Peripheral Artery Disease (PAD): Diagnosis and Management

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Acknowledgments

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- ACC/AHA (www.americanheart.org and www.acc.org) website
What is P.A.D.?

- Peripheral Arterial Disease (P.A.D.) is a common yet serious disease.
- P.A.D. occurs when extra cholesterol and fat circulating in the blood collects in the walls of the arteries that supply blood to your limbs.
- P.A.D. can affect your quality of life, make walking difficult, or worse, increase your risk of heart attack, stroke, leg amputation, and even death.

- A National Public Awareness Campaign from the P.A.D. Coalition and the National Heart, Lung, and Blood Institute
Why should you learn about P.A.D.?

- P.A.D. affects 8 to 12 million people within the U.S., especially those over age 50.
- Early diagnosis and treatment of P.A.D. can help to…
  - Prevent disability and restore your mobility
  - Stop the disease from progressing
  - Lower your risk for heart attack, heart disease, and stroke
Peripheral Arterial Disease
Overlap of Atherosclerotic Disease

Patients with one manifestation often have coexistent disease in other vascular beds

N = 1802 patients
Mean age = 80 yrs (60-102)

How do you know if you have P.A.D.?

- Most people with P.A.D. do not have the typical signs and symptoms of the disease.

- People who do experience symptoms often fail to report them because they think they are a natural part of aging.
What are the signs and symptoms of P.A.D.?

- **Claudication**—fatigue, heaviness, tiredness, cramping in the leg muscles (buttocks, thigh, or calf) that occurs during activities such as walking or climbing stairs.

- The pain or discomfort goes away once the activity is stopped or during rest.
What causes P.A.D.?

- Plaque builds up on artery walls, blocking flow of blood to the arteries of the limbs, often the legs.
- The cause of plaque buildup is unknown in most cases.
- However, there are some conditions and habits that raise your chance of developing P.A.D.
Are you at risk for P.A.D.?

- Are you over age 50?
- Do you smoke or used to smoke?
- Do you have diabetes?
- Do you have high blood pressure?
- Do you have high blood cholesterol?
- Do you have a personal history of vascular disease, heart attack, or stroke?
- Are you African American?
Prevalence of PAD

In a primary care population defined by age and common risk factors, the prevalence of PAD was approximately one in three patients.

NHANES¹ Aged >40 years 4.3%
San Diego² Mean age 66 years 11.7%
NHANES¹ Aged 70 years 14.5%
Rotterdam³ Aged >55 years 19.1%
Diehm⁴ Aged 65 years 19.8%
PARTNERS⁵ Aged >70 years, or 50–69 years with a history diabetes or smoking 29%

NHANES=National Health and Nutrition Examination Study;
PARTNERS=PAD Awareness, Risk, and Treatment: New Resources for Survival [program].
29% of Patients in a Target Population Were Diagnosed With PAD Using An Office-Based ABI.

ABI=ankle-brachial index; CVD=cardiovascular disease.
Prevalence of PAD Increases With Age

Rotterdam Study (ABI <0.9)¹  San Diego Study (PAD by noninvasive tests)²

ABI=ankle-brachial index

Gender Differences in the Prevalence of PAD

6880 Consecutive Patients (61% Female) in 344 Primary Care Offices

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Women (%)</th>
<th>Men (%)</th>
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<tbody>
<tr>
<td>&lt;70</td>
<td></td>
<td></td>
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<tr>
<td>70-74</td>
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<tr>
<td>75-79</td>
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<tr>
<td>80-84</td>
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<td></td>
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<tr>
<td>&gt;85</td>
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Adapted from Diehm C. Atherosclerosis. 2004;172:95-105 with permission from Elsevier.
Ethnicity and PAD:  
*The San Diego Population Study*

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>NHW</th>
<th>Black</th>
<th>Hispanic</th>
<th>Asian</th>
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</thead>
<tbody>
<tr>
<td>Fraction of Population With PAD (%)</td>
<td>4</td>
<td>8</td>
<td>5</td>
<td>2</td>
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</table>

NHW = Non-hispanic white.
More signs and symptoms of P.A.D.

- Cramping or pain in the legs and/or feet at rest that often disturbs sleep
- Sores or wounds on toes, feet, or legs that heal slowly, poorly, or not at all
- Color changes in the skin of the feet, including paleness or blueness
- A lower temperature in one leg compared to the other leg
- Poor nail growth and decreased hair growth on toes and legs
Risk Factors for PAD

- Smoking
- Diabetes
- Hypertension
- Hypercholesterolemia
- Hyperhomocysteinemia
- C-Reactive Protein

Relative Risk: 0 1 2 3 4 5 6
Cardiologists and PAD

**Rationale**

- Coexistence of CAD & PAD
- Common risk factors & modification
- Expertise in clinical evaluation of the patient
- Expertise in risk factor adjustment
- Interest in longitudinal follow-up and global approach to patients' disease
At risk for P.A.D.? Then...

- Discuss this concern with your health care provider.
- Ask your health care provider if you should be screened or tested for P.A.D.
Think you may be at risk? Ask your health care provider...

- Does my medical history put me at higher risk for P.A.D.?
- Which screening tests or exams are right for me?
- If I have P.A.D., what steps should I take to treat it?
- What steps can I take to reduce my risk for heart attack and stroke?
Physical Exam Findings of PAD

The Physical Exam Should Be Performed With Patient’s Pants/Shoes Off

Limb examination (and comparison with the opposite limb) includes:

- Absent or diminished femoral or pedal pulses (especially after exercising the limb) Pulse intensity - 0: absent, 1: diminished, 2: normal, 3: bounding

- Arterial bruits
- Hair loss
- Poor nail growth (brittle nails)
- Dry, scaly, atrophic skin
- Dependent rubor
- Pallor with leg elevation after 1 minute at 60 degrees (normal color should return in 10 to 15 seconds; longer than 40 seconds indicates severe ischemia)
- Ischemic tissue ulceration (punched-out, painful, with little bleeding), gangrene

Elevation Pallor/Dependent Rubor
More questions for your health care provider...

- What is my blood sugar level? If I have diabetes, what should I do about it?
- What is my blood pressure? Do I need to do anything about it?
- What are my cholesterol numbers? Do I need to do anything about them?
- What can I do to quit smoking?
The First Tool to Establish the PAD Diagnosis: 
*A Standardized Physical Examination*

Pulse assessment

0 = absent
1 = weak
2 = present (easily found)
ABI Procedure = Ankle/Brachial Index

- **A**: Doppler ultrasound amplifies the sound of arterial blood flow
- **B**: Pressure recorded in the brachial artery of the arm
- **C**: Sound of arterial blood flow located in ankle
- **D**: Pressure recorded in arteries of the ankle after each arterial flow is located
Exercise ABI Testing

- Confirms the PAD diagnosis
- Assesses the functional severity of claudication
- May “unmask” PAD when resting the ABI is normal
- Aids differentiation of intermittent claudication vs. pseudoclaudication diagnoses
Magnetic Resonance Angiography (MRA)

- MRA has virtually replaced contrast arteriography for PAD diagnosis
- No ionizing radiation
- Non-iodine–based intravenous contrast medium
- ~10% of patients cannot utilize MRA because of:
  - Claustrophobia
  - Pacemaker/implantable cardioverter-defibrillator
  - Obesity
- Gadolinium use in individuals with an eGFR <60 mL/min has been associated with nephrogenic systemic fibrosis (NSF)/nephrogenic fibrosing dermopathy
Computed Tomographic Angiography (CTA)

- Requires iodinated contrast
- Requires ionizing radiation
- Produces excellent arterial picture
The overall goals for treating P.A.D.

- Reducing the risk for heart attack and stroke
- Reducing any symptoms
- Improving quality of life and mobility
Two main treatment approaches

1. **Reduce cardiovascular risk**
   - Get help to quit smoking
   - Lower blood pressure
   - Lower LDL (bad) cholesterol
   - Manage diabetes
   - Take anti-platelet medicines such as aspirin or clopidogrel
   - Follow a healthy eating plan
Two main treatment approaches

2. Relieve leg pain symptoms
   - Get regular exercise
     - Special PAD exercise program
     - Medicines are available to improve walking ability
     - Special procedures or surgery, if needed
PAD: Prevention is Key
Risk Factors for PAD

Nonmodifiable

- Age
- Sex
- Family History (Race)

Modifiable

- Cigarette smoking
- Diabetes mellitus
- Hypertension
- Dyslipidemia
- Inflammatory Markers (CRP)
- Hyperviscosity
- Hypercoagulability
- Hyperhomocysteinemia
- Chronic renal insufficiency
Effect of Smoking Cessation on Survival

133 Patients observed after bypass graft or lumbar sympathectomy

Cumulative Survival (%)

- Australian census
- Tobacco abstinence
- Continued tobacco use

Years Postoperative

Intensive Antihypertensive Therapy in PAD: The ABCD Trial

Moderate treatment: n = 227
Intensive treatment: n = 227
*enalapril or nisoldipine

Effects of Exercise Training on Claudication

Meta-analysis of 21 Studies

Change in Treadmill Walking Distance (%)

- Onset of Claudication Pain
- Maximal Claudication Pain

Exercise Training
Control

* P < 0.05

How can I reduce my risk for P.A.D.?

- Don’t smoke/quit smoking.
- If you have diabetes, high blood pressure, and/or high cholesterol, talk to your health care provider about how to manage your condition.
- Eat a healthy diet full of fruits, vegetables, and whole grains.
- Be active for 30 minutes a day.
To Learn More about P.A.D. Visit:

- P.A.D. Coalition
  www.PADCoalition.org

- Vascular Disease Foundation
  www.vdf.org

- Stay in Circulation
  www.aboutpad.org
Long-Term Survival in Patients With PAD

- Normal subjects
- Asymptomatic PAD
- Symptomatic PAD
- Severe symptomatic PAD

Key Points

- PAD is often underestimated, under-evaluated, and requires proper diagnosis:
  - ABI is a non-invasive, easily performed measurement that reliably predicts ischemic risk in PAD patients

- Symptoms of intermittent claudication (PAD) serves as an important marker for systemic atherosclerotic complications
Key Points

Atherosclerosis: Systemic Problem

- Aggressive management of modifiable risk factors is paramount in decreasing risk for atherothromboembolic complications

- Proactive and vigilant management of patients identified with PAD will significantly
  - decrease premature mortality & morbidity
  - increase the quality of life