PERIPHERAL ARTERIAL DISEASE:

Giving Appreciation to an Often-Overlooked Cause of Poor Wound Healing

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Peripheral arterial disease (PAD) of the lower limbs is often neglected when evaluating reasons for poor wound healing, particularly in elderly patients. Affecting roughly 12–14% of the general US population, PAD increases with age and affects up to 20% of patients who are older than 75.1 Risk factors include diabetes mellitus, hypertension, smoking, and hyperlipidemia. PAD can also critically hamper one’s wound healing as well as prevent optimum delivery of systemic antibiotics, which can result in polymicrobial infections and advancement to osteomyelitis. The healing of any wound of the lower extremity, including those from trauma, pressure, or venous stasis, can be adversely affected by poor perfusion associated with atherosclerotic disease. Treatment of any lower extremity wound involves local hygiene, moisturizing cream for dry and flaking skin, removal of slough and necrotic tissue, antimicrobials (if indicated), and judicious choice of advanced dressings. If a wound does not respond to routine measures, alternative diagnoses must be entertained. Diagnostics include basic blood work, biopsy, and consideration of non-invasive vascular studies.

This article discusses proper monitoring for PAD and appropriate approaches to treatment.

PAD SURVEILLANCE

The typical symptom of a wound resulting from PAD is extreme pain; however, lack of pain does not rule out arterial disease as a contributor to poor wound healing. When PAD of the lower extremities is present, there are often other manifestations of arterial disease in the history, such as heart attack or stroke. The classic symptom of PAD is intermittent claudication, or muscle cramps, occurring in the legs when walking, usually around the calf. Pain can be mild or severe and usually goes away with rest. Intermittent claudication may be absent in patients with limited mobility. People who walk slowly or are wheelchair-bound due to musculoskeletal disease may not have symptoms of claudication but still have advanced PAD. Pain in the limb while at rest, advanced ulceration, or gangrene is categorized as critical limb ischemia and may lead to limb loss if revascularization is not considered.

Diagnosing PAD in a patient with a nonhealing wound is important, as improvements in arterial perfusion promote wound healing. Once diagnosed, treatment can begin with antiplatelet therapy, vasodilators, statins, and lifestyle changes such as weight loss and smoking cessation. Surgical therapies such as endovascular procedures or vascular bypass grafting must also be considered. Many complications related to PAD can be prevented with basic foot care, control of risk factors, timely treatment of ulceration, and interdisciplinary collaboration between nutritionists, nurses, physicians, and other specialists including podiatrists and vascular surgeons. Patients who live with PAD also have increased prevalence of vascular events elsewhere in the body, making control of risk factors a priority.

Atherosclerosis is characterized by thickening and loss of elasticity of the arterial walls and affects the abdominal aorta and the small- and medium-size arteries of the lower extremities. Physical signs include diminished or absent popliteal artery, posterior tibial, and dorsal pedis pulses. Other bedside diagnostic signs include delayed capillary refill, coolness, and chronic changes of the skin such as hairlessness, shininess, pallor, and thinning. Decreased sensation associated with peripheral neuropathy is often present, particularly in those living with diabetes. When diagnosing vascular ulcers, it is important that bedside physical diagnostic signs be supplemented by objective measurements obtained by vascular studies.

TESTING FOR PAD

Several non-invasive vascular studies are available, including ankle-brachial index (ABI), duplex ultrasound, and pulse-volume recordings using plethysmography. A plethysmograph is a device that records variations in volume and blood flow through the extremity and translates arterial pulsation in the lower extremity into visible waveforms (pulse volume recordings) using inflated cuffs at various levels of the leg.

ABI is a measure of ankle systolic pressure divided by brachial systolic pressure and is considered a standard test for PAD, but loses diagnostic value when arteries have advanced stiffness due to calcification. A normal ratio is 0.9–1.3, and a ratio less than 0.9 indicates a decrease in ankle blood flow relative to the arm. An ABI less than 0.5 indicates severe occlusive disease to the leg; however, this result is less reliable when arteries are stiff, as occurs when calcification is present. It is therefore advisable to supplement ABI with other studies. Pulse volume recording does not examine specific blood vessels but assesses the entire blood flow of the examined limb. The normal pulse volume waveform shows a systolic upstroke with sharp peak, followed by a downstroke with a dicrotic notch. Changes in contour that indicate PAD include diminution of pulse amplitude, blunted amplitude of the waveform, and absence of dicrotic notch. With severe PAD, pulsation is absent and waveforms are flattened. Transcutaneous oxygen pressure is another non-invasive test that can assist with therapeutic decision-making, as an abnormal result suggests the patient may benefit from hyperbaric oxygen therapy.

If non-invasive vascular studies suggest that a patient has blockage in the arteries of the lower extremity, chances of wound healing are greatly re-
duced and revascularization must be considered as an adjunctive therapy. Medical resonance angiography, computerized tomographic angiography, and angiogram are the next steps in determining endovascular intervention or revascularization. The rapid advances in catheter-based technology and percutaneous, minimally invasive vascular procedures have drastically decreased the use of open surgical revascularizations. Endovascular treatment offers the advantage of local anesthesia and return to ambulation on the day of treatment.

PAD TREATMENT APPROACHES

A large variety of minimally invasive endovascular technologies have become the mainstay of PAD treatment today and have largely supplanted open surgical bypass revascularization. Until recently, severe infrainguinal atherosclerosis was too anatomically challenging for minimally invasive treatments, but it is now assuming a primary role. Endovascular revascularization avoids additional wound healing problems related to vein harvesting and other surgical incisions and promotes shorter hospital stays. These newer technologies include laser atherectomy, balloon angioplasty, cryoplasty, and stenting. Outcomes related to percutaneous endovascular interventions are promising with regard to limb salvage rate and wound healing.

Several factors are considered when deciding upon revascularization, including general health of the patient, ambulatory status, and severity of the wound and limb ischemia. The vascular surgeon will also consider anatomic distribution of the disease and history of prior vascular interventions. Techniques for endovascular interventions are evolving rapidly, and outcomes related to particular technologies are still being studied. The elderly population is currently the most rapidly growing sector of American society. Multiple comorbidities frequently accompany advancing years and wound etiology is often multifactorial. When patients present with nonhealing wounds of the lower extremity, PAD must be considered as a contributing factor. The outpatient wound center should be prepared with access to resources that include vascular testing and consultation from a vascular specialist. (For more information on consultation, see “Identifying Appropriate Interventionists For Lower Limb Preservation” in this issue of Today’s Wound Clinic.)

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Reference

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