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Impact of JOBST<sup>®</sup> Elvarex<sup>®</sup>  
knee and elbow functional zones  
on quality of life

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Lymphoedema affects an estimated 500 million people worldwide with recent epidemiological studies showing prevalences of 3.99 per 1000 in the UK population, increasing to 10.31 per 1000 over 65–74 and then up to 28.57 per 1000 over 85 (Moffatt et al, 2012). It is thought that the number of people in the UK (>200 000) suffering from lymphoedema is more than those living with venous leg ulcers (Posnett and Franks, 2008). As there is a lymphatic component to all types of swelling, the term chronic oedema is used to describe persistent oedema of greater than 3 months duration, regardless of cause.

Primary lymphoedema due to genetic mutation, usually presents at puberty but can be present from birth. Over the last 10–15 years, more than 20 genes responsible for different forms of primary lymphoedema have been discovered; however, it is generally agreed by primary lymphoedema specialists that more will be identified over time. Primary lymphoedema is thought to affect around 1 in every 6000 people (NHS choices, 2016).

Secondary lymphoedema occurs as a consequence of disruption or obstruction of the lymphatic pathways; however, it is thought there may be a predisposition to breast cancer-related lymphoedema (Stanton et al, 2009). In the UK, cancer surgery involving the lymphatic system, radiotherapy, trauma, vascular disease, cellulitis, obesity, immobility and dependency are the most common reasons for secondary lymphoedema (Piller, 2013). Secondary lymphoedema affects around 2 in 10 women with breast cancer, 5 in 10 women with vulval cancer, approximately 3 in every 10 men with penile cancer, and 20–50% of people who have treatment for melanoma in the lymph nodes in the groin also get lymphoedema (NHS Choices, 2016).

Lymphoedema is not a curable condition but can be alleviated with appropriate management. However, the condition can have a devastating impact on the quality of life of those living with it (Morgan et al, 2005).

A study of over 700 chronic oedema/lymphoedema patients in Scotland found that 97.5% of those who received specialist care had their swelling controlled,

compared to fewer than 80% of those treated by non-specialist services (Sneddon et al, 2008).

Lipoedema results from the predisposition of an excessive number of fat cells in the lower limbs, typically from the ankle to the waist. It can also be seen from the wrist to the shoulder. Dieting tends to result in loss of fat from the non-lipoedematous areas with little effect on the lipoedema itself, whereas weight gain preferentially affects lipoedema sites, particularly thighs and hips. It almost exclusively affects women with the onset at puberty or around pregnancy, which suggests that there is a hormonal influence. The sufferer becomes aware of shapeless ankles and fat legs. The cause is not known, but genetic factors are possible and it is not unusual to find a positive family history.

The distribution of the swelling in the leg is characteristic giving rise to a bracelet effect around the ankle with inverse

## ABSTRACT

Lymphoedema results from a failure of the lymphatic system. The consequences are swelling, skin and tissue changes and predisposition to infection. Lipoedema, however, results from the predisposition of an excessive number of fat cells in the lower limbs, typically from the ankle to the waist. Management for lymphoedema consists of volume reduction, reduction in shape distortion and improvement of skin condition. Treatment consists of a two-phase approach including an intensive and maintenance phase. The maintenance stage of treatment or self-care consists of skin care, exercise and compression garments.

Case studies are presented featuring lower limb lymphoedema and upper limb lymphoedema and a patient affected by lipoedema. The case studies demonstrate how JOBST Elvarex custom-fit, flat-knit compression garments with knee and elbow functional zones enhances patient choice, garment suitability and potential for improved quality of life.

## KEY WORDS

- ◆ lymphoedema ◆ lipoedema ◆ chronic oedema
- ◆ compression garment ◆ functional zones

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shouldering immediately above and increased gaiter girth. The feet are usually spared with a fatty/doughy feel to the subcutaneous tissues and pitting is absent. Often sufferers bruise easily and complain of fluid retention and that the swelling fluctuates with heat, on standing for long periods and during the menstrual cycle. Lymphoscintigraphy is usually normal as is venous function. A pinch test is found to be positive, where the outer aspect of the thigh skin is more sensitive to pinching than the inner aspect. In many patients, lipoedema is accompanied by the formation of fluid oedema. It has been suggested that the oedema may result from overloading of an essentially normal lymphatic system (Wounds UK, 2017).

The charity Lipoedema UK (which launched the *Best Practice Guidelines: The Management of Lipoedema* in May 2017 (Wounds UK, 2017)) in partnership with the Royal College of General Practitioners has developed an eLearning course to aid recognition and diagnosis of lipoedema, which is Good Clinical Practice accredited. This 30-minute course can be accessed via the website [www.elearning.rcgp.org.uk](http://www.elearning.rcgp.org.uk) for free at <http://bit.ly/2vr7fd5>.

Due to a compromised lymphatic system, the patient will be at more risk of developing cellulitis and this risk is increased with mismanagement. In June 2017, the Healthy London Partnership produced and published a template business case for commissioners for lymphoedema services for adults living with and beyond cancer. The document shows that England currently spends more than £178 million on hospital admissions due to lymphoedema, with a rise in costs of £7 million from 2013 to 2014, equating to more than 22 904 additional admissions. It has been estimated that for every £1 spent on lymphoedema services, the NHS saves £100 in reduced hospital admissions (Healthy London Partnerships, 2017).

Education and training should be given to all health care professionals (including primary care, cancer, palliative, and allied health care professionals) regarding lymphoedema signs and symptoms and best practice for risk reduction and management.

Management of lymphoedema consists of volume reduction, reduction in shape distortion and improvement of skin condition. Treatment is a two-phase approach consisting of an intensive and maintenance phase.

The intensive phase consists of skin care, exercise, multi-layered lymphoedema bandaging (MLLB) and sequential pneumatic compression or manual lymphatic drainage. Following the intensive phase, a maintenance stage of treatment or self-care is initiated consisting of skin care, exercise and compression garments.

Compression garments can help to improve skin integrity, restore limb shape and enhance patient quality of life (Osborne, 2009). The Wounds UK *Best practice statement for compression hosiery* (Wounds UK, 2015) recognises hosiery selection must be based on holistic assessment, taking into account limb size and shape, the strength and stiffness of the garment, skin condition, allergies or sensitivities, and patient considerations (e.g. dexterity, psychosocial issues).

Compression garments can be categorised according

to the method of fabric manufacture. In circular-knitted garments, which may be thinner and more cosmetically acceptable, the material is continuously knitted on a cylinder with no seam. Flat-knit garments are often firmer and thicker, knitted flat and usually joined with a seam. JOBST Elvarex Soft, a flat-knit garment range, is also an option especially for sensitive skin such as those with lipoedema due to the less stiff and softer material. The further benefits of flat-knit are that stitches can be added and/or dropped to accommodate all levels of limb shape distortion. If measured for correctly, JOBST Elvarex custom-fit, flat-knit compression garments do not roll, curl, twist or tourniquet (Lymphoedema Framework, 2006), they lay flat against the skin and do not cut in at skin folds.

In order to achieve a bespoke and comfortable garment for the patient, careful attention to the JOBST Elvarex specific measuring instructions should be adhered to. If a garment fits well and is acceptable, it will be worn daily by the patient as part of maintenance therapy with optimum results and a positive impact on the patient's quality of life. A number of styles are available in a range of colours (beige, black, dark blue, dark brown, grey and cranberry) including:

AD knee high
BD knee high footless
AF mid thigh*
AG thigh high
BG thigh high footless
AGTL chap-style left
AGTR chap style right
AG-T chap-style pair
B1/C-G capri leg*
AT tights
AT tights one-leg
Bermuda
*not currently available on the Drug Tariff

Items can be customised to enhance choice and wearability. These include: adjustable waistband, T-heel, which reduces pressure on the instep and bridges, deep skin creases, and a new innovation, SoftFit (AD knee high, CCL 1–3 and CG1 armsleeve only). SoftFit is a silicone yarn knitted directly into the fabric, reducing the pressure in the top band, ensuring no slippage and offers patients increased comfort.

### Knee and elbow functional zones

There are additional options that can be fitted into selected styles of upper and lower limb JOBST Elvarex custom-fit garments. The aim of these specialised garment options is to provide an enhanced fit, offer improved comfort and to increase wear time of the compression garment. This offers the potential for improved treatment outcomes and quality of life.

The knee functional zone (*Figure 1*) consists of internal



**Figure 1. JOBST Elvarex tights with knee functional zone shown by darker stitching**

and external zones that cover the entire knee joint area, which adjust to the movement of the knee, reducing ‘cutting in’ and wrinkling. The knitted zone (Figure 2) has a soft, breathable inner zone that feels pleasant against the skin and aims to prevent irritation. The knee functional zone is available in all lower limb compression garments that have a knee joint area in RAL compression classes 2-4 Super.

In a similar way, the elbow functional zone (Figure 3) covers the entire elbow joint area to offer increased comfort. This also adjusts to the movement of the elbow allowing maximum range of motion and reducing discomfort and wrinkling at the elbow (Figure 4). The elbow functional zone is currently available in the CG/CG1 armsleeve style and RAL compression class 2 (23–32mmHg) only.

For both functional zones, the compression is not impacted and remains continuous throughout the knee and elbow areas.

Eight case studies follow that focus specifically on knee and elbow functional zones.

### Case study 1

A 69-year-old female with stage 2 lipoedema (Schmeller and Meier-Vollrath, 2007) with pubertal onset and no other relevant past medical history.

The patient walks regularly and chooses to follow a healthy organic diet. She was provided with JOBST Elvarex custom-fit, flat-knit tights in RAL compression class 2 (23–32mmHg) to treat all of the affected areas. The effects were felt immediately by the patient who stated the garment was extremely comfortable and took the weight out of the tissues. She also felt her shape was much improved and the compression she tried previously had been largely uncomfortable. It is of note, however, that this had been self-funded support tights. The patient returned to clinic for follow-up some months later and despite still being pleased with the overall results, complained of a gathering of fabric behind the knee on long walks. The garment was initially thought to be too long and a shorter option was supplied; however, this did not solve the problem, thus a knee functional zone was chosen. The patient was delighted to be able to walk for long distances without any issues as she felt that walking had a significant benefit in controlling the lipoedema and thus her quality of life. Reduction is not always the primary aim in lipoedema management, promotion of comfort and the feeling of lighter limbs was promoted in this case. Limb volume measurements did not significantly change but due to the minimal amount of fluid in the tissues this is to be expected. The patient did not have any difficulties applying or removing the JOBST Elvarex compression tights. Due to the success in this case, the application of RAL compression class 2 (23–32mmHg), JOBST Elvarex custom-fit, flat-knit tights with knee functional zone and adjustable waistband is the standard approach at the author’s clinic now for all patients with lipoedema.

### Case study 2

A 29-year-old male had primary lymphoedema that started originally in the left thigh when the patient was 18 years of age. He had no other relevant past medical history. He



**Figure 2. JOBST Elvarex garment with knee functional zone – garment inside out**

**KEY POINTS**

- ◆ JOBST Elvarex custom-fit, flat-knit compression garments offer an individual and bespoke option for chronic oedema, lymphoedema and lipoedema.
- ◆ Lymphoedema results from a failure of the lymphatic system, and the consequences are swelling, skin and tissue changes and predisposition to infection.
- ◆ The knee and elbow function zones can offer improved fit, comfort and movement for enhanced patient concordance and thus quality of life.



**Figure 3. JOBST Elvarex armsleeve with elbow functional zone shown by darker stitching**



**Figure 4. JOBST Elvarex armsleeve with elbow functional zone – showing zones both externally and internally**

was initially referred to the lymphoedema clinic at age 22, and following initial assessment was referred to the Royal Derby Hospital for further assessment. He was diagnosed as having primary lymphoedema of the left leg of the inguinal node fibrosis type, late stage 2 (International Society of Lymphology (ISL), 2003), and returned to the local lymphoedema service for decongestive lymphatic therapy (DLT) followed by JOBST Elvarex custom-fit, flat-knit, RAL compression class 4 Super (60–90mmHg) one-leg tights.

Unfortunately, the tights were not comfortable despite being effective in reducing limb volume measurement post-DLT as the patient found the garment too tight on the top of the foot, to the front ankle fold and behind the knee. This patient runs for leisure including fell running and triathlons. He also works full-time in a leisure centre, which requires a lot of squatting and bending at the side of the pool when carrying out swimming lessons. A knee functional zone was added and a silk pocket to the top of the foot and front ankle fold. The patient was able to tolerate the garment very well and stated that it was extremely comfortable for running in, as well as much easier when squatting beside the swimming pool. Being able to carry out his job, without consideration of his lymphoedema or compression garment, was a significant improvement in this patient’s daily quality of life. He required a smaller size garment within 3 months and he did not encounter any issues with donning or doffing.

**Case study 3**

A 63-year-old lady had breast cancer-related lymphoedema of the right upper limb, ISL stage 2 classification (ISL, 2003). The patient was in the maintenance phase of treatment with an excess limb volume of 16% compared with the left arm after decongestive lymphatic therapy some months before. Her past medical history included essential hypertension for which she was on medication. She was initially treated with decongestive lymphatic therapy and fitted with a JOBST Elvarex custom-fit, flat-knit armsleeve in RAL compression class 2 (23–32mmHg) and a separate glove with fingers to treat the entire affected area. The patient developed soreness to the cubital fossa when wearing the armsleeve, and a silk pocket was added. This had little improvement and the patient considered ceasing wearing her flat-knit compression garment as she had previously not encountered any issues when wearing circular-knit compression garments. However, another custom-fit, flat-knit armsleeve was ordered with the addition of an elbow functional zone. The addition of the elbow functional zone enabled the patient to carry out all activities of daily living including tasks she had struggled with, such as cleaning windows and vacuuming. Limb volume measurements showed a reduction in the volume of oedema. Zippers with linings were added to the dorsum of the hand of the custom-fit, flat-knit glove and at the top of the armsleeve to ease the independent donning and doffing of the garment. Previously, the

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patient had relied on her husband to apply the garment but stated that she felt better being able to do it herself as she no longer had to trouble him for assistance.

### Case study 4

A 54-year-old gentleman had secondary lymphoedema of the left arm following malignant melanoma and axillary node dissection. No hand swelling was noted and this patient had ISL stage 2 lymphoedema (ISL, 2003). The patient had undergone decongestive lymphatic therapy (DLT), which had led to a significant reduction in the volume of the oedema throughout the arm and a JOBST Elvarex custom-fit, flat-knit, RAL compression class 2 (23–32mmHg) armsleeve had had been selected due to the length of the gentleman's arm and all standard off-the-shelf garments being too short. Circular-knit compression garments had been problematic at the elbow joint before DLT but this was thought to be due to the poor shape of the limb. However, as a precaution, after DLT, an elbow functional zone was added to the garment.

The patient was a long distance lorry driver who spent significant amounts of time with his elbow bent and gripping the steering wheel. The patient was amazed how much movement he had in the compression garment and how comfortable the armsleeve felt. He found that there was no restriction in his driving and he had no difficulty applying or removing the garment. Limb volume measurement was initially maintained by the garment but 4 weeks on, there had been a reduction in the volume of oedema from the wrist and forearm.



**Figure 5a. JOBST Elvarex custom-fit, flat-knit armsleeve with elbow functional zone**

### Case study 5

A 55-year-old female had a right mastectomy for breast cancer in 2006. Her treatment included total axillary clearance, chemotherapy and radiotherapy. This patient was first seen in the lymphoedema clinic in 2007 with a 16.3% swelling in her affected arm compared to the left. She had previously been supplied with a circular-knit armsleeve by her breast care nurse but found this did not control her lymphoedema. The patient was given a course of decongestive lymphatic therapy over a period of 3 weeks and the arm was reduced to 7.5%. She was then placed in a JOBST Elvarex custom-fit, flat-knit armsleeve from wrist to axilla in RAL compression class 2 (23–32mmHg), to maintain the reduction. The patient has maintained this volume consistently since 2007 and since losing excess weight earlier this year, her arm has been much easier to control. Although happy with the JOBST Elvarex custom-fit, flat-knit armsleeve for the past 10 years, she had commented that it was sometimes irritating in the bend of her arm and caused a feeling of soreness. The same compression class 2 armsleeve was manufactured with the new elbow functional zone and the patient instantly expressed increased comfort (Figure 5a). She stated:

*'The functional zone reduces soreness to my elbow and bend of my arm, which makes the sleeve easier to wear for longer periods.'*

Her limb volumes were repeated after 3 weeks of wear



**Figure 5b. JOBST Elvarex custom-fit, flat-knit armsleeve with elbow functional zone**

to check the increased level of comfort did not reduce the efficacy of the garment and there was no difference recorded. The patient felt the garment was generally much more comfortable to wear and allowed the bending of her arm (Figure 5b); required for her job and daily household activities.

### Case study 6

A 44-year-old slim and active man had suffered with lymphoedema in his left leg due to multiple deep vein thromboses (DVTs). In 2006, he suffered an extensive DVT, which caused significant swelling throughout his leg. He was given a JOBST Elvarex custom-fit, flat-knit RAL

## CPD REFLECTIVE QUESTIONS

- ◆ How does compression therapy impact the quality of life of patients in your clinical practice?
- ◆ If patients stop wearing their compression garment, have you always considered the knit (flat or circular) and whether an improved fit and comfort may improve concordance?
- ◆ Which patients in your clinical practice, who wear flat-knit compression garments, could benefit from including this garment option?

compression class 2 (23–32mmHg) thigh high garment to reduce the oedema and support his venous circulation. The patient was placed on anticoagulants.

Unfortunately, he then suffered a further clot at the top of his thigh several months later and was referred to the haematology clinic for closer supervised management. At this point, he was given a JOBST Elvarex custom-fit, flat-knit RAL compression class 3 (34–46mmHg) Chap-style garment as increased swelling had occurred.



**Figure 6. JOBST Elvarex custom-fit, flat-knit thigh high with knee functional zone**

The patient remained stable until 2008 when he suffered another clot in his thigh. As part of his management strategy, the consultant requested increased compression so he was changed to RAL compression class 3 Forte (34–46mmHg), which has a greater static stiffness factor and therefore provides better compression at the higher end of the scale. The patient found this garment more successful in reducing his lymphoedema and after just 3 months' wear, the patient had to be remeasured for another garment due to a reduction in limb measurements. The patient was now considered stable and was therefore referred to the lymphoedema clinic in 2009 for decongestive lymphatic therapy. His initial volume was 12% greater than the right leg, with the majority of the swelling in the thigh area. After 3 weeks of decongestive lymphatic therapy, the limb volume reduced to 4% and the patient was delighted. He was placed into a new JOBST Elvarex custom-fit, flat-knit thigh high garment in RAL compression class 3 Forte (34–46mmHg). The patient returned to clinic every 6 months for renewal of his garments and his limb volumes remained stable since that date. The patient found the garment comfortable to wear and reliable as it did not allow increased swelling and he has not suffered a further DVT. The patient is an IT consultant and spends long periods sat at a desk. He likes to ski and is very active generally but always found the garment gathered slightly behind the knee when sitting at the desk or skiing. The same garment was manufactured but with the addition of the knee functional zone (Figure 6) and the patient's initial reaction on fitting was that it was:

*'So much more comfortable.'*

He was reviewed after 3 weeks of wear and his limb volume has again remained stable. The patient was delighted with the new garment with the knee functional zone as it was far more comfortable sitting at a desk and while exercising, and no gathering occurs. He stated:

*'The new garment with the functional zone around the knee is significantly more comfortable, especially for activities with significant knee bend, for example, gardening ... I bend or kneel with a more normal and balanced posture, reducing strain on my back.'*

## Case study 7

A 73-year-old female had primary bilateral lower limb lymphoedema (Figure 7). The patient had undergone a Homans procedure to debulk the left leg in 1987. She had a body mass index of 44.38kg/m<sup>2</sup> and had experienced recurrent episodes of cellulitis over the years.

The lymphoedema to the left leg was considered ISL late stage 2 (ISL, 2003) and management was in the maintenance phase. The patient had previously worn a RAL compression class 2, circular-knit (23–32mmHg). However, due to shape distortion, a skinfold at the ankle and volume excess she was introduced to a JOBST Elvarex custom-fit, flat-knit, chap-style garment (thigh high with waist attachment) in RAL compression class 1 (18–21mmHg). A flat-knit garment is manufactured as a flat piece of fabric and then sewn together with a seam. It sits flat against the skin and does not cut into skin folds. Stitches can be added



**Table 1. Limb volume measurements (case study 7)**

Date (initial assessment): 20 July 2017			Date (follow-up): 10 August 2017			Date (final review): 24 August 2017		
	Right	Left		Right	Left		Right	Left
Lower leg volume (ml):	5042	8056	Lower leg volume (ml):	5038	8433	Lower leg volume (ml):	4621	8388
Difference between right and left (ml):	3014		Difference between right and left (ml):	3395		Difference between right and left (ml):	3767	
Upper leg volume (ml):	9205	12334	Upper leg volume (ml):	8792	13702	Upper leg volume (ml):	8567	13449
Difference between right and left (ml):	3129		Difference between right and left (ml):	4910		Difference between right and left (ml):	4882	
Total limb volume (ml):	14247	20390	Total limb volume (ml):	13830	22135	Total limb volume (ml):	13188	21837
Difference between right and left (ml):	6143		Difference between right and left (ml):	8305		Difference between right and left (ml):	8649	



**Figure 7. Patient with bilateral lower limb lymphoedema at initial assessment**



**Figure 8. JOBST Elvarex custom-fit, flat-knit, chap-style garment in RAL compression class 2 (23–32mmHg) with knee functional zone**

and dropped to accommodate all levels of limb shape distortion. However, flat-knit garments are a firmer fabric than a circular-knit and therefore consideration was given regarding the transition from a circular-knit garment. If the patient is unable to tolerate the therapeutically indicated level of compression, lower levels of compression may be appropriate to encourage concordance with hosiery (Lymphoedema Framework, 2006).

The next stage of her management was to increase the therapeutic pressure to a RAL compression class 2 (23–32mmHg) garment, to further enhance the treatment outcomes established using a RAL compression class 1 garment. A knee functional zone was added to the garment to improve the comfort of the garment so that the transition to the higher compression was more acceptable to the patient (Figure 8). Patient concordance is an important aspect in the management of a lymphoedema patient to ensure optimum treatment outcomes. Health care professionals need to consider the wide ranging and complex needs of lymphoedema patients and adapt their therapeutic approach to provide effective hosiery that fits correctly, is comfortable and encourages long-term use (Lymphoedema Framework 2006).

At the follow-up, the patient reported:

*‘The garment was very comfortable.’*

In addition, she had now found it as easy to don as the compression class 1 garment (without knee functional zone). However, at the follow-up, limb volume had increased by 1745ml (Table 1). The patient explained this as being on her feet more than usual due to family staying with her for the week.

At the final review 14 days later, there had been an improvement in overall limb volumes with a reduction of 298ml (Table 1). In addition, the patient had noticed the skin on her leg was softer and her leg felt lighter as she was able to lift it into her car without difficulty. The subcutaneous tissues did appear softer when examined. Her final comments included:

**Table 2. Overall satisfaction scores (case study 7)**

Overall satisfaction with the performance in relation to the compression garment (1=poor, 5=excellent)	
Ease of donning:	2
Colour:	5
Appearance during wear:	4
Durability:	5
Comfort:	4

*Taken from BSN Medical Case Study Collection Data sheets*

*‘...this stocking is easier to put on than it was a month ago. I’m not sure about the knee segment, it doesn’t feel any different to the previous stocking.’*

Although the patient did not report any particular benefit of the knee functional zone, the fact that the patient had transitioned to a higher compression class garment without expressing any change in comfort levels was considered a success. It was hoped that as the patient now stated she was finding it easier to don than when initially provided with the garment, that concordance with treatment would improve. Limb volumes were starting to reduce and the positive improvements to the tissues and the patient’s mobility are considered of key benefit in the patient’s long-term, self-management of her condition. The patient was happy to continue wearing this garment. Overall satisfaction scores are presented in *Table 2*.

### Case study 8

A 71-year-old female developed left arm lymphoedema, secondary to surgery, for the treatment of recurrent breast cancer in 2014. Following a mastectomy and axillary node clearance, breast reconstruction in the form of a deep inferior epigastric artery perforator (DIEP) flap, skin grafting occurred. Infection and tissue necrosis ensued leading to skin grafting.

The lymphoedema was considered ISL stage 2 (ISL, 2003) and management was in the maintenance phase. The patient had been wearing a JOBST Elvarex custom-fit, flat-knit armsleeve in RAL compression class 1 (15–21mmHg). Given the overall limb volume excess of 1464ml (*Table 3*) and shape distortion (*Figure 9*), it was decided to continue with a JOBST Elvarex custom-fit, flat-knit armsleeve but increase the compression to RAL compression class 2 (23–32mmHg) to encourage better drainage and improve limb shape. An elbow functional zone was added to this garment with the thought being this may enhance comfort and assist in a smooth transition to a higher compression class. At follow-up, the patient stated:

*‘My arm has been fine while wearing this garment. It is ‘tighter’, especially at the top of my arm.’*

Her comments also included:

*‘...the functional zone was comfortable, which pleased me as I was concerned it may affect the fit of the garment.’*

At follow-up, approximately one week following the

fitting the garment, there was a slight reduction in overall limb volume measurements of 26ml (*Table 3*). There had been small increases in the upper arm measurements but the overall limb volume had reduced slightly. However, a family member assisted in donning the armsleeve in the first week of the patient wearing the garment with the elbow functional zone as the patient found it difficult to pull the garment sufficiently up her arm when donning independently. This variable may have contributed to the increases in limb volume measurements in the upper arm and should be considered when reviewing the results at follow-up (*Table 3*). At the final review, limb volume results indicated a slight increase in overall limb volume excess by 70ml (4.5%) when compared to the overall limb volume measurements at the initial assessment. However, this could be explained as the garment had not been worn for 3 days as the patient had become unwell with a urinary tract infection. The patient stated:

*‘I would like to go back to wearing the class 1 garment, just because I can get it on independently.’*

Overall satisfaction scores are presented in *Table 4*.

### Conclusions

JOBST Elvarex custom-fit, flat-knit compression garments offer an individual and bespoke option for chronic oedema, lymphoedema and lipoedema patients, many of whom will require compression garments to be worn daily for life. The functional zones support treatment as they allow for greater movement. Exercise is important when wearing compression garments—treatment regimes can include exercise and this may be encouraged and enhanced with an improved range of movement for the patient. The range of adaptations (or options), many of which are available on Drug Tariff and in a range of compression classes, further enhances patient choice and garment suitability. Although the knee and elbow functional zones are not currently available on Drug Tariff, they offer solutions where patients are experiencing problems with ill-fitting compression garments, discomfort or lifestyle limitations. They provide improved fit, comfort and movement for enhanced patient concordance and thus quality of life.

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**Figure 9. Patient’s arm at initial assessment**

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**Table 3. Limb volume measurements (case study 8)**

Date (initial assessment): 13 July 2017			Date (follow-up): 1 August 2017			Date (final review): 21 August 2017		
	Right	Left		Right	Left		Right	Left
Lower arm and hand volume (ml):	1186	1794	Lower arm and hand volume (ml):	1272	1772	Lower arm and hand volume (ml):	1178	1799
Difference between right and left (ml):	608		Difference between right and left (ml):	500		Difference between right and left (ml):	621	
Upper arm volume (ml):	2433	3289	Upper arm volume (ml):	2344	3285	Upper arm volume (ml):	2396	3309
Difference between right and left (ml):	856		Difference between right and left (ml):	941		Difference between right and left (ml):	913	
Total limb volume (ml):	3619	5083	Total limb volume (ml):	3616	5057	Total limb volume (ml):	3574	5108
Difference between right and left (ml):	1464		Difference between right and left (ml):	1441		Difference between right and left (ml):	1534	

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**Table 4. Overall satisfaction scores (case study 8)**

Overall satisfaction with the performance in relation to the compression garment (1= poor, 5= excellent)	
Ease of donning:	2/3
Colour:	3
Appearance during wear:	3
Durability:	5
Comfort:	3/4
<i>Taken from BSN Medical Case Study Collection Data sheets</i>	

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