

PRETIBIAL INJURIES: ASSESSMENT AND MANAGEMENT

Pretibial injuries are seen in all ages, but they are especially common in older people – in the young they are rarer and tend to be associated with sporting injuries. In older people, the lower leg is more vulnerable to injury due to minor contact with hard surfaces, which the younger person would shrug off. However, in frail, ageing skin, the result can be an open injury that may be slow to heal.

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To explain the potential severity of a pretibial injury, as well as the subsequent wound management, it is useful to first examine the vascular supply to the lower leg (*Figures 1 and 2*).

The main function of the arteries is to supply oxygen and nutrients to the body's tissues, whereas the veins absorb metabolic waste, toxins and excess fluid from the tissues and pass the blood through a filtering system — the heart, lungs, kidneys and liver.

The femoral artery is the main arterial feed to the lower leg. Just above and behind the knee it becomes the popliteal artery and descends through the capsule of the knee joint. Just below the head of the tibia, it divides into the anterior and posterior tibial arteries (Faiz and Moffat, 2006).

The anterior tibial artery runs down the front of the tibia and small branches run off it to supply the calf extensor muscles of the lower leg. At

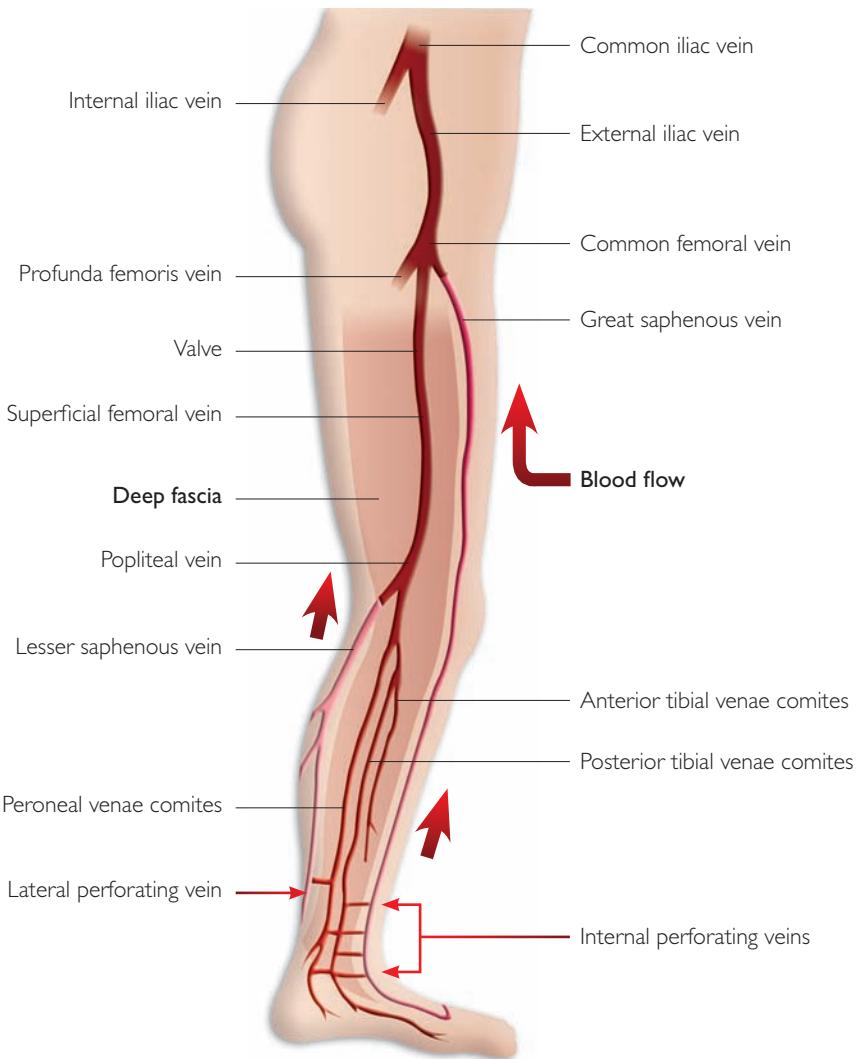


Figure 1. Venous vascular supply to the lower leg.

the front of the ankle joint it becomes the dorsalis pedis artery, which subsequently divides into smaller arteries to supply the dorsum (top) of the foot and toes.

The posterior tibial artery supplies the flexor calf muscles and approximately 2.5cm along its length the peroneal artery branches off it — this supplies the lateral side of the lower

leg and divides into branches to supply the sole or plantar aspect of the foot (*Figure 2*). The most common sites for pretibial laceration are the anterior, medial and lateral aspects of the tibia. It is unfortunate that while the deep fascia within the lower leg is well vascularised, this does not extend to the subcutaneous and dermal tissues (Haertsch, 1981), in fact, the lower limb does not have a significant direct vascular supply (Batchelor et al, 1995).

The three most important veins in the lower leg are the long and short saphenous veins and the popliteal vein. The long saphenous vein arises from the medial or inner ankle and ascends the leg between the anterior/front and medial/inner aspect of the leg. The long saphenous vein is connected along its entire length to the deep popliteal vein by perforating veins. The short saphenous vein arises at the lateral or outer ankle and travels up the posterior or back of the leg and eventually joins the deep popliteal vein at the top of the calf.

The popliteal vein is enclosed within the calf muscle and during mobilisation the muscle contraction squeezes the vein, propelling blood upward towards the heart (*Figure 1*).

It is important not to assume that a patient will automatically have a reduced vascular supply just because he or she is older — in fact, the presence of vascular disease is possible, but not probable.

Consequences of ageing on the skin

The skin is formed of two layers — the epidermis, which is mainly composed of dead epithelial cells and has no blood supply, and the dermis, which consists mainly of fibrous connective tissue and contains blood vessels, hair follicles, sweat and sebaceous glands, and sensory nerves. These dermal structures facilitate perspiration, temperature regulation, protection against extremes of heat and cold, touch and sensory input, as well as tissue repair and maintenance (Woodrow, 1998).

The epidermis and dermis meet at the dermo-epidermal junction, which forms an undulating membrane. Finger-like papillae project from the dermis into the epidermis and vice versa. Since it is avascular, these papillae permit the diffusion of oxygen and nutrients into the epidermis.

Ageing brings about many changes in the skin. There is a reduction in the papillae and a flattening of the dermo-epidermal junction, increasing the susceptibility to injury by friction/shearing forces (Woodrow, 1998). There is also a reduction in the number of capillaries carrying blood to the tissues. Consequently, the number of cells in the dermis is reduced and it becomes thinner, meaning the skin is drier and more prone to injury (Hayflick, 1985).

The pretibial area is especially exposed and has little protective soft tissue padding. With age, the tibial crest becomes

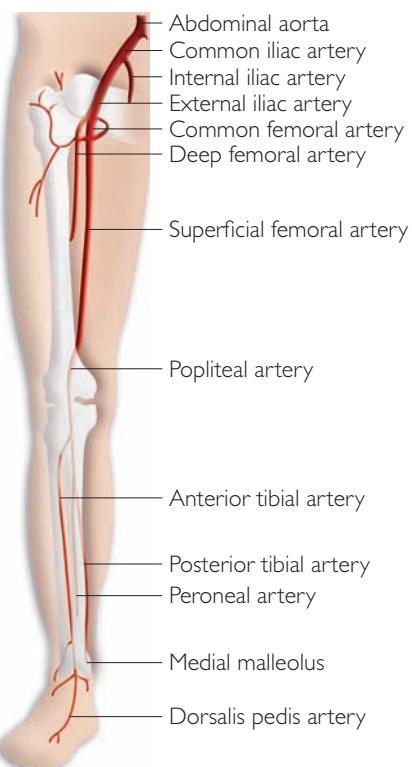


Figure 2. Arterial vascular supply to the lower leg.

especially prominent, with little more than skin and a meagre layer of adipose tissue (subcutaneous fat) to protect it. This means that an apparently minor injury can potentially develop into a large wound (*Figure 3*).

Factors that contribute to pretibial injury

Pretibial injuries are predominantly found in older people as a consequence of several predisposing factors:

- ▶ Ageing skin
- ▶ Falls — if this is the cause it is important to determine the circumstances, i.e. has the patient suffered dizzy spells, or experienced postural hypotension or cardiac arrhythmia
- ▶ Diabetes — patients may develop sensory neuropathy. Any loss of protective sensation can lead to injury



- and stumbling as mobility is affected
- ▶ Parkinson's disease/motor neurone disease — as patients' mobility begins to fail they are more prone to falls/stumbling
 - ▶ Cerebral vascular accident/transient ischaemic attack — these can lead to reduced mobility
 - ▶ Anaemia which may lead to dizzy spells and falls/stumbling
 - ▶ Oedema — swollen lower limbs due to cardiac failure, lymphoedema or venous disease can exacerbate the frailty of the skin and increase the predisposition to injury.

All of the above factors can lead to the development of reduced mobility and swollen lower limbs.

Pain assessment

Before assessing the injury itself, a pain assessment should be carried out. Older patients who have suffered an injury are often shocked and in need of reassurance as well as pain relief. They may also have comorbidities that result in both acute and background pain (Hollinworth and White, 2006). For example, a patient may have lived with rheumatoid arthritis for many years, resulting in chronic pain in the joints — suffering a pretibial injury adds another level of acute pain.

McCaffrey (1968) defined pain as 'whatever the patient says it is and occurring whenever the patient says it does'. This means that pain is a phenomenon that can only



Figure 3. Pretibial laceration caused by a stumble against furniture. The patient was 97 years old and had cardiac failure and oedematous legs.



Figure 4. Linear pretibial laceration.

be measured by the patient. However, this assumes that patients are able to describe their pain — in the presence of learning difficulties or advanced dementia this is not always possible.

Pain assessment tools are designed to be simple for the healthcare professional to use, but they must be relevant to the patient. Pautex et al (2005) studied four different pain

assessment scales and their use in older patients with dementia and concluded that self-assessment tools such as the Verbal Rating Scale, Pain Faces Scale and the Vertical and Horizontal Pain Scales could be used (see p114–118).

Following pain assessment, appropriate analgesia must be administered before an examination of the pretibial injury is performed.



Figure 5. Severe pretibial laceration, the skin has been torn away, revealing torn adipose tissue and fascia.

Assessment of the pretibial injury

Pretibial injuries can present with varying severity, ranging from a linear laceration (*Figure 4*), to a deep injury that exposes fascia, tendon or even bone (*Figure 5*).

With such a wide variation in injury presentation, it is important to have a classification system that enables healthcare professionals to both understand the severity of the injury using the depth and tissue involved, and also direct the management of the patient.

In addition to the assessment of the injury, it is vital to determine any underlying medical cause, which may require additional treatment and necessitate admission to hospital. It should never be assumed that hospitalisation is unnecessary just because the patient has a minor injury. For example, a patient might present with a relatively minor pretibial injury, but the background could include severe heart block, causing the patient's cardiac output to drop, resulting in dizziness and a fall. The patient would require a pacemaker insertion and hospitalisation for a thorough medical assessment.

Thorough wound assessment and documentation provides a baseline of information and enables both the healthcare professional and the patient to determine whether or not the wound is progressing. Photographs are useful, although the patient's consent must be obtained before any pictures are taken (Benbow, 2006). *Table 1* (adapted from Beldon, 2008) shows a sample assessment for a patient with a pretibial injury.

Table 1.

A typical assessment of a patient with a pretibial wound

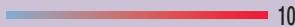
Medical history	History of injury												
► Vascular ► Cardiopulmonary disease ► Diabetes ► Anaemia	Time occurred: How much time elapsed: Where injury occurred:												
Pain assessment 0  10 Is the pain constant? Upon examination? Description of pain? Taking any regular analgesia?	Patient's tetanus status Last known Booster: (if unknown administer tetanus booster)												
Describe affected limb: Oedema? Bruising? Haematoma? Inflammation? Tissue necrosis? Depth of injury/tissue exposed?	Draw or attach mapping of wound site giving approximate dimensions												
Doppler Ultrasound of affected limb: <table border="1"> <thead> <tr> <th>Artery</th> <th>Present?</th> <th>Signal?</th> </tr> </thead> <tbody> <tr> <td>Ant. Tibial</td> <td></td> <td></td> </tr> <tr> <td>Post. Tibial</td> <td></td> <td></td> </tr> <tr> <td>Dorsalis pedis</td> <td></td> <td></td> </tr> </tbody> </table>	Artery	Present?	Signal?	Ant. Tibial			Post. Tibial			Dorsalis pedis			History of venous leg ulcers Y / N Previous compression therapy? (If YES, which?) Contact community nurse for details and referral to manage current injury
Artery	Present?	Signal?											
Ant. Tibial													
Post. Tibial													
Dorsalis pedis													



Figure 6. Necrosed skin flap due to tension on elderly skin.

Management

The management strategy for a pretibial injury consists of either surgery or conservative non-surgical treatment. The treatment option most suitable for a particular patient depends not only on the injury and its severity, but also on the degree of independence, the patient's continence status, and the severity of any comorbidities. If the decision is taken to use conservative treatment, the patient should be assessed by a suitably qualified healthcare professional.

Conservative treatment includes adhesive tape (for example, Steri-Strips™, 3M, Loughborough). However, these are only suitable for simple linear lacerations without any dermal necrosis or haematoma (Figure 4). The use of adhesive tape to appose the edges of a significant skin flap may lead to flap necrosis due to tension on the fragile older dermis (Figure 6).

Wound dressings can also be used as they manage the local wound environment, e.g. if the wound is exuding then an absorbent dressing should be

used. For simple, clean linear lacerations or for clean skin flaps with no evidence of skin edge necrosis or haematoma, a simple silicon-based, non-adherent dressing can be used (for example Mepitel® Mölnlycke Healthcare, Dunstable; N/A Ultra® Johnson & Johnson Healthcare, Ascot; Urgotulle®, Urgo Ltd, Shepshed, Leicestershire).

If it is considered unsafe or impractical for the patient to have a general anaesthetic or surgery, then any necrotic skin edges should be debrided and haematoma removed. Hydrogel sheets (for example, Actiform Cool™, Activa, Burton on Trent) are adept at gently debriding

a wound and providing the optimum environment for re-epithelialisation. In addition, they provide comfort and in some cases analgesia at the wound site (Hampton, 2004).

Surgical treatment

The following surgical techniques can be used to treat a pretibial injury.

Suturing

Caution should be exercised with suturing, as unless the patient's surrounding skin is robust and non-oedematous, it can cause necrosis due to tension. Suturing the edges of a pretibial flap together may cause undue tension being placed on the delicate blood supply of the skin flap, which may lead to flap necrosis (Figure 7).

Debridement and skin graft

The decision to debride a wound area and use a skin graft to cover it is essential in very deep or extensive pretibial injuries. Debriding an injury involves removal of all dead or dying tissue from the wound bed, and this is performed by a surgeon. However, the surgeon must also consider the consequences for the patient of inflicting a second wound — the donor site from which the skin graft is harvested.



Figure 7. Skin flap has been sutured under tension resulting in necrosis.



Figure 8. An 83-year-old patient with a history of ischaemic heart disease, cardiac failure and dementia, with a severe class 3a pretibial injury.

In patients with urinary incontinence, the dressing over the donor site may also become saturated with urine leading to healing problems.

Patients may have limited mobility and rendering them immobile with two wounds may lead to difficulties with rehabilitation or result in the patient losing the little mobility they had. For example, an older patient with a history of ischaemic heart disease, cardiac failure and dementia who experiences a severe class 3A pretibial injury, would not be suitable for surgical intervention (Figure 8).

Conclusion

Pretibial injuries are very common in the older population and are predominantly managed by practice and community nurses. Combining a treatment plan with input from the patient can assist in the decision-making process and help healthcare professionals decide on the appropriate form of treatment.

However, for serious, deep or extensive injuries, and provided

the patient is both medically safe to cope with anaesthetic and understands the possible consequences, surgery to debride the area of necrotic and devitalised tissue coupled with the use of a skin graft is often the optimum treatment. **WE**

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Key Points

- ▶ Pretibial lacerations are predominantly suffered by the elderly.
- ▶ Conservative treatment may be most appropriate for elderly patients with multiple co-morbidities.
- ▶ The vascular supply may be reduced in the elderly resulting in a delay in healing.

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