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Leg ulcers

Causes and management

BACKGROUND

A leg ulcer is not a disease but the manifestation of an underlying problem that requires a clear diagnosis.

OBJECTIVE

This article outlines the assessment and management of patients with leg ulceration.

DISCUSSION

The simple tag of 'leg ulcer' is not an adequate diagnosis. A comprehensive assessment of the patient, skin, vascular status, limb, and ulcer is required to determine the aetiology and to formulate an appropriate management plan. Most leg ulcers are caused by venous insufficiency and compression is required to successfully heal venous leg ulcers. Treatment must address oedema, infection and pressure. Managing peripheral oedema using compression bandages is often more important than the topical dressings. Success requires consistent adherence to a care plan designed to address the underlying pathology and contributing factors.

The majority of chronic leg ulcers presenting in general practice are the result of venous hypertension (~80%), arterial insufficiency (~10%) or a combination of both.^{1,2} Uncommon causes include lymphoedema, vasculitis, malignancy and pyoderma gangrenosum.¹

The first step toward diagnosis of any leg ulcer is to compile a comprehensive history and assessment of the patient (*Table 1*). This should include:

- general health status
- social and occupational situation
- past and current medical history of relevant diseases such as deep vein thrombosis, diabetes, autoimmune disorders, inflammatory bowel disease and connective tissue disease
- condition of the skin
- current vascular status
- limb size and shape, and
- history and status of the ulcer.

An understanding of the patient's history of venous and arterial signs and symptoms and consideration of body shape (especially the morbidly obese and extremely tall), influences the treatment regimen for many leg ulcers.³⁻⁵

What to look for in a skin assessment

Skin assessment identifies markers of underlying pathology. Venous disease may present with some or all of the following: brawny skin, haemosiderin staining, lipodermatosclerosis (inverted champagne bottle shaped leg), atrophe blanche (patchy areas of ischaemia), and stasis eczema.⁶ The skin of patients with arterial disease is often shiny, hairless, pale and cool; with thickened nails and changes in foot structure. The absence of venous or arterial signs and symptoms raises the possibility of less common causes of ulceration. Sun damaged skin, Bowen disease or a history of previous skin cancer treatment is an alert to a malignant lesion.⁷

Why do a vascular assessment?

Vascular assessment is the next step in differentiating the cause of the ulcer. The location and palpation of pedal pulses is helpful, but a more accurate assessment of arterial perfusion is the Ankle Brachial Pressure Index (ABPI) using a handheld Doppler ultrasound and sphygmomanometer.⁸ A blood pressure cuff is inflated around the lower calf muscle above the ankle joint, and a Doppler ultrasound probe placed over the dorsalis

pedis artery. The maximum cuff pressure at which the pulse can be heard with the probe is recorded and divided by the systolic blood pressure measured at the brachial artery. The results are used to determine the likelihood of arterial insufficiency and can be used to guide the management plan, especially in relation to healing potential, referral for vascular assessment and use of appropriate compression bandages (Table 2).⁹ It may not be safe to proceed with compression bandages in the presence of arterial disease. An ABPI can be done as an isolated investigation through a radiology provider, or can be included as part of an arterial duplex scan. It may also be available via a local wound clinic or district nursing service. If this is not accessible, clinical evidence shows that if pedal pulses are palpable, the systolic pressure is above 100 mmHg and therefore blood supply is adequate to allow healing.¹⁰

What to look for in a limb assessment

Ulcer healing occurs more readily in an ambulant patient with an oedema free limb.^{11,12} Limb assessment includes ankle and calf circumferences of both legs identifying the presence and severity of oedema. Leg shape, especially venous changes, can also assist in diagnosis. Some legs will need to be reshaped with compression routines over time to ensure preventive stockings fit posthealing. The very thin leg with an ankle circumference less than 18 cm must be padded out to at least 20 cm before the application of any compression to prevent skin necrosis due to pressure injury.

Identify orthopaedic problems of the ankle, as mobility of ankle joints is necessary to assist calf muscle pump function and venous return aiding the reduction of peripheral oedema. Assessment of ankle flexion, range of movement, gait patterns (normal heel strike or limp) and the distance walked each day influence venous return and subsequent wound healing. Leg elevation on a foot stool for extended periods reduces calf muscle pump function and may not improve healing rates, however, elevation above the level of the heart will assist venous return.¹³ Obese patients have difficulty reaching their feet, making self care of bandage routines difficult.

What to look for in an ulcer assessment

There is often a report of trauma to the area and failure to heal before the diagnosis of ‘chronic leg ulcer’. This may be misleading; it is important to consider the clinical appearance, site, oedema, pain history and vascular status for accurate diagnosis and recognition

Table 1. Assessment of lower limb ulcers	
Patient	History of ulcer development Past and current medical problems General health status Nutrition Social, occupation Mobility problems Limitations to self care Obesity
Skin changes	Venous Arterial Malignant Autoimmune
Vascular assessment	Pedal pulses Ankle Brachial Pressure Index
Limb factors	Oedema Circumferences Lymphoedema Orthopaedic problems Sensation and pain
Ulcer	Site – venous, arterial, pressure Appearance Size – measure Wound base Exudate level Surrounding skin

Table 2. Ankle Brachial Pressure Index		
Range	Clinical features	Interpretation
>1.2	Calcified artery walls	Arterial perfusion unclear – investigate further
0.8–1.2	Normal range	Safe to use therapeutic compression levels (up to 40 mmHg)
0.5–0.8	Claudication	Modify compression regimens Consider referral
<0.5	Rest pain	Refer for vascular opinion
<0.3	Chronic critical ischaemia	Refer for vascular opinion

of underlying pathology (Table 1).

Venous leg ulcers usually occur in the gaiter region of the lower leg, most often medially, and are superficial with poorly defined margins (Figure 1). The base of the wound is usually red granulation tissue with moderate to high levels of exudate. Exudate levels vary depending on ulcer size, the presence of leg oedema, compression regimens in current use, and the presence or absence of infection. Some obese

patients will present with coexisting lymphoedema adding to the oedema and exudate problems.

Arterial ulcers can occur anywhere on the lower leg and may appear in the gaiter region, especially with coexisting venous disease (*Figure 2*). Many arterial/ ischaemic ulcers occur over a bony prominence and have a history of pressure related to the cause (*Figure 3*). This

pressure must be eliminated if healing is to occur. These ulcers are often deeper with a punched out appearance and may involve structures such as muscle, tendon and bone in the base. They have sloughy, devitalised tissue in the wound base and low levels of wound exudate. Pain is a significant component to the history, relieved by dependency and made worse by elevation, even to a horizontal position in bed.

Accurate and regular measurement of the wound is important to give an objective assessment of the effectiveness of the current management plan.^{14,15} There are a range of techniques available such as digital photography, ruler based vertical, horizontal and depth measurements and circumferential tracings of wound margins using acetate sheets over cling film. The system chosen needs to reflect consistency, accuracy, and reduced operator error, and also provide visual feedback to the patient. This information should be collected regularly, progress compared with the previous assessment, and treatment plans modified as necessary. Documentation of exudate levels (whether increasing, decreasing or static), assessment of tissue type in the wound bed (necrotic, sloughy or granulating), and the absence of infection add to the overall assessment of wound status and its progress.

Ulcers occurring in an atypical site with an atypical appearance require further investigation to determine the cause. Any suspicious ulcer should be biopsied to exclude malignancy.¹ Ulcers with a violaceous (purple) border, inflammation, and extreme pain, may be related to a vasculitis problem or underlying connective tissue disorder. They often present with a rapid increase in size, severe pain and necrotic tissue in the wound base (*Figure 4*). Systemic management of the disease process is essential if healing is to occur.¹ Some 'leg ulcers' in the very elderly have a dermatological rather than vascular cause. Lesions that present as blisters such as bullous pemphigoid are related to an autoimmune condition and sometimes 'diagnosed' and managed unsuccessfully as a vascular problem. They respond very well to systemic or topical corticosteroids and a simple nonadherent dressing routine (*Figure 5, 6*).⁶

Basic principles of leg ulcer management

The main considerations in formulating a treatment plan are outlined in *Table 3*. The mainstay of treatment for any venous component to ulceration is the application of sustained, graduated compression at a therapeutic level.^{16,17} Graduated compression increases venous flow, decreases valvular reflux while walking and increases the effectiveness of the calf muscle pump resulting in



Figure 1. Venous leg ulcer (note the haemosiderin staining and atrophe blanche)



Figure 2. Past history of venous disease now has evidence of arterial disease (note leg shape and colour, ulcer sites and ulcer base with more depth and slough)



Figure 3. Pressure ulcer on lateral malleolus in the presence of mild venous and arterial disease

a 'thinning leg'. Ideally the patient with venous disease will obtain the maximum benefit if the sub-bandage pressure is 30–40 mmHg at the ankle.¹⁸ Application of all layers must be from the base of the toes to just below the knee (*Figure 7*). A number of variables will impact on this including bandage choice, operator skill in application, severity of the ulcer, cost and ability to comply. Very tall patients and those with a large leg circumference will require additional bandages or modified routines to achieve adequate compression levels. The efficacy of compression bandage routines and techniques is monitored by limb measurements over time. It is acknowledged that the application of compression bandaging is a specialised skill traditionally undertaken by nurses. Most general practitioners will need to access appropriately trained nursing staff to provide this service.

A modified compression regimen is necessary when pain is present.^{19,20} This may be achieved by providing periods of relief until pain is controlled or removing the bandage at night when the leg is elevated. Patients with mixed arterial and venous disease may only tolerate up to 20 mmHg compression to treat oedema.

Bandage choices include short stretch, long stretch, multilayer systems and stockings. A Cochrane Review of compression regimens identified increased healing rates with compression compared with no compression.²¹ Multilayered systems were deemed more effective than single layered systems and high compression was more effective than low compression. There were no clear differences in the effectiveness of different types of high compression.

Arterial ulcer care includes management of identified vascular risk factors, patient education to maximise peripheral perfusion and local dressing routines reflecting principles of moist wound healing. Failure to progress within reasonable time frames requires referral for possible surgical reperfusion or amputation.

Local management of the ulcer bed benefits from a systematic approach using the principles of wound bed preparation and dressing routines appropriate to the stage of healing.^{22,23} Understanding the performance criteria of dressing products improves the selection and appropriate use of these topical treatments.

Posthealing management

Once the ulcer site is well healed, continue with the compression bandages for at least 4 weeks and then maintain compression at a slightly lower level indefinitely as tolerated. This is best achieved by graduated compression stockings to below the



Figure 4. Vasculitis (note violaceous border, site, size [rapidly developed] slough, depth, history of extreme pain)



Figure 5. Bullous pemphigoid

Table 3. Treatment considerations in lower limb ulcers

Oedema	Requires compression up to 40 mmHg sub-bandage pressure at the ankle to treat venous leg ulcers Modify and reduce in the presence of arterial disease Maintain treatment long term to prevent recurrence
Infection	Regular cleansing More frequent changes of dressings if exudate levels high Topical antimicrobial dressings Systemic antibiotics
Pressure	Site – over bony prominence Requires pressure relief for the ulcer to heal Beware the thin leg when applying bandages to reduce the risk of injury from overcompression (additional padding around bony prominences to reduce areas of peak pressure and increase the limb circumference to make the limb more cylindrical in shape before applying compression)
Dressings	Appropriate to wound assessment



Figure 6. Same patient as Figure 5; ulceration almost healed 3 weeks later

knee and replaced annually. These are best fitted expertly as the degree of compression required, type and size of stocking is variable in each clinical situation.

Conclusion

Leg ulcers failing to progress within a reasonable time frame require re-assessment of diagnosis before changes in treatment. Reduction in the severity and frequency of venous leg ulcers can be achieved by managing peripheral oedema long term. Patient education and prevention of pressure related injury can reduce skin integrity problems in the presence of arterial disease. Successful management of leg ulcers requires a clear diagnosis, establishment of a treatment plan, accurate monitoring, and adherence to the plan as the ulcer decreases in size. Once healed, long term maintenance compression is essential.

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Figure 7. Compression bandages in situ