Acute Limb Ischemia

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KEYWORDS

• Acute limb ischemia • Limb thrombus • Limb embolus • Phlegmasia
• Myoglobinuria • Compartment syndrome

KEY POINTS

- Acute limb ischemia is classified according to clinical findings and severity. Accurate classification of the limb ischemia is essential in determining the timing and type of intervention.
- Despite the cause, class II ischemia (threatened limb) encompasses most patients presenting with acute limb ischemia and requires intervention. Familiarity with the different types of limb ischemia cause will assist in the further workup and treatment options.
- Upper-extremity ischemia is relatively uncommon with different disease processes compared with lower-extremity ischemia. Differentiation between small vessel and large vessel disease in the upper extremity leads to a significantly different workup. Open surgical therapy remains the mainstay of therapy for large vessel upper-extremity ischemia.
- Postoperative complications attributed to myoglobinuria and compartment syndrome are crucial to monitor and have specific treatments. Operative technique, as discussed in the article, is based on different anatomic locations for compartment syndrome and should be familiar for all surgeons performing revascularization of acutely ischemic extremities.

INTRODUCTION

Acute limb ischemia is defined as any sudden decrease in limb perfusion causing a potential threat to limb viability.[1] Acute limb ischemia is a critical, potentially end-of-life, clinical condition that presents in patients with multiple medical comorbidities. This critical condition threatens the viability of the extremity and the patient's survival due to systemic acid-base, electrolyte, and other abnormalities. The diagnosis and initial assessment are mainly clinical. Diagnostic errors have severe consequences resulting in amputation or possible death. A variety of treatment modalities are available to the clinician, including anticoagulation, catheter-directed thrombolysis, pharmacomechanical thrombectomy, percutaneous mechanical thrombectomy, and operative intervention. Depending on the patient and underlying limb ischemia cause, the most appropriate intervention is essential to the final limb outcome.

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This article details the classification of limb ischemia, outlines the numerous causes of limb ischemia, highlights the diagnosis with treatment options and describes common postoperative conditions after limb ischemia intervention. The acute limb ischemia causes in the article are divided into sections, including the presentation, diagnosis, and therapy for each cause. The broad limb ischemia causes include the following:

- Embolism
- Thrombosis
- Venous obstruction
- Trauma
- Upper extremity: uncommon causes

Postoperative management is extremely important after revascularization of an acutely ischemic extremity. Reperfusion injury, myoglobinuria, and compartment syndrome are summarized in the postoperative section.

CLASSIFICATION OF ACUTE LIMB ISCHEMIA

The classification system of acute limb ischemia is based on the severity of the ischemia, which determines the therapy and timing of intervention plus implications for outcomes. The Rutherford classification of limb ischemia is accepted as the standard reporting system for limb ischemia (**Table 1**). The three ischemia categories are based on clinical findings and Doppler measurements, which can be performed bedside.[2,3]

Class I: Viable, nonthreatened extremity, no neurologic deficit, audible Doppler signal

Class II: Threatened extremity, manifested by neurologic deficit and sluggish/absent Doppler signals in the affected limb. Class II is divided into 2 subcategories: class IIA has mild sensory deficits, whereas Class IIB is associated with both motor and sensory deficits

Class III: Irreversible ischemic nerve and sensory deficits

Table 1
Rutherford's acute limb ischemia classification

		Findings		Doppler Signals	
Category	Description/ Prognosis	Sensory Loss	Muscle Weakness	Arterial	Venous
I. Viable	Not immediately threatened	None	None	Audible	Audible
II. Threatened					
a. Marginally	Salvageable if promptly treated	Minimal (toes) or none	None	Inaudible	Audible
b. Immediately	Salvageable with immediate revascularization	More than toes, associated with rest pain	Mild, moderate	Inaudible	Audible
III. Irreversible	Major tissue loss or permanent nerve damage inevitable	Profound, anesthetic	Profound, paralysis (rigor)	Inaudible	Inaudible

From Rutherford RB, Baker JD, Ernst C, et al. Recommended standards for reports dealing with lower extremity ischemia: revised version. J Vasc Surg 1997;26:518; with permission.