CASE PRESENTATION

**HPI:** 64 y/o male c/o sudden onset right leg pain distal to the knee for 12 hours.

**ROS:** + history of claudication symptoms, + associated paresthesias to right leg

- No chest pain, back pain, weakness, history of trauma, PMH, medications

**Vital Signs:** BP 200/100, HR 110, RR 16 (99% sat on room air), afebrile

**General:** In obvious distress from leg pain

**Right Leg:** Slightly pale, cool, soft compartments

**Neurologic:** 5/5 strength bilaterally; light touch decreased in right toes

<table>
<thead>
<tr>
<th>Vascular</th>
<th>CR</th>
<th>DP</th>
<th>PT</th>
<th>Pop</th>
<th>Fem</th>
<th>Car</th>
<th>Rad</th>
</tr>
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<tbody>
<tr>
<td>RLE</td>
<td>5 sec</td>
<td>1+</td>
<td>1+</td>
<td>2+</td>
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<tr>
<td>LLE</td>
<td>1 sec</td>
<td>2+</td>
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</table>

**QUESTIONS:**

1. What treatment should be started immediately?
2. What ED tests should you order?
3. What imaging tests, if any, are needed?
4. What is the appropriate treatment for this patient?

**BACKGROUND**

**Definition of Acute Limb Ischemia (ALI):** Condition when blood flow to a limb is suddenly reduced from occlusion of an artery, such that tissue perfusion is compromised, threatening limb viability. Present for <14 days.

**Relevance to Emergency Medicine:**

1. “Time is limb and life”
2. Golden Time Window = 6 hours (before irreversible neuromuscular damage)
3. Amputation rate = 6-20% ([Jivegard et al, 1988; Eliason et al, 2003; Panetta et al, 1986](#))
   - 6% if revascularization performed within 12 hrs of symptom onset
   - 12% if revascularization performed during 12-24 hours
   - 20% if revascularization performed after 24 hrs
4. Mortality rate 6-12% ([Ouriel et al, 1998; Eliason et al, 2003](#)) – Same as AMI inpatient mortality rate of 6-12%!

**Common etiologies**

1. **Embolic** ([Abbott et al, 1982](#)) – Causes 15% of ALI cases
   - 80% from cardiac source - valve, mural thrombus
   - 20% non-cardiac source - thrombosed aneurysm, ulcerated atherosclerotic plaque
   - Decreasing incidence with fewer cases of rheumatic heart disease
   - Most commonly lodged at: Femoral artery bifurcation, aortoiliac arterial system, brachial artery
   - Unique condition = Blue Toe Syndrome
     - Sudden appearance of cool, painful foot with cyanosis/petechiae of toes and plantar foot
     - Paradoxically: normal pedal pulses
     - Etiology: emboli to the digital arteries of the foot
     - Management: Requires imaging for more proximal atherosclerotic lesion
     - Should consider popliteal artery aneurysm
     - Treatment: Antiocoagulation alone +/- surgical bypass of atherosclerotic lesion
2. **Thrombotic** – Causes 85% of ALI cases
   - Of native or aneurysmal artery
   - Most commonly located at: Bypass graft, common femoral artery, popliteal artery
   - Of indwelling bypass graft
Less common etiologies

1. **Extrinsic compression of arterial lumen**
   - Aortic or vascular dissection, creating pseudolumen which compromises true lumen
   - Compartment syndrome
   - Thoracic outlet syndrome
     - Condition with scalene muscle scarring and/or a cervical rib causing neurovascular compression in the superior thoracic cavity, leading to arm pain and paresthesias

2. **Vasospasm**
   - Raynaud’s disease
     - Vasospastic condition causing well-demarcated ischemia to fingers and toes
     - Three stages: Pallor (hypoperfusion), then cyanotic (hypoxemia), then hyperemia (reperfusion)
     - Usually bilateral limb involvement

3. **Vasculitis**
   - Buerger’s disease (Thromboangiitis obliterans)
     - Segmental, inflammatory vaso-occlusive disease of small and medium arteries
     - Heavy tobacco use is a significant risk factor
     - Angiogram classically shows “corkscrew” collaterals (small-vessel, collateral arteries around occluded sites)
   - Temporal arteritis (Giant cell arteritis)
     - Inflammatory condition of medium and large arteries
   - Takayasu’s arteritis
     - Chronic, inflammatory, large-vessel disease of aorta and its large branches
     - Predominantly found in young women (age 20-30)
     - Classically presents with a pulseless upper extremity

4. **Low intravascular volume +/- mild peripheral vascular disease (PVD)**
   - Congestive heart failure, dehydration, sepsis

5. **Trauma**

**Biphasic injury pattern**

1. **Ischemic injury**: Decreased arterial supply to a limb causes ischemic injury by local hypoxemia.
2. **Reperfusion injury**: Return of arterial blood flow with high oxygen content yields toxic oxygen free radicals, and the re-circulation of muscle catabolic products and inflammatory mediators. A patient at risk for a fatal systemic reperfusion injury (multiple co-morbidities and/or hemodynamically unstable) should instead undergo an emergent amputation instead of revascularization.

**HISTORICAL CLUES**

**Six classic “P”s of ALI**

- Pain
- Pallor
- Poikilothermia
- Pulselessness
- Paresthesia
- Paralysis

---

- Ischemic neuropathy
- Late stage of ALI: Harbinger of unsalvageable limb

---

- Ischemic myonecrosis

**Extremity pain**

- **Location**: Level distal to arterial occlusion
  - Thigh pain suggests aortofemoral disease. Calf pain suggests popliteal disease.
- **Quality**: Severe limb pain
- **Onset**: Sudden (embolic) vs subacute (thrombotic)
- **Duration**: Be aware of the 6-hour window for limb ischemia reversibility

**Checklist**: Identify underlying etiology

- Peripheral vascular disease: Claudication hx suggests a thrombotic event; arterial bypass graft surgery
• Atrial fibrillation: Presence suggests embolic event
• Vasculitis
  - Suspect especially in upper limb ischemia
  - Sultan et al, 2001: 25% of upper limb ALI cases were caused by arteritis
• Aortic dissection: Consider if concurrent chest or back pain
• Trauma

Check for contraindications for thrombolytic administration.

PHYSICAL EXAM FINDINGS

Classic appearance of extremity
• Pale and cool
• Mottled cyanosis
• Dependent rubor
• Muscle rigidity and limb woodiness are signs of an unsalvageable limb

Focused physical exam
• **Cardiac:** Checking for atrial fibrillation
• **Extremities:** Check for signs of chronic peripheral vascular disease (suggesting thrombotic etiology)
  - Decreased pulse strength in contralateral extremity
  - Skin ulceration
  - Shiny hyperpigmentation of skin
  - Hair loss
  - Muscle atrophy
• **Neurological:** Check sensation and motor exam
• **Vascular:** Grade all peripheral pulses (carotid, brachial, radial, femoral, popliteal, PT, DP)
  - <2% patients have a non-Dopplerable DP and/or PT pulse congenitally (Khan et al, 2006)
  - A reduced pulse intensity in the contralateral extremity may suggest long-standing peripheral vascular disease and a thrombotic etiology for the patient’s pain.
  - A prolonged capillary refill time (>5 sec) has a LR 1.9 for mod-severe peripheral arterial disease. Be aware that CR time is non-diagnostic in diabetic patients. (Khan et al, 2006; Boyko et al, 1997)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Pulse Intensity</th>
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<tbody>
<tr>
<td>0</td>
<td>No Doppler signal</td>
</tr>
<tr>
<td>1</td>
<td>Reduced</td>
</tr>
<tr>
<td>2</td>
<td>Normal</td>
</tr>
<tr>
<td>3</td>
<td>Increased</td>
</tr>
<tr>
<td>4</td>
<td>Bounding</td>
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</tbody>
</table>

Ankle-Brachial Index (ABI)
• Bedside test using a vascular Doppler ultrasound to more objectively measure pulse intensity
• **Caveat:** Because of calcified foot arterioles in diabetic patients, the ABI may be falsely elevated.
• **Doppler waveforms:**
  - Triphasic: Normal artery
  - Monophasic: Diseased, stenotic, or thrombotic artery
• **Technique:** Measure the blood pressure at which the brachial pulse disappears by Doppler ultrasound. Take the highest of the two brachial artery measurements and use as the common denominator. Repeat technique for DP and PT pulses. Use the higher of the DP or PT measurement as the numerator for each leg.
• **ABI > 0.9** is normal. **ABI < 0.5** suggests severe arterial occlusion.

<table>
<thead>
<tr>
<th><strong>ABI calculation for our patient case scenario:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Right leg: DP = 50 mmHg, PT = 30 mmHg, Highest brachial = 200 mmHg --&gt; <strong>ABI = 50/200 = 0.25</strong></td>
</tr>
<tr>
<td>Left leg: DP = 180 mmHg, PT = 200 mmHg, Highest brachial = 200 mmHg --&gt; <strong>ABI = 200/200 = 1.0</strong></td>
</tr>
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</table>
CLASSIFICATION SCHEME for ALI

<table>
<thead>
<tr>
<th>Class</th>
<th>Category</th>
<th>Prognosis</th>
<th>Sensory Loss</th>
<th>Muscle Weakness</th>
<th>Arterial Doppler Signal</th>
<th>Venous Doppler Signal</th>
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</thead>
<tbody>
<tr>
<td>I</td>
<td>Viable</td>
<td>No immediate limb threat</td>
<td>None</td>
<td>None</td>
<td>Audible</td>
<td>Audible</td>
</tr>
<tr>
<td>IIA</td>
<td>Threatened: Marginal</td>
<td>Salvageable if treated promptly</td>
<td>Minimal-none</td>
<td>None</td>
<td>± Audible</td>
<td>Audible</td>
</tr>
<tr>
<td>IIB</td>
<td>Threatened: Immediate</td>
<td>Salvageable if treated immediately</td>
<td>More than just toes</td>
<td>Mild-moderate</td>
<td>Rare audible</td>
<td>Audible</td>
</tr>
<tr>
<td>III</td>
<td>Irreversible</td>
<td>Limb loss or permanent damage</td>
<td>Profound</td>
<td>Profound</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>


- Usually thrombotic occlusions are class I or IIA (less severe because of collateral circulation)
- Usually embolic occlusions are class IIB or III

Non-Arterial Etiologies for Sudden, Severe Extremity Pain (Normal arterial pulses)

1. Musculoskeletal non-vascular trauma

2. Radiculopathy (impingement of a peripheral lumbar nerve root)
   - **Spinal stenosis**:
     - Disease in which there is narrowing of the neural canal secondary to congenital narrowing or degenerative / hypertrophic changes of the intervertebral disk, facets, or ligamentum flavum.
     - Classically, patients experience “pseudoclaudication”, which is leg pain which is exacerbated by walking and relieved with rest and, uniquely, leaning forward.
     - Spine flexion actually increases the diameter of the neural canal and there is less impingement of the spinal cord and peripheral nerve roots.
     - Patients are often misdiagnosed with mild claudication from peripheral vascular disease instead.
   - **Acute disk herniation**: Abrupt retropulsion of the intervertebral disk can suddenly impinge a nerve root, causing extremity pain from the radiculopathy

3. Deep vein thrombosis (DVT)
   - **Phlegmasia cerulea dolens**: Rare severe case of DVT usually of the leg, compromising both deep and collateral veins such that venous flow and sometimes arterial flow are compromised, causing significant limb pain, cyanosis, and edema.

Algorithmic approach to diagnosing the etiology for sudden, severe extremity pain
(In some causes of ALI, emergent anticoagulation is actually contraindicated, noted by X’s.)
DIAGNOSTIC STUDIES

Emergency Department studies

1. **Bedside studies**
   - ABI measurements
   - EKG (assess for atrial fibrillation)

2. **Laboratory**
   - CBC, type & screen (hemorrhagic risk with anticoagulation)
   - Basic metabolic panel (nephrotoxic risk of angiography contrast agents = 8%)
   - PT / PTT (heparinization treatment)
   - CK (assess for limb myonecrosis; significant risk for post-revascularization compartment syndrome)
   - Troponin (helps risk-stratify as a possible operative candidate)

Imaging options

1. **Digital subtraction angiography (DSA)**
   - Gold standard for limb ischemia imaging
   - **Advantages:** During angiography, may be able to immediately start therapeutic intervention (intra-arterial lysis) without losing time
   - **Disadvantages:**
     - 8% incidence of contrast nephrotoxicity (Srodon et al, 2003)
     - Relatively invasive

2. **Duplex ultrasonography**:
   - Ultrasound with color flow and Doppler waveform information regarding vascular flow and patency.
   - **Advantages:**
     - Noninvasive and non-nephrotoxic
     - Fairly accurate for infrainguinal arterial occlusive disease, especially of bypass grafts in this location
   - **Disadvantages:**
     - Time intensive (30-40 min)
     - Suprainguinal arterial occlusions and distal run-off vessels not well-visualized
     - Calcifications of arterial walls (in diabetic patients, especially) can create artifacts and obscure visualization.
   - Comparisons between duplex ultrasound versus angiography pre-operatively for chronic limb ischemia showed a high correlation rate between the two. (Ascher et al, 2003; Eiberg et al, 2003)
   - May be considered as a second-line approach to ALI imaging if angiography is not possible for infrainguinal arterial occlusion.

3. **CT angiography (CTA)**
   - **Advantages:**
     - Noninvasive
     - Can concurrently evaluate for aortic dissection while looking at runoff vessels in the extremities.
     - Promising literature regarding usefulness in staging severity of chronic peripheral arterial disease (PAD):
       a. Willman et al, 2005: Prospective study comparing 16-slice multidetector CT angiography vs DSA to detect chronic peripheral arterial disease. In detecting hemodynamically significant stenosis:
       >> Sensitivity of CTA = 96% and specificity = 97%
   - **Disadvantages:**
     - Time intensive (30-40 min)
     - Exposure to IV contrast –> If going to angiography after CTA for intra-arterial lysis of clot, patient will now receive a 2nd contrast bolus, increasing the risk of renal failure.
   - Not well-studied in acute limb ischemia

4. **MR angiography (MRA)**
   - **Advantages:**
     - Less contrast load than angiography
     - Gadolinium IV contrast is safe for the kidneys
- No ionizing irradiation

**Disadvantages:**
- Very time intensive and often unavailable during weekend and night hours.
- Promising literature regarding usefulness in staging severity of chronic PAD in the femoral/popliteal system:
  a. **Brillet et al, 2003**: Can be used as an alternative imaging modality for patients at high risk for contrast angiography complications (contrast-induced nephropathy).
  b. **Huegli et al, 2006**: Prospective study of 20 patients comparing MR angiography vs DSA for peripheral arterial disease (immediately after angioplasty)
    >> Femoral-popliteal arterial system: sensitivity 92%, specificity 94%
    >> Infra-popliteal arterial system: sensitivity 93%, specificity = 71%
- Less cost-effective than CT angiography in assessing arterial vasculature (**Ouwendijk, 2005**)

- No role currently in acute limb ischemia

### Current Imaging Recommendation:
Continue with angiography as first-choice imaging approach for ACUTE limb ischemia, because of the benefit of concurrently diagnosing and treating the arterial occlusion. Sending a patient to ultrasound, CT, or MRI with active limb ischemia will often delay treatment.

#### Exceptions:
- For severe contrast allergy:
  - Duplex U/S, MRA
- For bypass graft evaluation:
  - Duplex U/S
- For equivocal exam for ALI:
  - CTA
  - MRA
- If need to rule aortic dissection:
  - CTA or MRA with distal runoff angio

**NOTE:** Perform amputation without imaging for hemodynamically unstable patient – Reduces risk for further multiorgan failure and cardiovascular collapse. “Save life over limb.”

### TREATMENT
**Initial ED management** (**Clagett et al, 2004**)

- **Aspirin**
  - Aspirin reduces the chance of suffering a vascular event by 25%
    ([Anitplatelets Trialist’s Collaboration, 1994](#))
  - British Thrombolysis Study Group found improved outcome of thrombolytic patients who are concurrently on aspirin versus no aspirin. ([Braithwaite et al, 1995](#))

- **Unfractionated heparin**
  - To reduce propagation of thrombus and pericatheter thrombosis during angiography
  - Decreases morbidity and mortality in ALI ([Blaisdell et al, 1978](#))
  - Target PTT of 1.5-2.5 times normal (controversial)
  - Assuming no contraindications (aortic dissection, compartment syndrome, vascular trauma)
  - Check with consultant on need for heparin bolus and lower dosing infusion
  - Position extremity in **dependent position** to have gravity improve limb perfusion pressure

- **Avoid extremes of temperature** to affected extremity
- **Pain control**

**Decision point:** Interventional radiology suite (endovascular intervention) vs operating room (surgery)?

- **Endovascular intervention**: Intraarterial catheter-directed thrombolysis, percutaneous thrombectomy
- **Surgery**: Open thrombectomy, bypass grafting, amputation

### ED Management of ALI:
1. Aspirin
2. Unfractionated heparin
3. Dependent positioning
4. Avoid extremes of temperature
5. Pain control
Overview of Procedures

1. **Catheter-directed thrombolysis**
   - **Intra-arterial medications:** Urokinase, tPA, streptokinase, alteplase, reteplase
   - **Technique:**
     - An angiocatheter is inserted into the contralateral femoral artery. The guidewire crosses over to the affected side through the proximal portion of the arterial clot. If the guidewire passes through the entire length of the clot, the chances for thrombolytic success is high
     - **Injection technique:** Variable (eg. lacing, pulse-spray dosing, low continuous dose)
     - May need 4-24 hours of thrombolytics
   - **Intracranial hemorrhage rate 1-2%** ([Ouriel et al, 1994], [The STILE trial, 1994], [Ouriel et al, 1998])
   - Specifically preferred for bypass graft occlusion

2. **Percutaneous thrombectomy**
   - Mechanical versus catheter-suction technique

3. **Open thrombectomy**
   - Local anesthesia and direct removal of clot in the operating room

4. **Revascularization**
   - Bypass revascularization of occluded artery to reperfuse the distal extremity (autologous vein vs graft)

5. **Amputation**
   - In the ED, ice the extremity to decrease metabolism and production of inflammatory mediators

Landmark studies in ALI

1. **Rochester Trial** ([Ouriel et al, 1994])
   - **Study design:** Prospective, randomized, single-center study with 114 patients
   - **Study population:** ALI patients with symptom duration < 7 days
   - **Treatment arms:** Intra-arterial urokinase versus surgical revascularization
   - **Results:**
     - Lower 1-year amputation rate with thrombolytics (25%) versus surgery (48%)
     - Lower 1-year mortality with thrombolytics (16%) versus surgery (42%)
   - **Conclusion:** Especially in medically compromised group, ALI of < 7 days duration should receive thrombolytics.

2. **STILE Study (Surgery versus Thrombolysis for Ischemia of the Lower Extremity)** ([The STILE trial, 1994])
   - **Study design:** Prospective, randomized, multicenter study with 393 patients
   - **Study population:** Limb ischemia patients with symptom duration < 6 months (mean duration was 6 weeks) – not necessarily “acute” limb ischemia
   - **Treatment arms:** Intra-arterial thrombolytics versus surgical revascularization
   - **Results:**
     - Stopped prematurely after 393 patients, because significantly higher combined morbidity and mortality with thrombolytics (62%) versus surgery (36%)
     - Subgroup analysis of symptom duration < 14 days versus > 14 days:
       1. **Acute (<14 days):** 6-month amputation rate with thrombolytics (11%) versus surgery (30%)
       2. **Subacute (>14 days):**
       - Subgroup analysis of bypass graft arterial occlusion ([Comerota et al, 1996])
         - Average duration of graft occlusion: 34 days
         - If guidewire positioning into the thrombosis was successful (occurred 61% of time in this study), high success rate of thrombolysis = 84%
         - If symptoms < 14 days duration, thrombolytics yielded a lower amputation rate at 1 yr
         - If symptoms > 14 days duration, thrombolytics yielded no difference in amputation rate but had a higher recurrent ischemia rate at 1 yr
   - **Conclusions:**
     1. If symptom duration < 14 days --> Thrombolytics, otherwise surgery
     2. If bypass graft occlusion --> Thrombolytics, especially if symptom duration < 14 days
3. **TOPAS Trial (Thrombolysis Of Peripheral Arterial Study)** *(Ouriel et al., 1998)*
   - **Study design:** Prospective, randomized, single-center study with 544 patients
   - **Study population:** ALI patients with symptom duration < 14 days
   - **Treatment arms:** Intra-arterial recombinant urokinase (r-UUK) versus surgical revascularization
   - **Results:**
     - Similar amputation-free survival rate at 1 year: thrombolysis (65%) vs surgery (70%)
     - Half of thrombolytic patients averted need for open revascularization procedure
     - Rate of intracranial hemorrhage with thrombolytics in first 62 patients = 4.8%
     * Heparin was administered with a goal PTT of 1.5-2 times normal
     * Safety Monitoring Committee prohibited heparin after the first 62 patients
     * Subsequent intracranial hemorrhage rate with thrombolytics (without heparin) = 1.6%
   - **Conclusion:** Unlike the Rochester study, thrombolytics in ALI was not better than surgery for amputation and mortality rates, but thrombolytics did reduce the need for invasive, open revascularization surgeries.

### Treatment Options: The Bottom Line

**Indications for Intra-Arterial Thrombolysis**
- Class I or IIa limb ischemia with symptom duration < 14 days (especially if bypass graft occlusion)
- Significant co-morbidities with high operative risk

**Indications for Surgery**
- Class IIb or III limb ischemia (because thrombolytics take effect too slowly over 4-24 hours)
- Limb ischemia with symptom duration > 14 days

**Heparin Controversy**
- Anecdotal doses: Subtherapeutic infusions of 500 units/hr with or without a bolus

### FUTURE of ALI

1. Multidetector CT scanners and more advanced MRI scanners have increasingly better angiography accuracy
2. Trend away from emergent surgery and toward endovascular intervention
   - Newer thrombectomy devices
   - Prospective studies on the best thrombolytic and heparin doses
   - Use of GP IIb/IIIa inhibitors and prostacyclins (iloprost) to enhance thrombolysis

### CASE PRESENTATION REVISITED

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<thead>
<tr>
<th>Vascular</th>
<th>CR</th>
<th>DP</th>
<th>PT</th>
<th>Pop</th>
<th>Fem</th>
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<th>ABI</th>
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<td>2+</td>
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<td>2+</td>
<td>2+</td>
<td>2+</td>
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</tr>
</tbody>
</table>

**QUESTIONS:**
1. What treatment should be started immediately?  
   - ASA, heparin, dependent positioning of extremity
2. What ED tests should you order?  
   - CBC, BMP, PT/PTT, T+S, CK, Troponin, EKG
3. What imaging tests, if any, are needed?  
   - Angiography
4. What is the appropriate treatment for this patient?  
   - Class IIa limb ischemia < 14 days duration –> Lytics

**Case Follow-up:** On angiography, the patient had a thrombosed popliteal aneurysm with minimal distal run-off vessels seen. After intra-arterial thrombolysis, reperfusion was established, and the patient underwent an elective bypass.

### Popliteal Aneurysm

- Most common peripheral aneurysm
- Occurs bilaterally in up to 50-64% of patients.
- Occurs with coexisting abdominal aortic aneurysm in 40-62% of patients.
- Surgery recommended to all patients with popliteal aneurysms because of a high incidence of subsequent complications (thrombosis and embolism >> aneurysm rupture)
PARALLELS with ACUTE MYOCARDIAL INFARCTION

| Acute Myocardial Infarction (AMI) versus Acute Limb Ischemia (ALI) |
|-----------------------------|-----------------------------|
| **Diagnostic Test**        | **AMI**                     | **ALI**                     |
| EKG                        | Doppler and ABI             |
| ASA, NTG, Metoprolol, Heparin, +/- Glycolla inhibitor | ASA, Heparin, Dependent position |
| **Immediate ED Tx**        | Thrombolytics vs PCI        | Thrombolytics vs Surgery    |
| EKG, onset < 12 hrs        | Class I or II for < 14 days, Poor operative candidate |
| **Specialist Intervention**| Thrombolytics vs PCI        | Thrombolytics vs Surgery    |
| **Thrombolytic Candidate** | Thrombolytics vs PCI        | Thrombolytics vs Surgery    |
| EKG, onset < 12 hrs        | Class I or II for < 14 days, Poor operative candidate |
| **Mimickers**              | Aortic dissection, PE, Intracranial event | Trauma, Radiculopathy, DVT, Extrinsic compression, Vasospasm, Vasculitis, Low intravasc volume, Arterial trauma |
| **Teaching Pearl**         | Time is cardiac muscle      | Time is limb (<6 hours), Save life over limb |

* = Non-atherosclerotic causes of ALI

PITFALLS in ALI

- Not recognizing acute limb ischemia as a cause for limb pain or neurological deficit
- Not considering vasculitis in patients with upper extremity limb ischemia
- Not considering alternative disease processes, especially those in which heparin would be contraindicated
- Not administering aspirin and heparin in the Emergency Department
- Not promptly mobilizing resources to diagnose (angiography suite, ultrasound) and treat (angiography suite for intra-arterial thrombolysis, vascular surgeon) acute limb ischemia