	BELOW KNEE	33-37	38-43	>44
A-g	THIGH HIGH	57-67	68-80	>81
Inside Leg	TIGHTS	65-75	76-85	>86

  

Foot Length		SHORT	REGULAR	LONG
UK SHOE SIZE		SC-SF	Default	SC-LF
		< 5	5-9	>10

Table 2. Haddenham Star Cotton made-to-order sizing chart

higher level of compression, or if a patient is prone to rebound oedema.

### Case study 1

Mrs H is a 70-year-old woman who has a history of multiple sclerosis for the last 10 years. She has had mild, below-knee oedema for several years, but over the past 18 months this had increased as her mobility had declined. On assessment, her right leg was 9% larger than the left. The skin was intact, but dry on her right tibial area, slightly warm to touch and pink with mild pitting oedema. There were no clinical signs of infection and the patient was assured that the redness was more likely to be red leg syndrome. However, she was instructed to observe any changes and report to her GP if the redness increased, or she had any systemic symptoms of an infection. The left leg also had mild pitting oedema, but no skin changes were noted.

Prior to attending the lymphoedema clinic, Mrs H was prescribed Haddenham Veni Class 1 below-knee garments by her GP, which did not reduce the oedema sufficiently, although they provided some comfort. Alongside this, the garments had not been replaced, so were beyond the normal 6-month garment life expectancy. It was decided to continue with the Haddenham garments, after consultation with the patient, as they offered a lot of ankle flexibility, and she



Figure 1. After the initial use of Haddenham Veni garment



Figure 2. After using Haddenham Star Cotton Garment

Provided by the author

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**Table 3. Volume changes for case study 1 (EV = excess volumes)**

Pre treatment EV	Post HHC Veni class 2	Post use of HHC Star Cotton
766 ml	359 ml	138 ml
9%	4%	2%

could use the garments correctly with both her multiple sclerosis and hand weakness. An increase in compression to Class 2 Veni below-knee garments was chosen, as it was available in stock, and the patient was keen to have a suitable compression garment as soon as possible.

On return to the clinic 3 weeks later, the size of both limbs had reduced. The left leg had reduced in size by 61 ml and the right by 612 ml, overall reducing the size of the legs from 9% to 4%. However, the right leg was still slightly red and warm to touch (Figure 1). There were no clinical signs of infection, so the garments were changed to Haddenham Healthcare Star Cotton Class 2 below-knee.

When the patient was followed up after 3 weeks of using Haddenham Star Cotton garments, the right leg showed a further reduction of volume of 135 ml. However, the left leg, which had remained in a Veni garment, had increased by 93 ml. This treatment review was during a period of exceptionally hot weather in the UK, so some increase in the size of the leg was anticipated at the consultation. However, overall, the volume of the difference between the patient's legs had reduced to 2% during this 3-week follow-up. The patient commented that the Star Cotton garment was more comfortable in hot weather, and she felt that her skin condition had improved, and her leg felt less irritated (Figure 2). In light of this, the patient's compression therapy was changed to Star Cotton to be used on both legs.

### Case study 2

Mrs G is a 50-year-old woman who presented with unilateral left leg oedema as a result of recurrent episodes of cellulitis since 2010. The last episode in August 2017 resulted in hospital admission and intravenous antibiotics. Her medical history included hypertension and a high body mass index (BMI). At the patient's initial assessment it was apparent that both legs were oedematous below knee, the right (ankle circumference 30 cm) as a result of her raised BMI, and a degree of venous hypertension. Her left leg had significantly more venous hypertension (ankle circumference 40 cm) as a result of her recent infection. The skin on both legs was intact, but with some discolouration post-cellulitis; however, there was evidence of pitting oedema in both legs, more so on the left leg.

The ideal treatment plan would have been a course of multi-layer bandaging for the left leg and a flat knit garment for the right leg. However, the patient was due to go on holiday, which involved a short-haul flight. She was fitted with a double layer of Haddenham Healthcare



**Figure 3. Prior to application of compression**

Provided by the author



**Figure 4. After 4 weeks of self-application of Haddenham easywrap**

Provided by the author

Class 1 Pertex Light, a below-knee off-the-shelf garment as an interim measure, as her skin was too vulnerable to risk applying a Class 2 garment, because this could have resulted in shearing and trauma to the skin. It was also discussed whether it would be possible to try a course of bandaging, but due to the patient's work commitments she was unable to use this. It was decided to order a Haddenham easywrap garment for her return from holiday, alongside a custom-made Haddenham Class 2 anklet.



**Table 4. Volume changes for case study 2 (EV = excess volumes)**

Pre-treatment EV	Post use of Pertex light class 1 (double layer) EV	Post-use of easywrap, EV	Post-use of Haddenham Healthcare (HHC) Veni Cl2 EV	Post-use of HHC Star Cotton Cl2 EV
1141 ml	774 ml	477 ml	133 ml	64 ml
19%	13%	9%	3%	1%

Mrs G had a clinic session to demonstrate how to apply the easywrap, and had a review booked for after 4 weeks. The patient was advised to leave the easywrap in situ for 24 hours per day, and to only remove the easywrap for showering and skin care. The left leg was a much more defined shape after Mrs G's use of easywrap (Figure 3 and 4). It was decided after discussion with Mrs G, to fit Haddenham Veni Class 2 below-knee and to review this after 4 weeks. At her next review, there was a small amount of oedema accumulating around her ankle area, but this was not sufficient to warrant recommencing wraps.

While the use of flat-knit garments was considered, it was decided to convert to Haddenham Star Cotton below-knee, Class 2 and review treatment, before deciding on the need to revert to flat-knit fabric. This is because the slightly stiffer knit used in Star Cotton provides greater resistance than the stretchier Veni fabric. It is a good mid-point fabric, in cases where it is a borderline decision of whether circular or flat knit garments would be the best course of treatment. At the patient's next review, there was a reduction around the ankle of 1 cm, reducing the overall limb volume to 1%. Both limbs remained stable in Star Cotton Class 2 garments, and the patient preferred the treatment as she was reluctant to revert to thicker garments. Volume changes are shown in Table 4.

### Case Study 3

Mr E is a 90-year-old man, who has a history of polio since childhood and now has post-polio syndrome. He presented with minimal oedema around his ankle due to his poor walking gait and reduced calf pump action. However, over the past 6 months this had increased as his mobility had deteriorated. On assessment, the oedema was predominantly on the foot, ankle and the lower third of his legs, and the oedema was soft and pitting. His right leg was weaker and had more oedema as a result. On assessment, the limbs were a good shape, so it was decided with the patient to try Haddenham Veni class 2 below-knee garments, but a size larger than was needed to make it easier for the patient to get them on. His right leg was initially 24% bigger than the left leg. He managed remarkably well with the application of the garments and returned a few weeks later with a reduction in size to a 16% excess volume between right and left leg (Figure 4).

His legs were less swollen around the ankles, so the compression was reduced to Class 1, but using the slightly stiffer fabric of Haddenham Star Cotton. It was felt that

**Table 5. Volume changes for case study 3 (EV = excess volumes)**

Pre-treatment EV	Post-Haddenham Healthcare (HHC) Veni cl 2, EV	Post-HHC star cotton cl 1, EV
1908 ml	1165 ml	624 ml
24%	16%	8%

the additional fabric stiffness would compensate for the reduced compression, and the cotton fabric would be softer on the patient's skin, which was delicate due to age. On the patient's return to clinic 1 month later, Mr E's legs were stable, with only 8% excess volume (Figure 4; Table 5). He had managed the garments independently and felt that the cotton fabric was cooler to wear and better for his skin.

### Case study 4

Mrs H is a 62-year-old woman who has had primary bilateral full leg lymphoedema since teenage years. This was complicated by intestinal lymphangiectasia and chylothorax, which was diagnosed and treated in 2012. The patient had not had treatment for her lymphoedema until she was in her 50s, by which time she had developed a typical thick ankle shape and some fibrotic tissues. Her attendance at the clinic was intermittent, due to social reasons since 2012, but had become more regular in recent years. Although both legs were affected by oedema at her initial assessment in 2012, her left was 16% larger than the right leg. Initial treatment consisted of multi-layer bandaging, manual lymphatic drainage (MLD) and sessions on an intermittent compression pump (ICP). This treatment reduced the limb volume difference between both legs to 11%. At this stage, the patient was fitted with a thigh-length class 2 garment and layered with a class 2 below knee. Flat-knit garments were originally tried, but subsequently declined in favour of layering circular-knit garments. At this stage, the patient moved out of the area and was subsequently prescribed alternative garments from another service.

She was re-referred in January 2018. On reassessment, she had a greater extent of oedema across the base of her toes and restrictions at the ankle crease. She had been continuing to layer a thigh and calf garment, but with an open toe thigh garment and a closed toe below knee garment, which was placed over the top. This action

of pulling over the additional compression garment was causing the open toe garment to wrinkle and constrict over the dorsum of her feet. Despite this, the remainder of her leg had reduced to 4% excess volume and she had lost weight. It was decided to use the more rigid Haddenham Star Cotton class 2 thigh with closed toe as a new base layer and layer an open toe Haddenham Star Cotton class 2 calf over the top (Figure 5). On review a month later, there was a further reduction to 1% difference between her two legs and an improved foot shape in both legs (Table 6). This reduction has been maintained. The Star Cotton layering combination was less restrictive than the previous combination she had been using and improved the comfort and shape of her feet.

### Conclusion

This article has indicated how adapting a patient's compression therapy regime can improve the outcome of treatment and maintenance, while empowering patients to self-manage. Some of the techniques discussed here are implemented in specialist clinics, where staff have expert knowledge in the use of compression therapy; however, with the correct training and support from specialists, community clinicians can consider these options when treating patients. When health professionals have a thorough understanding of how garments are manufactured and the different fabrics and compression standards that are available, they can reduce the need for the intensive treatment of patients using high-compression bandages. **BJCN**

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**Table 6. Volume changes for case study 4 (EV = excess volume)**

Pre-initial treatment	Post-initial treatment	Initial maintenance regime	Post-layering Haddenham Healthcare (HHC) Star Cotton
1553 ml	1239 ml	194 ml	78 ml
16%	11%	4%	1%



Provided by the author

**Figure 5. Demonstration of layering of Haddenham Star Cotton open toe below knee garment, over Star Cotton closed toe Class2 thigh garment**

### CPD REFLECTIVE QUESTIONS

- ◆ How would you modify treatment for a patient finding it difficult to apply compression garments?
- ◆ In what instance would you change the fabric and not increase the compression class of your patient's compression therapy?
- ◆ This article does not discuss in detail contraindications to compression therapy; however, can you list and give rationale as to when and why you would not implement compression therapy?

### KEY POINTS

- ◆ Treatment can be altered without increasing or decreasing the level of compression if compression fabrics are used correctly
- ◆ Intensive treatment can be achieved by using a mixture of adjustable compression wraps and compression hosiery
- ◆ Treatment with compression therapy should be regularly evaluated and modified as needed

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