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Feel a Pulse, Save a Life: *Minimizing Complications in Critical Limb Ischemia*



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“They want to cut off my leg,” my clinic patient sobbed, her voice trembling from a mix of fear and unremitting pain. While this is not the usual patient interaction for most radiologists, it has become far too common for interventionalists and, no doubt, primary care physicians alike.

Critical Limb Ischemia

Critical limb ischemia (CLI), a severe form of peripheral arterial disease (PAD) manifesting as rest pain or inability to heal lower extremity wounds, occurs in as many as 5% of patients with PAD. Unlike the typical patient suffering from claudication—the vast majority of whom will never progress to critical limb ischemia—patients with rest pain or non healing wounds from PAD experience 1-year mortality rates as high as 25%, which is greater than for many types of cancer (Figures 1 and 2).¹ Furthermore, this severe form of PAD can be symptomatically silent, with foot or toe ulceration as the first clinical indication of PAD.

Diagnosis

Since patients with PAD and CLI may be asymptomatic, the diagnosis can be first suggested in the primary care physician’s office with a comprehensive history and physical examination, including iden-

tification of cardiovascular risk factors, peripheral pulse exam, auscultation for renal and carotid arterial bruits, palpation to detect abdominal aortic aneurysms, and inspection of foot and toes for ulceration. Additional signs of PAD include lower extremity hair loss, poor nail growth, muscle and subcutaneous tissue atrophy, and a positive Buerger’s test, whereby elevation of the leg results in extremity pallor which may proceed to hyperemia upon placing the leg dependent again.²

However, as venous insufficiency and neuropathy can also lead to lower extremity wounds (Figure 3), non-invasive testing is often required to confirm that the ulcer is of ischemic etiology. Ankle-Brachial Index (ABI) is one of the easiest non invasive tests to assess for peripheral arterial insufficiency: normally, ABI should be greater than 1.0, with an index ≤ 0.90 considered representative of PAD; patients with critical limb ischemia typically have $ABI \leq 0.50$. In addition, to their diagnostic utility, ABIs can also be used as a prognostic tool since the index has been shown to be predictive of fatal and non fatal cardiovascular events. In fact, ABI assessment can be useful in practice to identify patients with moderate risk for cardiovascular event (10-20% Cardiovascular 10-year risk score) who may benefit from a more aggressive secondary cardiovascular event prevention strategy rather than those indicated for primary prevention (Figure 4).¹

Other important non-invasive testing includes Doppler ultrasound and measurement of pressures throughout the thigh and leg (segmental pressures), toe pressures, and transcutaneous oxygen levels; the latter two may be of great value in diabetic patients, in whom ABI may be un-

reliable secondary to arterial calcification. CT and MR angiography additionally provide an invaluable means of assessing peripheral arterial anatomy, but may be more difficult to use in patients with vascular calcifications (CTA) or renal insufficiency (CTA and MRA). Finally, conventional catheter based angiography enables excellent imaging of the peripheral vasculature, but carries the risks of an invasive procedure, as well as contrast induced nephropathy; however, with meticulous technique and optimization of non invasive imaging, complication risk and contrast use can be drastically minimized.

Treatment and Amputation Prevention

The goal of CLI treatment is to relieve pain, heal wounds, and maximize quality and length of life. The family practice physician is uniquely qualified to play a leading role in this final goal, as cardiovascular risk reduction is an essential element of CLI therapy. Patients with CLI require vigilant lipid and blood pressure management, as well as assistance with smoking cessation and glycemic control (Figure 5). Additionally, these patients benefit from anti-platelet therapy with either aspirin or clopidogrel and, as demonstrated in the CAPRIE trial, patients with symptomatic PAD may achieve a greater cardiovascular risk reduction from clopidogrel over aspirin for antiplatelet medication.³ Unfortunately, unlike for symptoms of claudication, no medication is efficacious to treat CLI directly, beyond pain control.

Patients presenting with foot ulceration require special attention, and are best treated by a provider with expertise

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in this area. Off loading at pressure points, necrotic tissue debridement, and early treatment of local infections are essential to prevent further deterioration and tissue loss. Ultimately, patients with CLI require revascularization to alleviate rest pain and heal ischemic wounds.

Unfortunately, many patients undergo major amputation without ever receiving consultation from a vascular interventional specialist with expertise in limb salvage. Traditionally, techniques to revascularize the extremity to allow minor amputation or no amputation instead of major amputation have centered on open surgical bypass, though many patients are suboptimal candidates secondary to comorbid conditions or a lack of adequate vein with which to create the bypass conduit. How-

ever, over the past decade, development of newer and novel techniques in interventional therapies, as well as patient and provider preference to avoid open surgery, have led to a paradigm shift, favoring endovascular approaches as first line therapy for CLI.⁴ Multiple trials have established the safety and efficacy of endovascular approaches to limb salvage.⁵ The BASIL trial, a multicenter, randomized controlled trial evaluating outcomes in patients receiving balloon angioplasty versus open surgical bypass for CLI, demonstrated amputation-free survival to be equivalent for both treatment groups even at 3 years.⁶ Moreover, the future of superficial femoral artery and below knee artery endovascular interventional therapy for CLI patients is even more promising with further miniaturization of angioplasty balloons and stents, evolution of drug eluting stents, and development of techniques to directly access the small foot and ankle arteries to improve chances for successful revascularization.

Prevention

Early detection, even while patients are asymptomatic, is critical to prevent the complications of PAD and CLI. Unfortunately, many physicians omit a critical PAD-focused history and examination from their patients' clinic visits, which may lead to delayed diagnosis, risk stratification, and initiation of appropriate therapies.² Additionally, patients with PAD, especially those with CLI and/or diabetes, must receive effective education regarding foot self-care and the need for properly fitting shoes to minimize complications from CLI. Certain patient populations also benefit from PAD screening with ABIs: the American Diabetes Association (ADA) recommends screening ABIs for all diabetic patients over age 50 every five years and for diabetic patients under age 50 who

also have an additional risk factor (smoking, hypertension, hyperlipidemia, diabetes > 10 years).⁷

Conclusion

"Let's try to save your leg." After a small needle stick in her artery, balloon angioplasty in her leg, and successful reopening of her closed vessels, that distraught clinic patient who had been destined for amputation, got to keep her leg. More importantly, she was successfully weaned from the narcotics that had been required to control her previously endless rest pain. These stories are not uncommon, but, unfortunately, do not always finish with a happy ending: too many patients with PAD and CLI go undetected, despite readily available diagnostic tools, such as the physical examination and ABI. Moreover, patients often proceed to amputation without consideration from a specialist in vascular interventional limb salvage techniques that may stave off surgery; a recent article published in Cardiovascular and Interventional Radiology is titled with the simple, cautionary, "Always Contact a Vascular Interventional Specialist Before Amputating a Patient with Critical Limb Ischemia."⁸ Through the efforts of primary care physician advocates, early recognition of PAD, early referral to a vascular interventional specialist, and early, aggressive treatment will no doubt minimize morbid and mortal complications and diminish the frequency of unnecessary major amputations: in short, feeling a pulse may save a life. ■

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