Peripheral Vascular Disease

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Learning Objectives
1. Recognize the signs and symptoms of abdominal aortic aneurysms and aortic dissection.
2. Define claudication.
3. Describe the physical findings in chronic arterial insufficiency.
4. List some of the means for objective documentation of occlusive disease.
5. Recognize some of the supportive measures for patients with claudication.
6. Describe the benefits of walking programs for patients with claudication.
7. List the medications available for peripheral vascular disease.

Aortic Diseases

• Aortic Dissection (Thoracic)
• Abdominal Aortic Aneurysm (AAA)

Abdominal Aortic Aneurysm (AAA)

• Aneurysm is > 50% in vessel diameter
• Normal aorta diameter is 1.8 - 2.0 cm
• 2-5% prevalence in elderly populations
• Average age of dx: 65
• 13th most common cause of death in US
• 10th most common cause of death in men

1. The most common predisposing factors for the development of an abdominal aortic aneurysm are:
   A. History of syphilis and male sex
   B. Marfan’s syndrome and male sex
   C. Atherosclerosis and male sex
   D. Atherosclerosis and female sex
Abdominal Aortic Aneurysm (AAA)

- Location: 95% are infra-renal
- Pathogenesis: Atherosclerosis
  - (Thoracic and supra-renal aneurysms do occur - think Marfan's, Ehlers-Danlos, syphilis)
- Male to female ratio: 3-8 : 1

Abdominal Aortic Aneurysm (AAA):

- Rupture: 60% of patients die before arrival
- Only 50% that do arrive alive, survive
- Overall mortality rate (with rupture) = 80%

2. Because of the prevalence and its lethality, the USPFTF recommends that ultrasound screening be performed in which patients:

A. One-time screening for men ages 65-75, who have ever smoked
B. One-time screening for men ages 65-75, regardless of smoking history
C. One time screening for both men and women ages 65-75, who have ever smoked
D. One time screening for both men and women ages 65-75, regardless of smoking history

Should You Ultrasound “Screen” Patients for AAA?

USPSTF Recommendations: 2005

- (+) One-time screening for AAA by US in men ages 65-75, who have ever smoked.
  Rating: B Recommendation
- No recommendation (+ or -) screening for AAA in men ages 65-75, who have never smoked
  Rating: C Recommendation
- (-) USPSTF recommends against routine screening for AAA in women
  Rating: D Recommendation

Should You Ultrasound “Screen” Patients for AAA?

Why not women???

Chichester trial.
(Scott, RA; et al. Br J Surg; 1995)

- Methods: 9342 women, ages 65-80 randomly assigned to: Screening vs. Control (no screening)
- Results: - At 5 years, no difference in AAA mortality
  - At 10 years, no difference in AAA rupture rate
3. You identified an abdominal aortic aneurysm (AAA) in your patient.

At what size (in centimeters) should you refer your patient for surgical intervention?

A. 3 - 3.5 cm  
B. 4 - 4.5 cm  
C. 5 - 5.5 cm  
D. 6 - 6.5 cm

AAA: Risk of Rupture

- Rate of increase = \textbf{Is exponential!!!!}
- Smaller aneurysms expand slower
- (Conversely, larger aneurysms expand faster)

<table>
<thead>
<tr>
<th>Aneurysm size</th>
<th>Mean yearly increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0 - 3.9 cm</td>
<td>0.20 cm</td>
</tr>
<tr>
<td>4.0 - 4.9 cm</td>
<td>0.34 cm</td>
</tr>
<tr>
<td>5.0 - 5.9 cm</td>
<td>0.64 cm</td>
</tr>
</tbody>
</table>


4. Your patient’s AAA diameter is 4.3 cm.

He leaves your practice and returns 4 yrs later where you meet him in the ED complaining of severe right flank and abdominal pain.

Vitals: 120/60, P=90, afebrile

Labs: H/H=13/39, Urine=10-20 RBC’s/hpf.

Which of the following should be performed?

A. STAT Abdominal Ultrasound  
B. STAT Non-contrasted Abdominal CT scan  
C. STAT Aortogram  
D. STAT intravenous pyelogram (IVP)
AAA Rupture: Symptoms

- Pain is most common: Abdomen, flank, legs, buttocks, testicular/groin
- Syncope
- Vomiting
- Hypotension (+/-)
- Pulsatile mass (+/-)
- Femoral pulses are NORMAL!!!
- Laboratory: Hematuria is (+) up to 10-30% of cases!!!!

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52% A. STAT Abdominal Ultrasound
38% B. STAT Non-contrasted Abdominal CT scan
8% C. STAT Aortogram
2% D. STAT intravenous pyelogram (IVP)

AAA: Graft Complications

- **Aortoenteric fistula:**
  Distal Duodenum 57%, Esophagus 32%
  Presents with Gl bleed (sentinel hemorrhage)

- **Graft Infection:**
  Fever, source unknown, distal septic emboli (+) blood cultures,
  CT with gas surrounding graft

5. A 55-year-old male with hx of long-standing HTN presents to the ED with sudden onset of chest pain. The CXR suggests a widened mediastinum. The most likely diagnosis is:

A. Ruptured Aneurysm
B. Aortic Dissection
C. Mycotic aneurysm
D. Coarctation of the aorta
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- C. Mycotic aneurysm
- D. Coarctation of the aorta

### A Pet Peeve

- AAA do not “Dissect”
- Aortic Dissections are NOT aneurysms

*The pathophysiology is different!!!!*

### Aortic Dissection: Who’s at Risk?

- Ages: 40-80, but younger pts also
- Males: 2-3:1
- Hypertension: 70-90%
  - Marfan’s, Ehlers-Danlos

### Aortic Dissection: Presentation

- Patients with aortic dissections will commonly present with *ripping, tearing, interscapular back pain and pulse deficits*

  - A. True
  - B. False

*IRAD study. JAMA 283: 897, Feb 16, 2000*
Aortic Dissection: Location

Stanford Classification
- Ascending Aorta (60-65%) Type A
- Descending Aorta (30-35%) Type B
  (after origin of subclavian artery)

IRAD Study: JAMA, 2000
Symptoms/Findings N=464 Type A Type B
- Any Pain 95% 94% 98%
- Anterior CP 61% 71% 44%
- Back pain 53% 46% 64%
- Abdominal pain 30% 22% 42%
- Tearing/ripping 50% 49% 52%
- Migrating 17% 15% 19%
- Syncope 9% 13% 4%
- Hypertensive 49% 36% 70%
- Hypotensive/shock 16% 25% 4%
- Pulse deficits 15% 19% 9%

Aortic Dissection: Diagnosis
- Echocardiography
  - 1) Transthoracic (TTE)
  - 2) Transesophageal (TEE)
- CT scanning (with contrast)
- MRI
- Aortography

Aortic Dissection: Management
2 Goals:
- Lower Blood pressure: to BP systolic 90-110
  - IV nitroprusside
- Lower Velocity of LV ejection
  - IV esmolol

Pearl: Start with your B-Blocker

Arterial Occlusive Disease
- Chronic due to: Atherosclerosis => Claudication
- Acute due to: Thromboembolic => 5 “P’s”

6. A 68-year-old male presents with complaints of an aching pain in both thighs when he walks about one block. The pain subsides within about 1-2 minutes after he stops ambulating.

The most likely diagnosis is:
A. Claudication
B. Pseudoclaudication due to spinal stenosis
C. Lumbar radiculopathy
D. Bilateral hip degenerative joint disease

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6. A 68-year-old male presents with complaints of an aching pain in both thighs when he walks about one block. The pain subsides within about 1-2 minutes after he stops ambulating.

The most likely diagnosis is:

- **A. Claudication** 97%
- **B. Pseudoclaudication due to spinal stenosis** 5%
- **C. Lumbar radiculopathy** 8%
- **D. Bilateral hip degenerative joint disease** 8%

**Claudication: Definition**
Reproducible ischemic muscle pain that occurs with exercise, relieved with rest

*It's stable angina...of the legs!!!*

**Claudication: Presentation**
- Symptoms are distal to the location of occlusion
  - Calf symptoms: femoral - popliteal disease
  - Calf and thigh: profunda femoral artery
  - Thigh, hip, buttock pain, with impotence: aorto-iliac disease (Leriche syndrome)

**Chronic Arterial Occlusive Disease**

**Differential Diagnosis**
- Spinal stenosis - "Pseudoclaudication"
- Spinal cord tumors
- Lumbar radiculopathy
- DJD
- DVT

7. The best screening test for this patient is:

- **A. Perform an ankle-brachial index (ABI)** 95%
- **B. Perform bilateral leg ultrasound** 2%
- **C. Perform pulse volume recordings (PVR)** 1%
- **D. Perform lower extremity magnetic resonance arteriogram (MRA)** 2%
Chronic Arterial Occlusive Disease

Screening: Ankle-Brachial Pressure Index

<table>
<thead>
<tr>
<th>ABI</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.9 - 1.30</td>
<td>Normal</td>
</tr>
<tr>
<td>0.7 - 0.89</td>
<td>Mild</td>
</tr>
<tr>
<td>0.4 - 0.69</td>
<td>Moderate</td>
</tr>
<tr>
<td>&lt; 0.4</td>
<td>Severe</td>
</tr>
</tbody>
</table>

- Use higher of 2 brachial pressures if different
- Use higher of 2 Ankle pressures (DP or PT) if different
- CPT # 93922

8. Your patient has an ABI of .65 in the R leg and .70 in the L leg. You recommend exercise and smoking cessation.

Which drug therapy has been shown to increase walking distance?

A. Atorvastatin (Lipitor)
B. Carvedilol (Coreg)
C. Clopidogrel (Plavix)
D. Cilostazol (Pletal)

8. Your patient has an ABI of .65 in the R leg and .70 in the L leg. You recommend exercise and smoking cessation.

Which drug therapy has been shown to increase walking distance?

9%  A. Atorvastatin (Lipitor)
8%  B. Carvedilol (Coreg)
13% C. Clopidogrel (Plavix)
70% D. Cilostazol (Pletal)

PAD: Management

Risk factor modification
- Smoking cessation
- Hypertension
- Diabetes mellitus
- Hyperlipidemia
- Antiplatelet therapy
  - Aspirin
  - Ticlopidine
  - Clopidogrel (Plavix)

Intervention
- Exercise
- Cilostazol (Pletal)

PAD: Interventions:

1. Exercise Training

- 22 trials: => improve pain-free walking*
  - Exercise is better than angioplasty**
- 8 trials noted “supervised exercise” improved walking distance vs. “advice”***

- Exercise therapy for PAD: CPT 93668

**Fowkes GJ, et al. Cochrane Library, Issue 1, 2009
***Bendermacher BLW, et al. Cochrane Library, Issue 1, 2009
PAD: Interventions:

2. Drug Therapy for Claudication
   - Cilostazol (Pletal)
   - Inhibits phosphodiesterase type 3
   - Mechanism of action is unclear
   - 4 randomized, placebo-controlled trials
   => improved walking distance (100mg BID)

   Side effect: Headache = 34% (vs. placebo 14%)

   *****Black Box Warning*****

Do not give to patients with CHF

PAD: Management

Risk factor modification
Mild/moderate symptoms
   - Exercise
   - Drug therapy

Critical leg ischemia
Symptoms improve
Symptoms worsen

Localize the lesion:
   Pulse volume recording
   Magnetic resonance angiography (MRA)
   Conventional angiography

Chronic Arterial Occlusive Disease:

As Disease Progresses
   - Pain at rest in foot or toes
     (sometimes noted as paresthesias/numbness)
   - Worse with legs elevated, relieved with legs dependent
   - Develops leg edema

Chronic Arterial Occlusive Disease:

As Disease Progresses
   - Hair loss, smooth shiny skin
   - Thickened nails
   - Pallor with leg elevation and
   - Rubor with legs dependent
   - Bruits, decreased pulses
   - Cyanosis, ulceration, gangrene

9. Which of the following statements from USPSTF regarding screening for peripheral vascular disease is true?
   A. Men age 65-75 who have ever smoked should have one-time ABI screening
   B. Men and women age 65-75 who have ever smoked should have one-time ABI screening
   C. Men and women age 65-75 regardless of smoking hx should have one-time ABI screening
   D. Men and women, regardless of age or smoking history should not undergo ABI screening

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9. Which of the following statements from USPSTF regarding screening for peripheral vascular disease is true?

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>A. Men age 65-75 who have ever smoked should have one-time ABI screening</td>
</tr>
<tr>
<td>10%</td>
<td>B. Men and women age 65-75 who have ever smoked should have one-time ABI screening</td>
</tr>
<tr>
<td>5%</td>
<td>C. Men and women age 65-75 regardless of smoking hx should have one-time ABI screening</td>
</tr>
<tr>
<td>75% ✓</td>
<td>D. Men and women, regardless of age or smoking history should not undergo ABI screening</td>
</tr>
</tbody>
</table>

USPSTF Recommends AGAINST Routine Screening for PAD

- Rating: D level recommendation
- Fair evidence that screening for PAD among asymptomatic adults in the general population would have few or no benefits because:
  1. Low prevalence
  2. Little evidence that treatment of PAD at this asymptomatic stage of disease, beyond treatment based on standard cardiovascular risk assessment, improves health outcomes...
  3. Screening in asymptomatic adults...could lead to some small degree of harm, including false-positive results and unnecessary work-ups.

10. A 72-year-old female presents to the ED with sudden severe R leg pain, located from the knee to toes. Her past medical history is significant for HTN and DM. Exam: Vitals: 160/90, Pulse=120 and irregular, afebrile. Lungs are clear. Heart: rapid irregularly, irregular pulse. The right leg is cool to touch, pale in color, and you are unable to obtain posterior tibial or dorsalis pedis pulses. At this point you should:

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>66% ✓</td>
<td>A. Immediately consult a vascular surgeon</td>
</tr>
<tr>
<td>30%</td>
<td>B. Immediately obtain an ultrasound of the lower extremity</td>
</tr>
<tr>
<td>3%</td>
<td>C. Immediately obtain an echocardiogram</td>
</tr>
<tr>
<td>2%</td>
<td>D. Immediately obtain an abdominal aortic ultrasound</td>
</tr>
</tbody>
</table>

Acute Arterial Occlusion

- Thromboembolic
- Heart is most common source: 80-90%
- Presentation: The 5 “P’s”
  - “P”ain
  - “P”allor
  - “P”aresthesia
  - “P”ulselessness
  - “P”aralysis

Acute Arterial Occlusion

Cardioarterial emboli: Where do they lodge?

- Lower extremities: 65-70% (usually at bifurcations)
- Cerebral arteries: 20-25%
- Upper extremities: 5-10%
- Visceral arteries: 5-10%

  Don’t miss: Acute SMA occlusion: “Pain out of proportion to physical findings”

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11. A 76-year-old male with a hx of HTN, hyperlipidemia, and smoking presents with a painful toe. He denies trauma. No hx of atrial fibrillation. He has 2+ posterior tibial and 1+ dorsalis pedis pulses. The most likely diagnosis is:

A. Acute gout
B. Raynaud's Syndrome
C. Cellulitis
D. Blue toe syndrome

Acute Arterial Occlusion

2. Arterioarterial emboli: The Blue Toe Syndrome
- Cholesterol or atherothrombotic emboli
- Occludes small vessels
  - Don't be fooled
    - Pulses remain present
    - Often confused with bruising
- Can involve multiple organs - especially kidneys
- Can confirm diagnosis with
  - Skin or muscle biopsy
  - Cholesterol crystals on fundoscopic exam

Answers
1. C
2. A
3. C
4. B
5. B
6. A
7. A
8. D
9. D
10. A
11. D