

Acute Limb Ischemia

An Emergency Medicine Approach



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KEYWORDS

- Acute limb ischemia • Peripheral arterial disease • Arterial thromboembolism
- Arterial thrombosis • Compartment syndrome • Reperfusion injury

KEY POINTS

- Acute limb ischemia (ALI) occurs when there is sudden decrease in limb perfusion that threatens limb viability and requires urgent diagnosis and management to prevent loss of life and limb.
- If ALI is suspected based on history and physical examination, intravenous (IV) heparin should be initiated immediately and vascular surgery consulted.
- Assessment of pulses (by palpation and Doppler flow), sensation, and motor strength determines limb viability. Patients are then classified based on viability of the ischemic limb as follows: viable (stage I), marginally threatened (IIa), immediately threatened (IIb), and irreversibly damaged (III).
- Endovascular thrombolysis is most appropriate for patients with a viable or marginally threatened limb (I and IIa), acute occlusion (less than 2 weeks duration), and a history strongly suggestive of arterial or graft thrombosis.
- Surgical revascularization is preferred for patients with an immediately threatened limb (IIb), occlusion of more than 2 weeks' duration, proximal occlusion (suprainguinal), and embolic occlusion.

INTRODUCTION

Acute limb ischemia is a medical emergency with significant morbidity and mortality. The incidence is estimated to be 1.5 cases per 10,000 persons per year.¹ Rapid diagnosis is essential because timely treatment needs to be initiated to restore blood flow to the extremity. This is a time-sensitive condition, and the diagnosis is primarily

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clinical. An emergency physician must make the diagnosis and urgently involve the vascular surgeon for definitive management to prevent loss of life or limb.

DEFINITIONS

It is important for an emergency physician to distinguish between acute versus chronic limb ischemia. Chronic limb ischemia is most commonly caused by peripheral arterial disease (PAD) and gradually worsens over time, leading to progressive symptoms, known as claudication. PAD includes a broad variety of disorders that cause progressive stenosis or occlusion of arteries, most commonly atherosclerosis.²⁻⁴

Claudication is defined as fatigue, discomfort, or pain occurring in a specific limb muscle group during effort. Symptoms of claudication are a result of exercise-induced ischemia. Patients with claudication have sufficient blood flow to the limb so that symptoms are absent at rest. During exertion when there is increased demand for oxygen, blood flow is inadequate to meet metabolic demands, and therefore the limb suffers from muscular fatigue or pain.

Chronic ischemia from PAD can progress to the degree of causing compromised limb viability, known as critical limb ischemia (CLI). CLI is defined as limb pain that occurs at rest or impending limb loss caused by severe compromise of blood flow to the extremity.^{2,5} CLI may be the result of acute or chronic ischemia and is usually caused by progressive obstructive PAD but can also be caused by embolic disease, vasculitis, and thrombosis in situ related to hypercoagulable states, popliteal entrapment, vasospasm, compartment syndrome, or trauma. Patients with CLI have resting perfusion that is inadequate to sustain metabolic demands of the distal tissue bed, causing pain at rest or loss of tissue, such as skin ulceration or gangrene.

ALI occurs when there is sudden decrease in limb perfusion that threatens limb viability, with “acute” defined as within 2 weeks of the onset of symptoms.⁵ ALI can be the result of thrombotic, embolic, inflammatory, traumatic, anatomic, or iatrogenic causes. Whereas claudication reoccurs with walking set distances and abates after 2 minutes to 5 minutes of rest, acute ischemia occurs abruptly and is not relieved by rest.

Chronic ischemia induces the development of collateral blood vessels and results in skin changes secondary to progressive ischemia. Patients with preexisting occlusive PAD and claudication can also present with ALI; however, because there has been time for collateral vessels to develop, they may have milder symptoms than patients with minimal or no preexisting PAD.² Patients with normal underlying vasculature who develop acute ischemia have greater threat to limb viability because there has been insufficient time for new blood vessel growth to compensate for sudden loss of perfusion (**Table 1**).^{1,2}

RISK FACTORS

The most common cause of PAD is atherosclerosis. Risk factors for atherosclerosis include cigarette smoking, diabetes, dyslipidemia, hypertension, family history, and hyperhomocysteinemia.⁶⁻¹³

Disorders of collagen formation and vascular inflammation (vasculitis) may also lead to PAD by causing loss of structural integrity and dilation of the arteries. Disorders of collagen formation include Marfan and Ehlers-Danlos syndromes. Vasculitis can affect any arterial bed; for example, the aorta and its first-order and second-order branches may be involved in Takayasu disease, Behçet syndrome, and relapsing polychondritis^{14,15}; medium-sized vessels are the target of polyarteritis nodosa, temporal arteritis, Wegener granulomatosis, Churg-Strauss syndrome, and Kawasaki disease¹⁶⁻¹⁸; and

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