

The EM Educator Series

The EM Educator Series: Pain out of proportion – “please cut my leg off”

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Case: A 53-year-old male presents with left lower leg pain and pallor. The pain worsened suddenly this morning. He has a history of atrial fibrillation, coronary artery disease, hypertension, and hyperlipidemia.

Questions for Learners:

1. Which patients are at risk for an ischemic leg?
2. What etiologies should you consider? Thrombosis, embolism, and what else?
3. What is the differential for patients with pain out of proportion to exam?
4. How do you diagnose an acute ischemic limb? What roles do ABI, US, and CT with IV contrast play in diagnosis?
5. What is the ED management, and who can assist you in the ED (IR, vascular surgery)?

Suggested Resources:

- ✓ Articles
 - [emDocs](#)
 - [Emergency Medicine Cases](#)
 - [WikEM](#)
- ✓ PubMed:
 - [Emergency Medicine Clinics of North America](#)

Answers for Learners:

1. Which patients are at risk for an ischemic leg?

- Atrial fibrillation
- Recent/previous MI with impaired LV function
- Diseased/prosthetic valves
- Large vessel aneurysmal disease (Aortic aneurysm, femoral/popliteal aneurysm)
- Prior lower extremity revascularization procedure (angioplasty/stent, bypass graft)
- Risk factors for aortic dissection, neurologic disease (transverse myelitis)
- Direct arterial trauma
- Generalized arteriosclerosis
- Deep vein thrombosis (paradoxical embolism)

2. What etiologies should you consider? Thrombosis, embolism, and what else?

The most common cause of acute limb ischemia occurs secondary to generalized, chronic atherosclerosis, eventually contributing to thrombosis of an occluded vessel, but embolic sources, trauma, and vascular manipulation can precipitate acute pathology.

CLINICAL FEATURES	EMBOLUS	THROMBOSIS
SEVERITY	Complete (No collaterals)	Incomplete (Collaterals)
ONSET	Seconds-minutes	Hours-days
LIMB AFFECTED (LEG:ARM)	3:1	10:1
PREVIOUS CLAUDICATION	Absent	Present
BRUITS	Absent	Present
DIAGNOSIS	Clinical	Angiography
TREATMENT	Embolectomy, Warfarin	Medical, Bypass

3. What is the differential for patients with pain out of proportion to exam?

- Necrotizing fasciitis
- Compartment Syndrome
- Mesenteric Ischemia
- Vascular phenomenons (ie aortic dissection, renal artery dissection, etc.)
- Nephrolithiasis

4. How do you diagnose an acute ischemic limb? What roles do ABI, US, and CT with IV contrast play in diagnosis?

HISTORY

Obtaining a detailed summary of the events leading to presentation is of critical importance, including onset, duration, location, intensity of symptoms, any previous history of claudication or associated vascular procedures including vascular repair and arterial bypass.

Past medical history such as cardiomyopathy, congestive heart failure, renal failure, hypertension, diabetes, malignancy, hypercoagulable states, and/or tobacco use can affect overall morbidity and mortality.

Suspect embolus when the patient can communicate exact time of onset, has a known embolic source (i.e. atrial fibrillation), no prior history of claudication and/or a normal appearance/examination of the opposite limb.

PHYSICAL EXAMINATION

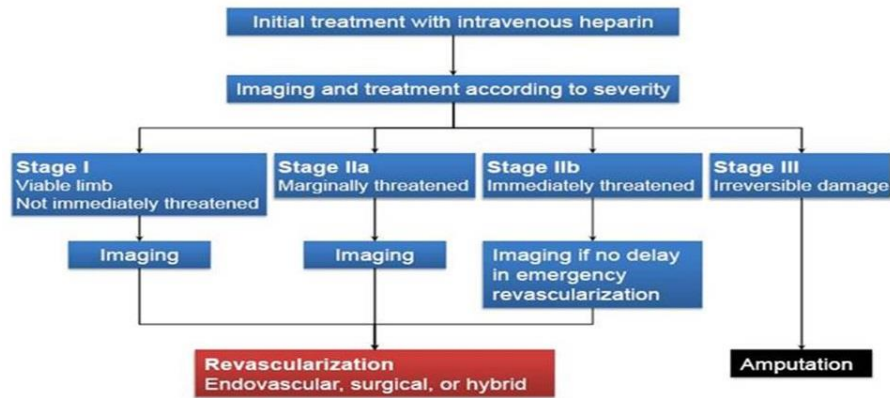
Careful examination is necessary to detect signs of ischemia. Initial evaluation should include:

- External appearance/temperature of the skin
- Peripheral pulses in affected and contralateral limbs
- Neuromotor evaluation for sensation and muscle strength

The 6 Ps (paresthesia, pain, pallor, pulselessness, poikilothermia, paralysis) comprise the classic presentation of acute occlusion in patients without underlying occlusive vascular disease. In contrast, signs of chronic insufficiency can be delineated through examination of hair, skin changes, atrophy of skin and subcutaneous tissues, and muscle. Physical exam findings of ALI may include loss of pulses, cool and pale or mottled skin, evidence of ischemic ulcers, and/or gangrene. Deoxygenation of stagnated blood and surrounding pallor secondary to vasoconstriction may also be demonstrated by mottling/marbling. Vascular evaluation should include palpation/auscultation of Doppler pulses, which allows for determination of perfusion pressure via the ankle-brachial index (ABI) ratio. Adequate perfusion pressure is maintained when the ratio exceeds 0.9.

Embolic sources generally have “bounding pulses” initially based upon transmitted pulses through fresh clot. Thrombotic sources usually demonstrate less sharp demarcation based upon collateral circulation maintaining some perfusion distal to the blockage.

5. What is the ED management, and who can assist you in the ED (IR, vascular surgery)?



Algorithm for the Diagnosis and Treatment of Acute Limb Ischemia

The degree of intervention depends upon the clinical presentation and associated degree of ischemia. Initial treatment for any suspected ischemic extremity should consist of immediate administration of weight-based IV Heparin bolus (80 units/kg) and associated continuous IV infusion (18 units/kg/hr) barring any contraindications [6]. Vascular surgery should be consulted immediately for further recommendations, in addition to prompt examination.

Pre-operative labs should be drawn, including CBC, BMP with focus on renal function and potassium levels, Coagulation studies, and Type and Screen. Creatinine Kinase may be drawn to evaluate potential rhabdomyolysis but ultimately will likely not change management. Obtain an EKG and Chest X-ray and any other potential pre-operative information, and optimize any pre-existing medical conditions for surgical intervention, if necessary.

Careful IV hydration is recommended, as often patients with acute ischemia can be relatively volume depleted. Acute renal failure related to myoglobinuria after revascularization and/or IV contrast from potential radiologic studies may also be reduced by adequate hydration. The extremity should be placed in a dependent position to maximize perfusion and have any constricting clothing/bandages removed while maintaining the limb at a warm temperature. Overall goals include maintaining systemic blood pressure (especially in patients with known low flow states), administering adequate IV analgesia, and supplemental oxygen as needed.

Generally, there is early symptomatic improvement with Heparin therapy, but its positive effects are of unclear origin. It may be attributable to its anticoagulation effects, its simple volume expansion, and/or a combination of both effects. Its use also helps prevent proximal and/or distal propagation of clot in the occluded vessel, as well as helps preserve or improve microcirculation.

If vascular surgery chooses not to treat the Acute Limb Ischemia with operative management and to treat medically, a goal activated partial thromboplastin time of 60 to 100 seconds, or an INR of 2.0 to 3.0, should be targeted with the above-mentioned heparin regimen. If this route is chosen, continuous monitoring of worsening clinical symptomatology must be strictly implemented to guard against unsuspecting worsening.

In the setting of such an acute life and limb-threatening event, it is always important to ensure that the overall medical condition of the patient is well considered, and to treat any underlying medical complications that may co-exist.