My Patient Has Claudication

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Atlantic Medical Imaging
What is Claudication?

• Intermittent Claudication
  – Derived from latin word for “limp”
    • A reproducible discomfort of a group of muscles that is induced by exercise and relieved with rest.
Types of Claudication

• Intermittent Vascular Claudication
  – Typically due to PAD

• Venous Claudication
  – Typically due to venous insufficiency

• Neurogenic Claudication
  – Typically due to LSS (Lumbar Spinal Stenosis)
### Differentiating between types

<table>
<thead>
<tr>
<th></th>
<th>Vascular Claudication</th>
<th>Venous Claudication</th>
<th>Neurogenic Claudication</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quality of pain</strong></td>
<td>Cramping</td>
<td>&quot;Bursting&quot;</td>
<td>Electric shock-like</td>
</tr>
<tr>
<td><strong>Onset</strong></td>
<td>Gradual, consistent</td>
<td>Gradual, can be immediate</td>
<td>Can be immediate, inconsistent</td>
</tr>
<tr>
<td><strong>Relieved by</strong></td>
<td>Standing still</td>
<td>Elevation of leg</td>
<td>Sitting down, bending forward</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td>Buttock, thigh, calf</td>
<td>Whole leg</td>
<td>Poorly localized, can affect whole leg</td>
</tr>
<tr>
<td><strong>Legs affected</strong></td>
<td>Usually one</td>
<td>One or both</td>
<td>Often Bilateral</td>
</tr>
</tbody>
</table>
Overall this is not easy...
But Noninvasive testing can help!
Vascular Claudication and PAD

- PAD occurs in approximately 1/3 of all patients
  - Risk increases over age 70
  - Higher risk at age 50 in smokers or DM
- Strong association with CAD
  - Increased risk of stroke, MI, cardiovascular death
- Progressive disease in 25% with intermittent claudication and ultimately limb threatening ischemia
- Results in impaired quality of Life, Limb Loss, and early mortality
Need for Screening

Progressive Disease ~25%
Outcomes in PAD

H&P distinguishers

- History of known PAD or significant PAD risk factors

- Symptoms triggered with standing, relieved by sitting, thigh pain, and shopping cart sign suggests Neurogenic

- Symptoms triggered with walking, relieved with standing, and below knee pain suggests Vascular

- Trophic Signs can help
  - Skin atrophy, thickened nails, hair loss, dependent rubor, ulceration, gangrene
## Classification Systems

<table>
<thead>
<tr>
<th>Fontaine</th>
<th>Clinical</th>
<th>Rutherford</th>
<th>Grade</th>
<th>Category</th>
<th>Clinical</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Asymptomatic</td>
<td>I</td>
<td>0</td>
<td>0</td>
<td>Asymptomatic</td>
</tr>
<tr>
<td>IIa</td>
<td>Mild claudication</td>
<td>I</td>
<td>1</td>
<td>1</td>
<td>Mild claudication</td>
</tr>
<tr>
<td>IIb</td>
<td>Moderate to severe claudication</td>
<td>I</td>
<td>2</td>
<td>2</td>
<td>Moderate claudication</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I</td>
<td>3</td>
<td>3</td>
<td>Severe claudication</td>
</tr>
<tr>
<td>III</td>
<td>Ischemic rest pain</td>
<td>II</td>
<td>4</td>
<td>4</td>
<td>Ischemic rest pain</td>
</tr>
<tr>
<td>IV</td>
<td>Ulceration or gangrene</td>
<td>III</td>
<td>5</td>
<td>5</td>
<td>Minor tissue loss</td>
</tr>
<tr>
<td></td>
<td></td>
<td>III</td>
<td>6</td>
<td>6</td>
<td>Major tissue loss</td>
</tr>
</tbody>
</table>
Risk Factors

- Smoking: Reduced (Relative Risk: 0.5)
- Diabetes: Increased (Relative Risk: 1)
- Hypertension: Increased (Relative Risk: 2)
- Hypercholesterolemia: Increased (Relative Risk: 3)
- Hyperhomocysteinemia: Increased (Relative Risk: 4)
- Fibrinogen: Increased (Relative Risk: 5)
- C-Reactive Protein: Increased (Relative Risk: 6)
- Alcohol: Reduced (Relative Risk: 0.5)

Data from the Framingham Heart showing the odds ratio for developing intermittent claudication.
How reliable is H&P for diagnosing PAD?

- Use of the history alone to detect peripheral arterial disease will result in missing up to 90 percent of cases.
- Asymptomatic patients with abnormal ABI have 50% increased risk of cardiovascular complications.
- Therefore, American Heart Association recommends screening certain high-risk populations.
Who should undergo testing?

• Symptomatic Patients
  – Vascular claudication, ischemic rest pain, ulceration, trophic changes

• High Risk Patients
  – Age <50 years, with diabetes plus additional RF
  – (smoking, dyslipidemia, hypertension, or hyperhomocysteinemia)
  – Age 50 to 69 and a history of smoking and diabetes
  – Age 70 or older
  – Leg symptoms with exertion (suggestive of claudication) or ischemic rest pain
  – Abnormal lower extremity pulse examination
  – Known atherosclerotic coronary, carotid, or renal disease
Ankle Brachial Index

- Workhorse of the lower extremity vascular evaluation
- Easy to perform
  - Blood pressure cuffs, Doppler
  - Ankle to brachial artery pressure
  - Sensitivity ~ 75%, Specificity ~ 90%
    Depending on cutoff value (0.90 - 0.95)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>0.96</td>
</tr>
<tr>
<td>Claudication</td>
<td>0.50-0.95</td>
</tr>
<tr>
<td>Rest Pain</td>
<td>0.30-0.49</td>
</tr>
<tr>
<td>Tissue loss</td>
<td>&lt;0.30</td>
</tr>
<tr>
<td>Significant change</td>
<td>0.15 or more</td>
</tr>
</tbody>
</table>
ABI

• If claudication symptoms but normal rest ABI, exercise ABI should be performed \(^4\)

• False negatives
  – Non-compressible vessels
    • Typically diabetics or renal patients
    • May lead to higher than normal ABI (>1.3)
    • Toe pressures may help (>0.7 normal)
  – Concomitant subclavian or brachiocephalic disease
Pulse Volume Recordings

- Consider in high-risk individuals or abnormally elevated ABI
- Combines segmental pressures with waveforms
- Technique:
  - Pneumatic Cuff inflated at multiple Levels
  - Inflated to 65 mm Hg
Pulse Volume Recordings

• Advantages:
  – Not Impacted by Calcification
  – More sensitive than ABI
  – Allows for waveform analysis

• Disadvantages:
  – Lacks very specific anatomic information
  – More time consuming than ABI
Duplex Doppler

- More specific in location of stenosis
- Also screen for AAA
- Great for surveillance of bypass grafts
- Can semi-quantify degree of stenosis
- Overall about 80% sensitivity and 90% specific
Advanced Testing - CTA

• Advantages
  – Provides good anatomic localization
  – Can give temporal information on delayed imaging
  – Good evaluation of aorto-iliac vessels
  – Speed
  – Ability to evaluate stented arteries
  – Pacer safe
Advanced Testing - CTA

• Disadvantages
  – Dense calcification difficult to assess patency
  – Radiation
  – Distal vessel limited
  – Renal failure/contrast allergy
Advanced Testing CTA

- Axial imaging
- Maximal Intensity Projection
- Shaded Surface Display
Advanced Testing - MRA

• Advantages
  – Renal Impairment
    • Gad vs. Time of Flight
  – Good anatomic Localization
  – Also gives temporal information

• Disadvantages
  – Uncooperative patient
  – Claustrophobia
  – Metal artifact
  – Pacemakers/ICDs
  – Lack of visualization of calcium
No Contrast!
Medical Management

• All Patients with PAD
  – Immediate Smoking Cessation
    (Most beneficial modifiable risk factor)
  – Antiplatelet Agents
  – Diabetes Control
  – Blood Pressure Reduction
  – Consider Ace Inhibitor usage
  – Lipid Control

• Symptomatic Patients
  – Consider Cilostazol (Pletal) - 100 mg PO BID
  – Exercise program!
Management Cont.

- Intermittent Claudication pts should undergo a 3 Month trial of risk factor modification and exercise program

- Critical Limb Ischemia (rest pain or tissue loss) should be worked up for possible revascularization
Management - Asymptomatic

**Figure 2. Diagnosis and Treatment of Asymptomatic PAD and Atypical Leg Pain**

1. **Individual at risk of PAD (no leg symptoms or atypical leg symptoms):** Consider use of the Walking Impairment Questionnaire
   - Perform a resting ABI index measurement
   - **ABI > 1.30 (abnormal)**
     - Pulse volume recording Toe-brachial index (Duplex ultrasonography*)
     - **Normal results:** No PAD
     - **Abnormal results**
   - **ABI 0.91 to 1.30 (borderline & normal)**
     - Measure ABI after exercise test
     - **Normal post-exercise ankle-brachial index:** No PAD
     - Evaluate other causes of leg symptoms†
   - **ABI ≤ 0.90 (abnormal)**
     - Decreased post-exercise ABI

2. **Confirmation of PAD diagnosis**
   - Risk factor normalization:
     - Immediate smoking cessation
     - Treat hypertension: JNC-7 guidelines
     - Treat lipids: NCEP ATP-III guidelines
     - Treat diabetes mellitus: HbA1c < 7%‡

3. **Pharmacological Risk Reduction:**
   - Antiplatelet therapy (ACE-inhibition*, Class IIb, LOE C)
Management – Claudication

Confirmed PAD Diagnosis

No significant functional disability

- No claudication treatment required.
- Follow-up visits at least annually to monitor for development of leg, coronary, or cerebrovascular ischemic symptoms.

Lifestyle limiting symptoms

- Supervised exercise program
- 3 month trial

Lifestyle-limiting symptoms with evidence of inflow disease*

- Pharmacological therapy: Cilostazol (Pentoxifylline)
- 3 month trial

Further anatomic definition by more extensive noninvasive or angiographic diagnostic techniques

- Endovascular therapy (or surgical bypass per anatomy)

Preprogram and postprogram exercise testing for efficacy

Clinical improvement: Follow-up visits at least annually

Significant disability despite medical therapy and/or inflow endovascular therapy, with documentation of outflow† PAD, with favorable procedural anatomy and procedural risk-benefit ratio

Evaluation for additional endovascular or surgical revascularization
Revascularization

• Endovascular tx is indicated for individuals with PAD and vocational/lifestyle disability where clinical features suggest reasonable likelihood of improvement from intervention and there is inadequate response to exercise/medical therapy or inflow disease.

• Indicated in all cases of critical limb ischemia (CLI), defined as Rutherford 4-6.

• AHA Level IA recommendation
TASC II Guidelines

• What defines reasonable likelihood?
  – Trans Atlantic Inter-Society Consensus (TASC) Guidelines attempt to define this
Endovascular Surgery

**Type A Lesions**
- Single Stenosis ≤10 cm in Length
- Single Occlusion ≤5 cm in Length

**Type B Lesions**
- Multiple Lesions (Stenoses or Occlusions), Each ≤5 cm
- Single Stenosis or Occlusions ≤15 cm
  - Not Involving the Infrageniculate Popliteal Artery
- Single or Multiple Lesions in the Absence of continuous Tibial Vessels to Improve Inflow for a Distal Bypass
- Heavily Calcified Occlusion ≤5 cm in Length
- Single Popliteal Stenosis

**Type C Lesions**
- Multiple Stenoses or Occlusions Totaling >15 cm
  - With or Without Heavy Calcification
- Recurrent Stenoses or Occlusions That Need Treatment After 2 Endovascular Interventions

**Type D Lesions**
- Chronic Total Occlusions of CFA or SFA
  - (>20 cm, involving the Popliteal Artery)
- Chronic Total Occlusion of Popliteal Artery and Proximal Trifurcation Vessels
Techniques

• Basic
  – POBA – Plain Old Balloon Angioplasty
  – Stentting
    • Bare Metal, covered, drug eluting

• Advanced
  – Typically required in chronic occlusions
    • Subintimal recanalization and angioplasty
    • Retrograde Transpedal Approach
    • Re-Entry Devices
    • Atherectomy
Case

- 49 yo male with critical limb ischemia
- Rest pain and nonhealing wounds 1\textsuperscript{st} and 5\textsuperscript{th} toes (Rutherford 5)
- ABI 0.2 on right; 0.4 on left
- CTA showed focal occlusion of right common/ext iliac. Also occlusion left common/ext iliac
- Revascularization indicated for CLI
Case

• 65 yo F, bilateral resting leg pain, no tissue loss (Rutherford 4)
• PMH: CAD, Carotid stenosis, Aortic Stenosis
• ABI <0.3 bilateral
• Revascularization for CLI
• CTA runoff performed to evaluate disease burden and plan approach
Arteriogram

BEFORE

AFTER

post 2nd stent
Follow-up

• Discharged home same day
• Near immediate improvement in rest pain
• ABI’s 0.9 bilateral 1 month follow up
• Resting pain completely resolved
Outcomes and Data

• Focal iliac and femoral lesions have clear cut benefit from either PTA and/or stenting

• Treatment of occlusive femoropopliteal disease continues to show prolonged patency with newer technology

• Treatment of SFA occlusions with heparin bonded stent grafts exhibits similar primary patency at 4 year (48 month) compared with conventional fem-pop bypass grafting with synthetic conduit.
Take Home Points

• History alone can miss up to 90% of peripheral arterial disease cases

• PAD is a progressive disease in 25%, including asymptomatic presentations

• Early detection can reduce cardiovascular related morbidity/mortality
Take Home Points

• ABI screening study of choice but consider advanced modalities in high clinical suspicion cases

• Patients with critical limb ischemia (rest pain or tissue loss) should be offered revascularization

• Endovascular techniques continue to evolve with promising outcomes that improve QOL and reduce risk of amputation
References

8. ACCF/AHA Pocket Guideline November 2011. Management of Patients With Peripheral Artery Disease (Lower Extremity, Renal, Mesenteric, and Abdominal Aortic)
AMI Vein Center & Vascular Clinic

• Free ABI screenings
• Free venous duplex
• Free consults if abnormal
• Expertise in diagnosing and treating vascular and venous claudication

• Patients or Physicians can schedule the free testing/consult online at www.AMI-IR.com