Ten top tips: arterial/ischaemic wounds


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Peripheral arterial disease (PAD) is chronic occlusive atherosclerosis (ASO) that limits arterial blood flow to the lower extremities. It is a manifestation of systemic atherosclerosis. Arterial ulcers, also known as ischaemic ulcers or ischemic wounds, develop as the result of a lack of blood flow to tissue. It is estimated that over 200 million people have PAD worldwide, with a spectrum of symptoms from none to severe, with mild to moderate symptoms such as intermittent claudication within that spectrum. It is relatively uncommon among younger people; the prevalence of PAD rises with age and affects a substantial proportion of the older population (>20% in >80-year-old individuals). The rate for African Americans is about twice that of non-Hispanic whites at any given age (Shu and Santulli, 2018). Diabetes and cigarette smoking are among the most powerful risk factors for PAD and the coexistence of both of those risk factors perhaps constitutes the group of individuals at the highest risk. These 10 top tips discuss how to diagnose and treat arterial wounds.

1 Consider PAD as the aetiology of open, painful, punched-out wounds on the foot and lower leg. The clinical presentation is related to the degree of ischaemia in skeletal muscle, soft tissue, and skin of the affected area. There are many causes of ulceration of the lower leg and the differential diagnoses should include venous ulceration, diabetic (neuropathic) foot ulceration, pressure injury, traumatic injury and autoimmune diseases, such as rheumatoid arthritis, scleroderma and pyoderma gangrenosum. Arterial ulceration often occurs after seemingly trivial trauma or as the result of localised pressure. The common appearance and location of PAD related ulcerations and wounds are over the bony prominences of the toes, top of the foot, malleoli and heel. The wounds have well defined borders, often called "punched-out" *[Figures 1 A and B]*. The wound has minimal drainage and a wound base that may range from red granulation tissue to pale, dry necrosis and black eschar. Arterial ulcers are often very painful, and the pain can be worse at night, referred to as 'rest pain'. Patients often get relief from pain by hanging the leg out of bed or sleeping in a chair to improve arterial flow by gravity.

2 Examine the patient and the limbs for signs and symptoms of arterial disease. PAD leads to occlusion of the lumen of the artery by plaques, or atheromas that form between the endothelial layer of the artery, known as the intima, and the smooth muscle layer, known as the media. These plaques are mainly composed of macrophages and lipids. In addition to the accumulation of plaque, the involved arteries frequently present with fibrosis and calcification, which cause hardening of the artery, or arteriosclerosis. Legs with arterial insufficiency generally lack hair and present with thin, cool, shiny, reddened or ruborous skin with minimal or no edema. It is important to recognise that these patients do not just have arterial disease of the legs, and often have concomitant occlusion of large and medium-sized arteries, including coronary, cerebral and visceral vessels. PAD affects the lower extremities more commonly than the upper extremities, and may lead to recurrent fatigue, cramping, or pain that is known as claudication. Claudication is the most recognised symptomatic subset of lower-extremity PAD. It has been long recognised that an insufficient blood supply to the legs can cause pain and dysfunction in the same way that coronary artery disease leads to angina. Smoking is one of the strongest risk factors for PAD along with diabetes, and when these risk factors are present together, the risk becomes even higher for a rapid progression of PAD. Embolisation in the lower extremity arteries can also lead to suddenly occurring ischemic areas that behave in a fashion similar to emboliation from the heart to the cerebral arteries with atrial fibrillation and stroke.

3 Confirm adequacy of blood flow to the legs and feet by conducting an ankle-brachial index. The diagnosis of lower-extremity PAD is established by vascular testing which should include the resting ankle-brachial index (ABI). This is calculated as the ratio of systolic blood pressure in the ankle and the higher of the two brachial artery pressures (A / B = I). Some clinicians are able to conduct this test in the clinic, while others refer the patient to the vascular lab for testing. Either way, resting ABI should be completed. Resting ABI results should be reported as: abnormal (≤0.90), borderline (0.91–0.99), normal (1.00–1.40), or non-compressible (>1.40). The ABI, although simple, has high intra- and inter-rater reliability, high sensitivity

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Figure 1. The small punched-out wounds with surrounding erythema are typical presentations of arterial ulcers.

Figure 2. Progression of arterial wounds in a patient with increasing leg and foot pain.

and specificity (between 97% to 100%). In patients with stiff arteries (arteriosclerosis), erroneously high measurements can occur and the toe should be used in addition to the foot, through the use of a toe-cuff to obtain a value known as the toe-brachial index (TBI). Lower extremity arteriosclerosis, or hardening of the arteries, occurs very commonly in the diabetic population, suggesting that TBI should routinely be performed in this population. This may necessitate the performance of a formal lower extremity arterial Doppler study. In practice, the ABI is measured using a blood pressure cuff, a standard sphygmomanometer, and a handheld Doppler instrument to detect pulses. In an attempt to provide the best evidence for measuring the ABI, in 2012 the American Heart Association Scientific Statement issued a compressive statement and guideline on how to accurately measure ABI (Aboyans et al, 2012).

4 Consider the presence of mixed arterial and venous disease. The coexistence of both venous and arterial diseases is postulated to be present in up to 26% of patients with lower-extremity ulceration. The mainstay treatment for chronic venous insufficiency remains compression therapy (elastic or inelastic), graded compression stockings or hook and loop compression garments. Literature supports the use of multilayer compression therapy in the treatment of active lower extremity ulceration, with compression stockings and hook and loop garments used for maintenance of healing. In the past, modified reduced compression was recommended for patients with ABIs of 0.5–0.7. However, it has been demonstrated that in patients with mixed arterial venous ulceration of the lower extremities, with an ABI >0.5 and an absolute ankle pressure >60 mmHg, inelastic compression up to 40 mmHg does not impede arterial perfusion. Modified compression therapy with compression pressures between 20 and 30 mmHg, can promote healing in mixed disease in patients with moderate arterial insufficiency ($0.5 \leq ABI \leq 0.8$). If ABI is <0.5, modified compression therapy can be considered once the restoration of acceptable ABI is achieved. Intolerance, lack of response or further deterioration of disease within 3 months should prompt further arterial imaging and intervention (Lim et al, 2021).

5 Do not debride the stable eschar. Stable eschar is a dark brown or black material that covers the wound bed. The word "stable" means that the eschar is dry, intact at the skin (no open areas), not boggy and has no inflammation around its edges. In most cases, eschar is debrided, but the difference in arterial wounds is that there is insufficient blood flow to support healing the resulting open wound. Unstable eschar, wet, draining, and inflamed should be debrided *[Figure 2]*.

6 Dress the wound with appropriate dressings to maintain a moist wound environment. Sometimes arterial disease is managed by surgical reconstruction. Other patients are not candidates for surgery and the wound is treated conservatively with the goal of reducing pain, odor, drainage and risk of infection. A Cochrane review in 2020 concluded that there is not enough evidence to determine if topical agents improve healing (Broderick et al, 2020), and this is logical because without improved blood flow, the topical treatment does heal the ulcer. Compressive therapy, in the case of an arterial wound or one of mixed arterial and venous etiology, must be initiated and managed very carefully in order to avoid worsening of the preexisting ischaemia. Accurate assessment of arterial status should guide this therapy. In the case of the dry stable eschar, care must be taken to avoid any dressings or topical agents, such as

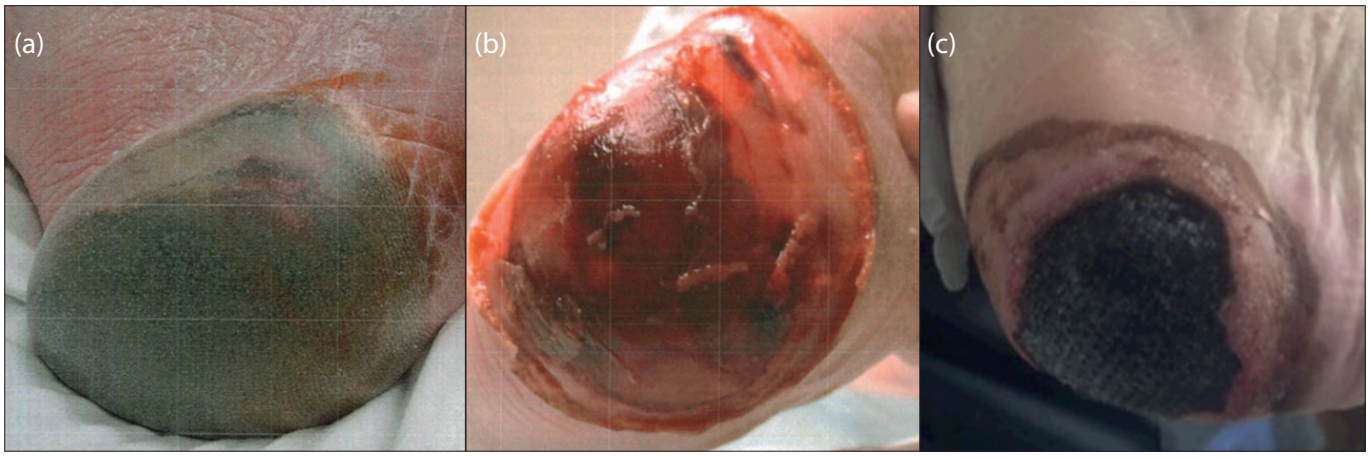

Figure 4. (a) This stable eschar was debrided and a dark wound bed was left behind. (b) Within 6 days the eschar had reformed, however, the wound bed was contaminated (c) and the leg was amputated.

foams, hydrogel, or honey, which could potentially soften the eschar converting it from dry and stable, to soft and moist thereby increasing the risk of infection.

7 **Treat the wound pain with topical or opioid analgesics.** Pain management is essential to improve quality of life and function. Arterial wounds can be extremely painful because they are ischemic. Further pain, anxiety and stress activate the sympathetic nervous system leading to vasoconstriction in the peripheral vascular system, further worsening the ischaemia. Hence, adequate analgesia can also help improve tissue perfusion. In the majority of cases, adequate peripheral revascularisation relieves peripheral pain. In patients who cannot have revascularisation, pain management is crucial. Topical application of xylocaine, lidocaine or benzocaine can be effective in reducing pain, especially during dressing changes, debridement and other procedures. Acetaminophen (Paracetamol), and nonsteroidal anti-inflammatory drugs are usually first-line treatments even if opioids are often required. Usually, a regular administration of analgesic therapy is more effective than when given on demand. Using long wear dressings is helpful to reduce pain with dressing changes, as these events have been repeatedly shown to be the most painful part of a patient's wound care experience. When the patient has peripheral neuropathy, the pain may be neuropathic. A careful differential diagnosis should be entertained because neuropathic pain may require a different therapeutic approach.

8 **Refer patients with arterial ulcers to vascular surgery.** For many of these non-healing and painful ulcers, urgent treatment is needed to improve the blood supply to the ulcer. The primary aim of surgical and endovascular management is to restore blood supply to the

tissues with bypass, angioplasty, or stenting. Indications for surgical treatment include patients who are unresponsive to conservative management, and in whom evidence of reconstructible disease can be demonstrated. Distal vessel patency should be assessed using MR angiography, CT angiography or traditional angiography before surgery. Bypass grafting has been regarded as a "gold standard" in the revascularisation of lower limbs. A bypass graft is constructed, ideally using the patient's saphenous vein, however, synthetic grafts can be utilised in the absence of a suitable saphenous vein. The results of bypass grafts are generally good and the graft can remain durably patent for 5 years or more, depending on other comorbid problems. Infrapopliteal angioplasty has been shown to have a similar rate of success. Angioplasty can often be performed in patients who are not suitable open bypass candidates due to the presence of other comorbidities, such as reduced life expectancy, unavailability of veins, absence of landing zone for distal bypass and infection at the site of potential anastomosis. In addition, angioplasty does not require general anaesthesia.

9 **Monitor for the development of critical limb ischaemia.** Not all patients are able to have corrective procedures quickly, so they must be taught how to monitor for progression of their disease. Critical limb ischaemia (CLI) is considered the most severe pattern of peripheral arterial disease. It is defined by the presence of chronic ischemic rest pain, ulceration or gangrene attributable to the occlusion of peripheral arterial vessels. It is associated with a high risk of major amputation, cardiovascular events and death. Clinically, CLI is defined as ischaemic rest pain with ankle pressure <50 mmHg or a toe pressure <30 mmHg. In patients affected by foot ulcers or gangrene an ankle pressure <70 mmHg, a toe systolic pressure <50 mmHg or TcPO2 <30 mmHg is diagnosed as CLI (Uccioli et al, 2018). CLI is a process occurring over weeks to months, in contrast with acute limb ischaemia which is defined as occurring within 14 days.

10 **Teach patients how to control their atherosclerosis.** Atherosclerosis is a progressive, chronic disease and in some patients, the development of ulcers on the feet makes the control of the disease a higher priority for them. The patient should stop smoking, and control of diabetes, hypertension, and hyperlipidemia should be optimised. Patients may find benefits from sleeping in a bed raised at the head end. Patients should follow professional advice on foot and leg care.

Guidelines for patients on protecting lower limbs and feet should be provided, such as:

- Examine the feet daily for broken skin, blisters, swelling, or redness
- Report worsening symptoms—for example, decreasing walking distance, pain at rest, pain at night, changes in skin colour
- Keep the skin clean, and moisturise with a pH balanced skin moisturiser
- Never walk barefoot
- Ensure shoes are well fitting and free of friction and pressure points; check them for foreign objects (such as stones) before wearing; and avoid open toed sandals and pointed shoes
- Give up smoking and do not vape or use nicotine patches
- Walk regularly within limits of pain and tolerance.

Conclusion

Unlike other lower-extremity ulcers, these wounds can sometimes take months to heal, if they are able to be healed at all. While your clinic staff may be treating the patient for arterial leg wounds, it is important to recall that the arterial disease is chronic and systemic, and the patient may need referral to a multidisciplinary team in order to achieve optimal care. WINT

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