Lower-leg ulceration affects around 1.5% of adults in the UK, and an ageing population means the number is likely to grow.

Prevention and management are often sub-optimal, leading to non-healing and a near doubling of patients each year.

Venous leg ulceration is the most severe manifestation of chronic venous disease caused by venous hypertension.

Skin changes are the biggest predictor of ulceration, with lower-limb oedema also being a risk.

Nurses need to spot the early signs of venous leg ulceration and take preventative action, such as using compression therapy.

Key points

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Abstract Ulceration of the lower limbs results in painful and often debilitating leg wounds that can have a profound effect on patients’ physical, social and psychological wellbeing. It is estimated that the UK spends nearly £2bn each year managing lower limb ulceration but NHS England has highlighted that the care patients receive is often sub-optimal and unwarranted variation results in higher costs and longer healing times. Rates of non-healing are both common and costly, which adds to the burden on patients and the healthcare system. The prevalence of leg ulceration is higher in older age groups and, as our population ages, the problem is likely to increase. All nurses have a vital role in identifying patients at risk of ulceration and supporting them to take preventative action to prevent skin breakdown. This article, the first in a three-part series on the prevention of leg ulceration, looks at how nurses can identify at-risk patients.

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L ower-leg ulceration affects around 1.5% of adults in the UK, with 730,000 people having often painful and debilitating leg wounds (Guest et al, 2015). Prevalence is highest among people aged 60-80 years, and increases with age (Farah and Davis, 2010), so the ageing population signals a growing problem.

Approximately 70% of lower-leg ulceration relates to venous disease (Casey, 2004), a debilitating condition affecting millions of people worldwide (O’Donnell et al, 2014). Varicose veins are often a first sign of venous disease and are a predictive factor in developing ulceration (Robertson et al, 2011) (Fig 1). The incidence of varicose veins in the adult population ranges from 10% to 60% worldwide (Selçuk Kapısz et al, 2014), and is estimated at 36% in the UK (Robertson, 2013; Evans et al, 1999).

Caring for patients with wounds and associated comorbidities costs the NHS £5.3bn a year, amounting to 4% of the UK public health budget (Guest et al, 2015). Of this, £1.94bn is spent on managing leg ulcers. Non-healing is both common and costly: 41% of patients have leg ulcers that fail to heal within a year, at a cost of £1,719-£5,976 per patient, compared with £698-£3,998 for those whose ulcers do heal (Guest et al, 2017). Non-healing ulcers result in a near doubling of patient numbers each year.

NHS England (2017) highlighted that management of lower-leg ulceration is sub-optimal for many patients, and that such an “unwarranted variation” results in higher costs and longer healing times. Atkin and Critchley (2017) identified care elements that can be standardised using evidence-based pathways, to reduce costs and service demands while improving quality of care and patient outcomes. These include:

- Holistic assessment;
- Timely taking of the ankle brachial
which can in turn lead to skin changes, including leg ulceration (Nicholls, 2005).

**Risk factors**
The causes of CVD are complex and still not fully understood, but there are several key risk factors (Yun et al, 2018). These include:

- Increasing age;
- Being female or pregnant;
- Family history of venous disease;
- High body mass index (BMI);
- Occupational risk.

All the above factors increase an individual’s risk of venous hypertension and varicose veins, as explained below.

**Increasing age**
Degenerative changes and atrophy of the smooth muscle layer in the vein increases susceptibility to dilatation (Robertson et al, 2011; Nicholls, 2005).

**Being female or pregnant**
Cyclical changes in women’s progesterone levels affect the vein wall and valves. This risk increases during pregnancy, when blood volume is increased, and venous pressure index (ABPI, Box 1) to establish arterial perfusion of the lower limb;

- Formal diagnosis to establish the underlying causes;
- Use of appropriate compression therapy.

NHS England and NHS Improvement have commissioned the Academic Health Science Networks to develop a national wound care strategy that will provide clear guidelines to help shape future services and care to:

- Improve patient safety and management;
- Reduce costs.

National initiatives, such as Legs Matter (legsmatter.org) and Betty’s Story (NHS England, 2017) also aim to increase awareness and improve standards for patients with lower-leg ulceration.

**The role of venous disease and hypertension**
Venous ulceration is the most severe manifestation of chronic venous disease (CVD) caused by venous hypertension. The venous system consists of a deep vein system (femoral and popliteal veins) below the muscle fascia, which transports approximately 85% of total blood volume (Santler and Goerge, 2017), and a superficial venous system (short saphenous and long saphenous vein) between the dermis and the muscle fascia. Perforating veins pass through the muscle layer connecting the two systems.

CVD can occur in the deep or superficial systems, either as a result of venous obstruction or venous reflux (backing up of blood in the veins), or both. Venous pressure is highest at the ankle and gradually diminishes as it gets closer to the heart; the average venous pressure at the ankle in a standing adult is 90-110mmHg (Recek, 2010).

Venous thrombosis (clotting) is the usual cause of venous obstruction. Venous reflux is often caused by failure of one-way valves in the veins, but can also result from inflammation of the vessel wall, failure of the calf or foot muscles to pump properly or haemodynamic factors (Santler and Goerge, 2017). Venous insufficiency causes venous hypertension, which leads to:

- Expression of inflammatory mediators;
- Changes to the endothelial lining of the vein wall;
- Infiltration of white cells (monocytes and macrophages);
- Increase in collagen and reduction in elastin.

This leads to chronic inflammation, which can in turn lead to skin changes, including leg ulceration (Nicholls, 2005).

**Box 1. Ankle brachial pressure index**

- The ankle brachial pressure index (ABPI) assesses the peripheral arterial blood supply of the lower limbs, helping to identify patients with peripheral arterial disease.
- It is a ratio of the systolic blood pressure in the brachial artery and the systolic pressures in the arterial flow at the ankle.
- The following calculation is used:

  \[
  \text{Highest systolic reading (mmHg) of any of the arteries in the foot (dorsalis pedis, anterior tibial, peroneal)}
  \]

  \[
  \frac{\text{Right dorsalis pedis = 65}}{\text{Left dorsalis pedis = 65}} \quad \text{Right posterior tibial = 75} \quad \text{Left posterior tibial = 130}
  \]

  \[
  \text{Highest systolic reading (mmHg) of both arms}
  \]

  \[
  \frac{\text{Right brachial = 150}}{\text{Left brachial = 135}} \quad \frac{\text{Left ABPI 150/150 = 1}}{\text{Right ABPI 75/150 = 0.5}}
  \]

**Normal values**

- >1.3: Consider arterial wall calcification – other assessments required such as pulse palpation, doppler wave assessment, toe pressures
- 0.8-1.3: Safe to apply compression
- <0.8: Consider referral to specialist to assess for presence of arterial disease and determine safe level of compression

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Family history of venous disease

Varicose veins in a first-degree relative substantially increases the risk of developing venous disease, with evidence suggesting there is a genetic component (Beebe-Dimmer et al, 2005).

High BMI

Being overweight puts extra pressure on the venous system and increases the risk of valvular incompetence. In patients with morbid obesity (BMI of >40, or >35 with obesity-related complications), the increased intra-abdominal pressure can directly hinder venous and lymphatic drainage. A high BMI plays a specific and independent role in the development of varicose veins, the risk increasing linearly with the rise in BMI (Iannuzzi et al, 2002).

Occupational risk

Prolonged standing is known to increase the risk of venous disease, when the ankle venous pressure generated by the column of blood above may be as high as 100mmHg (Raffetto and Khalil, 2008). This sustained high pressure is thought to lead to venous distention and secondary valvular incompetence (Nicholls, 2005). Moving around causes the pressure in the veins to drop significantly (Vayssairat, 2003).

Identifying patients at risk of ulceration

Not all people who have CVD will develop ulceration; specific risk factors are associated with ulceration in this patient group.

Skin changes are the biggest predictor of lower-leg ulceration: patients with CVD who have varicose veins, lipodermatosclerosis (fibrosis or thickening of the skin) or venous eczema are at significantly increased risk (Robertson et al, 2009).

Oedema is the most common cause of lower-leg oedema and present in 90% of cases (Vayssairat, 2003). It occurs when the rate of capillary filtration (lymph formation) exceeds lymphatic drainage because of increased capillary filtration (as a result of venous hypertension), inadequate lymphatic flow or both (Gorman et al, 2000). This leads to a build-up of interstitial fluid, causing the lower legs to swell. Chronic oedema (persisting for more than three months) is common and its prevalence rises with age – from 3.93 per 1,000 in the general adult population to 28.75 per 1,000 in people aged >85 years (Moffatt et al, 2017).

Lower-limb oedema and CVD both significantly reduce quality of life. Symptoms can include pain, heaviness in the legs, cramps and itching, as well as significant aesthetic effects (Greene and Meskell, 2017). When severe, this can lead to reduced mobility, poor body image and social isolation (Cooper, 2018; Moffatt et al, 2017).

Oedema and CVD also have a substantial physiological impact on the skin, causing multiple chemical inflammatory mediators to be released, resulting in the tissue becoming chronically inflamed. This can lead to haemosiderin staining (changes in skin pigment), lipodermatosclerosis and, ultimately, cellular hypoxia (oxygen-starved cells) and ulceration (Fig 3).

Preventing lower-leg ulceration

Given how distressing and debilitating leg ulcers are for patients, and how expensive...
Compression therapy plays an important role in prevention as it directly affects venous and lymphatic return, improving microcirculation and reducing local inflammation (Lim et al, 2018). Known to improve both venous and lymphatic function, it simultaneously:

- Improves venous pump function;
- Counteracts increased capillary filtration;
- Increases movement of fluid into the lymphatic system;
- Decreases venous hypertension (Kolluri, 2011; Földi et al, 2005).

Compression can be achieved using bandages, hosiery or wraps; all have been shown to improve symptoms, reduce oedema and help skin condition (Williams, 2016; Ashby et al, 2014; Clarke-Moloney et al, 2014; O’Meara et al, 2012). However, compression should only be applied by health professionals who have been trained to do so.

Before any form of compression therapy is applied, the patient should be given a holistic assessment to identify any underlying causes and establish their medical history and any contraindications, such as peripheral arterial disease. The health professional should then gauge the optimal level of compression to manage that patient’s symptoms; the best practice statement Compression Hosiery (Wounds UK, 2015) is a useful guide and the following pointers are beneficial:

- Patients with varicose veins (Fig 4) should wear class 1 or class 2 British Standard hosiery, depending on the severity;
- Patients with previous ulceration (Fig 5) will need to wear compression hosiery for life to prevent recurrence – class 2 British Standard stockings are recommended, upgrading to class 3 if symptoms are not controlled (NICE, 2017);

Lifestyle measures
Nurses should advise patients how to reduce their modifiable risks, for example by offering advice on weight loss and skin care, or simple exercises – such as heel raises and ankle flexion – to reduce occupational risk. Box 3 outlines measures that can be taken to reduce the risk of varicose veins.

Treating varicose veins
For many years patients were told that varicose veins had no serious health implications, and their removal was cosmetic; however, it is well established that they can lead to further complications such as skin ulceration (Robertson et al, 2009). All patients with symptomatic varicose veins – presenting with pain, itching, skin changes, ulceration – should be referred to a vascular centre to assess whether they need endovenous treatment, in line with guidance from the National Institute for Health and Care Excellence (2013).
Box 4. Choosing a compression system

Consider the following factors when selecting the appropriate compression system for a patient:

- If oedema is present the equivalent EU compression garment should be considered. These are constructed to contain oedema and may, therefore, be better tolerated than British Standard hosiery if limb swelling is present;
- Patients with venous ulceration need a compression system providing at least 40mmHg pressure at the ankle.

The choice of compression system depends on patients’ individual needs; factors that nurses should take into consideration are outlined in Box 4.

Guided reflection

Think about a patient you have nursed who presented with lower-limb oedema or signs of skin changes, such as haemosiderin staining:

- What questions would you ask your patient?
- What signs and symptoms would indicate that venous disease was a possible cause of the oedema?
- How would you explain venous disease to your patient?

References


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