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Chronic oedema is the umbrella term used to describe swelling that has been present for 3 months or more (Table 1). The swelling is most likely to affect a person's legs, and is characterised by skin changes, fibrosis, and deepened skin folds; it can be compounded by complex poly-morbidity. Chronic oedema is a distressing symptom and is the result of several conditions including chronic venous disease, immobility, and obesity. In a study carried out by Moffatt and Pinnington (2012) in Derby City, England, the researchers found that in every 1000 people, 3.99 are affected by chronic oedema, and this prevalence increases to 10.31 in those aged over 65 years and 28.57 in those aged over 85 years. The prevalence is also higher among women. Moreover, owing to poor identification by health professionals and under-reporting of the condition, this prevalence rate is thought to be underestimated (Moffatt and Pinnington, 2012).

One of the key facets in the long-term management of chronic oedema is compression therapy. Compression can be practitioner-led through episodes of intensive therapy, which can consist of the application of bandaging systems, skin care, as well as manual lymphatic drainage. The self-management mode of care typically involves hosiery or wrap systems with hook-and-loop fastening. Compression bandaging is advocated to reduce swelling as well as improve

skin changes and limb shape in order to facilitate long-term self-management using hosiery. Occasionally, rebound swelling occurs, necessitating further episodes of bandaging. The Haddenham Custom Goldpunkt range of garments and hosiery can be useful in controlling rebound swelling.

## Why does chronic oedema occur?

The circulatory system comprises arteries, veins, and lymphatics. Blood is pumped away from the heart via the arteries that deliver oxygen and nutrients throughout the body. The deoxygenated blood returns to the heart through the veins. It was previously believed that 90% of the normally produced excess fluid in the tissues was reabsorbed into the venous system, with the lymphatics draining the remainder (Mortimer and Rockson, 2014); however, it is now known that most of the tissue fluid is drained via the lymphatics. This fluid containing waste toxins, protein, and fat molecules is drained through the lymphatic network and eventually rejoins the venous system at the jugular veins.

Chronic oedema develops if there is blockage or damage to the lymphatics, thus reducing their drainage capacity. In the case of chronic venous disease (CVD) or immobility, there is a reduction in venous return that causes more tissue fluid to be produced, consequently resulting in an overload of the lymphatic system and in lymphatic failure.

## ABSTRACT

The management of chronic oedema often consists of a programme of compression bandaging to reduce swelling and improve skin changes and limb shape, followed by patient self-care management in compression hosiery. Occasionally, patients experience rebound swelling and require further episodes of bandaging. In such cases, a thorough assessment of the causes of the rebound swelling should be carried out so that they can be eliminated. By evidencing three case studies, this article demonstrates that Haddenham Custom Goldpunkt garments can be useful in preventing rebound swelling, making it a cost- and resource-effective method of managing stubborn chronic oedema and lymphoedema.

## KEY WORDS

- ◆ rebound swelling ◆ chronic oedema ◆ compression stockings
- ◆ lymphoedema ◆ lymphatic system

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## Cellulitis

Cellulitis is common in chronic oedema and lymphoedema, and consequently represents a significant health-care issue with substantial resource and financial implications (Clinical Resource Efficiency Support Team (CREST), 2005). Episodes of cellulitis account for 2%–3% of hospital admissions in the UK (Morris, 2004), and the mean length of stay of patients admitted to hospital is 7.1 days (Wingfield, 2009), with 25%–50% of patients suffering recurrence (Cox et al, 1998; Dupuy et al, 1999). Over a 7-year period, there has been an increase of 77% in the number of people being admitted to hospital for management of lower-limb cellulitis (Driscoll et al, 2014), costing between £172–£254 million per year (Curtis, 2010).

## Lymphoedema

Lymphoedema is a form of chronic oedema caused by a congenital defect in the development of the lymphatic

**Table 1. Causes of chronic oedema and lymphoedema**

Chronic oedema	Lymphoedema
Chronic venous disease	Congenital malformation of lymphatic system
Obesity	Surgical removal of lymph nodes
Prolonged dependency or immobility, e.g. following stroke or because of chronic pulmonary disease (COPD) or chronic cardiac disease	Radiotherapy to lymph node areas
Side effects of medication, such as steroids, calcium channel blockers, and gabapentin	Tumour blockage of lymphatic system
Chronic inflammatory conditions, e.g. arthritis	
Significant trauma to limbs, e.g. burns or degloving	

system (primary lymphoedema) or damage to the lymphatic system (secondary lymphoedema) (Mortimer, 1995). The main cause of secondary lymphoedema is the surgical removal or radiotherapy-induced fibrosis of lymph nodes in the management of cancer. The swelling will present distal to the damaged/removed lymphatic tissue and can therefore affect any of the limbs, the trunk, genitals, head, and neck.

### Treating chronic oedema and lymphoedema

If left untreated, chronic oedema and lymphoedema will result in progressive swelling, skin changes, psychosocial morbidity, and increased risk of cellulitis. Prompt assessment and treatment is essential in preventing this progression. A systematic and thorough assessment that assesses the patient holistically and not just the affected limb(s) should be carried out regardless of the severity, and should include the site of the swelling, degree of swelling, skin changes, and effect on the patient. Although a holistic and comprehensive approach to assessment can be time consuming, it is essential for obtaining a differential diagnosis. The severity of lymphoedema can be graded using the International

Society of Lymphology (ISL) staging system (ISL, 2013) (Table 2), and there are a number of strategies to manage the conditions (Table 3).

### Compression therapy

Appropriate containment of the tissues from compression therapy (Földi et al, 2003; Partsch and Jünger, 2006) can:

- ◆ Provide an abutment to the venous leg pump
- ◆ Prevent venous dilatation when walking or standing
- ◆ Increase velocity of venous blood flow, preventing the trapping of leukocytes and reducing inflammation
- ◆ Reduce valvular insufficiency and prevent backflow
- ◆ Reduce capillary filtration and decrease lymphatic load
- ◆ Increase interstitial pressure that results in oedema being reabsorbed into the venous and lymphatic system
- ◆ Stimulate lymphatic contractions.

### Compression bandaging

Peaks in high pressure during activity can only be achieved using bandages with a higher static stiffness index (SSI). Stiffness relates to the elastic property of compression appliances and is calculated by the increase in interface pressure caused by muscle contraction. When walking or standing, elastic (or long stretch) bandages will yield to the increase in limb volume caused by muscle contraction. However, bandages with a high SSI (inelastic or short stretch) will not yield during muscular activity, resulting in much higher pressure being exerted (Partsch et al, 2008). Inelastic ‘intelligent bandaging systems’ applied at full stretch will form a rigid cast around the limb, delivering high-working pressures and creating the pulse effect during muscle contraction, while providing tolerable lower pressures during rest, thus making them more comfortable and improving compliance.

### Compression hosiery

Compression garments can be constructed using two methods: circular (or round) knit and flat knit. Circular knit hosiery is seamless and uses finer yarns, which makes them more cosmetically pleasing to patients. They are suitable in

**Table 2. Stages of lymphoedema**

Stage	Presentation	Severity	Management
Stage 0 (latent sub-clinical stage)	No overt swelling, but lymphatic pathways have been disrupted		
Stage 1 (early stage)	Mild pitting oedema that resolves with elevation	Mild: <20% increase in excess limb volume	Compression hosiery, exercise, self-lymphatic drainage, and preventive skin care
Stage 2	Swelling does not resolve with elevation. Less evidence of pitting as fibrosis development occurs	Moderate: 20%–40% increase in excess limb volume	Custom-made hosiery/compression bandaging, exercise, self-/manual lymphatic drainage, and skin care
Stage 3 (late stage)	Non-pitting with skin changes (e.g. papillomata, fibrosis, hyperkeratosis)	Severe: >40% increase in excess limb volume	Compression bandaging, skin care, exercise, and manual lymphatic drainage

Source: International Society of Lymphology (2013)

**Table 3. Strategies to manage chronic oedema and lymphoedema**

Strategy	Condition	Rationale
Compression	Chronic oedema and lymphoedema	Reduce swelling, improve shape of limb, and maintain reduction
Skin care	Chronic oedema and lymphoedema	Maintain skin hygiene and integrity, improve any skin changes, heal any ulceration, and prevent cellulitis
Exercise	Chronic oedema and lymphoedema	Muscle contraction assists lymphatic and venous return; it also helps in weight reduction and improvement in health measures
Lymphatic drainage	Lymphoedema	Directs fluid from area of swelling to areas where lymphatics are draining normally
Psychological care	Chronic oedema and lymphoedema	Improves wellbeing and encourages compliance
Healthy lifestyle advice and support	Chronic oedema and lymphoedema	Reduces impact of comorbidity and improves health and wellbeing

the management of mild swelling, where there is no shape distortion and the skin is intact.

Flat knit hosiery is knitted using heavier and more robust yarns and the material is sewn together creating a seam. These garments are indicated in the management of patients with more severe swelling, distortion in shape, or problems with rebound swelling, and they are also useful for bridging skin folds and fatty limbs where circular knit garments would gather and cause a tourniquet effect. Both types of hosiery can be produced in either made-to-measure or ready-to-wear styles.

All aspects of patient need, lifestyle, and ability should be included in the decision-making process regarding selection of compression hosiery. Involving patients and allowing them to make informed choices about their hosiery will improve compliance and foster greater nurse-patient relationships.

### Rebound swelling

The ultimate aim of intensive therapy is to maintain the volume reduction achieved. The need to manage rebound swelling is both costly and time consuming for the patient and nurse. Rebound swelling can be defined as swelling that fails to be maintained using current management measures. The reasons for rebound swelling include:

- ♦ Inappropriate hosiery selection
- ♦ Noncompliance with hosiery, which may be due to poor hosiery selection, inability to apply hosiery, or issues with body image
- ♦ Noncompliance with reducing compounding factors, e.g. prolonged dependency, immobility, and obesity

- ♦ Cancer recurrence, that is, expansion of the tumour may cause new or further blockage of the lymphatic routes.

If rebound swelling occurs, it is important to investigate the causes. Failure to identify significant clinical changes could result in delayed cancer treatment, and prescribing hosiery that the patient cannot or will not wear is not cost-effective.

### Haddenham Custom Goldpunkt

Haddenham Custom Goldpunkt is a flat knit, custom-made garment that is very useful in the management of stubborn and rebound swelling; it is available in nearly all compression classes (Table 4) (German Standard RAL classes 1, 2, and 3 for gloves, armsleeves, and toecaps, and classes 1-4 for lower limbs). The material is very firm with a unique stretchability that makes it comfortable to wear, supportive, and easier to apply. Haddenham Custom Goldpunkt garments come in a variety of styles for both arms and legs including gloves and toecaps, can be black or beige, and are available on prescription.

**Table 4. RAL compression classes**

Class	Compression
Class 1	18-21 mmHg
Class 2	23-32 mmHg
Class 3	34-46 mmHg
Class 4	>49 mmHg

**Table 5. Limb volumes of the three patients in the case studies**

	Pretreatment limb volumes		Posttreatment limb volumes		Follow-up limb volumes	
	Left	Right	Left	Right	Left	Right
Case 1	6546 ml	10957 ml	6553 ml	8893 ml	6551 ml	8907 ml
Case 2	11 101 ml	21 469 ml	11 107 ml	13 241 ml	11 104 ml	13 275 ml
Case 3	5892 ml	12 066 ml	5885 ml	8062 ml	5895 ml	8119 ml

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**Figure 1. Rebound swelling, with excess volume of 67%, in patient's right leg**



**Figure 2. Reduction in volume in leg posttreatment**

The clinical benefits of wearing Haddenham Custom Goldpunkt garments to prevent rebound swelling can be demonstrated through the following three case studies. The limb volumes of the three patients are shown in *Table 5*.

### Case 1

A 59-year-old woman with previous history of cervical cancer treated by hysterectomy, lymphadenectomy, and radiotherapy, developed mild lymphoedema with an excess

volume of 6%. There was also coexisting moderate chronic venous disease (CVD). Initial management consisted of a class 2 circular knit, thigh-length stocking that maintained the mild swelling. Excess volume increased to 36% a year later, and decongestive lymphatic therapy (DLT) achieved slight reduction to 30%, followed by the application of a flat-knit class 3 garment. Rebound swelling ensued after about 2 weeks. Pelvic and para-aortic node recurrence with deep vein thrombosis (DVT) in right groin was diagnosed that required further chemotherapy and low-molecular-weight heparin (LMWH). This resulted in a slight reduction in her swelling. Local recurrence of the cancer was diagnosed along with possible iliac vein stenosis, and further chemotherapy was commenced. Excess volume at this point was 67% (*Figure 1*), which increased the weight of the limb and led to difficulty in walking and driving. On completion of the chemotherapy, DLT was carried out, reducing the excess volume to 36%. The patient was fitted with a Goldpunkt class 3 garment with a class 1 circular knit to support the CVD in her other leg.

The reduction of excess volume, shown in *Figure 2*, has been maintained with the Custom Goldpunkt stocking, which the patient finds supportive and easier to apply. She can drive her car again, which makes it possible for her to plan her return to work in the near future.

### Case 2

A 42-year-old baker developed left lower leg swelling at the age of 32 years, following an episode of cellulitis. Recurrent episodes increased leg swelling, resulting in an excess of 93% (distal excess: 160%) (*Figure 3*), which made wearing ordinary trousers very difficult; the only option was to wear jogging trousers. His job involved prolonged periods of standing, which made the swelling worse, and the increased weight of the leg affected his gait and resulted in back pain. Prophylactic antibiotic therapy was commenced and DLT reduced the distal excess volume to 81%. However,



**Figure 3. Excessive leg swelling before treatment**



**Figure 4. Patient fitted with a Custom Goldpunkt stocking**



**Figure 5. Reduction of swelling following use of the stocking**

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class 3, flat knit, custom-made hosiery failed to maintain the reduction, and rebound swelling occurred 1 week later.

The patient was fitted into a Custom Goldpunkt class 4, knee-length stocking (Figure 4) that led to better oedema control. The reduced weight of the leg (Figure 5) resulted in decreased back pain and improved gait; most importantly, the patient was able to wear a pair of jeans or regular trousers. Further episodes of DLT have been planned to reduce the distal excess volume.

### Case 3

A 62-year-old woman developed late-onset unilateral leg lymphoedema at the age of 28 years following an episode of cellulitis, which was precipitated by sunburn. She had no family history of the condition and the swelling was worse during her pregnancy. Excess volume at assessment was 36%, and management consisted of episodes of DLT followed by class 3, flat knit, custom-made hosiery. She cycled regularly to keep fit and maintain her weight. However, over time, the excess volume increased to 105% (Figure 6) owing to gradual weight gain and reduced activity due to menopausal changes. Success at attempts to lose weight were short term, and her total weight gain over the period was 2 stone (i.e. 12.7 kg).

The size and weight of the leg affected her mobility and gait, and caused pain in her hip and back. She was fitted with a Custom Goldpunkt class 4, thigh-length stocking following reduction of excess volume by 54% (Figure 7), and this reduction has been maintained. Gradually, the patient has been able to return to cycling. She finds the garment easy to apply and comfortable to wear, and it does not hinder her cycling.

### Conclusion

Being able to effectively maintain the volume reduction achieved from intensive therapy sessions is important as it is less costly in terms of resources and time for both the patient and nurse. Rebound swelling can occur if there is inappropriate hosiery selection or there are compounding clinical or compliance issues. These issues should be identified and addressed to ensure the correct treatment plan is followed, which will lead to improved clinical outcomes. The three case studies in the article have demonstrated that Haddenham Custom Goldpunkt garments can be an effective compression garment in reducing rebound swelling, and patients found them to be comfortable, supportive, and easy to apply. **BJCN**

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Figure 6. Excess volume of 105% seen in right leg



Figure 7. Significant reduction in leg swelling after bandaging, which was maintained in hosiery

### KEY POINTS

- ◆ Chronic oedema management requires compression therapy to reduce and maintain the swelling and improve skin changes
- ◆ Following compression bandaging, patients can self-manage the condition using compression hosiery
- ◆ Occasionally, rebound swelling occurs, the cause of which should always be investigated
- ◆ Haddenham Custom Goldpunkt is an effective garment for the control of rebound swelling

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