

## ABC of arterial and venous disease

### Ulcerated lower limb

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Ulceration of the lower limb affects 1% of the adult population and 3.6% of people older than 65 years. Leg ulcers are debilitating and painful and greatly reduce patients' quality of life. Ulcer healing has been shown to restore quality of life. Lower limb ulceration tends to be recurrent, and the total annual cost of leg ulceration to the NHS has been estimated at £400m.

### Aetiology

Venous disease, arterial disease, and neuropathy cause over 90% of lower limb ulcers. It is useful to divide leg ulcers into those occurring in the gaiter area and those occurring in the forefoot because the aetiologies in these two sites are different. At least two aetiological factors can be identified in one third of all lower limb ulcers.

Venous ulcers most commonly occur above the medial or lateral malleoli. Arterial ulcers often affect the toes or shin or occur over pressure points. Neuropathic ulcers tend to occur on the sole of the foot or over pressure points. Apart from necrobiosis lipoidica, diabetes is not a primary cause of ulceration but often leads to ulceration through neuropathy or ischaemia, or both. The possibility of malignancy, particularly in ulcers that fail to start healing after adequate treatment, should always be borne in mind. The commonest malignancies are basal cell carcinoma, squamous cell carcinoma, and melanoma.

Patients with reduced mobility or obesity may develop ulceration in the gaiter area because of venous hypertension resulting from inadequate functioning of the calf muscle pump. The commonest causes of vasculitic ulcers are rheumatoid arthritis, systemic lupus, and polyarteritis nodosa. The blood dyscrasias that most commonly lead to leg ulceration are sickle cell disease, thalassaemia, thrombocythaemia, and polycythaemia rubra vera.

### Clinical assessment

#### History

It is important to determine the duration of ulceration and whether it is a first episode or recurrent. Pain is a major problem for patients with leg ulcers unless there is a neuropathic component. Lack of pain therefore suggests a neuropathic aetiology. Systemic diseases that may contribute to the development of the leg ulceration (such as diabetes or rheumatoid arthritis) should be noted, as should a history of trauma, deep vein thrombosis, or varicose vein treatment. Patients should also be asked about their mobility.

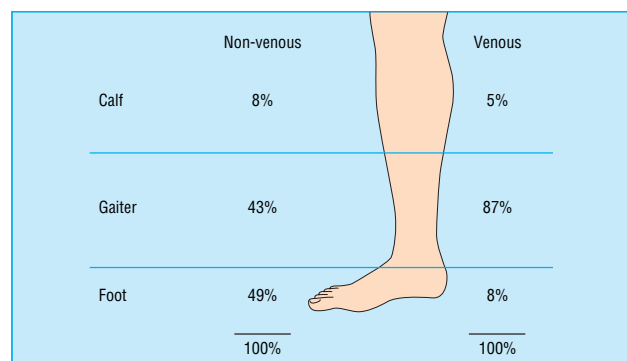
#### Examination

Examination of the leg should include palpation of pulses and a search for the signs of venous hypertension, including varicose veins, haemosiderin pigmentation, varicose eczema, atrophie blanche, and lipodermatosclerosis. The range of hip, knee, and ankle movement should be determined, and sensation should be tested—for example, with a monofilament—to exclude a peripheral neuropathy.

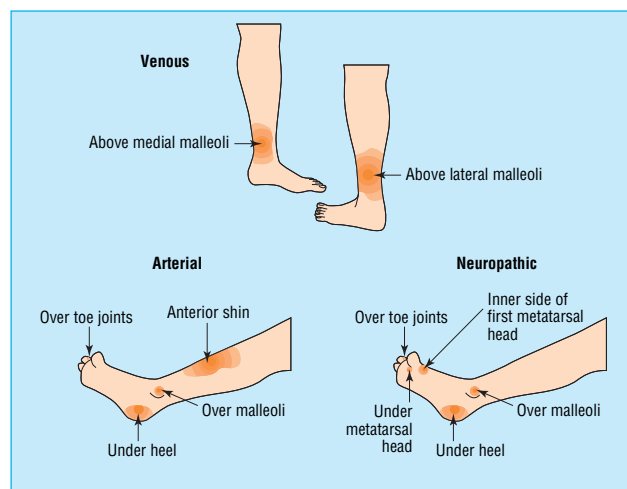
In patients with ulcers on the sole of the foot, the sole should be examined for signs of ascending infection, including proximal tenderness and appearance of pus on proximal

#### Causes of lower limb ulceration

- Venous disease
- Arterial disease
- Mixed venous-arterial disease
- Neuropathy
- Trauma
- Obesity or immobility
- Vasculitis
- Malignancy
- Underlying osteomyelitis
- Blood dyscrasias
- Lymphoedema
- Necrobiosis lipoidica diabetecorum
- Pyoderma gangrenosum
- Self inflicted



Distribution of non-venous and venous ulcers of lower limb. The majority of venous ulcers are in the gaiter area and the majority of non-venous ulcers in foot



Common sites of venous, arterial, and neuropathic ulceration. Adapted from Tibbs et al



Neuropathic ulcers on sole of foot and dorsum of toe joints

compression of the sole. Note any surrounding callus typical of neuropathic ulceration and look for tracking to affect the bones of the foot.

**Investigation**

Patients with foot ulceration should be referred to hospital for investigation because many will have underlying arterial ischaemia that requires prompt intervention. Diabetic patients with signs of infection should have plain radiography of the foot to look for osteomyelitis. Patients with venous ulceration should have their ankle brachial pressure index measured and can be managed either primarily in the community by trained nurses or referred to hospital for further investigation into the underlying venous abnormality.



Arterial ulcer affecting the heel and shin

**Management**

The management of the more unusual causes of lower leg ulceration is based on treating the underlying disease. However, because venous disease affects up to 30% of the population, it is not uncommon for patients with, for example, rheumatoid arthritis to have lower limb ulceration caused by venous disease. Indeed, in up to half of patients with rheumatoid arthritis and leg ulcers the ulceration is due to venous disease rather than to the rheumatoid arthritis.

**Venous ulceration**

Debate continues not only about how venous ulcers should be treated but also where they should be treated. It has recently been suggested that patients with leg ulcers should have an initial assessment in a hospital vascular clinic, with patients who are unlikely to benefit from surgery then being cared for in the community. Although this approach has the potential for large cost savings, clinical trials are required to establish cost effectiveness. There is no evidence that any form of drug treatment improves venous ulcer healing, and antibiotics should be used only if the patient has cellulitis.



Venous ulcers usually occur above the malleoli (left) but may affect the dorsum of the foot (right)

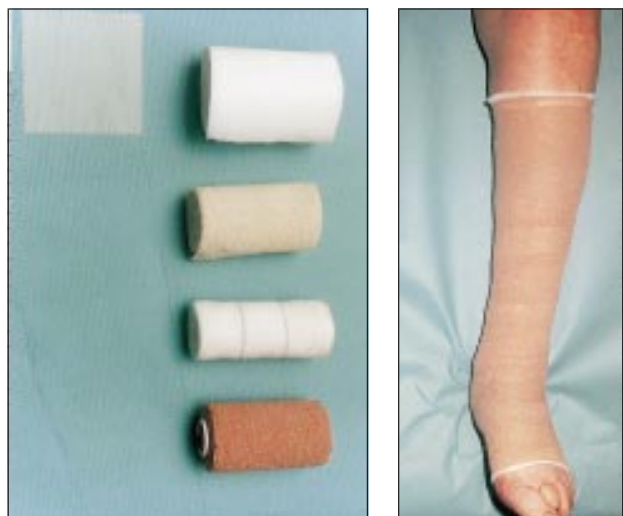
*Community management*

Current evidence suggests that the mainstay of the community management of venous ulceration should be graduated compression bandaging. The compression bandaging should be elastic and have multiple layers with a simple, non-adherent dressing underneath. For compression bandaging to be safely applied the ankle brachial pressure index must be at least 0.8. Nurses caring for patients with venous ulcer need to be trained to measure the ankle brachial pressure index and apply compression bandages safely. The bandages should be changed once or twice a week. The healing rate depends on the initial size of the ulcer, but 65-70% of venous ulcers heal within six months.

The skin on the lower leg should be kept moist with an emollient such as simple aqueous cream or 50:50 liquid:white paraffin, and surrounding eczema should be treated with a topical steroid. It is important to keep both the primary wound dressing and any medicaments used as "bland" as possible because many patients with venous ulcers develop a contact dermatitis to wound care products.

*Hospital treatment*

Patients referred to a hospital clinic will have colour duplex scanning to define the underlying venous abnormality. Recent studies have shown that about 60% of patients with venous ulcers have isolated superficial venous incompetence with normal deep veins. Evidence is mounting that patients with long saphenous or short saphenous incompetence in the presence of



Components of Charing Cross four layer bandaging regimen. The primary wound dressing (left) is a non-adherent dressing, over which are placed (middle; top to bottom in order of use) wool, crêpe, Elset, and Coban bandages. The bandages (right) need replacing once or twice a week

normal deep veins should have surgery to correct the venous abnormality in the leg and allow ulcer healing. Patients with refluxing deep veins do not benefit from superficial venous surgery and are best managed by compression bandaging in the community.

#### Prevention of recurrence

The five year recurrence rate of healed venous ulcers can be as high as 40%, and preventing recurrence is therefore very important. The rate of recurrence in patients who have had surgery to correct superficial venous incompetence has not yet been established, but it is expected to be low. In patients with healed ulcers who have not had surgery, the mainstay of preventing recurrence is graduated elastic compression hosiery. One study found that ulcers recurred in 19% of patients wearing class 2 compression hosiery and in 69% of non-compliant patients. However, elderly patients with arthritis of the knee or hip may struggle to apply class 2 compression hosiery, and class 1 hosiery is a sensible compromise. Such patients may find a hosiery applicator useful.

#### Arterial ulceration

For arterial ulcers to heal, the underlying arterial abnormality must be corrected. Patients therefore require colour duplex scanning of their arterial system or diagnostic arteriography to define the underlying arterial abnormality. Angioplasty is the treatment of choice because bypass grafting in patients with ulcers carries an increased risk of wound or graft infection. For patients in whom angioplasty is not possible, some form of bypass operation, preferably using the saphenous vein, should be attempted.

#### Neuropathic ulceration

The commonest cause of neuropathic ulceration is diabetes, and many diabetic patients with neuropathic ulceration will also have an arterial problem that requires correction. In many hospitals diabetic patients with foot ulcers are managed in specialist foot clinics run by a combination of diabetes physicians, vascular surgeons, specialist nurses, and podiatrists. The principles behind treatment are to optimise blood supply, debride callus and dead tissue, treat active infection, and protect the ulcerated area so that healing can occur. This often requires the use of a protective plaster boot with a window cut out at the site of the ulcer. Once healing has occurred, the patient is fitted with footwear designed to minimise trauma and protect bony prominences.

#### Key references

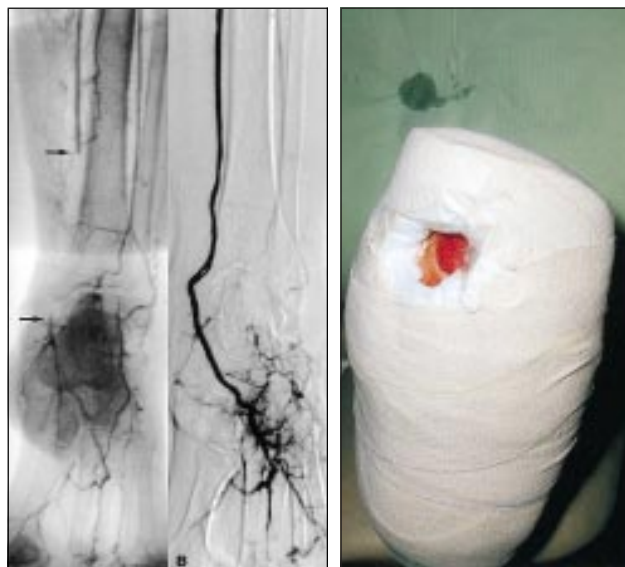
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#### Classes of compression stocking: most patients can be managed with below knee class 2 stockings

Class	Pressure at ankle (mm Hg)	Uses
1	14-17	Mild varicose veins
2	18-24	Treatment and prevention of venous ulcer recurrence
3	25-35	Treatment of severe venous hypertension and ulcer prevention in large diameter calves



Patients may find an applicator helps with putting on compression hosiery



Occlusion (arrows) of distal posterior tibial artery before (left) and after angioplasty (right)

Protective plaster boot with window cut out

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