Acute limb ischemia: ALI

นพ. พงศ์  จันทรประทิน
Songklanagarind Hospital
Faculty of Medicine
Prince of Songkla University
Thailand
Acute limb ischemia: ALI

- Definition:
  - Any sudden decrease or worsening in limb perfusion, causing a potential threat to extremity viability
  - Duration < 14 day
Cause of acute limb ischemia

**Native arterial occlusion**

- Embolism to an arterial bifucation
- Thrombosis at atherosclerotic stenosis lesion
- Thrombosis in normal artery (Hypercoagulable state)
- Thrombosis of an aneurysm
- Arterial inflammatory disease
- Rare etiologies: popliteal entrapment syndrome, Adventitial cystic disease

**Graft occlusion**

- Prosthetic graft
  - Intimal hyperplasia
  - Unknown cause
- Autogenous graft
  - Retain valve cusp of in-situ vein graft
  - Stenosis of the vein graft
Embolism

• Cause of Micro embolism

1. Aneurysm
   : Popliteal artery aneurysm
   : Infra-renal AAA

2. Atherosclerotic disease
   : CFA, SFA, Iliac artery

Blue toe syndrome
Embolism

• Cause of Macro embolism

1. Cardiac source: 80 -90%
   1. Atrial fibrillation: most common cause
   2. Myocardial infarction: between post MI day 3rd – 28th
   3. Thrombus of prosthetic valve
   4. Valvular heart disease, Rheumatic heart disease, Vegetation, Atrial myxoma

2. Non-Cardiac source: 5-10%
   1. Aneurysm (TAA, AAA)
   2. Tumor emboli, bullet emboli
   3. Paradoxical emboli

3. Cryptogenic emboli: Unknown cause
Embolism

- 60 - 80% axial limb vessels
- 20% cerebral vessels
- 10 - 20% upper extremity vessels
Embolism

- Lodge at arterial bifurcation
- 60 - 80% axial limb vessels
- 20% cerebral vessels
- Most common: CFA
- Aortoiliac artery, popliteal artery
Thrombosis

• Cause of thrombosis

1. By pass graft thrombosis
   • Prosthetic graft: Intimal hyperplasia
   • Autogenous graft: stenosis of vein graft, retain valve cusp of in-situ graft

2. Atherosclerotic artery thrombosis

3. Hyper-coagulable stage

4. Other:
   • Inflammatory disease: giant cell arteritis (Takayasu’s disease)
   • Peripheral artery aneurysm: popliteal artery aneurysm thrombosis
   • Acute dissection of artery: aortic dissection
Acute graft thrombosis
Atherosclerosis disease
Popliteal artery aneurysm
# Embolism VS Thrombosis

<table>
<thead>
<tr>
<th>Embolism</th>
<th>Thrombosis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>History</strong></td>
<td><strong>Hx of By pass surgery</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Hx of By pass surgery</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Hx of Atherosclerosis risk : DM, Hypertension, Dyslipidemia, smoking</strong></td>
</tr>
<tr>
<td><strong>Physical examination</strong></td>
<td><strong>Abnormal pulse in contralateral limb</strong></td>
</tr>
<tr>
<td>Normal pulse in contralateral limb</td>
<td>Abnormal pulse in contralateral limb</td>
</tr>
<tr>
<td>Abnormal of heart examination</td>
<td><strong>Laboratory</strong></td>
</tr>
<tr>
<td>Palpable abdominal aneurysm</td>
<td>Angiogram: Meniscus shape and sharp cut off sign, filling defect, no collateral vessel, multiple embolism, occlusion at bifurcation or branch of vessel</td>
</tr>
<tr>
<td>ABI: Normal ABI at contralateral limb</td>
<td>ABI: abnormal ABI in contralateral limb</td>
</tr>
</tbody>
</table>
Clinical presentation

1. Pulselessness: used for located lesion
2. Paresthesia
   - Effect sensory nerve, Earliest signs of ALI
   - loss of 2 point discrimination test, light touch, proprioception
3. Paralysis
   - Effect motor nerve cause muscle weakness
   - Effect muscle: muscle necrosis (end stage signs of ALI)
4. Pallor
   - Pallor \(\rightarrow\) Dusky blue \(\rightarrow\) Marbling skin \(\rightarrow\) skin staining
5. Pain
   - Sudden onest mild claudication \(\rightarrow\) muscle tenderness
   (end stage signs of ALI)
6. Poikilothermia
Pallor

Marbling skin

Dusky blue

Skin staining
<table>
<thead>
<tr>
<th>Localization</th>
<th>Pulse</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CFA</td>
<td>PA</td>
<td>PTA</td>
<td>DPA</td>
</tr>
<tr>
<td>Abdominal aortic occlusion</td>
<td>0*</td>
<td>0*</td>
<td>0*</td>
<td>0*</td>
</tr>
<tr>
<td>Iliac occlusion</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CFA bifurcation occlusion</td>
<td>2+</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Popliteal occlusion</td>
<td>2+</td>
<td>2+</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

* = Effect on both leg, 0 = no pulse, 2+ = normal pulse
<table>
<thead>
<tr>
<th>Category</th>
<th>Description/prognosis</th>
<th>Finding</th>
<th>Doppler signals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1 viable</td>
<td>Not immediate threatened</td>
<td>none</td>
<td>+ ve</td>
</tr>
<tr>
<td>Class 2a</td>
<td>Salvageable if promptly treated</td>
<td>Minimal (toes) or none</td>
<td>+ ve</td>
</tr>
<tr>
<td>Class 2b</td>
<td>Salvageable with immediate revascularization</td>
<td>More than toes associated with rest pain</td>
<td>-ve</td>
</tr>
<tr>
<td>Class 3</td>
<td>Major tissue loss, permanent nerve damage</td>
<td>Profound anesthetic</td>
<td>-ve</td>
</tr>
</tbody>
</table>

Summary of Diagnosis: 6s

- Set up time: Acute (<14 days), Chronic (>14 days)
- Source: embolism, Thrombosis
- Side of limb involvement
- Site or level of obstruction: Aorta, CIA, EIA, FA, PA, PTA, ATA
- Severity and degree of limb ischemia: Rutherford’s classification of ALI
- Synchronous disease or underlying disease
Treatment

- Initial treatment:
  - Hydration with urine monitoring
  - Heparinization: 80 U/kg iv push, 18 U/kg/hr iv drip, keep aPTT: 2-3
  - Oxygenation with oxygen mask
  - Urine alkalization: NaHCO₃
  - Analgesia: Opioid IV
  - Completed laboratory: CBC, BUN, Cr, EKG, CXR
Acute limb ischemia

Initial treatment

Class 1, 2a
- Work up co-morbidities
- Semi-elective angiography
- Open revascularization

Class 2b
- Urgent angiography
- Therapeutic decision
- Thrombolytic therapy

Class 3
- Amputation
- Mechanical thrombectomy
- Observation
Open revascularization

Embolectomy

Surgical bypass
Open revascularization

• Endarterectomy

• Intra operative thrombolysis

Aortic Endarterectomy with ePTFE patch
Thrombolytic therapy

Pre CDT

Post CDT
Thrombolytic therapy

• Contraindication

  – Absolute

  1. Recent stroke or neurosurgery within 2 months
  2. Major surgery (Including by pass graft) within 2 weeks
  3. Patients at significant risk of bleeding or with a bleeding tendency such as recent gastrointestinal bleeding

  – Relative

  1. Any surgery within 1 month
  2. Uncontrolled hypertension
  3. Hepatic failure
  4. Bacterial endocarditis
  5. Pregnancy
  6. Limb ischemia including neurologic deficit
  7. Occluded retroperitoneal Dacron graft
Mechanical thrombectomy

- Aspiration Devices
  - Angiojet
  - Trellis
  - Fino
  - Solera
  - Rescue
  - Oasis
  - Hydrolyser
  - Gelbfish Endo Vac
  - The Cleaner
  - Xtrak thrombectomy
  - Rotarex
  - X-Siser

- Micro-fragmentation Devices
  - Arrow-Trerotola
  - Amplatz Clot Buster
  - Cragg brush
  - Castaneda brush

- Ultrasound Devices
  - Acolysis
  - Resolution 360
  - Therapeutic wire
AngioJet device
Thank you